

Electronic Trading Hubs: Review and Research Questions

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Abstract

This paper is a first attempt to describe and assess a new business phenomenon, namely electronic trading hubs. E-Hubs use computing power and World Wide Web technology to link producers, resellers, distributors and buyers together for transaction and other purposes. Significant numbers of E-Hubs have been developed and analysts are bullish about their future. The paper provides an outline of E-Hub developments and practices, and examines the implications of E-Hubs for business and scholarly research.

1. Introduction

A new species of company is exploding onto the scene—the B2B market maker. We believe that over the next five years, B2B market makers will cause profound change in the world economy and, possibly, create more than \$1 trillion in stock market value.”

The above quote is drawn from a recent report prepared by brokerage house Merrill Lynch (2000, p. 2). B2B market makers “act as intermediaries and transaction engines within large, established, often stagnant industrial industries [sic].” Others refer to these entities as “trading hubs,” “vortals,” “eMarketplaces” and “E-Hubs.” For the sake of brevity, we use the latter term in this paper. Many brokerage houses and research organizations have produced reports and analyses of E-Hubs in the past year. Although almost certainly over-hyped, these provide evidence of considerable activity and achievement in a short period of time, with the prospect of significant growth in the near future. For instance, it is expected that US B2B online trade will grow to \$1.5 trillion (Forrester Research 2000) and worldwide trade to \$2.5 trillion by 2003 (Merrill Lynch 2000). The latter study projects that E-Hubs could represent 15–20% of this total, with the remainder resulting from the enterprise portals of large companies such as Intel, Boeing, Dell and Federal Express (see below).

This paper provides a view of E-Hubs as they are today, as well as a look into the future. The recent nature of E-Hubs means that the literature is scattered and very much industry-based. Those who have a direct and immediate interest in E-Hubs are responsible for the great majority of analysis and writing. To date, few contributions have been made by academic researchers. Given the above situation, an attempt is made: (1) to draw these materials together, (2) to frame the topic in an academic manner, (3) to raise and comment on

a number of issues, and (4) to look at the implications of E-Hubs for business and scholarly research.

2. History

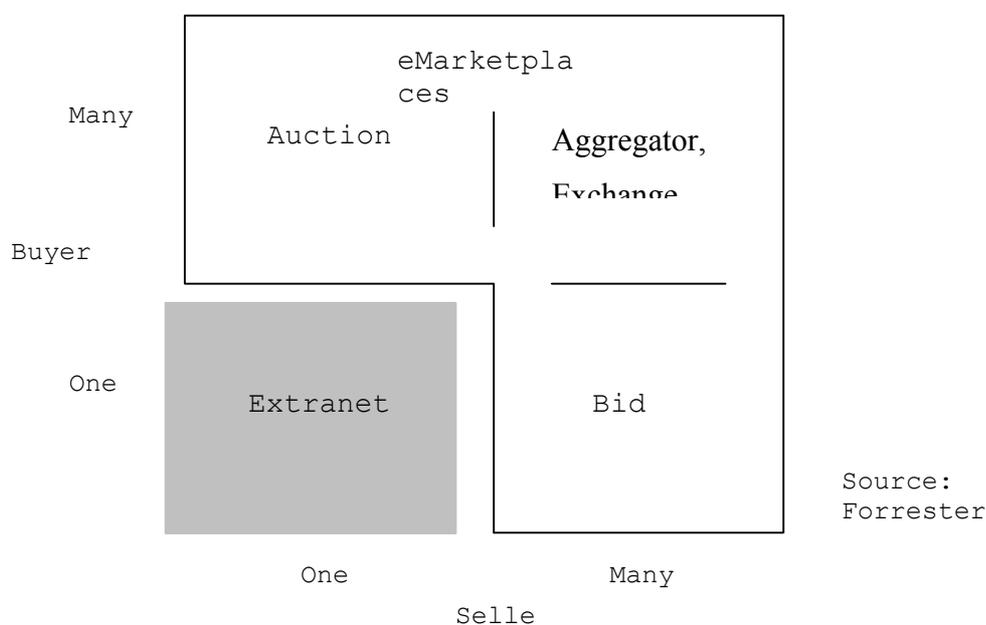
Developments that have led to the establishment of E-Hubs are described by a number of writers. Central to this process is the continued search by companies and entrepreneurs for sustainable competitive advantage, growth and profits, in an environment marked by rapid technological change. Kalakota, Oliva & Donath (1999), for example, note that competitive success in the future will increasingly depend on “business model innovation: using information to communicate and interact with customers and to leapfrog the capabilities of rivals” (see also Evans & Wurster 1999). Critical to such success is the development of “digital capabilities” or the ability to deploy necessary resources to conduct business activities electronically (Lefebvre & Lefebvre 1999), and adaptation to a “virtual world” (Rayport & Svioka 1999).

