

B2B E-Commerce Hubs: Towards a Taxonomy of Business Models

By

Steven Kaplan
Mohanbir Sawhney

December 1999

© 1999 Mohanbir Sawhney and Steven Kaplan.
Please do not cite without prior written permission of the authors.

About the authors:

Steven Kaplan (steven.kaplan@gsb.uchicago.edu) is the Neubauer Family Professor of Entrepreneurship and Finance at the University of Chicago Graduate School of Business, and the faculty director of the Entrepreneurship Program.

Mohanbir Sawhney (mohans@nwu.edu) is the Tribune Professor of Electronic Commerce and Technology at the Kellogg Graduate School of Management, Northwestern University, and heads the E-Commerce and Technology group.

Wherever you look, it seems like B2B is the place to be. In an earlier article, we introduced the concept of electronic hubs (eHubs)¹ in Business-to-Business E-commerce. Since we wrote that article, these eHubs have received a tremendous amount of attention. Ariba, Chemdex, CommerceOne, Freemarkets, Internet Capital Group, and SciQuest.com have attained breathtaking stock market capitalizations. A torrent of research reports have been issued by Wall Street analysts. A robust community of “Net Market Makers” has emerged (www.netmarketmakers.com). And the venture capital community is racing to get in on the B2B action.

In our article, we defined 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*. We argued that eHubs create value by aggregating buyers and sellers, creating marketplace liquidity, and reducing transaction costs. We explained why we thought eHubs would proliferate and thrive.

In this article, we expand on and refine the ideas in our earlier article. We examine the dimensions on which B2B hubs can be classified. We use these dimensions to develop a taxonomy of business models for hubs. The taxonomy reveals important new categories of business designs that have yet to be exploited. The taxonomy also provides a deeper understanding of the relative merits and value creation potential of different business models, and the settings where different models are most appropriate.

We begin by describing the process of business purchasing on two simple dimensions - what companies buy and how they buy. We use these dimensions to create a taxonomy of B2B hubs along three key dimensions – (1) value creation mechanism (aggregation versus matching); (2) purchase situation (systematic versus spot purchasing); and (3) bias of the market-maker (one-sided/biased versus two-sided/neutral). This taxonomy offers insights into a new class of B2B hubs called reverse aggregators that are biased, and do not suffer from the “chicken-and-egg” problem in creating liquidity. The taxonomy also helps us understand where matching-based mechanisms (exchanges and auctions) are more appropriate than aggregation-based mechanisms (catalogs), and how these mechanisms differ on defensibility and value creation potential.

The Whats and Hows of Business Purchasing

To understand B2B hubs, it is useful to understand *how* businesses buy, and *what* they buy. Businesses buy a diverse set of products and services ranging from paper clips to computer systems, and steel to machinery. At the broadest level, business purchases can be classified into *manufacturing inputs* and *operating inputs*. Manufacturing inputs are raw materials and components that go directly into the manufactured product or manufacturing process. Manufacturing inputs tend to be *vertical* in nature, because the finished products that they go into are industry-specific. They are typically sourced from industry-specific suppliers and distributors, and they require specialized logistics and fulfillment mechanisms. For instance, UPS is not a good fulfillment provider for Hydrochloric Acid or High Density Polyethylene.

Operating inputs, on the other hand, are indirect materials and services that do not go into finished products. Operating inputs, sometimes called MRO (Maintenance, Repair, and Operating) inputs, include

¹ “Let’s Get Vertical”, Mohanbir Sawhney and Steven Kaplan, *Business 2.0*, September 1999 (www.business2.com)

industrial supplies, capital equipment, services, and travel-related services. Unlike manufacturing inputs, operating inputs tend to be *horizontal* in nature (with the exception of capital equipment and some industrial supplies). For instance, every business needs computers, office supplies, and airline tickets. But an advertising agency does not buy steel, and a chemicals company does not buy semiconductors. Another important difference is that operating inputs are much more amenable to being shipped through 3rd party logistics providers like UPS. Operating inputs have been traditionally sourced from MRO suppliers like W.W. Grainger, who aggregate MRO catalogs for a diverse set of industries.

