

Electronic Commerce: Structures and Issues

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Abstract: Electronic commerce (E-commerce) is sharing business information, maintaining business relationships, and conducting business transactions by means of telecommunications networks. Traditional E-commerce, conducted with the use of information technologies centering on electronic data interchange (EDI) over proprietary value-added networks, is rapidly moving to the Internet. The Internet's World Wide Web has become the prime driver of contemporary E-commerce. This paper presents a hierarchical framework of E-commerce development, as well as of analysis, range from the wide-area telecommunications infrastructure to electronic marketplaces and electronic hierarchies enabled by E-commerce. Several nodal problems are discussed that will define future development in E-commerce, including integrating electronic payment into the buying process, building a consumer marketplace, the governance of electronic business, and the new intermediation. The paper also introduces the *International Journal of Electronic Commerce*, which will provide an integrated view of the new E-commerce.

Key Words and Phrases: electronic commerce, electronic hierarchies, electronic markets, information infrastructure, new intermediation, World Wide Web.

Introduction: From the Traditional to the Web-Driven Electronic Commerce

As electronic commerce approaches the end of its beginning, and as it is redefined by the dynamics of the Internet, it is time to take stock and to look forward. This paper shall discuss a hierarchical framework for electronic commerce within which the mutually reinforcing changes in business practices and in the underlying information technologies are surveyed analytically. Indeed, this is the role of the *International Journal of Electronic Commerce*, which is being introduced with this article, both to analyze the fundamental change and to extend the practice.

Electronic commerce (E-commerce) is the sharing of business information, maintaining business relationships, and conducting business transactions by means of telecommunications networks. In today's business environment, where the operational boundaries between firms have become fluid, it is often both pragmatically and analytically unfruitful to separate interorganizational and intraorganizational business processes. Therefore, as understood here, E-commerce includes the sell-buy relationships and transactions between companies, as well as the corporate processes that support the commerce within individual firms.

Electronic commerce is a new and certainly a trendy name, but the practice it denotes originated about a half-century ago in the Berlin airlift¹. This practice became electronic data interchange (EDI), the computer-to-computer exchange of standardized electronic transaction documents. Although what can now be called traditional E-commerce has not been limited to EDI and has included business practices built around computer-to-computer transmissions of a variety of message forms, bar codes, and files, the use of EDI has arguably led to the most significant organizational transformations and market initiatives (see, for example, [29]). Some well-known cases in point are Wal-Mart, Levi Strauss, General Motors, and other companies that have built new kinds of relationships with their suppliers and customers through electronic linkages. Electronic integration, supported by EDI and other information technologies, drastically reduces the time and space buffers that shelter a firm, but that also limit its competitive opportunities.

Electronic integration has led to dramatic shifts in the definition of a firm, with the emergence of virtual companies whose capabilities to deliver their products to the market are defined largely by their ability to organize and maintain a network of business relationships, rather than by their ability to manufacture a product or deliver a service. New business networks have been formed by relying on this form of integration (such as the local and global business communities' reliance on TradeNet in Singapore) and entire industries are being radically changed (U.S. grocery retailing is an excellent example). To understand an individual firm, it is necessary to study the business networks in which it is embedded [31].

The arrival of the commercial use of the Internet, driven by its World Wide Web subset, has been defining the new E-commerce since 1993². E-commerce is now emerging from the convergence of several major information technologies and business practices. Among the principal technologies directly enabling modern E-commerce are: computer networking and telecommunications; client/server computing; multimedia (and hypermedia in particular); information retrieval systems; electronic data interchange (EDI); message handling and workflow management systems; groupware and electronic meeting systems; and public-key cryptography. In a broader sense, all the major computer and telecommunications technologies, and database management in particular, undergird E-commerce. The set of technologies driving E-commerce is embodied (for a want of a better word) today in the Internet. This conglomerate is a transformational technology [18] that has challenged old assumptions and helped shape new workplaces, organizations, and markets.

It would be entirely wrong to interpret E-commerce as a purely technological development. This way of doing business can be understood as the deployment of information technologies together with the organizational and management advances that pull the technology and are pushed by it in turn. Team-centered work organization with international teams working around the clock if desired, telework, moving products and operations to virtual value chains, demassing the firm by building it around core competencies, and transnational organizations are some of these advances. In Schumpeterian creative destruction, the use of transformational technologies challenges preexisting ways of doing business, of collaborating, and of competing. In a wider realm, the underlying technology of global, accessible, and nonproprietary connectivity changes many aspects of our life in the public and private domains.

This paper first presents a systematic view of the organization of the complex enterprise of E-commerce within a hierarchical framework, extending from the networking infrastructure to global marketplaces. It then lays out some of the nodal problems of E-commerce practice and research, relating them to this framework, and it concludes by introducing the *International Journal of Electronic Commerce* as the first scholarly journal devoted to the integrated study of E-commerce.

