

# The Emerging Landscape of Business to Business E-Commerce

By

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A quiet revolution is underway in business-to-business (B2B) e-commerce. Most of the attention in B2B e-commerce has focused on individual firms like Cisco and Dell who eliminate middlemen and sell directly to business customers. However, the real B2B e-commerce revolution is taking place outside the boundaries of individual firms, and this revolution involves the *creation* of new middlemen.

A new breed of intermediaries is emerging to facilitate B2B e-commerce. These new intermediaries go by different names – “Vortexes”, “Butterfly Markets”, “Net Market Makers”, and “E-Markets”. We prefer to call them **eHubs** for two reasons. First, these intermediaries do for e-commerce transactions what a network hub does for bits - concentrating, routing, and switching transactional traffic in B2B e-commerce. Second, they occupy a central position between buyers and sellers, much as airline hubs do between city pairs. We define eHubs 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*. eHubs create value by aggregating buyers and sellers, creating marketplace liquidity, and reducing transaction costs.

eHubs promise to reshape the landscape of B2B E-commerce. They will create lucrative franchises for themselves in the process. Charles Finnie at Volpe Brown Whelan, a San Francisco-based investment bank, estimates that transaction volumes through eHubs could grow from \$290m in 1998 to \$20b in 2002. The Precursor Group’s estimates are even higher, at \$50b-\$130b by 2002. Even with the lower estimates, eHubs could generate transaction fees of more than \$10 billion within three years, with gross margins of 85%. If these numbers sound too optimistic, consider eBay, an eHub in the consumer-to-consumer market. eBay boasts gross margins in excess of 80%, and, more strikingly for an Internet company, reported a profit within a year of its inception.

Despite their enormous significance for B2B e-commerce, eHubs remain poorly understood. Like the bulk of an iceberg below the surface, they remain largely invisible in the eyes of the media, investors, and analysts. While the landscape is still blurry, and few eHubs have achieved any degree of prominence, it is possible to describe what eHubs are, what they do, how they create value, and what the future is likely to hold. Although our analysis at this early stage is less precise and our predictions less certain than we would like, understanding the underlying forces at work is likely to be valuable for entrepreneurs and investors. It is productive to begin by contrasting eHubs with eTailers in the Business-to-Consumer arena.

### ***eHubs versus eTailers: A different kettle of fish***

At a time when eTailers like Amazon.com and Buy.com are positioning themselves as “commerce hubs”, it is tempting to think about eHubs as the B2B equivalent of eTailers. Nothing could be further from the truth, as the contrast in Table 1 illustrates.

**Returns to scale:** This is the most important and perhaps the least well understood difference between B2C commerce hubs and B2B eHubs. B2C commerce hubs are *one-way networks* (also called “Sarnoff Networks after the inventor of TV broadcasting) that deal directly with buyers, and create benefits mostly for sellers. However, B2B commerce hubs tend to be *two-way networks* (also called “Metcalfe Networks” after Metcalfe’s Law of switched networks) that mediate between buyers and sellers, and create benefits for both buyers and sellers. Consequently, *the value created by B2C hubs tends to increase linearly in the number of*

*buyers, while the value created by B2B eHubs increases as the square of the number of participants.* This difference is illustrated in Figure 1.

Consider a B2C retailer like Amazon. The benefits to an individual buyer are roughly the same whether Amazon has 100 customers or 100 million customers, because the benefits to buyers are primarily the time saved from going to a physical bookstore and ordering a book. Amazon does, however, benefit on the supply side from marketing and procurement economies of scale. These benefits tend to be linear, so the total value created by Amazon increases only linearly in the number of customers. There are no strong demand-side externalities, other than user-generated content and option value of brand extensions.