The other important distinction in business purchasing lies in *how* businesses buy products and services. Businesses can either engage in *systematic sourcing* or in *spot sourcing*. Systematic sourcing involves buying through pre-negotiated contracts with qualified suppliers. These contracts are often long-term in nature, so systematic sourcing tends to be relationship-oriented. A large proportion of manufactured inputs is purchased through this mechanism. In the semi-commodity chemicals, for instance, over 90% of purchasing is through prenegotiated catalog-based mechanisms. On the other hand, businesses can also buy commodity-like products on the spot market from anonymous sellers. Commodity trading for commodities like oil, steel, and energy exemplifies this mechanism. Spot sourcing is transaction-oriented, and rarely involves a long-term or ongoing relationship between buyers and sellers.

Classifying B2B Hubs based on Purchase Situations

This simple two-way classification - *manufacturing inputs* versus *operating inputs* (the “what”); and *systematic sourcing* versus *spot sourcing* (the “how”) allows us to classify B2B hubs into four categories (see Figure 1):

- MRO hubs (operating supplies, systematic sourcing, horizontal focus)
- Yield managers (operating supplies, spot sourcing, horizontal focus)
- Catalog hubs (manufacturing inputs, systematic sourcing, vertical focus)
- Exchanges (manufacturing inputs, spot sourcing, vertical focus)

MRO hubs focus on improving the efficiencies in the procurement process for operating supplies for a diverse set of industries. Classic examples of these players are W.W. Grainger, Ariba, and Commerce One. These firms started out with an *enterprise focus* by licensing expensive “buy-side” software for eProcurement to large enterprises. These MRO players are now scrambling to reinvent themselves as MRO hubs on the Internet, by moving from a licensed model to a hosted model for software, and by moving from an enterprise-centric model to a network-centric model, where all catalogs are hosted on a common hub that businesses connect into. Newer entrants who have started out with the hub architecture in this space include Bizbuyer.com, MRO.com, PurchasingCenter.com, and ProcureNet.com. These players are horizontal in nature, because operating inputs are common to a significant extent across a wide variety of industries. Given their horizontal nature, MRO hubs tend to use “horizontal” third-party logistics. Therefore, they can disintermediate existing middlemen in the channel, without having to replicate the fulfillment capabilities and assets owned by the current channel.

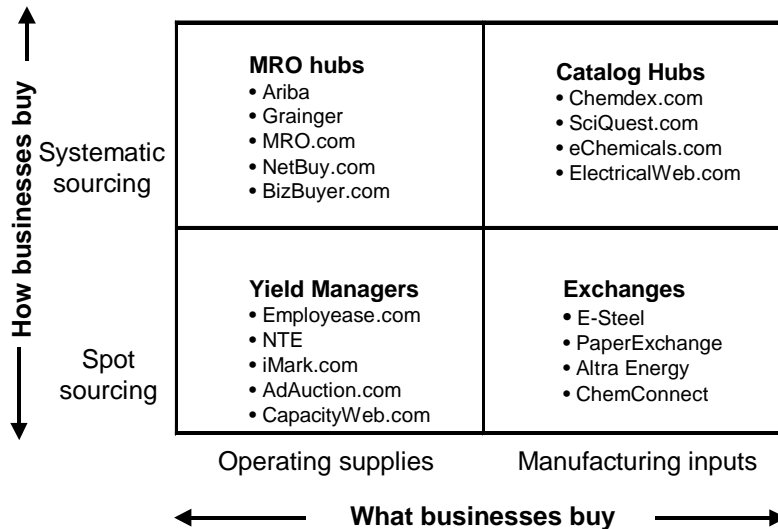
Yield managers focus on the spot procurement of operating inputs. Examples include human resources (Employease.com, Elance.com), utilities (Youilities.com), capital equipment (iMark.com), manufacturing capacity (CapacityWeb.com), and advertising inventory (AdAuction.com). These yield

