Business Models for Internet-Based B2B Electronic Markets

Qizhi Dai and Robert J. Kauffman

ABSTRACT: Information technology (IT) has long been applied to support exchanges of goods, services, and information between organizations. With the advent of Internet-based business-to-business (B2B) electronic markets, however, real opportunities for online transactions have opened up. This paper develops an extended framework for studying business models of B2B electronic markets in terms of their roles and functions. Synthesizing prior research on electronic markets, interorganizational information systems, and adoption of network technologies, we reveal that B2B electronic markets offer basic market functions, as some researchers have indicated, and that the current functionality base for electronic markets is beginning to emphasize other capabilities that aim to satisfy management information and risk-management needs and enable technological adaptation and systems integration. The analytic framework is applied to a systematic study and classification of representative electronic markets to make sense of the landscape of the emerging on-line B2B marketplaces. Several potential impacts and characteristic development trends are identified, along with a variety of opportunities that B2B e-markets can exploit to create competitive advantage. The extension of prior evaluative frameworks builds a strong foundation that managers can rely upon to enhance their understanding of future developments in this arena.

KEY WORDS AND PHRASES: B2B e-commerce, buyer-supplier relationships, electronic markets, interorganizational information systems, procurement, supply chain management, technology adapters.

The application of Internet technologies to interfirm transactions has led to the amazing growth of Internet-based business-to-business (B2B) electronic markets and on-line B2B sales. In the United States, for example, B2B transactions in 1999 generated US$56.8 billion, accounting for 70 percent of total Internet economy revenues [33]. Worldwide, according to the Gartner Group, the value of B2B Internet commerce sales transactions surpassed $433 billion in 2000, a 189 percent increase over 1999 sales transactions [36]. With more corporate procurement completed on-line every month, the number of virtual marketplaces in the United States soared from 300 in June 1999 to more than 1,000 in the year 2000, although far fewer are in operation today [25]. Electronic markets are operating in a variety of industries, including industrial metals, chemicals, energy supplies, food and grain, construction, and auto-

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mobiles. Industrial materials and maintenance, repair, and operating (MRO) supplies can also be transacted on-line (e.g., FreeMarkets, www.freemarkets.com and FindMRO.com, www.findmro.com). Indeed, as illustrated in Table 1 by examples from several industries, services as well as goods are being procured via electronic markets on the Internet.

Since the introduction of Internet technologies for commercial use, however, Internet-based B2B e-commerce has experienced a dramatic change, from the emerging phase, through the peak of market interest in mid-1999 through late 2000, to today’s shakeout. According to a research report from Deloitte Research, only about 400 of today’s more than 1,500 e-marketplaces are likely to succeed over the next three to four years [20]. Observing and experiencing the dramatic changes in the arena of B2B e-commerce, both academic researchers and Internet market makers are wondering what B2B business models will lead to lasting success in the digital economy.

To understand the various B2B business models, it is necessary to investigate the roles and functions that B2B electronic markets play in interfirm value chains. The roles of the business actors are basic elements of the business models that one observes in the e-commerce marketplace [43]. Since it is through their various functions that B2B e-markets bring value to their customers and generate revenue for themselves, a major objective of this paper is to identify and characterize the roles and functions of B2B e-markets through the analytical lens of a theory-based framework.

Basically, as illustrated in Figure 1, B2B e-markets function as electronic hubs that bring together a large number of buyers and sellers and automate business transactions [30]. Although buyer-side e-procurement systems and seller-side catalog management systems are also opening on-line markets for interfirm transactions, the present discussion will focus on B2B electronic markets operated by intermediaries. First of all, B2B electronic markets are markets whose central role is to facilitate product and information exchange, and to support the all-in process of business transactions from initial contacts and negotiation to settlement [5]. Such marketplaces are digital intermediaries focusing on industry verticals or specific business functions [30]. With electronic catalogs, electronic auctions, and other capabilities supported by the new electronic markets, buyers can do one-stop comparison shopping for thousands of suppliers and select the best source in real time.

A second aspect to bear in mind is that a B2B e-market is an interorganizational information system (IOS) in the sense that Internet technologies are employed to store and exchange information between business partners, following the definition of IOS proposed by Cash and Konsynski [11]. As an ongoing and forward-looking example of an innovative application of IOS concepts, B2B e-markets will play an important role in the management of interorganizational relationships and business processes. According to various authors, an IOS can enable innovative interorganizational business processes accompanying its implementation [17, 18, 44, 45]. For example, in the grocery industry, Clark and Lee find that the deployment of an IOS leads to the implementation of continuous replenishment processes (CRP), an innovative ordering approach adopted by retailers and their suppliers [18]. The use of CRP programs results in a higher level of interorganizational coordination and interdependency. It
is through business process innovation that firms can reap exceptional business value from IOS adoption.

Underlying these business and management functions is the technology infrastructure that supports an electronic trading network connecting firms running various back-end systems. B2B e-markets differ from the traditional IOS in that they are built on open network infrastructures and connect firms that employ different information systems for their procurement/distribution activities. The process of network technology adoption predicts that in the presence of network effects, new technology providers need to enable connectivity with old technologies and other networks so as to survive and prosper [23, 31].

Recognizing that B2B e-markets function as digital intermediaries and innovative interorganizational systems built on open network technologies, the

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*CheMatch.com was acquired by ChemConnect in January 2002.
present study draws on prior conceptual and empirical research on information systems (IS) to categorize and analyze the roles and functions of current B2B e-markets. Although previous IS researchers emphasized the impact of information technology (IT) and the benefits for firms that adopt it, their work provides a solid basis for evaluating and characterizing the business models of B2B e-markets. More important, the functions and services that prevail or emerge in the arena of B2B e-markets are viewed as the result of the efforts of Internet market makers to increase value to adopting firms and to meet the various needs and value expectations of adopting firms. Stating this another way, the business models of B2B e-markets are ultimately determined by how well they can satisfy firms’ needs, how much potential value they offer, and how much realized value they can deliver to adopting firms. Therefore, this paper investigates the roles and functions of B2B electronic markets from the perspective of adopting firms. The conceptual and theoretical background is derived from prior IS research on IT impacts and business value for firms.

Theoretical Background

Research on information technology and its impacts provides a rich resource for studying the various business models of B2B electronic markets and the dynamics of organizational adoption of electronic markets. The analysis in this paper is based on previous research in the economics of electronic markets and intermediation, interorganizational relationships and business processes, and the adoption of network technologies.

Intermediation and Electronic Markets

By bringing buyers and sellers together on-line, electronic markets play the role of digital intermediaries [2, 5]. For example, demand and supply information can be aggregated and disseminated, and buyers and sellers can be matched in electronic markets, just as an expert nontechnological intermediary would be able to do. To do so, markets aggregate suppliers’ product offerings, and help buyers to search for desired products and discover attractive prices. After buyers and sellers agree on a deal, facilitating mechanisms for transaction settlement can also be provided so that logistics and payment can be arranged. Moreover, industry-specific expertise is an important capability that electronic market intermediaries are able to leverage. This important factor has enabled traditional intermediaries to reintermediate, or recapture, market share in electronic commerce [14]. When the business process or the product-selection procedure is complex, expert advice can save buyer time and effort that would otherwise be spent on purchasing. Thus, one would expect both market facilitation and expert services to become integral parts of the offerings associated with the new electronic market business models of the World Wide Web.