In the increasingly electronic and networked business environment, the forerunner of today’s developments is Electronic Data Interchange (EDI), which automated standardized transaction data exchanges between existing trading partners. Although EDI has been around for 30 years or more, cost and technological factors have limited adoption to all but the largest companies. Even in these cases, a substantial number of partner companies—especially smaller ones—did not make the EDI connection.

In the initial phase of E-commerce (from the mid-1990s on), lead companies established extranet connections with their suppliers and customers. Whereas EDI automated paperwork, extranets went considerably further, providing a secure private electronic environment for real-time communication up and down the supply chain. Forrester Research estimated that extranets accounted for \$35 billion of US trade in 1998, with this figure to double in each of the following three years. General Electric Co. was a pioneer in the development and use of extranets, as was Chrysler. The success of extranets in driving down purchasing costs, shortening order cycles, reducing errors, providing instant order-status information, and notifying of shortages, has fueled further expansion. Many companies now run more than one extranet and a recent development is the so-called enterprise portal, which combines extranets so as to provide one integrated entry point for interaction between large companies and their partners, either for buying or selling. Dell Computers is a good example of a sell-side enterprise portal, “automating the order-entry and fulfillment process through an online ‘storefront’ open 24 hours a day, offering the latest inventory, and enabling self-service ordering and tracking” (Kalakota, Oliva & Donath 1999).

E-Hubs developed for similar reasons to those noted above. For companies that wish to expand their market scope and/or do not have the resources to develop their own enterprise portals, third-party marketplaces have appeared. These bring together buyers and sellers in real-time trading communities at relatively low cost and are of obvious appeal to small and medium-sized companies (SMEs). Sawhney and Kaplan (1999) define E-Hubs as “neutral Internet-based intermediaries that focus on specific industry verticals or specific business processes, host electronic marketplaces, and use various market-making mechanisms to mediate any-to-any transactions among businesses” (see Exhibit 1). Before describing the various E-Hub types, several milestones in the growth of this business form are identified, along with company examples.

Exhibit 1: Extranets versus eMarketplaces



Early days

One of the first E-Hub entrants was VerticalNet. Founded in 1995, the company promotes itself as the “Internet’s premier provider of vertical trading communities.” VerticalNet operates sites for 51 vertical trading communities in 10 sectors: advanced technologies; communications; environmental; health care; process; food and packaging; food service/hospitality; manufacturing and metals; science; and service. VerticalNet offers tailored information to buying and selling professionals in the sectors in question, as well as a digital meeting place. The 51 sites emphasize content, commerce and community (Peek 1999). Historically, transactions have not been a major emphasis of these sites. Rather, commerce takes the form of advertising, sponsorship and member fees. This is expected to change in the future as VerticalNet develops transaction capabilities and moves away from its fairly pure “community” form.

Growth

The establishment of Chemdex in 1997 marked an early attempt to connect SME buyers and sellers via an E-Hub featuring an electronic catalogue and ordering service. Chemdex founders targeted life-sciences research products, a market worth about \$15 billion annually in the US, but one characterized by fragmentation, inefficiency and high costs. There are about 1,500 suppliers in this industry, most with sales of \$10 million or less. Prices for identical products can vary by as much as 200%. Buyers are principally found in university, laboratory and hospital settings, and all are under pressure to improve the speed and cost of research. Chemdex growth has been impressive. In late 1999, 335 suppliers selling more than