managers aim to insulate buyers and sellers from ups and downs in operations by allowing them to scale their operating resources upwards or downwards at short notice by participating in the spot market. They add most value in situations where there is high degree of price and demand volatility (e.g., utilities), or where there are huge fixed-cost assets that cannot be liquidated or acquired at short notice (e.g., manpower or manufacturing capacity). Yield managers tend to be more vertical in nature than MRO hubs, but are less vertical in nature than industry-specific vertical hubs like Chemdex or PlasticsNet.com.

Exchanges aim to create spot markets for commodities or near-commodities within specific industry verticals. These exchanges approximate commodity exchanges, and largely focus on transactional sourcing. The exchange maintains relationships with buyers and sellers, but buyers and sellers rarely have direct relationships. In fact, in many exchanges, buyers and sellers may not even know each others' identities. Exchanges serve a yield-management role, because they allow purchasing managers to smooth out the peaks and valley in demand and supply by "playing the spot market". Examples of exchanges include E-Steel, PaperExchange, and IMX Exchange.

Finally, *catalog hubs* streamline the systematic sourcing of manufactured input within specific vertical industries. These players start out by putting industry-specific catalogs online, and creating a large universe of supplier catalogs within the vertical. They aim to automate the systematic sourcing process, and create value for buyers by lowering transaction costs. These catalog hubs can be buyer-focused or seller-focused, depending upon who they create more value for. Examples include PlasticsNet.com, Chemdex, and SciQuest. Catalog hubs need to work closely with distributors, especially on specialized fulfillment and logistics requirements for each vertical.

**Figure 1:
Classifying Business-to-Business Hubs**



How Hubs Add Value: Aggregation versus Matching

As we think about the difference between systematic and spot purchasing, it becomes obvious that the market-making mechanism that is appropriate for catalog hubs is quite different from the market-making mechanism used by exchanges and yield managers. Fundamentally, hubs create value by two different mechanisms – *aggregation* and *matching*. The aggregation mechanism relies on bringing a large number of buyers and sellers under one roof, and reducing transaction costs by “one-stop shopping”. For instance, PlasticsNet.com allows plastics processors to issue a single purchase order for hundreds of plastics products, and PlasticsNet.com sources these products from a diverse set of suppliers.

An important characteristic of the aggregation mechanism is that *adding another buyer to the hub only benefits sellers, and does not benefit other buyers*. This happens for a simple reason – buyers can never be sellers in a catalog aggregation model. So adding a buyer to the system only benefits sellers, and adding a seller to the system only benefits buyers². The aggregation mechanism is static in nature, because prices are pre-negotiated. The aggregation mechanism (also called the “catalog mechanism”) works best in the following settings:

- The cost of processing a purchase order is high relative to the cost of items procured.
- Products are specialized and not commodity-like.
- The number of SKUs (Stock Keeping Units) is extremely large.
- The supplier universe is highly fragmented.
- Buyers are not sophisticated enough to understand dynamic pricing mechanisms.
- Most purchasing is done on the basis of pre-negotiated contracts.
- A metacatalog of products carried by a large number of suppliers can be created.

The *matching mechanism* is a trade mechanism that creates value by bringing buyers and sellers together to negotiate prices on a dynamic and real-time basis. For example, iMark.com brings buyers and sellers together in the market for used capital equipment, and Altra Energy makes a market in energy and electricity. In contrast with the aggregation mechanism, *buyers can be sellers in the matching mechanism*. So adding a buyer to the hub benefits *buyers as well as sellers*. The source of value creation in the matching mechanism is improved matching due to improved marketplace liquidity. While catalogs benefit only from the aggregation mechanism, exchanges benefit from both aggregation and matching. Because they benefit from both mechanisms, we think that successful exchanges will reap greater benefits from being successful first-movers. The matching mechanism tends to work best in the following settings:

- Products are commodities or near-commodities.
- Trading volumes are massive, relative to transaction costs.
- Products are relatively standardized and can be traded sight-unseen.
- Buyers and sellers are sophisticated enough to deal with dynamic pricing.
- Purchasing is often done on a spot/transactional basis.
- Logistics and fulfillment can be conducted by third-parties, often without revealing the identity of the seller or buyer.
- Demand and prices are volatile.