In today’s electronic markets, information technology has been leveraged to perform the above market functions more efficiently and effectively. More than a decade ago, Malone, Yates, and Benjamin formulated the electronic
markets hypothesis, which predicted that electronic markets would become the favored mechanisms for coordinating material and information flows among organizations in the presence of electronic communication technologies [35]. The basic argument is that IT reduces the coordination costs between firms involved in supplier selection, price discovery, delivery scheduling, and other activities associated with business transactions, enabling buyers to compare purchase alternatives at lower search costs and to transact with business partners more efficiently. In the presence of lower search costs, buyers tend to search for more information through the vast product offerings made available by the extensive connectivity of IT, and thus drive average seller prices down [5]. This is what has been going on in the Internet-based markets for books and music CDs, where retail prices show greater dispersion in on-line stores than in brick-and-mortar stores, even if they are not always lower [9]. The benefit for buyers is that they can consider more alternatives, so that the quality of the selected alternative improves while the costs of the product selection process decrease [5].

With the introduction of Internet-based electronic markets, buyers are able to use the electronic communication and information-sharing capabilities of the World Wide Web to more quickly and conveniently screen suppliers and product offers [6]. As a result—and as the theorists predicted—it now takes less time and effort than ever before to search for prices and product information when shopping in electronic markets. This means that the role of B2B electronic markets as digital intermediaries has been enhanced by Internet technologies.

**Buyer-Supplier Relationships**

Although information technology enables firms to do business with more sellers, interorganizational information systems do not necessarily create unbiased electronic markets where firms source their procurement from many participants in the markets. For instance, Hess and Kemerer showed that in the home mortgage industry, computerized loan-origination systems failed to develop into electronic markets as predicted by the electronic markets hypothesis [26]. Among the possible reasons, one explanation is the need for a limited number of suppliers to maintain suppliers’ incentives to participate in a trading network. Analytical models of the adoption and growth of IOS networks demonstrate that suppliers face negative network externality effects while the buyer obtains most of the benefits [42, 47]. That is, marginal returns to suppliers decrease as a supplier is added to the network, and so the buyer needs to provide suppliers with incentives to participate. This leads to an equilibrium whereby only some suppliers participate in the IOS network.

Furthermore, as network size increases, the *ex post* bargaining power of each individual firm in the network decreases, and, in turn, individual incentives to make noncontractible investments also decrease [5, 41]. However, for buyer-supplier transactions it is difficult and, quite realistically, may be impossible to contract for *all* of the efforts that a supplier must make in such a relationship. To encourage the supplier to maintain the appropriate incentives to make such *relationship-specific investments* for technological innova-
tion and quality improvement, the buyer will tend to keep its supplier network smaller than what might otherwise be predicted, in a marketplace with greatly reduced search costs.

Clemons, Reddi, and Row proposed another view of the impact of IT on interfirm relationships: the move-to-the-middle hypothesis [19]. They argued that, on the one hand, as IT increases information availability and processing capacity, coordination costs, operations risk, and opportunism risk are all reduced. As a result, the need for ownership is reduced, which leads to more outsourcing. On the other hand, reducing transaction costs will lead to more explicit coordination, which generates highly integrated interorganizational relationships involving significant investments in human relationships and organizational processes. Since there are setup costs for establishing integrated buyer-supplier relationships, buyers seeking to safeguard these relationship-specific investments and to achieve economies of scale in transacting will prefer to develop partnerships with a small supplier group [21]. In addition, increasing the level of explicit coordination will increase product differentiation, which, in turn, will increase search costs and thus decrease the benefits of search among a large number of suppliers. Combining these factors with the need to give suppliers incentives for making noncontractible investments, Clemons, Reddi, and Row concluded that firms will prefer to develop long-term value-adding partnerships with a small group of suppliers [19].

As shown in prior research, firms adopting IOS take account of the effect on interorganizational relationships. For this reason, one may argue that consideration of buyer-supplier relationships will also influence the functions that B2B e-markets offer when these market makers try to accommodate firms’ requirements in retaining preferred interorganizational relationships.

**IOS-Related Business Process Innovations**

Empirical research has found evidence that implementing an interorganizational information system significantly improves the efficiency of supply procurement processes. For example, Mukhopadhyay, Kekre, and Kalathur report on the effects of Chrysler Corporation’s adoption of electronic data interchange (EDI) systems [37]. Their results show that the firm obtains approximately $100 in savings per vehicle, attributable solely to electronic document preparation and better information exchange. Similarly, Choudhury, Hartzel, and Konsynski show that electronic markets in the aircraft parts industry can improve purchasing efficiency for airlines [16]. Recent research also shows that Internet technologies enable companies to reorganize their procurement processes to maximize the benefits from adopting innovative IT via lower administrative costs, shorter order-processing time, and fewer off-contract buys [24].

Moreover, as most senior managers know, the greatest leverage for strategic business value that IT can provide often comes through the creation of business process innovations [46]. When the implementation of an IOS is accompanied by transformations in intra- and interorganizational business processes, participants will obtain higher returns than they would from just automating document exchange. Integrating an organization’s EDI systems
with its internal business functions streamlines the workflow, improving operational efficiency and effectiveness [44, 45]. In fact, the lack of EDI integration often leads adopting firms to perceive only limited benefits from EDI implementation [27].

Beyond improving internal operations, interorganizational information systems can also improve the performance of the value chain by transforming interorganizational business processes. The key features of these innovative interfirm processes are increased interdependence and expanded coordination between participating organizations enabled by information technology. For example, in the retail industry, electronic data interchange systems are deployed to create a continuous replenishment process between manufacturers and retailers. This process is made possible by the increased coordination and interdependence that EDI systems promote, often resulting in 50 percent to 100 percent higher inventory turns than were achieved before the deployment of continuous replenishment [17, 18]. Similar interorganizational coupling also occurs in other industries. For example, in the airlines industry, Japan Airlines leverages EDI and computerized reservation systems to improve the extent of collaboration with firms along its value chain [12]. In the automotive industry, Honda and its suppliers exchange strategic information, such as detailed computer-aided design drawings, via EDI systems [13]. This practice has become crucial for minimizing time-to-market in new product development.

These research results prove that information technologies can streamline and transform business processes, and they imply that B2B electronic markets, as an innovative application of Internet technologies, will also be leveraged to facilitate business processes along industry value chains.

**Adoption of Network Technologies**

Electronic markets have evolved as new channels for corporate purchasing. They provide open transaction networks where a large number of potential buyers and sellers are able to participate, unhampered by restrictions of time and space. For a buyer, the more suppliers there are in an electronic market, the more purchase alternatives it can consider, and the more benefits it can extract from the low operating and search costs made possible by Internet technologies. For a supplier, the more buyers there are in an e-market, the more reach its products achieve, and thus the better is its chance of increasing sales. On this basis, one may argue that the organizational adoption of electronic markets must take account of the network externalities that a particular solution offers. As used here, network externalities refer to the installed base effect of buyer and supplier participants, which together enable the market to achieve its presence and size to enhance transactability and liquidity. Clearly, the larger the installed base of participants (i.e., buyers from the seller’s point of view, and sellers, from the buyer’s point of view), the greater will be the business value of an electronic market solution.