Now, consider a B2B eHub (or a C2C eHub like eBay with similar two-way characteristics). eHubs create value by reducing search costs, reducing information transfer costs, standardizing systems, and improving matching for both buyers and sellers. Buyers benefit because they have more choices and sellers benefit because they have access to more buyers. All of these value drivers increase with the square of the number of participants in the hub. To see how this works for search costs or information transfer costs, take the case of five potential sellers and five potential buyers. In the absence of the eHub, each seller would have to determine the identity of each buyer. Determining potential buyers might be done through advertising, a direct salesforce, etc. After having determined the buyer's identities, each seller would have to contact each buyer each time it wanted to do a transaction. Without the eHub, the participants in this market would have to undertake 25 searches – each seller looking for five buyers – and, then, make 25 contacts – either faxes or phone calls – each time the sellers wanted to sell. With an eHub, the eHub finds the buyers and sellers, reducing the number of searches to ten. Similarly, each time the sellers want to sell, there are only ten contacts – five postings on the eHub and five views by the buyers. An eHub reduces searches and contacts by 15 ( $= 5^2 - 5 \times 2$ ). For 100 buyers and sellers, an eHub reduces searches and contacts by 9800 ( $= 100^2 - 100 \times 2$ ).

The “hubonomics” are similar for matching buyers and sellers, transferring information like credit checks, product descriptions, and evaluations, and for standardizing systems. Further, the non-linearity of the benefits to an eHub makes it difficult for a competitor to offer customers similar benefits. This is particularly true for matching between buyers and sellers in auctions and exchanges. A buyer is far less likely to find a match in an illiquid eHub than in a liquid one. For these reasons, it comes as no surprise that eBay is profitable, and commands a rich valuation.

**Importance of domain expertise:** Setting up shop as an eTailer does not require deep knowledge of specific categories. The founders of many popular eTailers, including Amazon.com and eToys, had no previous category experience, and Amazon has quite easily migrated across retail categories. In contrast, domain expertise is a must for creating an eHub. Consider an eHub like SciQuest that mediates between buyers and sellers in the laboratory and scientific equipment marketplace, or PlasticsNet, that makes a market between plastics manufacturers and plastics processors, or e-STEEL, that makes a market between buyers and sellers of steel. The founders of these eHubs had extensive industry experience and relationships with key buyers and suppliers. Domain expertise and relationships are key barriers to entry for eHubs.

**Customer acquisition and retention:** eTailers typically use advertising and affiliate programs for customer acquisition. However, buyers and sellers don't simply see a banner advertisement and sign up with SciQuest. Customer acquisition requires sales calls made by a nationwide direct salesforce. The process for signing up buyers and sellers is time-consuming and expensive – supplier catalogs have to be loaded online, business processes need to be

understood, business rules need to be defined, and the eHub's systems need to be integrated with the systems of buyers and sellers. However, customer switching costs and customer retention rates are correspondingly higher for eHubs, once they embed themselves into the business processes of buyers and sellers. For eHubs, competition is much further than a mouse click away.

In summary, the higher entry barriers due to increasing returns to scale, to domain expertise, and to higher customer switching costs from process embeddedness, cumulate into stronger profit potential and more defensible business designs than B2C retailers.

### ***Types of eHubs: Vertical versus Functional eHubs***

In contrast to pure financial marketplaces, eHubs are *contextual marketplaces*. The importance of context means that eHubs need to focus on a specific dimension of context. Attempting to be everything to everybody is a recipe for failure, as the experience of Jim Manzi's Industry.Net suggests. Industry.Net was designed as a B2B shopping mall across different verticals and different functions. One of the primary reasons that it failed is that it had no focus or context. It was neither vertical nor functional. As a result, it was never able to attract enough buyers and sellers to generate liquidity.

An eHub can specialize *vertically* along a specific *industry or market*, or it can specialize *horizontally* along a specific *function or business process*. Based on these dimensions, we classify the universe of eHubs into two primary types - **vHubs** (vertical eHubs) and **fHubs** (functional eHubs). Together, vHubs and fHubs form the quilt of B2B e-commerce illustrated in Figure 2.

vHubs are hubs that have a vertical market or industry focus. They provide deep domain-specific content, and domain-specific relationships. Examples of vHubs include Altra Energy (energy) Band-X.com (telecommunications), Cattle Offerings Worldwide (beef and dairy), Chemdex and SciQuest (life sciences), e-STEEL (steel), FloraPlex (flowers), IMX Mortgage (mortgages), PaperExchange (paper), and PlasticsNet.com (plastics). vHubs typically start out by automating and hosting the procurement process for a specific vertical, and then supplement their offerings with industry-specific content.