² There is an important exception to this – if buyers form buying groups, then buyer can benefit from demand aggregation. This is the basis for the reverse aggregation model that we discuss later.

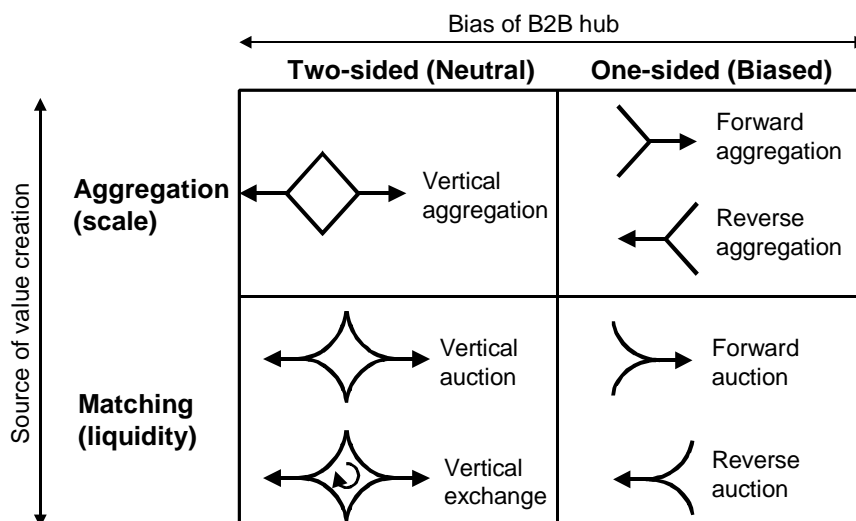
Who Hubs Serve: Biased versus Neutral Hubs

There is one other dimension that is important in describing a B2B hub – its bias. B2B hubs can be either neutral or biased. Neutral hubs do not favor buyers over sellers or vice versa. All of the hubs listed in Figure 1 are neutral. Biased hubs, in contrast, favor either buyers or sellers. Neutral hubs, by definition, are faced with a “chicken-and-egg” problem, in that they need to get buyers as well as suppliers into their system, without compromising their neutrality. They need to be careful in taking equity investments from large buyers as well as from large suppliers, because they can be perceived as biased. The benefit that neutral hubs have is that they are true “market-makers”, because they bring both buyers and sellers together.

There is another category of hubs that are *one-sided* and biased by design. These biased hubs either work for sellers or buyers, and help them to negotiate better terms or streamline the buying/selling process. Biased hubs (like neutral hubs) can occur both as aggregators in systematic markets and as matchers in spot markets. When they favor sellers, biased hubs act as forward aggregators or forward auctioneers. Examples include Ingram Micro in the computer industry, or eChemicals in chemicals. When they favor buyers, biased hubs act as reverse aggregators or reverse auctioneers. Examples include FreeMarkets.com (focusing on Fortune 500 companies with a spot purchasing mechanism), or FOB.com (focusing on demand aggregation for small buyers in chemicals and other verticals).

In Figure 2, we summarize this taxonomy of mechanisms for B2B hubs using a simple pictorial scheme. The direction of the arrow shows the bias of the hub (forward, reverse, or two-sided/neutral). The line versus the curve shows the nature of value creation (linear versus non-linear/exponential). This simple pictorial depiction allows us to classify hubs very parsimoniously on the mechanism they use, and who they serve (their bias).