one million products were registered with this E-Hub. Revenues of \$129 million are forecast for 2000 (The Economist 1999). Although Chemdex is viewed to be a very successful E-Hub, its owners see limits imposed by operating in one marketplace. Consequently, it recently embarked on a diversification strategy, using its technology and E-Hub know-how, to enter other marketplaces (Girishankar 1999). The company now operates in five marketplaces and has renamed itself Ventro. Many other E-Hubs have been established since Chemdex's early lead: some 150 were in development in early 1999 (Girishankar 1999) and 600 identified fifteen months later (Hof 2000). These follow four main models: catalogues; auctions; exchanges; and barter, and are described in the next section. Further insights into the benefits conferred by B2B E-Hubs are outlined in Exhibit 2, which contrasts these with conventional web sites.

Enter the MNC

In recent months, a new development has seen multinational corporations enter the E-Hub fray. On February 25, 2000, General Motors, Ford and DaimlerChrysler announced that they would abandon their plans for individual enterprise portals in favour of collaboration. This will create the largest virtual market in the world, involving the supply of auto parts valued at \$240 billion annually, from tens of thousands of suppliers. Toyota, Renault and associate Nissan have since decided to join the group (The Economist 2000a). If these companies are able to persuade their own supply chains to join the venture, it is expected that the value of purchases will double (Deutsche Banc Alex. Brown 2000). Europe's largest auto company, Volkswagen AG, has chosen not to join the group but rather to establish its own network for the acquisition of parts, auto manufacturing equipment and office supplies. VW spent \$71 billion on purchasing in 1999, and expects to link all 6,000 suppliers in a bid to cut costs. Payments to suppliers account for two-thirds of a vehicle's costs. BMW and PSA Peugeot Citroen have yet to announce their plans (National Post 2000).

Exhibit 2: Web Site versus E-Hub

Basic E-Commerce	Integrated B2B E-Hub
Sporadic, opportunistic usage	Deeply entrenched, habitual channel for business activities; becomes an integral part of a user's daily activities
Limited benefits	Compelling value proposition; significant reduction in transaction costs
Low-margin commodity	Differentiated services; barriers to entry for competing hubs
Singular focus on procurement process	Multiple complementary business processes are integrated and optimized
Limited user retention	Barriers to exit and high switching costs for users; customer lock-in

Source: Deutsche Banc Alex. Brown (2000)

Since February, similar announcements have been made in other industries, including forest products, chemicals, groceries, aerospace, defense and oil and gas. The rationale for such developments is a desire on the part of established companies to retain control and fully exploit the value of their respective supply chains. Each of these announcements stands as an endorsement for the growing impact that the Internet is having on B2B E-Commerce (US

Bancorp Piper Jaffray 2000). However, there have been some negative reactions to the advent of MNC-initiated E-Hubs and these are dealt with later.

3. E-Hubs: Models, Types and Functions

In this section, E-Hubs are described more fully. Some agreement exists concerning E-Hub models, types and functions. However, as is the case in other new fields, there is a lack of precision in the use of relevant terminology. This situation may persist, given that E-Hubs are moving from “pure-types” to more complicated forms, and that the dynamic nature of the sector is likely to generate new entities with their own names.

Vertical versus horizontal E-Hubs

A beginning and fundamental distinction should be made between vertical and horizontal E-Hubs. Hundreds of E-Hubs have sprung up to serve the distinct needs of particular industries and these are termed *vertical* markets. To be successful in generating transaction revenue here requires that the E-Hub sponsor possess deep domain knowledge and strong industry relationships. These attributes will be necessary so as to generate buyer traffic to the E-Hub and to recruit key suppliers. Most of the E-Hubs mentioned above are vertical in their nature. *Horizontal* markets run across several or many industries. Common buyer needs characterize these markets and are addressed through the supply of standardized goods and services. Examples include maintenance, repair and operating (MRO) supplies, logistics services and media buying. Since there is less call for specialized knowledge and products, and prices are more standardized, success in this business calls for automating workflow and reducing process costs for buyers and sellers. Relevant E-Hubs include MRO.com, NetBuy.com and BizBuyer.com (Merrill Lynch 2000).

