An Exploratory Study of B2B Marketplaces

by

Denise Nicole Minier

BS, Industrial & Systems Engineering
Virginia Polytechnic Institute & State University, 1993

Submitted to the Engineering Systems Division
In Partial Fulfillment of the Requirements for the Degree of

Master of Engineering in Logistics
at the
Massachusetts Institute of Technology

June 2003

Signature of Author_____
Engineering Systems Division
May 9th, 2003

Certified by_____
Yossi Sheffi
Professor of Civil & Environmental Engineering
Professor of Engineering Systems
Thesis Supervisor

Accepted by_____
Yossi Sheffi
Professor of Civil & Environmental Engineering
Professor of Engineering Systems
Co-Director, Center for Transportation and Logistics

An Exploratory Study of B2B Marketplaces

by

Denise Nicole Minier

Submitted to the Engineering Systems Division on May 9, 2003
in partial fulfillment of the requirements for the degree of
Master of Engineering in Logistics

Abstract

A business-to-business (B2B) e-marketplace brings together buyers and sellers using the Internet to conduct or facilitate business transactions. They came onto the scene in the late 1990's. There are independent exchanges, those formed by industry consortia, and private exchanges which are formed for the exclusive use of the single owner and its suppliers and customers. E-marketplaces support nearly all major types of B2B transactions, such as sales via catalogs, contracts, auctions, procurement via reverse auctions and RFQ's (request for quotes), and trading via exchanges.

At the height of the dot-com boom, there were approximately 2,500 B2B exchanges worldwide. There was tremendous hype and expectations surrounding them. They were to revolutionize the way companies do business and fundamentally transform industries and the global economy. But the B2B e-marketplace has experienced a shakeout, and most have merged, closed down, or been converted to software vendors. Only about 1,000 are still operating, and this number will likely decline further.

Even so, there are still great benefits to be had in the B2B exchange arena. B2B digital marketplaces reduce transaction costs by automating purchasing and sales processes. They reduce information inefficiencies by making prices more transparent and aggregating relevant real-time industry news into one easily accessible place, and they diminish geographic limitations.

This research examines the different types and strategies of B2B marketplaces, the rise and fall of exchanges, examples of successful marketplaces, and future trends in the area.

Thesis Advisor: Yossi Sheffi
Title: Co-Director, Center for Transportation and Logistics

Acknowledgements

To Grammy.
Your support is the reason I'm here. I'm eternally grateful.

To Mom and Dad.
I wouldn't be the person I am today without you.

To Aunt Barb.
Your love and encouragement throughout my entire life have meant the world to me.

To Happy and Yogi.
You put countless smiles on my face.

To Kevin.
My love and my best friend – what more can I say

And finally to my fellow MLOG's: you made this an experience that I'll never forget.
You'll always have a special place in my heart and I wish you all the best.

Table of Contents

1.0 Introduction

In the late 1990's, business-to-business e-marketplaces came onto the scene. There has been a lot of discussion and hype about the tremendous value they can add to a company's purchasing capabilities and in fact across a company's entire supply chain. However, recently, many of these highly touted marketplaces have folded. Customers' expectations often have not been met and investors have been disappointed in their lackluster performance. Yet there still seems to exist the notion that given the right environment (right model, product and service offering, market), business-to-business marketplaces can be successful.

1.1 Motivation for Thesis

Given that there was such hype surrounding business-to-business (B2B) marketplaces a few years ago, one wonders whether there are examples of successful B2B marketplaces currently in existence and why they are successful. There have been a lot of misunderstandings, confusion, and frustration as well. This research analyzes the different types and strategies of B2B marketplaces, the benefits and potential pitfalls of each model, examples of successful marketplaces, and future trends in this area in an attempt to shed some light and provide clarity around the topic of B2B Marketplaces.

1.2 Business-to-Business (B2B) Marketplace

The traditional definition of a business-to-business (B2B) e-marketplace is an on-line marketplace where buyers and sellers congregate to exchange goods and services for money. This definition should be expanded to include information sharing and tools as well as these are key components of many e-marketplaces. B2B marketplaces either execute a particular purchasing activity for the customer or enable the customer to better perform a specific function. It is important to note that there are many terms in the field that are used interchangeably to describe this concept. One of the most common is B2B Exchange. B2B marketplace, B2B e-marketplace, and B2B Exchange will be used throughout this document to represent the same idea.

1.3 Types of B2B Marketplaces – Classification Schemes

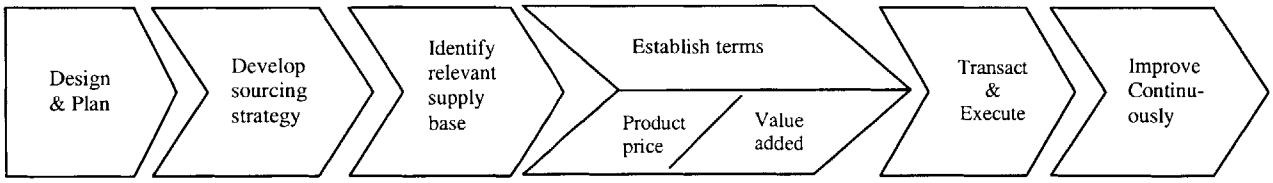
Within this broad definition above, there are different schools of thought and ways to break down the types of B2B marketplaces. One such way is to view them by the type of market they serve. A second classification of exchanges is based on how they integrate into the customer's purchasing process. And a third classification is based on what businesses buy and how they buy these items.