Figure 2: Taxonomy of market mechanisms



**Figure 3:
Taxonomy of business models for B2B hubs**

	Two-sided (neutral)	One-sided (biased)
Aggregation mechanism (systematic purchasing)	<p>Two-way aggregators</p> <ul style="list-style-type: none"> • Negotiated catalog-based prices • Benefit buyers and sellers by aggregating supply <i>and</i> demand • Need to maintain neutrality • Need bilateral participation • Ideal for <i>systematic</i> purchasing • Ideal for markets with <i>bilateral fragmentation</i> 	<p>Seller aggregators (forward aggregators) Buyer aggregators (reverse aggregators)</p> <ul style="list-style-type: none"> • Negotiated catalog-based prices • Primarily benefit buyers <i>or</i> sellers by aggregating demand <i>or</i> supply • Can be biased, as they represent buyers <i>or</i> sellers in aggregation • Ideal for <i>systematic</i> purchasing • Ideal in markets where large buyers <i>or</i> sellers benefit vis a vis smaller ones.
Matching mechanism (spot purchasing)	<p>Dynamic Market Makers</p> <ul style="list-style-type: none"> • Dynamic market-based prices (two-way auctions or exchanges) • Benefit buyers and sellers by aggregating supply <i>and</i> demand • Benefit buyers and sellers by improved matching and liquidity • Need to maintain neutrality • Need bilateral participation • Ideal for <i>spot</i> purchasing • Ideal for markets with <i>bilateral fragmentation</i> 	<p>Forward Auctioneers (seller-driven auctions) Reverse Auctioneers (buyer-driven auctions)</p> <ul style="list-style-type: none"> • Dynamic market-based prices • Primarily benefit buyers <i>OR</i> sellers by improved matching and liquidity • Can be biased, as they represent buyers <i>or</i> sellers in match-making • Ideal for <i>spot</i> purchasing • Ideal for markets with <i>unilateral fragmentation</i> (demand <i>or</i> supply)

In Figure 3, we illustrate the different types of business models for B2B hubs, using this simple taxonomy – the purchasing situation for which they are appropriate and their bias. Neutral hubs attempt to aggregate many buyers with many sellers. To do so, neutral hubs require two-sided liquidity. This creates a “chicken and egg” problem. Buyers do not want to participate unless there are a sufficient number of sellers; sellers do not want to participate unless there are a sufficient number of buyers. Neutral hubs also have to overcome the channel conflict that accompanies seller participation in many cases. When sellers sell through B2B hubs, they will do so at the expense of their normal distribution channels. This problem is particularly acute for two-way aggregators. Chemdex solved this conflict by partnering with a large cataloger – VWR. VWR promised to send all its business through Chemdex in exchange for an equity stake in Chemdex, as well as a concession that Chemdex not charge a transaction fee to VWR’s largest buyers.

By their very nature, biased hubs do not need to worry about the “chicken-and-egg” problem, and can therefore hitch their wagon to one side of the transaction. This helps them to scale quicker than two-sided or neutral hubs. It also helps them to focus on smaller buyers or sellers, because they can aggregate demand or supply. Furthermore, biased hubs that represent buyers typically will not have to overcome channel conflict. This is true, for example, of Freemarkets, which organizes auctions for large buyers.