E-Hub Initiator

Another useful distinction is made by Phillips and Meeker (2000). By identifying four main types (buyer-managed, seller-managed, distributors/market makers, and content aggregators), they point to the source of the E-Hub initiative. *Buyer-managed* hubs are usually formed by large companies, are private in nature and have been established with technology partners. These hubs lie within the firewall of the buyer, who also is responsible for hosting and content management (e.g. Dell). Procurement and administrative efficiencies usually drive these efforts. *Supplier-managed* hubs are less well explained. These are run by “producers with dominant market share or limited, proprietary product ... [Those] that serve fragmented, small buyers may be better served by running their own marketplace since their customers might alternatively set up a series of small buyer-managed exchanges” (p. 39). Works.com and Grainger.com are examples. *Distributor/market maker* hubs were among the early innovators in this field. They are independent of buyer and seller and survive either as distributors (mark-up) or as order matchers (transaction fee). Chemdex has been cited earlier as an example. *Content aggregators* build and maintain multi-vendor catalogues. By moving catalogues into a digital and user friendly format, these companies create significant value over the present paper-based, chaotic environment. Catalogues are then maintained as a service on behalf of suppliers. Instill.com is doing this work in the food industry.

E-Hub Models

Four main E-Hub models have been established to date (see Exhibit 1). *Catalogue* models create value by aggregating suppliers and buyers and creating search and transaction efficiencies. They work best where demand is predictable and price fluctuations are low.

Chemdex, SciQuest.com and MRO.com are good examples. *Auction* models create value through the spatial matching of buyers and sellers. This model works best for unique and perishable products and where different perceptions exist about the value of the items in question. IMark.com sells used capital equipment through this method and Adauction.com does the same for perishable online and print advertising inventory. *Exchange* models create value by temporal matching of supply and demand. They perform well for near-commodity items and can create substantial value in volatile markets, allowing companies to manage excess supply and peak-load demand. Examples include PaperExchange, e-steel and Altra in energy. *Barter* models create value by matching two parties that have reciprocal assets. Applications include the bartering of manufacturing capacity and high-transportation cost assets (such as paper or steel). To this point, E-Hubs have usually focused on one of these models but there is a move to provide more options to buyers and sellers (Sawhney & Kaplan 1999). A comprehensive treatment of E-Hub models is found in Merrill & Lynch (2000, p. 26).

Taxonomy of E-Hubs

Kaplan and Sawhney (2000) classify Hubs along three dimensions: (1) value creation (aggregation versus matching); (2) purchase situation (systematic versus spot purchasing); and (3) bias of the market-maker (one-sided/biased versus two-sided/neutral). E-Hubs create *value* through either aggregation or matching. The aggregation function brings large numbers of buyers and sellers together and in the process lowers transaction costs through “one stop shopping.” PlasticsNet.com makes it possible for plastics processors to issue a single invoice for hundreds of products and source these from diverse suppliers. In contrast, the matching mechanism brings buyers and sellers together to negotiate prices on a dynamic and real-time basis. Altra Energy brings buyers and sellers together in the energy market. The writers describe conditions under which each mechanism works best. The *bias* of an E-Hub is also an important consideration. Neutral Hubs do not favour either the buyer or the seller. This makes these Hubs true “market-makers.” Biased Hubs, however, are designed to favour one side over the other, negotiating better terms and streamlining the buying or selling process. For example, FOB.com focuses on demand aggregation for small buyers in chemicals and other areas. Finally, Kaplan and Sawhney (2000) employ purchase situation as another dimension in understanding E-Hubs and, through examining “what” businesses buy and “how” businesses buy, identify four varieties of Hub:

- 1) MRO Hubs (operating supplies, systematic sourcing, horizontal focus)
- 2) Yield Managers (operating supplies, spot sourcing, horizontal focus)
- 3) Catalogue Hubs (manufacturing inputs, systematic sourcing, vertical focus)
- 4) Exchanges (manufacturing inputs, spot sourcing, vertical focus)

There is clearly some overlap between these four types and the four models of E-Hub presented earlier. However, these writers present rich ideas about extant E-Hubs, as well as pointing to future developments.