The Framework of Electronic Commerce

The established way both to analyze and to develop very complex systems, such as that of E-commerce, is to visualize them as a hierarchical structure comprised of several levels, with each of the lower levels delivering a well-defined functional support to the higher levels. Such a hierarchy is shown in Table 1 (a part of which has been modified from [30]).

Level	Function	Examples
	Products and Structures	
7	Electronic marketplaces and electronic hierarchies	Electronic auctions, brokerages, dealerships, and direct-search markets Interorganizational supply-chain management
6	Products and systems	Depots consumer services (shopping, banking, stock

6	Products and systems	Remote consumer services (shopping, banking, stock brokerage) Infotainment-on-demand (fee-based content sites, educational offerings) Supplier-consumer linkages On-line marketing Electronic benefit systems Intranet-based collaboration systems
Services		
5	Enabling services	Electronic catalogs/directories, smart agents E-money, digital authentication services Digital libraries, copyright- protection services Traffic auditing Smart-card systems
4	Secure messaging	EDI, E-mail, EFT
Infrastructure		
3	Hypermedia/multimedia object management	World Wide Web with Java
2	Public and private communication utilities	Internet and value-added networks (VANs)
1	Wide-area telecommunications infrastructure	Guided- and wireless-media networks

Table 1. The hierarchical framework of electronic commerce

The framework recognizes that E-commerce consists of three meta-levels:

- Infrastructure: the hardware, software, databases, and telecommunications that together deliver such functionality as the World Wide Web over the Internet, or support EDI and other forms of messaging over the Internet or over value-added networks;
- Services: messaging and a variety of services enabling the finding and delivery (on business terms, if desired) of information, as well as negotiation, transacting business, and settlement;
- Products and structures: direct provision of commercial services to consumers and business partners, intraorganizational information sharing and collaboration, and organization of electronic markets and supply chains.

The individual levels that constitute these three meta-levels are now discussed, followed later by an examination of the issues engendered by their functions.

Technological Infrastructure

The first three levels of the hierarchical framework form the technological infrastructure of E-commerce. This foundation is the intermeshed network of wide-area telecommunications networks, extended by the metropolitan and local-area nets. Deploying both guided (such as fiber-optic and coaxial cable) and wireless transmission media (such as satellite microwave and radio) under computerized control, these networks span the globe. Thus, E-commerce is inherently global. Yet, there are, and will continue to be, major differences in national and regional development of infrastructure, as well as in the national governance of telecommunications, with government monopolies in a number of countries limiting development and imposing high telecommunications costs. In Europe and, to a degree, in Latin America, a movement toward privatization has produced, or is expected to produce, beneficial effects on prices and services. In salutary cases of government intervention, such as that of Singapore, national development programs support the development of E-commerce.

Telecommunications capabilities are delivered for business use through two essential means. The older order is that of proprietary value-added networks (VANs), established by vendors to deliver services over and above those of common carriers that are licensed by governments to provide communications services to the public. The new order is that of the Internet, which has become the principal vehicle of E-commerce. The history of the almost organic emergence of today's Internet from its U.S. Department of Defense-sponsored origins as a network for research support is well known. The salient features, conditioned by the development path of this *de facto* global information infrastructure are: easy and relatively inexpensive public access; absence of centralized control and consequent organic growth combined with limited security, reliability, and bandwidth; reliance on an open and simple packet-switching protocol suite (TCP/IP), and thus ease of linking additional networks with routers, with standardization managed by the Internet Society and its subsidiary bodies, such as the Internet Architecture Board.

The Internet has become the driver for E-commerce thanks to the invention of the World Wide Web as a principal means of sharing information. The Web has turned the Internet into a global, distributed, and hyperlinked multimedia database. By relying on the client/server architecture, the Web further builds on the decentralized model of the Internet. It is easy to join and it is easy to organize an information space for a small or a very large group. Internet communities can carve out the space that suits their purposes [53]. The Web can serve as a medium for presentation, distribution, and use-based sale of passive or active (in the sense of software) information objects³. Specialized platform-independent programming languages, such as Java, help make the electronic pages of the Web a source of active software objects.

Services: Enablers of Interpersonal Communication and Commerce

The meta-level of services consists of provision of secure messaging and of enabling services for E-commerce. Taken together, these services provide the business infrastructure for E-commerce.

Secure messaging for business-transaction processing has to feature the following attributes: confidentiality (generally accomplished through encryption, but secure key logistics remain a problem even in the public-key systems); message integrity (achieved with hash totals or similar tokens accompanying the message); authentication of both parties (generally via a digital signature and possession of a private key); and nonrepudiation by either party (achieved through a combination of the means mentioned before). Some transactions require additional attributes; thus, generation of electronic cash requires anonymity of the receiving party (accomplished with a blinding factor during the encryption). A number of secure protocols are being actively considered [7], with security, and especially perceived security, remaining a fundamental obstacle to E-commerce. In particular, by making it necessary to separate the settlement from the informational steps in an acquisition, the security concern is perhaps the most serious obstacle to consumer-oriented E-commerce.