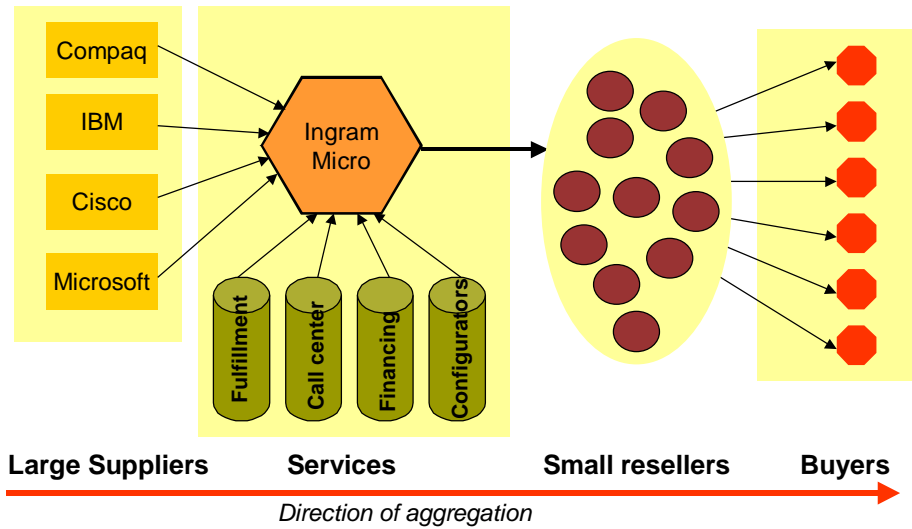
Neutral hubs and biased hubs also differ in one other important way. Neutral hubs are most likely to succeed and add value in markets that are fragmented on both the buyer and seller sides. In such markets, neutral hubs add value both by reducing transaction costs (aggregating) and improving matching (providing liquidity). If one side of the market is concentrated, these benefits are small or non-existent to the concentrated side of the market. Biased hubs, in contrast, can succeed as long as one side of the transaction is fragmented. In fact, reverse aggregators like FOB.com will add most value when the supplier universe is relatively concentrated, while the buyer universe is fragmented. In these situations, “leveling the playing field” for smaller buyers has significant value.

More about Reverse Aggregators: Enter the “Reverse VAR”

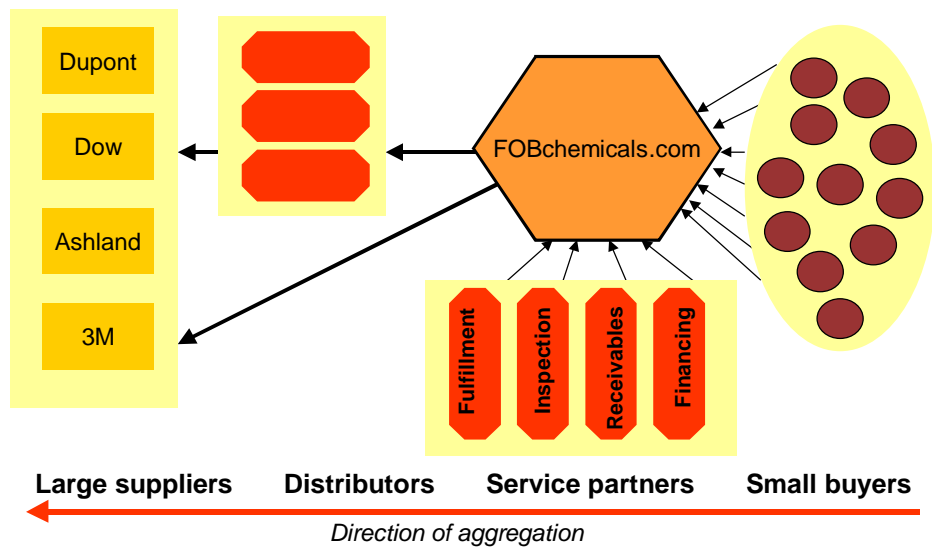
Reverse aggregators deserve some additional discussion, because they are a relatively recent development in the B2B arena. Reverse aggregators form groups of buyers of particular products or commodities within specific vertical or horizontal markets. Reverse aggregators reduce two major inefficiencies. First, by aggregating the buying power of many buyers – particularly, small and medium-size buyers – they can negotiate price reductions for those buyers. In some industries, volume discounts can approach 20%. Second, the purchasing hub can reduce procurement transaction costs by outsourcing the procurement function.