Revenues from E-Hubs

To this point, E-Hub sponsors have mainly earned revenues from transaction fees. *Transaction fees* range from 0.5% to 8%, with most settling in the 1–2% range for catalogue orders. Industry observers see a greater number of revenue sources becoming important in future. Other revenue sources are now listed. Some E-Hubs have opted for standard annual *subscription fees*, based on assumptions about usage. Many will try to migrate to transaction fees but may find the move from flat charges difficult. Since they involve sourcing work,

auction services have commanded a 3% fee to this point. These fees have declined as the service becomes more common. Some E-hubs take title to goods and have been rewarded through a *mark-up* in the range of 5% to 10%. Another revenue stream is the storefront fee. In some E-Hubs, vendors list their catalogue and promotional materials in a segmented storefront in the Hub. Fees for this service have varied from zero to \$15,000 annually. Finally, some E-Hubs charge users a fee for use of proprietary software at the buyer's or seller's site. As Hubs evolve to offer more services, the possibilities for revenue generation will multiply (Phillips & Meeker (2000, pp. 40-1).

4. Issues

Having outlined the history of E-Hubs, as well as some of their key characteristics, several issues are presented in this section, together with a brief commentary.

US versus International

The first point to make is that at the present time, E-Hubs could be said to be an exclusively American phenomenon. It is very difficult to find a story about an E-Hub start-up or about the topic outside the US media.²⁶⁶ This makes it difficult to know whether E-Hubs will become a force in other countries. Although many of the same drivers may be found in other nations, this does not guarantee the emergence of E-Hubs in that location. Another point concerns the fact that many US E-Hubs have been set up to do business domestically rather than internationally. For example, non-US visitors to the Chemdex web site are restricted to browsing. Of course, this could simply reflect the first phase of operations at that E-Hub.²⁶⁷ Given these two points, how likely is it that E-Hubs will become a force in international trade? Growth projections for E-Hubs appear to include the world outside the US, but the literature is very quiet on this matter. The first mention of E-Hubs involving Canadian companies has occurred in the last few months (Akin 2000; McKinnon 2000). The advent of MNC E-Hubs was referred to earlier, and this is the first time that there has been any substantial mention of European and Asian involvement in this new field.

Technology advances

Although there is a considerable literature extolling the virtues of E-Hubs, some writers are more guarded in their analysis. Mougayar (2000), for example, states that Hubs are not as open as they could or should be. This stems from the fact that prime movers in this field (such as Ariba Network and Commerce One's MarketSite.net) have pushed their proprietary technology so as to achieve first-mover advantage, rather than developing technology that is more open and interoperable and so permits broader membership of E-Hubs. Mougayar is particularly concerned that SMEs should be able to participate in E-Hubs, rather than being left on the sidelines as occurred with EDI. He sees evidence of this trend with two new services. PurchasePro is an open system where a supplier of any size can list. PartMiner provides universal access to global inventory information on electronic components that was previously restricted to large companies. Industry observers point to other technology trends that will help shape the future of E-Hubs. These include the greater availability (and lower cost) of packaged E-Hub applications,²⁶⁸ the integration of horizontal and vertical Hubs, and the growing competition that Ariba and Commerce One will face from enterprise systems providers SAP and Oracle, and supply chain experts like i2 Technologies and Manugistics

²⁶⁶ For exceptions, see Hyperchannel (1999) and NST-Business Computing (1999).

²⁶⁷ ChemConnect is a recently established E-Hub that does have an international orientation. It does not handle transactions but instead acts as an electronic forum for buyers and sellers of chemicals (Husum 1999).

²⁶⁸ Chemdex is said to have spent \$50 million on its technology infrastructure.

(Karpinski 1999; 2000). In this new environment, where integration of E-Hubs into back-end applications and processes is required, selection of the “right” supplier will be critical (Wilson 2000).