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The principal messaging services include EDI, electronic funds transfer (EFT), and E-mail, voice messaging and telefacsimile are also available. The basic motivation for implementing EDI is economy. Corporations spend an average of \$150 to process a paper order, but only about \$25 to process an electronic order [58]. Beyond economy, companies seek strategic benefits, such as a compressed business cycle and intensified relationships with business partners. Time-based competitive moves of quick-response retailing by "pulling in" demanded products from the supply chain and just-in-time manufacturing with close-to-zero inventories are enabled by EDI.

Traditional EDI relies largely on the hub-and-spoke model, with a dominant business partner (the hub) gradually surrounding itself with the spokes of its supplier, customer, and collaborator firms. This form of EDI is still largely VAN-based, with proprietary standards and relatively high costs of bundled-in services. While industry standards have emerged in such segments as groceries or railroads, the international EDIFACT standard has met with only limited adoption. At this time, many leading companies are moving their EDI communications to the Internet, seeking the benefits of lower costs and seamless global connectivity [1]. This move will have important consequences for industries and entire economies, even more so when combined with a semantically enriched open-EDI. Such open-EDI will offer public international standards for common business scenarios. The objective is to interact spontaneously with a new trading partner, without a prior agreement on a common protocol of interaction. Global business-to-business E-commerce is expected to benefit hugely by moving forward from the simple transaction sets of the traditional EDI, which are basically electronic equivalents of paper forms, to far more elaborate and customizable open-EDI business scenarios [33].

Another form of messaging is a special type of secure EDI used in electronic funds transfer systems (EFTS) that enable interbank funds transfers in the form of information. Electronic mail (E-mail) has become a ubiquitous means of communication, often with profound organizational effects⁴. E-mail remains the most popular use of the Internet. It may be expected to remain such as it incorporates the transmission of multimedia documents and combines with other services, such as negotiation tools and smart software agents.

The most turbulent technological and entrepreneurial activity is taking place at the level of enabling services. These services facilitate searches for business information as well as for business partners, negotiating and maintaining a business relationship, as well as consummating business transactions by financial settlements. This E-commerce level includes (or will include) digital libraries [20], electronic catalogs and directories, smart agents helping to seek out a desired good or service, electronic authentication services helping to establish the bona fides of a partner, copyright-protection services (possibly relying on digital watermarks), traffic auditing to establish the worth of an electronic site for advertising purposes (still the dominant revenue source for most of the sites that do have revenue), and a variety of other services that are being invented even as you read this.

The development of electronic money (E-money) is the subject of a lot of work and popular excitement. Called reengineering of money by some [12], it may be expected to further limit the role of cash in the economy. E-money in its various forms is expected to become a substitute for credit (e.g., credit cards) and debit instruments (e.g., checks or debit cards), or for banknotes and coins, which offer anonymity to the owner (within certain legal limits in the United States) at the considerable expense of handling to the commercial organizations. At present, the money supply of the United States surpasses \$4 trillion, but only one-tenth of that \$400 billion exists in the physical form of bills and coins. Moreover, two-thirds of even that amount has been taken out of circulation, largely in the form of \$100 bills, by various agents (many of them abroad) with little interest in banking [22]. Thus, most of the currency extant today in the United States and other developed countries already exists only as a magnetized domain in the secondary storage of a computer system. Many agents beyond buyers and sellers have a vested interest in the development of E-money, including the vendors of the new instruments, but also the banks of issue, regulators, and agencies entrusted with national security and law enforcement.

Products and Structures of Electronic Commerce

Products and structures of E-commerce cover its three categories: consumer-oriented commerce, business-to-business commerce, and intraorganizational business. All three are experiencing vigorous developments, albeit with differing economic outcomes at this time.

The most highly touted applications of E-commerce are consumer-oriented. They include remote (or home) shopping, banking, and stock brokerage, accompanied by (and, in most cases so far, paid for by) on-line advertising. The audience for this market has not reached a critical mass, although its immense potential is driving much of the interest in E-commerce, as expressed, for example, by the stock-market capitalization of a number of companies that intend to provide services for it. The fact that the relatively successful vendors are so well known is a testimony to their dearth. These vendors include Virtual Vineyards, a storefront-free supplier of wines and gourmet foods, and Amazon.com, a bookseller with a huge virtual inventory, a large following, and, as yet, no profits. A number of smaller traditional vendors derive incremental revenues from E-commerce. For a chance of success in this marketplace, the firm must identify an actual customer need and the firm's relationship with the customer must build on the key feature of the medium, namely interactivity [27].