To increase the size of its market, an electronic market maker typically aims to connect many players that employ different technologies in their procurement activities. When firms consider adopting any new technology in the presence of network effects, the compatibility of the new technology with the older
technologies that form the current core of the industry’s solutions will typically determine the success of the new technology. Only with such considerations made will the new technology generate the demand-side economies of scale necessary for it to succeed in the marketplace [23, 31]. When the incompatibility is anticipated, potential adopters may not choose the new technology, even if the total benefits of the new technology are greater than those of old, because they may not be able to link with the established pool of users of the old technologies [22]. By the same token, compatibility between the networks will boost adoption. For example, Kauffman and Wang, in their study on the adoption of national-level electronic banking networks, showed that both of the shared networks, CIRRUS and PLUS, enjoyed significant growth even when they were competing in a market with somewhat limited growth potential [32]. This occurred even after the networks became compatible with each other, and when the individual networks had long been viable on their own.

Two mechanisms can be used to achieve compatibility: standardization and adaptation [23, 31]. Standardization requires that all technologies follow the same specifications so that components of various implementations of the adopted solutions are interchangeable. When standards for electronic procurement are adopted, the users of one system can communicate directly with the users of other systems, saving the cost of keeping two systems up-to-date, but enjoying the benefits of network effects. The primary drawback of standardization is the reduction of variety that might be desirable in the presence of heterogeneous preferences for e-procurement. Adaptation occurs when “adapters” or “converters” are attached to the components of a system. By enabling a system to interface with systems employing other technologies, this would result in at least partial compatibility.

Since many senior IS managers perceive Internet-based B2B markets as new forms of information technology that support corporate purchasing, B2B markets need to be compatible, to the greatest possible extent, with existing technologies and other trading networks if they are to have a reasonable chance of being widely adopted in the marketplace. They must be especially compatible with traditional interorganizational information systems, such as EDI systems. This is particularly important for firms that already have, and would like to retain, electronic linkages with their suppliers. Therefore, one would expect electronic markets to provide functions ensuring that they will be compatible with traditional IOSs and other electronic market–based networks.

**Analytic Framework**

Previous research on information technology has revealed that electronic markets fulfill a variety of functions, and similarly that a number of factors influence the adoption of ITs, especially network technologies. Although most researchers have investigated one or another aspect of electronic markets or interorganizational information systems, Internet-based B2B e-markets, built upon sophisticated information processing and networking technologies, are able to support the development of full-fledged virtual marketplaces and distribution channels. Therefore, it is only by bringing together different per-
spectives from research on electronic markets and IOS that one can identify the roles and functions of B2B e-markets. Based on previous research on electronic markets and IOS, a framework is proposed here for analyzing the B2B electronic markets that have been developed to appropriate the communication and operating efficiencies enabled by Internet technologies (see Figure 2).

**Framework Elements: Market Functions, Management Needs, and Technological Adaptation**

As Bakos stated, the central role of markets is to facilitate the exchange of information, goods, services, and payments [5]. These basic market functions are also a necessary part of B2B electronic markets. But, in addition to buying and selling, interfirm interactions usually involve other dimensions that may affect company performance in the long run. As a result, in making sourcing decisions via on-line markets, managers also consider the set of factors that belong to the management needs portion of the proposed framework. The capability that IT provides for networking business partners becomes more prominent when the marketplaces are formed on top of the Internet and the World Wide Web. How B2B e-markets act to expand their trading networks will be looked at through the lens of technology adaptation. But first it is necessary to explain the specific functions used for these three elements.

B2B e-markets are developed to support the whole transaction process by electronic means, including information search, price discovery, and transaction settlement. Through aggregation, B2B e-markets compile product information from many suppliers so that buyers can do one-stop shopping on the Internet [2]. In the context of B2B e-commerce, electronic cataloging is the common mechanism that e-markets use to aggregate supplier offerings. When a market for a good or a service is uncertain, B2B e-markets provide mechanisms to find buyers for sellers and suppliers for buyers, matching what is wanted with what is offered in the market. In on-line B2B markets, this matching is implemented through dynamic trading processes, or electronic auctions. While aggregation and matching enable firms to identify products and discover prices, B2B e-markets also provide facilitation services that help firms
to close interfirm transactions. Financial services and logistics arrangements are two of the most important facilitation functions that are activated once buyer and seller agree on a deal. In short, aggregation, matching, and facilitation constitute the basic market functions of B2B electronic markets.

Second, the information processing and storage capacities of B2B e-markets, along with their communication networks, are leveraged to satisfy management needs in business transactions. Procurement knowledge is derived from the vast quantity of data generated from on-line transactions as firms analyze purchase patterns. In addition, product information and purchase expertise can be made available for better sourcing decisions. Such procurement expertise and knowledge greatly help management in strategic sourcing activities. B2B e-markets also offer platforms to streamline workflow and promote interorganizational collaboration, supporting business process management. The major function of B2B e-markets in workflow management is to automate certain business activities. B2B e-markets also enhance communication and coordination among multiple parties sharing common resources in collaborative project management. In addition, B2B e-markets can be built for collaborative supply chain management by coordinating demand forecasting and production scheduling in real time. On-line market makers do not simply construct marketplaces for conducting transactions, but also offer mechanisms to accommodate firms’ requirements for maintaining preferred business partnerships. They provide private trading mechanisms, allowing firms to transact with preferred business partners, which are favored when the goal is to strengthen strategic buyer-supplier relationships.

Finally, B2B e-markets extend the connectivity of their trading networks via systems integration, the implementation of technical standards, and IT outsourcing services. Since they are built with Internet technologies, B2B e-markets are able to create value for buyers and sellers by opening up more trading opportunities and by connecting more business partners within marketplaces. To attract companies to join the networks, Internet market makers provide solutions that integrate member firms’ back-end enterprise systems with the marketplaces they wish to trade in so that the benefits of participation increase. For the same reason, they also integrate with third-party business service providers, such as financial institutions, which offer options to close on-line business transactions. Technical standardization is another mechanism for enhancing the connectivity of a network technology, and it also helps system integration in this case. Relying on industry-specific Extensible Markup Language (XML) standards, for example, many B2B e-markets standardize the data formats used in exchanging business documents. Also based on XML standards, B2B e-markets can implement common business processes among trading partners. To help member firms to overcome some of the adoption hurdles resulting from technical complexities, B2B e-markets also provide IT outsourcing services in terms of systems analysis and implementation.

**Relationships Among the Three Elements**

If one recognizes that B2B e-markets are based on Internet technologies, it is easy to see that the role of B2B e-markets as technology adapters provides a
foundation for enabling fulfillment of both the market functions and the management needs that were described above. For example, B2B e-markets leverage Internet networking infrastructures to link business partners at reasonably low cost. They use Web browsers to offer easy-to-use interfaces for searching for products and placing orders, XML protocols to transmit business documents, and Web commerce servers to host applications for business transactions. IT systems in general, and Internet technologies in particular, can electronically implement functions for commerce because of their information processing and networking capabilities. The point here is how the technology can be fully exploited to enable innovations in the ways firms do business on-line. Interconnectivity and interoperability are the keys, since compatibility between different technologies is essential in the adoption of network technologies. Therefore, the ability of B2B e-markets to integrate the systems of different players with their marketplaces, to standardize data formats and business processes, and to provide IT outsourcing services will affect the size, efficiency, and effectiveness of the trading networks, which, in turn, will determine the value added to the bottom lines of member firms.