Hub survival

The growth in E-Hubs has been explosive: from almost nothing two years ago, Hubs now number about 600, and more are announced each day. The number of Hubs that is sustainable is another matter. Most E-Hubs have yet to consummate their first transaction and experts feel that, in many cases, action will coalesce around a maximum of two Hubs in each industry. The speed of technical change means that new opportunities are presented almost continuously, making alignment decisions difficult from both the buyer and seller side. Collaboration between some vertical and horizontal E-Hubs creates additional turbulence (The Economist 2000b). Sawhney (1999) predicts another change. He identifies an institution called “metamediaries,” that are emerging “to inform and advise customers, and to simplify their dealings with product and service providers.” They “dramatically improve the efficiency and effectiveness of transactions in the networked economy” ... and ... “redraw the boundaries of markets by creating metamarkets, which have no parallel in the physical world.” Edmunds’ role in the auto market provides one example of a metamediary. Such dynamism creates considerable uncertainty for those involved and suggests failure rates might be high. This extends to E-Hubs involving major players. Some analysts see the required meshing of corporate cultures and conflicting goals in the recently announced MNC-dominated Hubs as large hurdles to be overcome (Hof 2000).

Corporate concentration

The announcement by General Motors, Ford and DaimlerChrysler that they will coordinate purchasing through a new joint venture company is almost certain to attract the attention of US regulators.²⁶⁹ Some analysts expect that the sizeable business at issue here to create resistance to the collaboration; others see this case as leading to a new frontier in regulatory review. Although the joint venture company and its operations are little more than concepts at present, the fact that “you are taking an oligopoly and creating a monopoly” is bound to come under close scrutiny (Dalton 2000, Dalton & Wasserman 2000). Collaborative developments of this and other kinds are likely to lead to strenuous efforts from many quarters to get the US (and other) governments to accept that cooperation is a requirement of the Internet economy.

5. Implications

In this final section, some implications arising out of the E-Hub phenomenon are presented.

Business

Analysts continue to be bullish about E-Hubs. A study of 50 vertical marketplaces that transacted more than \$250,000 in the previous 12 months produced striking results. The median value of transactions was expected to grow from \$2 million in 1999 to \$155 million in 2001. Such growth will be fueled by increased service, with most Hubs planning to offer additional transaction methods, credit and logistics assistance. Hubs also plan to expand their revenue base beyond transaction fees through exploiting the market data at their disposal. Finally, it is anticipated that Hubs will increasingly partner with each other so as to provide comprehensive coverage for given niche areas (Forrester Research 1999). These results explain the lofty expectations that exist in this new field, the high market valuations on

²⁶⁹ Under the Hart-Scott-Rodino Act of 1976, large-scale corporate mergers, acquisitions and joint ventures are subject to antitrust oversight by either the Justice Department or the Federal Trade Commission.

companies that have already gone public, as well as those in the IPO queue. Developments have, of course, been complicated somewhat by announcements by several groups of MNCs (February 2000), and the stock market correction in the US (April 2000). However, confidence is still at high levels for well-conceived E-Hubs.

The prospect of E-Hubs run by MNCs is viewed with guarded optimism. On the one hand, E-Hubs are seen as permitting greater efficiencies and system-wide savings. However, system-wide savings may take some time to achieve and, in the short-term, suppliers anticipate greater cost pressure (Dalton 2000). It has been stated that most MNC E-Hubs will be independently run and spun-off as separate businesses at an appropriate time. The extent to which an E-Hub can operate independently of the companies that are its owners is a concern for some (The Economist 2000a). Although it will be some time before the recently announced E-Hubs can be realistically assessed, some skepticism exists. One Internet analyst states that “while we do maintain that there will be some opportunities for the old economy leaders to monetize their order-flow in these ‘few-to-many’ models, we believe in the inherently more compelling ‘many-to-many’ models that will come from new players able to establish neutrality and aggregate many buyers and sellers” (US Bancorp Piper Jaffray 2000).

Scholarship

The scale of activity presently underway, as well as projections of business that will be transacted over the next three to five years, suggest that E-Hubs will play a substantial role in the economy. Consequently, these new entities deserve research attention. The basis for our present understanding of E-Hubs is various reports and articles by brokerage houses, management consulting and research firms, and business and technical writers. Although a commendable body of literature has been established in short order, the time seems ripe to supplement these writings with those from a more neutral and dispassionate perspective. The very newness of E-Hubs means that very few academics have yet undertaken research on this topic.²⁷⁰ E-Hubs appear to be a fertile ground for academic research. To that end, suggestions are made below of research questions that might be answered through theoretical and empirical research by marketing and other business scholars.