The likely success of a vHub increases with:

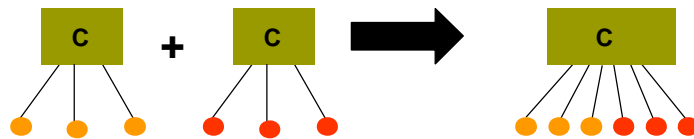
- Greater fragmentation on the buyer and the seller side in the vertical market.
- Greater inefficiency in the existing supply chain.
- Ability to create critical mass of key suppliers and buyers.
- Domain knowledge and industry relationships
- Ability to create master catalogs and metadata schemes for searching across catalogs.
- Presence of attractive adjacent verticals for leveraging existing supplier or buyer base.

The primary challenge for vHubs is the difficulty of diversifying and extending their business into other vertical markets, because their expertise and relationships are fairly domain-specific.

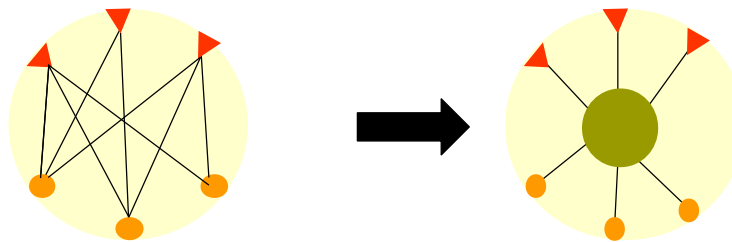
**Table 1: eTailers (B2C) versus eHubs (B2B)**

	<b>etailers (B2C E-Commerce)</b>	<b>eHubs (B2B E-Commerce)</b>
<b>Objective</b>	Connecting consumers to information, products, and services they want.	Improving the efficiency of buyer-seller transactions in business markets.
<b>Customer attractors</b>	Content, community, commerce	Process automation, process outsourcing and hosting.
<b>Value proposition</b>	Convenience, wider assortment relative to physical stores.	Transactional efficiency, improved liquidity.
<b>Customer acquisition methods</b>	Mass communication - Advertising, affiliate programs.	Personal selling - Direct salesforce, trade shows.
<b>Customer acquisition costs</b>	Low - referral fees, advertising CPM.	High, declines over time - sales calls, system integration costs.
<b>Entry barriers for competitors</b>	Low - Audience size, logistics capability, experience quality.	High - Domain expertise, buyer/ supplier relationships.
<b>Switching barriers for customers</b>	Learning, user-generated content, affinity programs.	Process embeddedness, liquidity.
<b>Partners and complementors</b>	Content providers, logistics and fulfillment providers.	Logistics, credit approval, escrow, receivables, payment processing, inspection, etc.
<b>Value creation as a function of scale</b>	Typically linear, driven by one-sided (demand) aggregation.	Typically nonlinear, driven by two-sided (buyer-seller) aggregation and liquidity.