As needs for collaborative interorganizational relationships and business processes increase, the task of technology adaptation becomes more challenging. For example, collaborative supply chain management requires highly integrated business processes and information exchange among trading partners that are enabled by industry-wide standards. To tackle such challenges, new forms of industrial organization are emerging. An instance is the formation of industry-sponsored e-markets that are working to implement industry-specific standards that will promote interorganizational collaboration through the Internet. For example, GlobalNetXchange (www.gnx.com), a truly global electronic marketplace in the retail industry, was initiated and sponsored by some of the world’s largest retailers, including Sears, Roebuck and Co., Carrefour SA, Coles Myers, and Kroger Co., and the technology and services providers, Oracle, Inc., and PriceWaterhouseCoopers. At the same time, independent Internet markets are building partnerships with third-party system integrators and including systems implementation consulting in their services. Such partnerships sometimes lead to mergers and acquisitions between companies with complementary skills, services, and products.

Thus, technology infrastructures are the underlying base from which B2B market makers launch a whole range of business functions. Figure 2 (see above) offers an overall representation of these ideas. As it illustrates, B2B e-markets provide technology infrastructures and business functions that support, not only basic market functions, but management requirements for interorganizational relationships and business processes.

**Analysis of B2B Electronic Markets**

The roles and functions of current B2B electronic markets will now be categorized and studied in accordance with the proposed analytic framework. A set of on-line B2B marketplaces has been selected to showcase the various services they offer in performing the functions suggested by the analysis.
**Data Sources and Research Methods**

The first stage of the research reported in this paper consisted of compiling a list of B2B electronic markets from trade journal publications (e.g., *Business 2.0* and *InformationWeek*), and an on-line content portal, Net Market Makers (www.nmm.com) owned by Jupiter Media Metrix, which lists B2B e-markets in a range of industries. These on-line marketplaces were then studied by analyzing the information posted on their corporate Web sites and available in articles about them in trade journal publications. With information on company history, products, solutions, and services, as well as press releases as the main focus of attention, a set of representative B2B e-markets was selected that showcased common practices or offered emerging value-added services in on-line marketplaces. The selected B2B e-markets were then subjected to in-depth analyses of their functions based on the proposed framework.

During the process of data collection, the content and delivery of products and services in the business models of B2B e-markets were continually changing. The dynamics in the arena of B2B e-commerce are such that some of the B2B services and transacting mechanisms evaluated in this paper may still be in the early stages of their life-cycle. As a result, some still need to prove their viability in the marketplace. Notwithstanding these factors, the analytic framework presented here provides a basis for categorizing B2B e-markets. It also sheds light on future development trends and business opportunities of B2B e-markets, as will be discussed at the end of this paper.

Overall, the game plan in this section is to describe and identify the solutions and services of B2B electronic markets from the press releases and trade journal publications. These offerings will also be evaluated and analyzed based on the prior research that underlies the analytic framework. The major functions provided by current B2B e-markets, summarized in Table 2, will be discussed in detail using representative B2B electronic markets.

**Basic Market Functions: Aggregation**

In the context of B2B e-commerce, the traditional role of markets in aggregation is realized as one-stop shopping [2]. That is, electronic markets compile and integrate product offerings from different suppliers so that buyers can find various items from one on-line store. This function takes advantage of IT’s information processing and storage capabilities to greatly reduce search costs [4, 35]. Product offerings are most commonly aggregated by means of electronic cataloging, which presents a list of product specifications and prices for buyers. B2B electronic markets use two forms of e-cataloging.

**Public, Buyer-Neutral E-Cataloging**

Under the mechanism of public, buyer-neutral e-cataloging, on-line market makers publish the same product and price offerings to all potential buyers in the marketplaces. The offerings are not customized for any particular buyer. The major value of public e-cataloging comes from the reduction in the search costs buyers have to incur in finding needed products. Public e-cataloging is
desirable when the market is fragmented, demand has low predictability, and purchases are made on an infrequent basis, just as multilateral IOS is preferred in the aircraft parts industry in similar situations [15].

This is also true in the chemical reagent and biotechnology industries. In these industries, it is difficult for a supplier to have a complete inventory of every possible chemical reagent and item of lab equipment. On the other hand, research chemists and life scientists are likely to require particular products or instruments unpredictably and infrequently. As a result, buyers’ search costs are high, and suppliers struggle to target appropriate buyers. Electronic markets have emerged here to provide on-line catalogs. For example, SciQuest’s electronic marketplace (www.sciquest.com) provides on-line aggregated cata-

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<td>Role of technology adapters</td>
<td>System integrators</td>
<td>NewView Connect (previous E-Steel Connect from e-Steel)</td>
<td>Adoption of network technologies</td>
</tr>
<tr>
<td></td>
<td>Standards providers</td>
<td>Converge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outsourcing services</td>
<td>PurchasePro</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Summary of B2B Electronic Market Functions.
logs for products used by the pharmaceutical, chemical, and biotechnology industries. With its public e-cataloging mechanism, SciQuest simplifies the search and order processes for researchers and scientists.

**Private, Buyer-Specific E-Cataloging**

By using private e-cataloging, an on-line B2B market is able to present electronic catalogs with different sets of products and prices to different buyers. Buyers and suppliers usually have to establish contracts for the products in the catalogs before they set up an electronic linkage via a B2B e-market. As a result, buyers are able to preselect business partners and to develop prequalified supplier relationships. An instance of such a model is the cataloging mechanism adopted in MarketSite, Commerce One’s Internet marketplace (www.commerceone.com). For example, Schlumberger, Inc., a Texas-based oil exploration and technology services company, linked the internal e-procurement system through which it purchases office supplies with MarketSite. Now MarketSite customizes catalogs for Schlumberger with the prices and product offerings that the company prenegotiated with vendors [39].

Using private e-cataloging, buyers do not enjoy as much of a reduction in search costs as when they use public e-cataloging. Why, then, do B2B market makers offer such a trading mechanism? The reasons lie in the fact that private e-cataloging lets buyers retain preferred buyer-supplier relationships that have developed through long-term interactions. As discussed earlier in this paper, firms sometimes develop long-term relationships with their business partners involving noncontractible investments [7]. It is in order to accommodate the requirements for retaining such preferred relationships that B2B e-markets offer private, buyer-specific e-cataloging.

Private cataloging is favored in transactional purchasing, where the reason for joining on-line markets is to reduce operating costs. This will occur when purchases take place frequently and in large quantities. Price discovery and search for product information will not be the focus in such situations. For the same reason, supplier selection mostly occurs off-line, and buyers often have established long-term relationships with their suppliers. However, systems integration and connectivity with suppliers are necessary, since a firm can only minimize its operating costs by streamlining the whole purchasing process.

**Basic Market Functions: Matching**

The second major function of markets, matching supply and demand [6], is realized in B2B electronic markets by electronic auctions, which are basically dynamic trading processes or dynamic pricing markets. These processes enable firms to negotiate more efficiently when prices are uncertain and their advance information about product demand and pricing is imperfect. Several aspects of these processes are outlined below.

- The criteria for bidding include quality, delivery, warranty, and other dimensions, as well as price. All of these are specified in
requests to buy and offers to sell. Business is awarded not on a best-price basis, however, but on how the offers satisfy the various conditions.

- The bidding processes typically will allow for counteroffers to be made. Participants can withdraw, reject, counter, or accept offers. They are not required to accept the highest bid.

- As in on-line consumer markets, such as eBay (www.ebay.com) and Priceline (www.priceline.com), both ascending price auctions and reverse auctions are used in B2B electronic markets.

- Both public and private negotiation mechanisms can be found in B2B electronic markets.

Public Bidding Mechanisms

Since bids are open to all market participants, public bidding is efficient at enabling buyers to find suppliers and revealing the market value of products. This trading mechanism may be especially beneficial for buyers who are seeking hard-to-find products or wish to purchase products in small batches. For instance, buyers are sometimes able to find products that cannot be obtained via traditional mechanisms when suppliers wish to dispose of excess inventories. Public bidding mechanisms create great reach for a seller to potential buyers. As a result, they can maximize the likelihood of selling excess inventory.