Technology and strategy

What technology developments prompted the emergence of E-Hubs? What technology advances made it possible for E-Hubs successively to offer greater functionality? Technologists, venture capitalists and entrepreneurs have each contributed to the development of E-Hubs. What have been their respective contributions? How will the rivalry between E-Hubs, enterprise system providers and logistics experts play out?

Networks and relationships

For a given industry, what did the network structure look before and after the establishment of an E-Hub? How does an E-Hub change the nature of interaction in business networks? Which networks are most likely to change? Which are least likely to change? How do relationships change and in which direction?

Intermediaries and distribution

What channel intermediaries are at greatest risk as E-Hubs develop stronger ties between buyers and sellers? (Steinfeld, Kraut & Chan 1995). What examples exist of successful

²⁷⁰ Notable exceptions are Kaplan and Sawhney.

adaptation by intermediaries? How do E-Hubs handle delivery and fulfillment functions: Domestically? Internationally?

Investment and return

What capital investment is typically required to establish an E-Hub? What is the usual payback period? What efficiency gains are achieved by E-Hubs? How are the gains distributed through the business system? What are the aggregate level economic savings?

Success and failure

What industry and company factors lead to E-Hub success? (Merrill Lynch, pp. 38–44). What lessons might be learned from E-Hubs that have gone out of business? In industries that are prime for E-Hubs, can companies be successful when they go it alone (i.e. not participate in the E-Hub)?

International

Are E-Hubs being formed in countries other than the US? What activity has taken place to date? What is projected? What factors might affect adoption levels elsewhere? Are regional trading blocs likely to be a factor in E-Hub formation and scope? How “friendly” are regulations towards E-Hubs? How many E-Hubs are involved in international trade transactions?

References

Space limitations preclude inclusion of the full set of references. Major references are included. The full list is available from the author.

Deutsche Banc Alex. Brown (2000), “Revolution 2.0: The Rise of the B2B e-Hub,” New York: North American Equity Research, March 1.

Evans, Philip B. & Thomas S. Wurster (1999), “Strategy and the New Economics of Information,” in *Creating Value in the Network Economy*, Don Tapscott, ed., Boston: Harvard Business School Press, 12–34.

Forrester Research (1999), “Net Marketplaces Grow Up,” December. [www.forrester.com/er/print/research/report/0,1338,8774,ff.html]

Kalakota, Ravi, Oliva, Ralph A. & Bob Donath (1999), “Move Over, E-Commerce,” *Marketing Management*, 8 (3), 22–32.

Kaplan, Steven & Mohanbir Sawhney (2000), “B2B E-Commerce Hubs: Towards a Taxonomy of Business Models,” [www.mohansawhney.com/articles/linked/B2B.pdf].

Lefebvre, L. & E. Lefebvre (1999), “Virtual Enterprises and Virtual Economy: Manifestations and Policy Challenges,” *International Journal of Manufacturing and Technology Management*, (Fall), 11–23.

Merrill Lynch (2000), “The B2B Market Maker Book,” New York: Global Fundamental Equity Research Department, Merrill Lynch & Co., February 3.

Phillips, Charles & Mary Meeker (2000), "The B2B Internet Report—Collaborative Commerce," New York: Morgan Stanley Dean Witter, April.

Rayport, Jeffrey F. & John J. Sviokla (1999), "Exploiting the Virtual Value Chain," in *Creating Value in the Network Economy*, in Don Tapscott, ed., Boston: Harvard Business School Press, 35–51.

Sawhney, Mohanbir (1999), "Meet the Metamediary." Unpublished paper, [<http://sawhney.kellogg.nwu.edu/metamed/metamediation.htm>]

_____ & Steven Kaplan (1999), "Let's Get Vertical," *Business 2.0*, (September). [www.business2.com/articles/1999/09/text/models.html]

Steinfeld, Charles, Kraut, Robert & Alice Chan (1995), "The Impact of Interorganizational Networks on Buyer-Seller Relationships," *Journal of Computer Mediated Communication*, 1 (3). [www.ascusc.org/jcmc]

US Bancorp Piper Jaffray (2000), "Equity Research Notes," *The B2B Analyst*, 1 (10), March 31.