A vertical reverse aggregator pursues this buyer aggregation / purchasing outsourcing strategy in manufacturing inputs. FOB.com is pursuing this strategy in chemicals. BizBuyer.com and PurchasingCenter.com are a few of many firms pursuing this strategy in horizontal markets (MRO procurement). An interesting way to think about a reverse aggregator is that they act as “reverse VARs” or “Value-Added Rebuyers”! Traditionally, firms like Ingram Micro have worked as “forward aggregators” by aggregating *selling power* for small VARs (Value Added Resellers), by providing them with virtual back-office functions, and virtual economies of scale in purchasing (see Figure 4). In contrast, players like FOB.com are turning this supply chain on its head by reversing the direction of aggregation. They aggregate *buying power* for smaller buyers. In this way, they are exactly the reverse of Ingram Micro (see Figure 5 for an illustration of this).

**Figure 4:
Ingram Micro as a forward aggregator**



**Figure 5: FOB.com as a reverse aggregator
in the chemicals vertical**



Reverse aggregators have some advantages and disadvantages relative to neutral hubs for procurement of manufactured inputs. On the negative side, reverse aggregators will not be attractive to larger purchasers who already enjoy substantial volume discounts. Thus, unlike exchanges, reverse aggregators are unlikely to have all buyers as possible customers. On the positive side, reverse aggregators can potentially address both spot and systematic sourcing of inputs, in contrast with exchanges, who are largely tied to spot transactions. For example, a manufacturer looking for a long-term supply of steel is less likely to use e-STEEL than to negotiate directly with a steel manufacturer. Even in those instances where manufacturers do source inputs on the spot market, some fraction of that sourcing is still likely to be systematic and relationship-oriented in nature. Reverse aggregators will be able to aggregate buyers not only for spot purchases, but also to negotiate long-term contracts with suppliers. In many industries, we suspect that reverse aggregators will have access to at least as large a market as exchanges and catalogs.

Where will we see reverse aggregators emerge? First, such hubs are likely to spring up in vertical and horizontal markets in which buyers are fragmented. As mentioned above, it is not necessary for the market to be fragmented on *both the buy and the sell side*. Second, the primary benefit that purchasing hubs provide is *demand aggregation*, so they will thrive in markets where there are a few large buyers and a large number of small buyers. In these situations, larger buyers enjoy significant volume discounts, while smaller buyers don't have the buying power to negotiate with sellers, especially with larger sellers. Third, purchasing hubs will be favored in products and services that can be more easily broken down into smaller orders. The smaller the lot size that the purchasing hub can deliver, the greater its value addition. Finally, they will add most value in product categories where the number of SKUs is not too large, because demand aggregation adds less value when product diversity is extremely high.

A logical concluding question to ask is – why does the reverse aggregator opportunity exist? Can't the neutral hubs (Chemdex, SciQuest, PlasticsNet) destroy these new entrants? Interestingly, we believe that existing neutral hubs in the relevant vertical markets or horizontal markets are unlikely to create reverse aggregators. First, and most important, neutral hubs must provide effective neutrality between buyers and sellers to obtain the participation of both sides. If a neutral hub were to favor one side too heavily, it would risk losing its liquidity. Second, neutral hubs (especially exchanges) provide marketplaces for buyers and sellers to make spot purchases and sales. Exchanges are not designed to support systematic or contractual purchases. In other words, a manufacturer might use ChemConnect to find chemicals that it unexpectedly needs in the next month. That same manufacturer, however, is less likely to use ChemConnect for the chemicals that it buys under long-term contracts or through relationships.

In the din and noise of the rapidly-evolving B2B marketplace, there is an enormous amount of confusion about what the different B2B hub business models are, where they add most value, and how profitable and defensible are they likely to be. We hope that the simple classification frameworks and taxonomy that we offer provides some clarity and direction as we see the landscape evolve. We also hope that the frameworks presented in this article will help entrepreneurs identify promising B2B hub business designs, and to better understand the what, where, why, and hows of B2B hubs.³

³ One or both of the authors advises e-STEEL, FOB, iMark, PaperExchange, and PlasticsNet.