FastParts.com (www.fastparts.com) is a good example of this. It features auctions of used and surplus electronic parts and components. FastParts.com serves the needs of procurement professionals who have to deal with two related challenges: carrying excess inventories related to canceled jobs, and facing inventory shortages for orders that were incorrectly forecasted. Auctions on the FastParts.com market are open to all member firms, and a firm can be both a buyer and a seller.

Private Negotiation Mechanisms

As in the case of private e-cataloging, private negotiation mechanisms in online marketplaces enable firms to preselect participants for their bids. Auctions are used as market mechanisms for awarding business within a group of prequalified suppliers. In these cases, firms benefit by being able to maintain privacy while negotiating deals electronically with various partners. The motivation for providing such mechanisms is the same as for private e-cataloging, that is, to accommodate firms’ requirements for maintaining preferred buyer-supplier relationships.

Private negotiation mechanisms typically are adopted for purchasing direct products in large quantities, such as steel products and bulk chemicals. Since products of this kind are usually of great strategic significance to the buyer, supplier reliability and qualification are a major concern, possibly even more of a concern than achieving the lowest price. Buyers usually identify
qualified suppliers based on their previous purchasing experiences, and they attempt to maintain these established buyer-supplier relationships. Private negotiation helps them to achieve this objective by rewarding a few preselected suppliers with their business, while also enabling them to benefit from the low search costs afforded by the electronic market.

A useful illustration is the private negotiation mechanism adopted by e-STEEL Exchange (exchange.e-steel.com) from NewView Technologies, Inc. (www.newview.com), a portal for firms in the steel industry to exchange prime and nonprime steel products. In this on-line market, member firms making buy inquiries are allowed to specify, in accordance with their own perceived interests, the firms to which their inquiries will be sent. Once the inquiries and offers are submitted, a dynamic trading process begins. Buyers and sellers can track the responses to their inquiries and offers, make counteroffers, and carry out effective electronic negotiations. This model gives member firms a great deal of flexibility in choosing business partners, along with the transaction efficiency one would expect from an Internet-based marketplace.

**Basic Market Functions: Facilitation**

Transaction facilitation is one of the primary functions of markets, and settlement is also an indispensable step in corporate procurement [6, 24]. After buyers and sellers agree to transact via the Internet, they still need to arrange for payment and delivery, and may need other kinds of assistance along the way as well.

**Internet-Based Financial Services**

The earlier generation of B2B electronic markets focused mainly on identifying products and suppliers for buyers, but on-line financial settlement is rapidly catching up. Since financial services can only be provided by specialized institutions, B2B electronic markets are developing partnerships with financial service providers to offer these necessary services. Financial institutions, however, have to become more active in providing Internet-based real-time credit approvals and business payment services.

For example, Ariba, Inc. (www.ariba.com), a B2B electronic market platform provider, is partnering with American Express, an issuer of corporate credit cards, to fill the void in its on-line payment processing systems [28]. Ariba is already well known for its Ariba Marketplace, Ariba Buyer, and Ariba Supplier Network (see Figure 3). Ariba is also working with the Bank of America to develop a line of B2B on-line financial services that expand to include electronic invoicing, electronic payment capabilities, an automated clearinghouse, wire transfer, and foreign exchange services [38]. These B2B financial services are deployed on the Ariba B2B e-commerce platform.

Another interesting phenomenon is the emergence of independent players providing integrated financial services to on-line marketplaces and their members. Basically, these players are intermediaries between financial institutions and B2B e-markets, offering a full set of financial services parallel to the trans-
action cycle, including payment services and credit and risk management. They are usually backed by on-line financial providers. For example, TradeCard (www.tradecard.com) has set up an alliance with MasterCard so that it can support payment settlement for international trades.

Delivery and Logistics

Similar developments are taking place in the area of delivery and logistics. As an example of a vertical B2B electronic market forming partnerships with specialized service providers, one may cite the recently acquired CheMatch.com. This on-line market maker in the chemical industry partnered with Optimum Logistics (www.optimumlogistics.com), Elite International Transportation (www.eliteint.com), and Laycan (www.laycan.com) to enable its member firms to make logistical arrangements on-line. In addition, independent electronic markets dedicated to logistics have emerged, with their focus on ensuring the smooth flow of information among multiple players involved in the delivery process. For instance, both Optimum Logistics and Laycan operate independent on-line marketplaces in the transportation industry.

The independent on-line markets for logistical services, unlike the markets for financial services, also target shippers and transportation carriers as customers. Their niche in the landscape of B2B e-commerce is shaped by the complexity of the logistics processes and the concomitant requirement for efficient information flow among the many parties involved. For example, Optimum Logistics offers an Internet-based open logistical system called TransLink for bulk commodities like chemicals, vegetable oils, petroleum products, and other bulk liquids. Shipments of bulk commodities involve multiple players, from transportation and storage providers, to freight forwarders and surveyors, to customs agents and banks. It is important to have the right information delivered to the right person at the right time. This is where Optimum Logistics adds value to the bulk commodity transportation processes. It aggregates in-
formation from participants along the logistics value chain and delivers it to the appropriate parties. As a result, bulk shipping is streamlined, and the recipients are able to take action when a shipment is delayed.

**Management Needs: Procurement Expertise and Knowledge**

Some intermediaries enjoy the important competitive advantage of *expertise and knowledge* that helps them to choose the right products and make better sourcing decisions [14]. In the context of B2B electronic markets, some digital intermediaries offer similar solutions to add value to their marketplaces. B2B e-markets use three kinds of mechanisms to help firms make informed sourcing decisions.

First, some B2B e-markets provide tools and reports that leverage the large quantity of data generated from on-line transactions to analyze procurement costs and trends. For example, Instill Corporation (www.instill.com), an e-market for the food services industry, standardizes and integrates purchase data that enable buyers to understand how their expenses were allocated across different purchase areas. A similar business model has been adopted by RiverOne, Inc. (www.riverone.com, the result of a merger between Efinity.com and Need2Buy.com in November 2001), an electronics parts e-market, which has
developed a research center for a vast number of electronic parts and components. Using the firm’s on-line information resources, electrical engineers can view product specifications, learn how to use components, and compare alternatives across an aggregate catalog of some 7 million parts. This searchable library makes it easier for the buyer to find the right products, especially when product descriptions are complex. Consequently, the service benefits electronics engineers by reducing search costs. This ultimately will benefit the market makers by increasing users’ willingness to pay.

Third, the knowledge and expertise that guide purchase decisions from traditional intermediaries can also be made available through partnering and joint ventures. For example, Market Axess (www.marketaxess.com), a B2B electronic market specializing in global credit products, issuance of fixed-income securities, and securities trading, enables institutional investors to utilize the trading expertise and market insights of eight leading dealers in global securities trading and investments that have partnered to develop the marketplace. The participation of firms like ABN Amro, Bank of America Securities, Bear Stearns, Credit Suisse First Boston, Deutsche Bank, J.P. Morgan Chase, Lehman Brothers, and UBS Warburg creates an impression of critical mass in competency that cannot be disputed.

**Management Needs: Business Process Support**

As an innovative example of the application of IOS concepts, B2B e-markets not only support transactions of goods, but also promote information flows along the related business processes, enabling new levels of emphasis on collaboration between business partners via workflow management, project management, and supply chain management.