The other principal consumer-oriented segment is "infotainment-on-demand." This segment builds on the Web as a new communication medium whose nature is still being explored. Infotainment ranges from education, through the delivery of specialized information, to entertainment. Many educational offerings can respond to just-in-time, specialized requirements. Some of the educational programs and courses may be expected to bear appropriate accreditation and degrees; virtual universities are being formed [16]. The segment also includes "webzines" (such as *HotWired* and *Slate*), electronic newspapers and books, and access to analytical reports, expert opinions, and to the experts themselves. Legitimization of expertise, packaging of knowledge and information from several sources, preservation of intellectual property, and use-based payments (including micropayments for chunks of information) are issues to be resolved through further research and development. The entertainment side, overlapping with the informational one, includes several categories of webzines and electronic books, as well as video-on-demand, virtual-reality experiences on demand, and games that can provide an engrossing and continuing experience to multiple players. The consumer-oriented category is expected to expand in many ways, only some of which can be predicted. For example, electronic benefit systems can be used to distribute government transfers over the Internet, which can then be employed for direct payments; a variety of electronic interactions with "live" creators of infotainment may be expected to complement their creations.

The business-to-business supplier-customer linkages maintained with EDI are the best-established category of E-commerce application. U.S. companies are currently estimated to buy \$500 billion worth of goods electronically each year [58]. This category is likely to expand very significantly with the new E-commerce, leading in many cases to interorganizational supply-chain management (discussed below). Business-to-business commerce is facilitated by consortia such as CommerceNet and by firms that organize industrial marketplaces on the Web, such as Industry.Net. Business-to-business and consumer-oriented marketing is one of the most important areas of E-commerce.

The fastest-growing area on this level of E-commerce is intranet-based information sharing and collaboration. Intranets support the opening of the organizational databases and data warehouses, as well as geography-independent team-oriented collaboration within the corporate firewalls. A typical intranet employed by Morgan Stanley displays on the globally accessible Web site automatically generated up-to-the-minute data summarizing the company's investment positions. This is the solution of the business problem the firm had long grappled with unsuccessfully by other means [54]. More active uses of intranets are being developed, including on-line collaboration on common projects via electronic documents and videoconferencing. Thus, Ford Motor Company has used an intranet to link its design centers in the United States, Asia, and Europe, enabling engineers to develop on-line electronic prototypes of automobiles and components. By including a rich variety of non-numeric information, the intranets can also be expected to become a new form of support for organizational memory [55].

At the apex of the E-commerce framework are the electronic marketplaces and electronic hierarchies that facilitate business relationships and transactions between firms. Electronic marketplaces are created to facilitate transactions over telecommunications networks between multiple buyers and multiple

between firms. Electronic marketplaces are created to facilitate transactions over telecommunications networks between multiple buyers and multiple suppliers. Electronic hierarchies are long-lasting supplier-customer relationships between firms, maintained with telecommunications networks and coordinated largely by management, rather than by market forces.

Market-based coordination can be classified into four categories (as in [21]): direct-search markets (where the future partners seek out one another), brokered markets (with the brokers assuming the search function), dealer markets (with the dealers holding inventories against which they buy and sell), and the auction markets. Industry.Net is an example of an established direct-search market for industrial products; Onsale Inc. provides an electronic auction market [47]. Lee and Clark [32] offer several further examples of the electronic brokerage and auction marketplaces.

The formation of interorganizational electronic hierarchies is being supported by the fashioning of integrated supply chains, promoting just-in-time manufacturing, pulled by the actual customer orders. The partners' value chains are integrated to a significant extent with the use of information systems and telecommunications networks. The visibility of stocking levels throughout the supply chain helps to minimize inventories and to reduce working capital. This mode of operation imposes tight constraints on intra- and interorganizational coordination, in which both the intranets and the Internet may be expected to play a significant role. Indeed, the reliance by both on the same fundamental technology package is vital for integration.

The hierarchies of individual firms and the open marketplaces may be interpreted as the two ends of a continuum of business governance, with electronic hierarchies situated in the middle. As the next section elaborates, the spreading of the new E-commerce will alter comparative advantage between hierarchy-based and market-based coordination, and among the various ways of structuring the market. Many and serious questions about the effects of E-commerce on business governance remain open.

The Problematic of Electronic Commerce

The business, societal, and research problematic of E-commerce spans an immense range, which reflects the depth of change caused by this rapidly expanding mode of doing business (any business, including those of governing and educating). It is, of course, possible here to point only to some nodal issues within the hierarchical framework we have discussed. The role of the *International Journal of Electronic Commerce* is to address the problems that emerge at the intersection of business and policy with information technology from an analytical perspective. This discussion of the issues of E-commerce shall move up the hierarchy of Table 1 from the infrastructure to the business governance.

Limitations and Asymmetries of Infrastructure

Although we should be wary of a technology-centered, "field-of-dreams" view of success factors, an appropriate infrastructure is necessary for the development of E-commerce. The infrastructure of the Internet, the current equivalent of a global information infrastructure, has acknowledged problems. The issues hinge on the provision of sufficient bandwidth for the surging use that is also moving to multimedia transmissions, and on the problems fostered by the Internet's decentralized nature. The provision of sufficient bandwidth of the telecommunication infrastructure is considered a serious limitation by many (although not all see [49]). The current Internet 2.0 backbone operates at 45-155 megabits per second, enabling the World Wide Web [5], but not sufficient for the massive use of video-on-demand, for example. The poor performance experienced by users, however, often stems from the equipment limitations as well as from the connectivity limitations of their access providers, rather than from the limited backbone bandwidth. Significant asymmetries exist between the bandwidth actually available to the larger organizations and that available to small businesses and homes (where the consumers are). Solving the last problem, known as the "last mile problem" or "fiber to the home," outside urban centers by using the existing technology is prohibitively expensive. The issues pale in comparison with the fact that the fifty least developed countries currently run only twenty-three Internet host machines [41], out of a total of about 9.5 million hosts around the world counted in January 1996 [34].