**Figure 1: Hubonomics 101 - Why B2B and C2C hubs create more value than B2C hubs**



**One-way (Sarnoff) network in B2C commerce: Value  $\mu N$**



**Two-way (Metcalfe) network in B2B or C2C commerce: Value  $\mu N^2$**

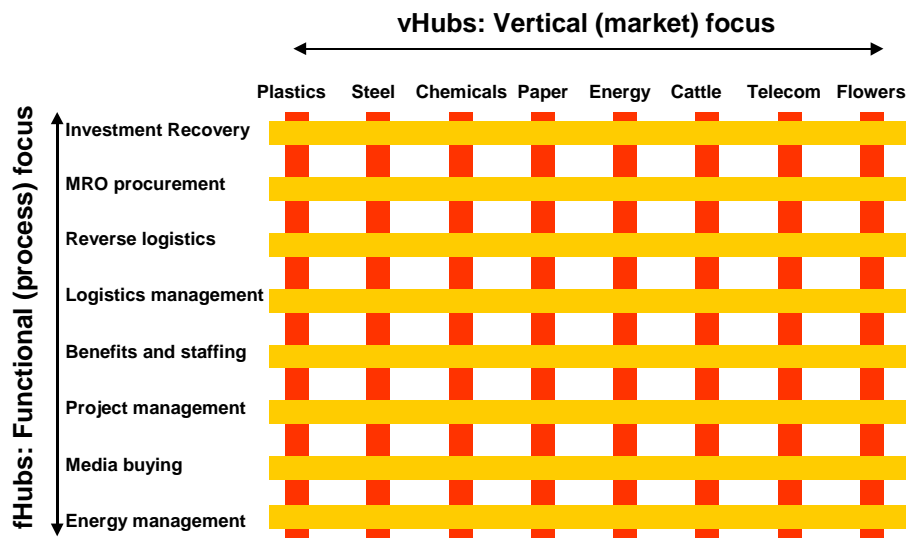
fHubs focus on providing the same functions or automating the same business process across different industries. Their expertise usually lies in a business process that is fairly “horizontal”, which means that it is generalizable across vertical markets. For example, iMark.com focuses on buying and selling used capital equipment. Their target participants are investment recovery managers responsible for the equipment. Other examples of fHubs include Processors.com (reverse logistics), MRO.com (MRO procurement), Employeease.com (employee benefits administration), Celarix (global logistics monitoring and tracking), Bicdom.com (project management), AdAuction.com (media buying), and energy management (Youtilities.com).

The likely success of an fHub increases with:

- Degree of process standardization and generalizability.
- Process knowledge and workflow automation expertise.
- Ability to complement process automation with industry-specific content.
- Ability to customize the business process to respond to industry-specific differences.

The primary challenge for fHubs is the lack of industry-specific content. fHubs target functional managers who affiliate and organize their work primarily around their functional area, and not their industry. But many functional managers also affiliate with their industry. There is a risk that they will gravitate towards a vHub for their vertical and relegate the fHub to become a back-end service provider for the vHub.

**Figure 2: Vertical versus Functional eHubs**



## Hub design: How to create and scale an eHub

Architects of eHubs must address a number of key design and execution issues. These include:

### Choosing market-making mechanisms

eHubs can employ a variety of market-making mechanisms to mediate transactions between participants in the hub. These mechanisms can be fixed-price mechanisms that are typical of catalog purchasing, or dynamic pricing mechanisms that include auctions, exchanges, or barter. We compare these mechanisms in Table 2.

**Table 2: Market-Making Mechanisms employed by eHubs**

	<b>Catalog mechanism</b>	<b>Auction mechanism</b>	<b>Exchange mechanism</b>	<b>Barter mechanism</b>
<b>How it works</b>	Demand and supply aggregation	Spatial matching	Temporal matching	Reciprocal asset matching
<b>How buyers benefit</b>	Lower search costs, lower transaction costs, broader supplier base	Catalog benefits, better matches, better prices	Auction benefits, Manage peak-load demand, hedge risk in volatile markets.	Ability to manage currency risk, savings in transportation costs.
<b>How sellers benefit</b>	Broader customer access, lower transaction costs	Catalog benefits, better prices.	Auction benefits, ability to liquidate excess supply, ability to manage volatility	Same benefits as buyers
<b>Returns as a function of scale</b>	Quadratic for information flows, linear for physical flows, aggregation-driven	Highly nonlinear, aggregation and liquidity-driven	Highly nonlinear, aggregation and liquidity driven	Highly nonlinear, aggregation and liquidity driven
<b>Where it works best</b>	<ul style="list-style-type: none"> <li>• MRO products</li> <li>• Pre-planned purchases</li> <li>• Fragmented supplier base</li> </ul>	<ul style="list-style-type: none"> <li>• Used capital equipment</li> <li>• Perishable capacity</li> <li>• Hard-to-specify products</li> </ul>	<ul style="list-style-type: none"> <li>• Near-commodities</li> <li>• High fixed-cost assets</li> <li>• Volatile markets</li> </ul>	<ul style="list-style-type: none"> <li>• Cyclical demand</li> <li>• High-inflation regimes</li> <li>• High transportation costs</li> </ul>
<b>How prices are set</b>	Pre-negotiated, usually static	Most attractive bid, prices move only in one direction	Marketwide bid-ask, move up or down	Subjectively set based on relative prices
<b>Can buyers be sellers?</b>	No	Yes, sometimes	Yes, quite often	Yes, by definition
<b>Key challenges</b>	Creating master catalog, gaining supplier critical mass	Liquidity, misrepresentation/fraud, fulfillment	Asset specificity, matching algorithms, off-exchange trade	Liquidity, determining exchange rates for assets