**Workflow Management**

The most basic function of information technology is to automate working processes [48], and EDI systems have improved efficiency by automating the ordering processes [37]. In light of this, it is reasonable to expect that B2B electronic markets will also be implemented to automate interorganizational processes.

In some industries, work processes are document-intensive or information-intensive and involve interactions among multiple players. Examples are the insurance and trade finance industries, and the mortgage market and credit services, among others. The complex interactions in these industries often result in process inefficiencies that are costly to providers and create an apparent lack of customer responsiveness. Enabled by the communication capabilities of the World Wide Web, B2B e-markets can provide leverage to improve workflow management. B2B e-markets that emphasize services in this area construct their business models around processes that can be streamlined using Internet technologies. For example, ChannelPoint.com (www.channelpoint.com) focuses on supporting core processes for insurance distribution and administration, connecting multiple carriers and distributors. Through ChannelPoint, insurance carriers and their agents can manage all
the activities entailed in processing a claim, including entering claims, ordering and tracking underwriting requirements, and tracking the status of claims and required actions.

Corporate printing is another area in which on-line markets have been developed to streamline the workflow. Firms always need to print product brochures, marketing sheets, catalogs, postcards, and so on, as a routine part of their marketing communications. The designs and contents of these documents change as product features and marketing requirements change, however. This creates a need for a good deal of information exchange between print buyers and suppliers. An especially unattractive part of the process is the inevitable spate of last-minute modifications and approvals that make the end-to-end process of commercial printing highly inefficient. By pushing the envelope on process innovations with respect to the usual business processes for corporate printing, B2B e-markets like PrintLYNXX (www.printlynxx.com) and PrintChannel.com (www.printchannel.com) integrate the processes of creating, editing, proofing, approving, and producing commercial documents. Documents can be uploaded and downloaded easily, and order status can be tracked on-line. The main value of on-line printing markets comes from facilitating the workflow between buyers and suppliers to greatly improve the efficiency of commercial printing channels.

**Collaborative Project Management**

In addition to streamlining workflows, information technology also reduces the costs of coordinating interdependent tasks among multiple players and encourages the use of coordination-intensive structures [34]. In the context of B2B e-commerce, Internet market makers can exploit the extensive reach and communication capabilities of the World Wide Web for cooperative activities. These on-line markets not only create open markets for transactions, but also provide platforms for communication and collaboration. Complex industry-specific business processes are optimized and embedded into the business models supported by such B2B e-markets. Unlike workflow management solutions that aim to automate tasks, current efforts that involve collaborative project management solutions emphasize the use of Internet technologies for informing multiple parties who share resources in a task or a process.

For instance, CollabNet (www.collab.net) provides a Web-based collaborative software development platform trademarked as SourceCast. It incorporates software project management functions, such as code versioning and automatic code-change notification. Other market makers emphasize the importance of collaboration end-to-end, through the whole business process. For example, Citadon, Inc. (www.citadon.com), focuses on supporting the lifecycle of a building construction project. To make this practical, the firm’s core products encapsulate a business process model that is commonly used in the building industry. Since collaboration and information exchange among participants are essential for accomplishing projects on schedule, Citadon also offers a collaborative project management platform that emphasizes the effectiveness of the project management process.
Supply Chain Management

Internet technologies can improve the efficiency of the supply chain links between buyers and sellers by synchronizing their planning and scheduling activities. Indeed, the extensive connectivity and communication capability of the Internet has made real-time, interactive collaboration an operational reality to a greater extent than ever before.

In their research on the implementation of electronic data interchange systems, Clark and Lee find that retailers and their suppliers engage in innovative inventory-management programs (e.g., continuous replenishment) that are enabled by IOS linkages \[17, 18\]. Similarly, in the area of B2B e-commerce, the retailing industry is constructing B2B electronic markets around innovative supply chain management processes. All three industry consortium–sponsored B2B electronic markets, Transora (www.transora.com), the World Wide Retail Exchange (www.worldwideretailexchange.org), and the Global Net Exchange (www.gnx.com), provide platforms for collaborative planning, forecasting, and replenishment. The capabilities of these consortia extend the current common practices of vendor-managed inventory and continuous-replenishment processes. Their technical platforms also permit suppliers and retailers to supplement their demand forecasting and replenishment scheduling capabilities to reduce inventory and increase sales, by using tools that are Web browser-based and delivered through the Internet.

A similar supply chain management process has been adopted by E2open.com (www.e2open.com), which offers an industry-sponsored B2B e-market in the high-tech and electronics industry. E2open.com enables original equipment manufacturers (OEMs), suppliers, distributors, and contract manufacturers to collaborate effectively through the entire product life-cycle because it replaces multiple linkages using incompatible technologies with a single open platform (see Figure 5).

At present, most of the B2B e-markets that provide supply chain management platforms are sponsored by industry consortia, such as the on-line markets in the retailing industry and E2open.com. This is so because putting such
processes into action requires sophisticated data-processing and network technology, as well as a common data model shared by trade partners. Independent Internet markets may not be able to enforce the adoption of a common data model on their member firms, and similarly may be unable to obtain the economies of scale enjoyed by industry-sponsored e-markets.

Role of Technology Adapters

All the business functions described above are built upon technology infrastructures enabled by the Internet. However, to turn their value propositions into reality, B2B electronic markets increasingly have become providers of systems integration, standards implementation, and technology solutions services to buyers and sellers. In short, they are playing the role of technology adapters that maintain and grow trading networks on the Internet.

System Integrators

There are two reasons why B2B electronic markets will offer system integration solutions and services, both of them motivated by the desire to increase the value of the marketplace to adopting member firms. First, as discussed above, greater access to business partners is a major benefit for firms joining an electronic market, and this requires that electronic markets maximize connectivity with other firms and other trading networks so as to appropriate positive network effects. System integration solutions represent an effort by B2B e-markets to enhance network connectivity. Second, system integration is mission-critical for achieving high performance in implementing an interorganizational information system [46]. Since B2B electronic markets are basically an innovative form of IOS, their value to participating member firms is related to the degree of integration between them and the member firms’ enterprise systems.

For these reasons, B2B market makers try to create a seamless end-to-end electronic trading channel to maximize the operational efficiency of member firms. Thus, NewView Technologies, Inc. (which, as noted above, was formerly known as e-STEEL, Inc.), has created a system integration solution called NewView Connect that can be deployed to set up a seamless connection between a firm’s back-end system and NewView’s Web-based systems.

As more business services (e.g., financial settlement) are brought to B2B e-markets, these services and their underlying systems will also need to be integrated with the B2B market platforms so that firms can not only initiate transactions on-line but also can complete them. Systems integration makes sense when a partnership is developed between an e-market and a business service provider. An example is CheMatch.com, the on-line bulk chemical market provider discussed earlier. The firm introduced financial services from First International Bank to complement its existing services. Under this alliance and prior to CheMatch.com’s acquisition by ChemConnect, transactions were to take place in CheMatch.com’s marketplace and be integrated with the bank’s on-line financing capabilities via Thru Credit, a proprietary solution for automating e-business financing [10].
Standards Providers

Standardization is an important mechanism for enhancing the compatibility and connectivity of network technologies, which in turn increase the value of networks to adopters [31]. This gives a reason to believe that B2B electronic markets will advocate and implement standards that make the connections between heterogeneous systems as smooth as possible.