Marketplace solutions, in some cases stimulated by government intervention, are in view in the developed and rapidly developing countries. A number of U.S. corporations are acquiring the requisite bandwidth on parallel for-profit networks with premium high-bandwidth links, as well as accessing commercial duplicate Web sites [15]. The trend, which splits the issue of public access from the open systems, may be expected to expand. The future development of the multimedia Internet 3.0 backbone that would be able to carry data, video, and voice communications simultaneously is a wide-open issue. Aside from financial risk and technological problems, public policy questions of access are sure to arise. Regulatory changes may be expected to attempt to facilitate funding, and the necessary expertise has to be provided for the regulation.

A number of limitations are apparent on the Web level of the infrastructure, and they do translate into business problems. Many of the integration solutions are provided by middleware that is, systems placed between the client and the server software. Because of the sessionless nature of the hypertext transfer protocol (HTTP), you need to identify yourself to every electronic site during a single session in order to do business. There is no built-in way to establish who is calling the site and perhaps make the caller another offer next time he or she dials in. This limitation clearly highlights the business effects of the technological limitations and their unintended consequences, which in this case is privacy. "Dropping a cookie" into a caller's system is a way to circumvent this limitation, but is highly invasive of the user's privacy.

Major infrastructural questions remain: Assuming that the Internet will further evolve into the global information infrastructure, will it remain fundamentally decentralized? How do we create a protected, secure business environment in a decentralized infrastructure? Is the limited bandwidth a real barrier for the consumer? What infrastructure can be provided to enhance the ability of vendors to differentiate their offerings and the ability of customers to compare them? ([4] is one such attempt.) Will an inexpensive network computer or a WebTV, marketed as a nonthreatening appliance, bring about a true consumer marketplace?

Integrating Electronic Payment into the Buying Process

The consumer should be able to pay for a purchase on the Web easily and with a of security. Although the overall shopping experience, product perceptions, and customer service on the Web today lead to significant dissatisfaction among potential customers [28] and require the attention of marketers and researchers, the problem of settlement is one problem that is capable of a systemic solution. As stated above, electronic equivalents of all the payment instruments in use today are appearing on the Web (see, for example, [42]).

The most excitement is occasioned by the development of electronic cash, the informational equivalent of physical banknotes and coins. Electronic cash can offer such benefits as buyer anonymity, global acceptance, and divisibility that can cost-effectively go beyond real cash in the case of so-called micropayments (such as paying \$0.025 for the one-time use of a software object). Widespread use of electronic cash would have serious implications for the national banking systems and the banks of issue⁶.

At this time, an electronic cash system (E-cash) is being implemented by Digicash (of Amsterdam) together with the Mark Twain Bank of Missouri (<http://www.digicash.com>); other banks have adopted a posture of watchful waiting, accompanied by internal research. A cash-like system relying on a smart card, Mondex, has been tested with mixed acceptance results in Swindon (United Kingdom) and will be introduced in the United States by AT&T and Wells Fargo & Company (<http://www.Mondex.com>). The NetCheque system developed at the Information Sciences Institute of the University of Southern California allows its registered users to "write" electronic checks (<http://nii-server.isi.edu/info/NetCheque>). On the other side of the issue are the financial intermediaries, such as First Virtual Holdings, which facilitate settlements for E-commerce transactions by external means, without the financial tokens (such as credit-card numbers or bank-account information) ever appearing on the Internet (<http://www.fv.com>). The proponents of this mode of operation consider

the Internet fundamentally insecure for financial transactions [8, 52]. At this time, the apparently prevalent opinion is that financial transactions on the Internet are no less secure from the consumer's point of view than today's "physical-world" transactions, with the admixture of fear that "a big hit from cyberspace" is possible because of the complexity and the distributed nature of the system.

Clearly, opinions and points of view are not enough. The issue of electronic banking calls for a great deal of research on the acceptability of various solutions to consumers, the apportioning of the risk, the institutional framework, the economic effects of electronic cash, and, certainly not least, making electronic settlement transactions secure.

Building a Consumer Marketplace

Some would argue that the main question of E-commerce today is how to convert Web-surfers from browsers into consumers by creating an encompassing market space for information, services, and goods. The statistics describing the phenomenal growth of the Internet (with an estimated 16.4 million users in the United States in the fall of 1995 [26]) and of its Web segment in particular (an estimated 11.5 million users) have to be counterbalanced by the statistics of actual consumer buying—approximately \$132 million in 1995 [37].