A listing or *catalog model* creates value by aggregating suppliers and buyers. It works best in industries characterized by fragmented buyers and sellers who transact frequently for relatively small ticket items. Given the small transaction size, it is too costly, even on the Internet, to negotiate each transaction. The catalog model also works well when most of the purchasing takes place with pre-qualified suppliers and with pre-defined business rules, and the occasional purchase requires searching across a number of smaller suppliers. Finally, it works best for situations where demand is predictable, and prices do not fluctuate too frequently. Chemdex, SciQuest, and MRO.com are examples of catalog-centric eHubs.

An *auction model* creates value by spatial matching of buyers and sellers. It works best in industries or settings where one-of-a-kind, non-standard, or perishable products or services need to be bought or sold among businesses who have very different perceptions of value for the product. Capital equipment, used products, unsaleable returned products, and hard-to-find products fit this description. iMark.com uses an auction model to sell used capital equipment. AdAuction.com auctions off perishable online and print advertising inventory.

An *exchange model* creates value by temporal matching of supply and demand. It requires a real-time bid-ask matching process, marketwide price determination, as well as a settlement and clearing mechanism. The exchange model works best for near-commodity items that can have several attributes, but are easy to specify. Exchanges create significant value in markets where demand and prices are volatile, by allowing businesses to manage excess supply and peak-load demand. PaperExchange in paper, e-STEEL in steel, and Altra in energy are all good examples of eHubs that employ exchange models.

A *barter model* creates value by matching two parties who possess reciprocal assets within an asset class, or across asset classes. While barter has traditionally been used in inflationary economies with shortages of hard currency as a tool to minimize currency risk, there are other innovative applications. These include bartering manufacturing capacity, bartering services for other services, and bartering high-transportation cost assets (like paper or steel). Interestingly, barter is a symmetric exchange, and there is no distinction between a buyer and a seller in a barter transaction. We predict that several innovative barter-related eHubs will emerge in the near future.

In many cases, an eHub will find it valuable to offer more than one market-making mechanism. Customers of eHubs will favor eHubs that allow buyers and sellers to choose the appropriate market-making mechanism. This means that eHub architects need to take care in choosing a technology platform, because technology providers have tended to focus on catalog (Ariba, Commerce One, IBM), auction (Moai, Dynamic Trade, Open Site), or exchange (TradeEx) models, and lack integrated multi-mechanism platforms.

### **Solving the chicken and egg problem**

The value created by an eHub increases non-linearly in the number of participants. The key goal of any eHub, therefore, is to obtain liquidity – a critical mass of buyers and sellers – as quickly as possible. The problem, of course, is that it is difficult to attract buyers without sellers and difficult to attract sellers without buyers.

While eHubs need to market to both sellers and buyers, they will generally be better off marketing more heavily to the party in the transaction that receives greater relative benefits. Once the eHub has gained the participation of that side, it can market more easily or even compel the other side to take part in the eHub. Despite conventional wisdom that eHubs tend to be buyer-centric and hence need to attract buyers first, there is no reason why eHubs will consistently favor buyers over sellers or vice versa. Chemdex and SciQuest focused on buyers first in order to attract sellers. PaperExchange, in contrast, has focused on sellers first in order to attract buyers.