Standardization occurs at two levels. First, data models and formats need to be standardized to make information sharing easier. In recent years, XML has become the de facto standard for interfirm transactions because of its ability to convey semantic meaning in business documents. As a result, many B2B e-markets are implementing XML specifications to enable computer-to-computer communication with member firms based on a common data format. For example, NewView Connect, provided by NewView Technologies, Inc., uses the latest XML technology to transmit data securely on the Internet in order to synchronize with any legacy system, including enterprise systems, MRP systems, and intranet/extranet applications.

The second level of standardization takes place when a common protocol of business processes is applied. To effectively achieve supply chain collaboration, B2B e-markets need to provide trading partners with a common view of the processes of order fulfillment, demand forecasting, and production scheduling. The high-tech industry has been a pioneer in this arena with industry-sponsored B2B e-markets. One example is Converge.com (www.converge.com), which is committed to building its exchange and supply chain solutions on top of RosettaNet’s (www.rosettanet.org) e-business process protocol. The latter uses XML-based industry-specific standards for exchanging business information via the Internet.

B2B Electronic Market Outsourcing Vendors

Firms usually have to overcome high knowledge barriers in adopting information technology innovations and reaping value from implementing new ITs [1]. Such barriers limit the benefits firms can obtain from joining B2B e-markets and may translate into less willingness to participate. This constitutes a threat to the efforts of B2B electronic markets to expand their installed base to enjoy positive network effects. Therefore, to help member firms overcome such adoption hurdles, many B2B e-markets assume the role of a technology-outsourcing vendor.

They provide systems that enable buyers to automate purchasing processes, and enable suppliers to manage catalogs. In addition to implementing these systems, some B2B e-markets provide services that help member firms analyze systems integration requirements and formulate design specifications. For example, SciQuest offers a line of products to serve scientific research companies and their suppliers, ranging from buyers’ product-search and order-management tools, to supplier’s content and order-management tools, to systems implementation and integration services.

Although some B2B markets operate their own marketplaces, others provide technology platforms for other marketplaces. The latter are actually ap-
Application service providers (ASPs), which host other marketplaces on their servers. A typical example of an ASP in B2B e-commerce is PurchasePro (www.purchasepro.com), which offers private e-procurement systems for buyers, private virtual-distribution systems for sellers, and private e-marketplaces for market makers, all customized and hosted on PurchasePro’s servers.

Findings and Discussion

Internet-based e-markets are deployed where buyers and sellers exchange information and products using a matrix of transaction mechanisms. Along with these transaction mechanisms, B2B e-markets also provide services that facilitate transactions and manage business relationships and processes. The business models adopted by B2B e-markets vary, depending on the structure of the industry and market they serve, and the products they cover. The analysis, summarized above, of the offerings of representative B2B e-markets leads to several conclusions on the impacts and possible development trends of online marketplaces, and identified areas where future research questions can be asked. The general findings from this exploratory research will be presented next.

Finding 1: The private aggregating and matching networks observed on the Internet are not predicted by the theory of electronic markets.

In Internet-based electronic markets, the buyer’s job of identifying product and price information is made much easier and more efficient by the electronic communication effect and the electronic brokerage effect associated with the electronic markets hypothesis of Malone, Yates, and Benjamin [35]. The benefits of lower search costs and coordination costs will be amplified, reducing transaction costs overall, when there are more players in the market and buyers can transact with an extensive pool of suppliers. However, in some cases, buyers would rather forgo some of the benefits engendered by extensive searches to engage in closer relationships with only a handful of suppliers. That is why private aggregating and matching mechanisms will also play a significant role in the mix.

The preceding analysis noted that a private aggregation approach, such as buyer-specific e-cataloging, is likely to be adopted for transactional purchases when prices are negotiated off-line with selected suppliers, and thus will be fixed in on-line purchasing. Even though operational efficiency is the major benefit accruing to firms that adopt such e-procurement systems, buyers will still expect a good deal of flexibility in choosing suppliers on-line, given the reach and range of electronic markets. A private matching approach, such as private negotiation, will be adopted for purchasing production inputs that are of significance to buyers. Buyers will reward a few preferred suppliers with their business by using reverse auctions and on-line negotiation mechanisms. Thus, buyer-supplier relationships will be taken into account even as the benefits of dynamic pricing on electronic markets are exploited.
Overall, the adoption of private transacting mechanisms indicates that interorganizational coordination mechanisms are not moving directly toward the kind of market that the electronic markets hypothesis predicts in the presence of information technology. Nor is the current outcome exactly what the positive externalities associated with open transacting networks should lead to, despite the impact of Internet-based systems in lowering coordination and search costs. Instead, firms in electronic markets are retaining their linkages with preferred suppliers while enhancing their flexibility in developing trade relationships with new suppliers. In reality, firms are more likely to use different transacting mechanisms to meet different purchase needs. This, in turn, is pushing market makers in the B2B arena to aggregate a matrix of trading mechanisms onto a single platform, forming all-in-one markets in which firms can shift between different transacting mechanisms to obtain transaction variety, transaction efficiency, and information access [29].

Finding 2: The need for streamlined on-line transaction settlement and logistics services will result in more alliances between market makers and specialized service providers, and in the emergence of new digital intermediaries fulfilling these services.

Corporate purchasing in the value cycle for electronic markets comprises three steps: information search, negotiation, and settlement and logistics [24]. Today’s electronic markets have developed a variety of models for searching and negotiation. But the last step—settlement and logistics—is just beginning to get the attention of Internet-based market makers.

The approaches of logistical and financial services providers to B2B markets were discussed briefly above. For example, Ariba B2B Commerce Platform offers on-line financial services through its partnerships with Bank of America and American Express. With the rapid growth of on-line purchasing, adopting firms will demand high levels of support for transaction settlement. Because the payment and delivery processes involved in corporate purchasing are so complex, specialized expertise is often required. As a result, more and more market makers are partnering with market-service providers (e.g., banks, telecommunications security specialists, and other networking-focused firms) to streamline transaction processes via the Internet. On the other hand, the need for transaction-settlement services opens an opportunity for banks and other market-service providers to catch up with the wave of B2B e-commerce. The future holds promise for strategic alliances between Internet market makers and specialized service providers.

For the same reason, Internet-based markets dedicated to financial and logistical services, such as Optimum Logistics and TradeCard, are emerging to close the loop in business-to-business transactions. Basically, these on-line markets are electronic intermediaries that exist in the second intermediation layer, that is, between other B2B markets and physical financial institutions or transportation carriers. Firms in the second intermediation layer often transform the competitive landscape in relevant industries and trigger an intermediation–disintermediation–reintermediation (IDR) cycle, as predicted by Chircu and Kauffman [14]. How the move toward reintermediation by traditional com-
petitors (in lieu of the dot-com startups that have entered this service arena) will evolve around such B2B e-markets is an interesting research question for future study. Also interesting is the impact of this round of the IDR cycle on strategies that other vertical B2B e-markets can adopt in offering on-line financial and logistics services. In the meantime, though, additional research on digital intermediation will provide insights for a better understanding of the market dynamics.

Finding 3: On-line B2B markets can differentiate themselves more effectively by providing valuable knowledge and expertise to customers, based on the structure of the industry in which they operate and the complexity of the products they cover.

The discussion earlier in this paper made the case that B2B electronic market providers can deliver procurement expertise to both buyers and sellers, increasing the effectiveness of new technological solutions and members’ willingness to pay for them. Because of their access to transaction data and their data processing capability, B2B markets can improve the sourcing decisions of member firms by conducting and reporting data analysis for them. Recall what Instill Corporation is doing for the food service companies that purchase through its on-line market. And, instead of helping just with ex post purchase analysis, other on-line markets, such as RiverOne, Inc., offer a knowledge base that helps buyers process product information prior to the actual purchase.