Shopping remains relatively uncommon as a principal motivator for Web use, and it is believed that ease of access should ultimately determine the success of Web shopping [24]. Poor consumer interface can be a potent disincentive. However, new ways to market have to take advantage of the new, interactive, marketing medium [6]. Multinational corporations may find themselves effectively challenged on the Web by small upstarts and need to review their business models [43]. A variety of the possible commercial sites for Web presence are analyzed by Hoffman et al. [27]; Web-enabled selling techniques are discussed by Gogan and Applegate [23]. Selling on the Web can tap into the well-formed and committed communities of interest and provide on-line demonstration, consultation, and assistance. Yet, the nature of many electronic communities is antithetical to commerce and a pull-model of doing business has to be built. A number of firms are being formed to market information-based products, such as software, over the Internet (for example, Cybermedia, TestDrive, and Tuneup.com); the software-over-the-Web market alone is projected by Forrester Research to reach a volume of \$750 million in 1999 [58].

An emblematic experience of a small merchant on the Web is that of GolfWeb, based in Cupertino, California [11]. GolfWeb has painstakingly built up a following on its electronic site before trying to sell anything. By providing extensive golf-related features and information, GolfWeb has been able to attract some 500,000 hits a day to its 25,000 pages. Until recently, the firm has relied on advertisers for its revenue; it has just started a virtual pro shop to produce sales. The firm treats the Web as a new medium by providing such interactive features as virtual equipment fitting for customers. Yet, questions remain: Will smaller firms, encountering a relatively low entry threshold (\$1.7 million of venture capital in the case of GolfWeb), make money on the Web? Will the business model such as that of GolfWeb ultimately lead to profits? What are the successful business models for the Internet? And how do we measure what is actually happening on the Internet? (See, for example, [26].)

Moving Supply Chains and Products into the Market Space

It is recognized that networked infrastructure offers new opportunities for adding value by moving the stages of corporate value chains into the realm of information processing, saving money and time in the process [45]. We are witnessing the virtualization of value-chain segments, and, in the future, perhaps also of an increasing number of products. Business processes can be moved into the virtual, informational value chains, be they paperless transaction processing or electronic prototyping (with the development of the Boeing 777 aircraft a well-known example). As they move from the purely informational to collaborative use, corporate intranets can serve as vehicles for these virtual elements of value chains. Corporate intranets are being opened to business partners, suppliers, and customers [39]. In the future, they can become secured extensions of the Internet in interorganizational market space networks.

Many questions regarding the relative economic efficiency of the physical-versus-virtual organization of work and product delivery need to be formulated and researched. What goods and services can be converted to information that can be moved around and traded over the electronic marketplace? Rayport and Sviokla offer an example of the answering machine [46]. Cash is another example of a good (albeit a special kind of good) that can be virtualized; videocassettes are another such good, and retail services are already delivered over the Web instead of physical stores (e.g., by Virtual Vineyards). Moreover, many personal computers may be converted to appropriate over-the-network services. After all, a network computer—the appliance whose concept is promoted, for example, by Oracle Corporation—will be such an attempt.

Business Governance

Our understanding of a firm as a monolith has been problematized by Coase's milestone paper [14]. Transaction cost economics that arose from this work helps us see the boundary of the firm as defined by the equilibrium between the advantages of the lower transaction costs of internal production, on the one hand, and the lower agency costs (such as the costs of management) and economies of scale and scope of outside procurement, on the other [60]. In other words, the costs of conducting marketplace transactions namely, information seeking, negotiating the terms, and settlement—define to a large extent what a firm will buy, instead of making it. Since these coordination costs are lowered in E-commerce, a general agreement exists (following the analysis in [35]) that more outsourcing buying rather than making in-house will take place. There is considerable evidence that the use of information technologies is indeed associated with the emergence small firms as the result of outsourcing of noncore activities [9]. Will the Internet reaffirm and amplify this trend? Will the Internet become an equalizer that will enhance the opportunities for smaller firms, and if so, to what extent?

Going beyond the "boundaries-of-the-firm" analysis, the electronic market hypothesis offered by Malone et al. [35] suggests that the development of interorganizational systems based on telecommunications networks will move governance toward the market end of the spectrum, with increased transaction-oriented buying from multiple suppliers. Yet the "move-to-the middle" hypothesis of Clemons et al. [13] postulates that outsourcing will go only as far as long-term collaboration with a limited number of suppliers. Likewise, Bakos and Brynjolfsson [3] argue that the consideration of coordination costs needs to be combined with incentives for noncontractible investments, which suppliers need to make to maintain a relationship with a buyer. These relationship-specific investments have to be made to ensure, for example, the appropriate quality control, the implementation of information-sharing systems, and the modification of business processes. This consideration leads the authors to postulate the "move to the middle" as well.