In its early stages, eHubs might also consider injecting liquidity into the market. A good example of this is the strategy that Priceline.com adopted in growing its eHub for airline tickets. Priceline.com focused on getting buyers (who arguably receive the greater relative benefit) and injected liquidity by buying airline tickets at a loss in order to attract buyers. Once it achieved

critical mass, the incentives for airlines to cooperate increased. A related strategy is to act as a “temporary buyer”. For instance, the reverse logistics eHub Processors.com has good relations with sellers (grocery store chains), and might decide to act temporarily as the buyer in conjunction with selected liquidation brokers, to inject liquidity.

### **Timing the market entry**

How quickly should an eHub open for business? eHubs that start early reach buyers and sellers more quickly, preempt competitors, and begin to learn earlier about the market. But these benefits must be weighed against the risks that premature opening will discourage market participants from returning because of lack of functionality or lack of liquidity and alert potential competitors. Given the network externalities associated with eHubs, we are inclined to favor early entry over waiting. The risks can be mitigated by making it clear that the eHub is early and by soliciting feedback from early users. Another strategy can be to open an informational or content-focused eHub, and to add transactional functionality as liquidity improves.

### **Managing channel conflict**

Some existing intermediaries are initially likely to be hostile to eHubs, because of concerns around disintermediation and price erosion. To deflect the disintermediation concern, eHub architects should stress that an eHub can complement an intermediary rather than act as a substitute. For example, an eHub can provide more volume and better matches to existing intermediaries. This is particularly useful in industries with uncertain or volatile supply and demand. To counter the price erosion issue, sophisticated eHubs should provide *value proposition transparency*, and not merely *price transparency*. This can be done by providing metrics related to quality, reputation, reliability, speed, or service, in addition to providing prices. Finally, eHubs can create “virtual private marketplaces” that preserve pre-negotiated terms and relationships between specific buyers and suppliers.

### **Expanding the scope of the offering**

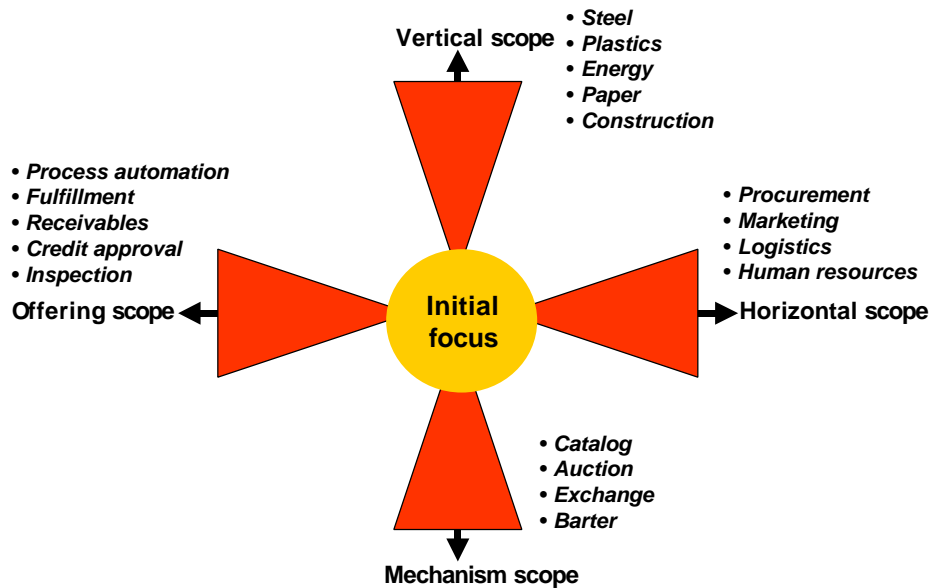
While liquidity is the key determinant of an eHub’s success, an eHub also should try to increase the depth and breadth of its relationships with participants. This can be done by providing complementary services to participants that make it more costly for buyers and sellers to transact elsewhere. Such services might include IT services like system integration and hosting; financial services such as payment processing, receivables management and credit analysis; logistics services like shipping, warehousing, and inspection; and risk mitigation services like escrow and warranties. Partners like Skyway (time-definite logistics), PayLinx (enterprise payment servers), iEscrow (escrow), eCredit.com (credit analysis), and USInternetworking (application hosting) help to round out the offering. In addition, each of these complementors are potential sources of referral revenues from the existing participant base.