Among the different forms of procurement knowledge, B2B markets need to choose the one that fits the characteristics of the products transacted in their marketplaces. As the complexity of product descriptions increases transaction costs [35], a knowledge base of product specifications and usage will be valuable. Assisting firms by providing this kind of information technology support for complex products will reduce the load of information processing that buyers must bear. In contrast, if the procurement process is highly complex, then expertise for comparing alternatives and making choices among different products will prove to be valuable, as Chircu and Kauffman have shown for the managed corporate travel industry [14].

Since B2B e-markets stand as hubs along the virtual value chains through which buyers and sellers exchange purchasing information [40], they are able to help their clients to turn data into knowledge and thus add value to the transaction processes. While the different transacting mechanisms may be duplicated, the procurement expertise and knowledge can be unique and thus may be leveraged as a source of unique and inimitable competitive advantage for an Internet-based market. The point is to find out what knowledge is valuable to buyers and sellers, based on the industry’s structure and product characteristics. Future research should address the question of how differentiation can be generated by sharing expertise and knowledge.

Finding 4: By providing collaboration platforms based upon data and process standardization, B2B markets will foster a higher level of inter-organizational integration.
Internet-based electronic markets can create value by providing platforms on which activities are organized according to optimized workflow models suited to specific industries. The analysis of B2B e-markets in this paper shows that both project management and supply chain management can be enhanced with the better collaboration enabled by real-time information exchange via the Internet. In collaborative project management, multiple players can be brought onto a single platform to work from a shared view of project status and process. The example used earlier was on-line construction markets like Citadon, Inc. In the collaborative supply chain management supported by B2B e-markets like E2open (www.e2open.com), buyers and sellers can coordinate production planning and scheduling to achieve value chain optimization.

The key in bringing trading partners into the electronic collaboration process lies in having a common protocol and data model shared by all participants. Since this requires standardization of both communication protocols and data formatting, Internet-based collaborative e-business will evolve concomitantly with progress in the diffusion of e-business process standards.

At present, collaboration processes are supported by just a few electronic markets, but more and more B2B electronic markets will make collaboration processes an integral part of their business models in the future. Previous research in EDI systems has already shown that interfirm electronic connections enable interorganizational coupling, characterized by increased interdependency, expanded coordination, and interorganizational business processes reengineering [18]. Thus there is a reason to believe that the collaborative project management and supply chain management now being delivered via Internet-based B2B e-markets will provide a basis for further innovation in interorganizational business processes. More specifically, with real-time information exchange, shared data formats, and agreed-upon workflows, firms will inevitably increase the degree of their cross-business process integration, moving toward electronic hierarchies or private trading networks [35]. As interorganizational integration increases, trust between business partners will become a major concern because so much proprietary and strategic information will be shared. As a result, research on interorganizational trust will become even more important and will enhance our understanding of the effect of B2B e-markets on interactions among companies.

**Finding 5:** The network externalities associated with open B2B electronic markets will make it increasingly attractive for firms to consolidate their purchases of direct and indirect products.

In addition to deriving implications for trends in the development of B2B markets from the analysis summarized earlier in this paper, the discussion here also draws upon prior research in network technology adoption. Baily identifies five basic business purchasing requirements: merchandise for resale; parts and materials for production; maintenance, repair, and operating supplies; plant and equipment; and maintenance of equipment, cleaning, and similar services [3]. These can be grouped in two broad categories, based on the purpose of the purchases: direct products or production inputs, and indirect
products or operating inputs. Equipment, parts, and materials for manufacturing, for example, are direct products, whereas maintenance, repair, and operating supplies and services are indirect products. Present B2B electronic markets are focused either on direct products for a particular industry or on indirect products across industries [30]. The latest trend, however, is to enable purchasing companies to procure both production and operating supplies from the same e-market. This strategy brings more resources to the e-market, and also makes better use of the positive network externalities associated with open trading networks. The theory of positive network externalities creates a basis for this strategy. That is, the desire to expand installed base motivates complementary B2B e-markets to become compatible and connected with one another.

For example, the Ariba B2B Commerce Platform, the on-line MRO marketplace operated by e-procurement system provider Ariba, Inc., includes vertical Internet markets like SciQuest.com in its suppliers list. Buyers on the Ariba Commerce Platform are able to purchase life science reagents and instruments from SciQuest.com when they procure other operating supplies. In this way, both Ariba and SciQuest.com are able to expand the scope of their respective trading networks. Simultaneously, each can take advantage of what the other offers—the synergies arise from the fact that Ariba has more suppliers and SciQuest.com has more customers. As a result, because of the network externality effects, Ariba and SciQuest.com are both more valuable to potential adopters. In the competition among networks, adopting companies will choose markets that provide both operating and production supplies. Such electronic markets are destined to become larger and more important players on the Internet of the future.

Conclusion

This paper draws on theory from several academic literatures to develop an extended framework for studying business models of B2B electronic markets in terms of their roles and functions. Synthesizing prior research on electronic markets, interorganizational information systems, and adoption of network technologies, the framework reveals that B2B electronic markets offer basic market functions, satisfy management needs, and serve as technology adapters. The analytic framework is applied to a systematic study and classification of representative electronic markets to make sense of the landscape of the emerging on-line B2B marketplaces. The analysis finds that a variety of business models will continue to be viable in the marketplace, and will be adopted by firms with heterogeneous requirements. For example, firms use private trading mechanisms to retain preferred buyer-supplier relationships in parallel to the public transacting mechanisms used to drive down transaction costs. The study also identifies several potential impacts and developmental trends of B2B e-markets, and reveals opportunities for B2B e-markets to create competitive advantages. As a whole, a foundation has been built upon which an understanding of future developments in this arena can be obtained.

As an exploratory study, this paper aims to understand the current status
of B2B electronic markets. The exploration is limited to identifying the factors that characterize different business models, but offers brief overviews of the application contexts in which these business models function. The paper is also limited in that it does not consider issues related to industry structure and organization, and does not discuss the issue of trust in any detail. Future research by the authors will add these elements to the analytic framework, so as to further consolidate an understanding of the factors that can predict which business models are the most successful under different circumstances. This paper explored B2B electronic markets using data collected mainly from trade journal publications and press releases, and analyzed and evaluated their roles and functions based on prior research. The next step is to collect data for empirical testing of how the e-market functions identified in this paper are adopted, how adopting firms benefit from these offerings, and how both firms and market structures are changed by the implementation of B2B e-commerce solutions. In the future, additional research that combines theoretical and empirical analysis will shed light on the issues discussed here and provide guidance for business decision making relative to the adoption and deployment of B2B e-markets.

Overall, the present analysis indicates that B2B e-markets are still in their formative stages. However, there is no doubt about the value of these virtual markets and of the efficient, effective transacting mechanisms they provide, for buyers, sellers, and intermediaries. Quite clearly, the adoption of B2B e-markets ultimately will be of strategic significance to all market participants in the digital economy, even though a significant amount of change in industrial organization in the B2B services sector is likely to occur in the next few years.

NOTE

1. Whether they save money in the process, especially in the case of such popular retail market applications as airline tickets, rental cars, and hotel room reservation making, where price and flexibility comparisons are paramount, is another question. Intermediated solutions may still be more efficient. See Berghel for an interesting view on the inefficiencies of transacting on the World Wide Web [8].

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