The evidence available at this time tends to support the second hypothesis. For example, a study of loan-origination systems found no move to the market [25]. A study of the effects of the French Teletel system, whose Minitel terminals are a part of the landscape in that country (40 percent of the nonretired population has access), found stable customer-supplier relationships as a result [56]. However, the new E-commerce relies on tools that are radically different from, for example, the French Teletel (whose technology is outdated), and the developments surrounding the Internet (e.g., open-EDI) are certain to lead to further analyses of the issue.

Within market governance, profound changes can be expected. For example, global reach and the low access cost of the Internet can be expected to promote the growth of auction markets⁶. Electronic auction companies that are able to tap into an enthusiastic user community, such as Onsale Inc., which sells on-line overstocked and refurbished PC products and consumer electronics, are almost instantaneously successful [47]. This naturally leads to the next question: Will there be a role for business intermediaries in a business world where the ultimate agents—the buyer and the seller—can seek each other out, negotiate the terms, and settle the trade over the Internet or a similar global open network?

New Intermediation

It is commonly argued that the greater reliance on telecommunications networks for doing business will lead to disintermediation—the disappearing role of an intermediary, such as a dealer or a broker. Indeed, perceptible pressure can be felt on the role of car dealers, for example [40]; likewise, new electronic commodity and stock exchanges can be created, squeezing out trade intermediaries. Powerful social and organizational barriers feeling counteract many of these developments [32]. Beyond that, intermediaries play an important economic role in business exchanges by limiting the risk to the trading parties and by creating economies of scale and scope. It may even be argued that their role will be reinforced in E-commerce [48].

New types of intermediaries can become valuable. They can facilitate product search, evaluation, and distribution in the form of virtual malls or on-line auctioneers. Buyer search costs are an important factor in market behavior and in allocation efficiency [2], and intermediation may be necessary for products of more complex description. New intermediaries can provide packaging and enhancement of information-based goods, for example, by delivering customized targeted multimedia information packages, with use-based payments to the holders of intellectual property rights, and with the access to the authors as a premium service. Suppliers receive the efficiency of a single payment; customers save on search costs and get a more focused and comprehensive product. Intermediaries can track the copyrights and licensing payments, for example, enforcing site-license agreements. If, in the future, persistent software copies will not need to be made for many products (they will simply be downloaded for each use), appropriate billing can be provided by an intermediary. Intermediaries can also handle support services and updating of information-based products. At the same time, those traditional publishers and resellers of information-based products that cease to provide value in the new constellation may indeed be made obsolete. The revenue stream extracted by the new intermediary will depend on the value added, which may be hypothesized to correlate with the level in the framework of Table 1 at which the intermediary operates⁷.

An excellent example of a territory being carved out by a new intermediary is Healthon, a company recently formed by Jim Clark, the founder of Silicon Graphics and Netscape Communications [19]. Healthon expects to sell its services to insurers and health maintenance organizations, which will use the firm's software to present their own services to employers and to register their employees. The firm will also provide health-plan management for these employers. It will use the Web as the platform for its operations. Health plans representing eight million customers have already been signed.

Multiple questions present themselves: How can traditional intermediaries become new intermediaries? What will be the categories and the role of the new intermediaries? How will the profits and welfare be redistributed among the parties in the business transactions? How will the supply chains of industrial segments change?

The International Journal of Electronic Commerce

As one may readily conclude from the above discussion, the study of E-commerce has to span a wide range of disciplines. The *International Journal of Electronic Commerce* is the first scholarly publication entirely devoted to E-commerce and will provide an integrated view of its subject. Contributions from the vantage point of management information systems, marketing, management and organizational studies, computer science, economics, legal studies, sociology, and other disciplines will be at home on these pages. Both practitioners and researchers will benefit from these multiple perspectives. Papers reporting empirical results, interpretive works, as well as discussions of paradigmatic designs will be published in the journal. We intend to study E-commerce and to help it realize its promise.

The present issue of the journal is opened by a special section that illustrates the diversity of E-commerce research with three papers selected from the many presentations made at the annual conference on E-commerce held in Bled, Slovenia. Over the years, this pioneering conference has been able to attract diverse and important work on the subject. Introduced by guest editors Roger Clarke and Joze Gricar, the papers in the special section concentrate on the meta-level of services of the hierarchical framework of Table 1. Their authors show, respectively, how to model the procedures of open-EDI, how to organize a semantically rich business directory, and how to rigorously assess the benefits of EDI investments.

In the first paper of the general section, Sirkka L. Jarvenpaa and Blake Ives mine a rich theoretical base to offer lessons for the introduction of transformational technologies that can be learned from the implementation of the World Wide Web in two major organizations. The propositions they develop are instructive for those who wish to exploit organizationally the commercial potential of the Web and are important for further theory building in the area of information technology implementation.

In the following article, Ho Geun Lee and Theodore H. Clark analyze more closely the top level of our framework, specifically concentrating on the dynamics of the introduction of electronic brokerages and electronic auctions. Using a rich set of examples, the authors employ an argument based on transaction cost economics, yet also show how a variety of extraeconomic barriers can lead to failure in the introduction of electronic markets.