### **Managing growth and diversification**

Over time, the eHub will need to diversify beyond its initial choices of strategic position. These growth vectors can be along four key dimensions – *horizontal scope*, *vertical scope*, *offering scope*, and *mechanism scope*. Consider e-STEEL, a vHub specializing in the steel industry, the procurement process, using an exchange mechanism, and by largely outsourcing logistics services. On the horizontal dimension, eSTEEL could choose to add logistics tracking or investment recovery services. On the vertical dimension, it could choose to branch into the packaging vertical. On the offering scope dimension, it could choose to offer credit analysis or fulfillment services. The choice of the growth vector should be based on the relatedness of the new supplier and buyer base, the relatedness of the new business process, the relatedness of the knowledge and relationships needed to win in the new vertical or horizontal eHub, and the

need for alternative market-making mechanisms within the current participant base. In some cases, the growth may be derived through partnerships and acquisitions.

**Figure 3: Growth vectors for eHubs**



### **HubCasting; Forecasting the evolution of eHubs**

In conclusion, we offer some predictions of what the future holds for eHubs over the next one or two years:

1. *eHubs will have winner-take-all characteristics:* The strong increasing returns characteristics will create even more scale advantages for the first eHub to achieve scale and liquidity than in the consumer portal or eTail business. Even being the second-biggest player may not be enough.
2. *vHubs will find it hard to diversify beyond their verticals:* vHubs compete on domain-specific relationships and expertise. Unless they are able to find closely related domains where they can leverage these assets, they will find it difficult to diversify into other vertical markets.
3. *vHubs will form a patchwork of alliances with fHubs:* vHubs possess domain expertise but lack functional expertise. fHubs possess functional expertise, but lack domain expertise. This complementarity will result in a number of alliances across the “quilt” between vHubs and fHubs. In these alliances, vHubs will usually emerge as the ones that control the customer relationship.
4. *Software vendors will climb out of their silos:* Currently, software vendors sit in three silos that correspond to their market-making mechanism of choice – buy-side software vendors (e.g., Ariba and Commerce One), auction software vendors (e.g., Moai and OpenSite), and exchange platform vendors (e.g., TradeEx). The walls of these silos will break down, and a flurry of mergers and alliances between software vendors will ensue.
5. *Exchange models will evolve to include derivatives:* The exchange mechanisms in eHubs currently are limited to spot markets. As participants become more sophisticated and eHub

software platforms improve in functionality, eHubs will begin to offer derivative products like forward contracts and options on commodities and manufacturing capacity.

6. *All except the biggest firms will give up on hosting eHubs:* Early generations of B2B e-commerce software focused on catalogs, auctions, and exchanges hosted by individual firms. This firm-centric model limits liquidity, and will give way to catalogs hosted by eHubs.
7. *Metahubs may emerge with shared infrastructure and services:* Although vHubs will not consolidate across vertical domains, there is no reason for them to have dedicated infrastructure and supporting services. We may see the emergence of Metahubs – “malls of eHubs” with shared back-ends and common fHubs servicing the different “tenant” vHubs. These Metahubs may be operated by Application Service Providers.
8. *The power of conventional commodity exchanges will erode:* Conventional commodity exchanges are devoid of context. Therefore, they will find it difficult to compete with the powerful integration of context and exchange functionalities that eHubs will provide. They also lack business process integration capabilities. As a result, eHubs will gradually drain liquidity from conventional commodity exchanges.

Clearly, we are going out on a limb in making these predictions at a time when the landscape of Business-to-Business commerce is changing daily. However, if the recent successful IPOs of VerticalNet and Ariba are any indication, the Year 2000 might very well be the Year of the eHub. In any event, it would be refreshing if e-Commerce gurus moves beyond Amazon and Yahoo!, and finally gave B2B e-Commerce the attention it deserves.