The papers to appear in forthcoming issues investigate, among other subjects, electronic payments systems, the Web as a consumer marketplace, a rational-choice model for network crime prevention, developing a marketplace for quantitative knowledge, and the design of artificial negotiation agents.

Conclusion

Over time, new E-commerce will present countless opportunities and challenges to our economies and societies. Expansion of commerce and technological innovations are two of the levers of economic growth [38]. These forces are combined in the progress of E-commerce. The macroeconomic effects of E-commerce on the national and regional economies, and on international trade and its terms, will need to be assessed and analyzed. The traditional institutions, such as banks of issue, commercial banks, universities, established business intermediaries, the media, and publishing companies, will find it necessary to redefine their roles in the new environment. Intellectual property that can be converted to on-line content may find itself revaluated in the global marketplace⁸. Traditional distinctions, such as those between a publisher and a reader, may be redrawn.

The tension between the transactional efficiency of spot purchasing facilitated by electronic markets and the need for long-term relationships of trust and forbearance, enabled by electronic hierarchies, will persist and call for much study. The geographical limitations that have bound the place of residence to the place of work—already eroded by the growth of telework—may be expected to be even less binding. Indeed, the possibilities of the loss of rural space to the new ex-urbanites are already causing environmental alarms [51]. The new working arrangements will be studied from multiple perspectives.

The protean capacity of the global information infrastructure serving as a communication medium and as a powerful business tool has yet to be understood. What are the possible business consequences of rapid social amplification of news, as in the case of the flawed Pentium chip in the fall of 1994? What is the value of the information that is there for the taking and yet whose source may or may not be tainted? What laws are binding on those acting in cyberspace? All of these issues will require further experience, observation, analysis, and research.

Although it is impossible to encompass the extraordinarily rich domain of E-commerce in a single issue of the journal, we expect to come close to this within its first annual volume. Like any journal, the *International Journal of Electronic Commerce* will depend on the cooperation of its readers, contributors, referees, and the Editorial Board.

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Notes

1. A fascinating story of the EDI technology emerging from the airlift organized to supply Berlin when the city was blockaded by the Soviet Union in 1948 is told in [50].
2. The World Wide Web, which has brought people to the Internet, was devised by Tim Berners-Lee in 1989 as a collaborative means for the physicists working on the projects of the international research center CERN. However, it is actually the first popular Web browser, NCSA Mosaic (originally designed by Marc Andreessen, not much later a founder of Netscape) that began to bring people to the Web in the spring of 1993. That year can serve as the beginning point of the new E-commerce.
3. To some, the Web is the embodiment of such visions as Vannevar Bush's memex, or, very far beyond that, when taken with the humanity using it in the future, Pierre Teilhard de Chardin's noosphere (a collective mind, the thinking layer of the biosphere), or Vladimir Vernadsky's ultimate holistic interactions of the spheres of existence and consciousness. The visionary statements are [10, 57, 59].
4. According to John Gage, the director of the science office of Sun Microsystems: "Your E-mail flow determines whether you're really part of the organization; the mailing lists you're on say a lot about the power you have. I've been part of the Java group at Sun for four or five years. Recently, by mistake, someone removed my name from the Java E-mail list. My flow of information just stopped and I stopped being part of the organization, no matter what the org chart said. ... The best way to understand what's happening in a company is to get its alias file-the master list of all its E-mail lists" (from an interview with John Gage in [44]).
5. In November 1995, I was queried quite extensively on the issue by the head of the central bank of one of the smaller countries of the European Union, who appeared to have been highly sensitized to the problem.
6. An interesting system that shows the potential of almost frictionless auction markets has been developed at Xerox Corporation. The system auctions off cool or hot air in a building to the individual rooms. Software agents track the temperature in the rooms and bid accordingly for heating or cooling. The system holds about 1,500 auctions a day, more than one a minute. The "market-based" system was found to distribute warm and cool air throughout the building better than traditional, "hierarchical" systems [36].
7. Here is an example of a trajectory to the new intermediation. Andrew Klein, founder and president of Spring Street Brewing Company, was the first to complete the initial public offering (IPO) of his company's stock on the Internet, disintermediating the investment bankers. He has now launched WIT Capital Corporation, an investment bank that will specialize in Internet IPOs. He justifies the need for the new intermediation thus: "There is a tremendous amount of risk that [an Internet IPO] won't work" [17]. One can speculate that by moving the function of IPO from the top level in Table 1 to level 5, he will be able to extract a smaller surplus than the traditional intermediaries.
8. It is a claim of Esther Dyson, a well-known analyst of the information industry and society, that the market value of the intellectual property will be eroded with the expansion of the Web (expressed, for example, in an interview in *The New York Times Magazine*, July 7, 1996). A different claim may be made: With the advent of electronic payment schemes (including micropayments) and copyright protection techniques, the global penetration of the new medium can polarize the content providers into the winners of new riches and those drawing no attention.

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