1.3.1 Market Based

In the simplest form, there are horizontal and vertical markets. Horizontal markets cut across many industries and typically provide a common service, such as financial services, benefits management, or MRO (maintenance, repair, and operating) equipment procurement. Vertical markets concentrate on one specific industry such as chemicals and transportation and seek to provide all of the services needed by that industry. At this high level, there are three common models of marketplaces: buy-centric, sell-centric, and neutral exchanges. Buy-centric markets are where a few big buyers join forces to act as one buyer and build a marketplace where small fragmented sellers can sell their goods. An example of this market is Covisint, the marketplace formed by the big three US automakers. Sell-centric markets are markets where one or a few big sellers work together acting as one seller and build a marketplace for many, small fragmented buyers. Examples of this model are Grainger.com and DoveBid. Neutral exchanges appear where both the sellers and buyers are fragmented. In this environment, a third party creates a neutral exchange and performs the transactions through a bid/ask system. The middleman or market maker receives a cut or transaction fee for each deal. Examples include Intercontinental Exchange and Arbinet. This market and exchange based approach for categorizing B2B e-marketplaces seems to be the most basic and common approach.

1.3.2 Integration into the Customer's Purchasing Process

Another way to describe B2B marketplaces is based on the way they integrate into the customer's purchasing process. The Purchasing Process of a company can be defined as follows:



McKinsey & Company[65] and CAPS Research[65] have chosen to describe marketplaces in this fashion. They define B2B e-marketplaces as having 5 different model types, based on the way they integrate into the customer's purchasing process as defined above. These models are as follows:

1. Project / Specification Managers
2. Supply Consolidators
3. Liquidity Creators
4. Aggregators
5. Transaction Facilitators

Marketplaces classified as Project / Specification Managers primarily specialize in the design and planning phase of the purchasing process. They provide tools to plan and manage complex projects or processes for buyers. These tools help customers increase their speed to market and improve decision-making on product development. This ultimately leads to improving potential revenues. This occurs through helping buyers and suppliers collaborate on design and other high value decisions in order to reduce rework, excess inventory, and other costs in the system. An example of this type of marketplace and how it can bring benefits to the customer would be a printing e-marketplace. It can help the customer evaluate the marketing benefits of different brochure options, but it doesn't help the customer negotiate a price with the printer. In addition, it helps reduce errors and rework caused by poor communications.

Supply consolidator marketplaces focus less on product development and more on purchasing to support existing products. They cover the "Identify Relevant Supply Base" and the "Transact and Execute" phases of the purchasing process. They help identify the relevant supply base for a customer and conduct the purchasing transaction. These B2B marketplaces bring together product offerings of many suppliers to increase a buyer's options. This fragmented base of suppliers may be difficult to reach off-line or are so numerous that working with them on an individual basis is ineffective. Marketplaces utilizing this model typically provide in depth product information in a catalog format and search capability across suppliers to identify the best options for the buyer. An example of how this model adds value might be a B2B marketplace in the electronic components industry. It could help engineers compare specs across multiple components to evaluate potential substitutes for a component they are currently using. This helps customers reduce the transaction costs of searching through multiple paper-based catalogs or websites, compare the specs across products, and manage the accounts with numerous suppliers.

Liquidity creators establish the terms of the purchase. They create liquid, dynamic markets for commodity products traded between many buyers and sellers. An example of this model is the spot market for trucking capacity or electronic components. This model provides suppliers with a market for their products and buyers with a steadier source of supply. This improves industry utilization and reduces costs for buyers by them being able to avoid dealing with brokers.

Aggregators are the most focused of the models and deal with the "Product Price" portion of the purchasing process. They primarily combine demand within and across buying enterprises and then use this combined market power to achieve lower prices from suppliers. In general, aggregators do not help buyers determine what to buy or provide tools that reduce other operating costs.

The final model identified by the McKinsey & CAPS study is the Transaction Facilitator. This model focuses on the "Transact & Execute" piece of the purchasing process and

helps eliminate complex, paper-based transactions between buyers and sellers. When tailored to a specific industry, the tools provided by these marketplaces can be invaluable in reducing transportation costs, dispute costs resulting from errors, and other operating costs.

All of these B2B e-marketplace models provide functionality and purchasing information that a customer can use to make better purchasing decisions. The best strategy is for a company to use a portfolio approach, combining traditional purchasing practices with the specific online benefits that these different e-marketplaces can provide.

1.3.3 What Businesses Buy and How They Buy

A final classification scheme worth noting was developed by Kaplan and Sawhney[57] and is based on what businesses buy (manufacturing inputs versus operating inputs) and how they buy these things (systematic sourcing versus spot sourcing). Manufacturing inputs are the raw materials and components that go directly into a product or a process. Because these goods vary considerably from industry to industry, they are usually purchased from industry-specific, or vertical, suppliers and distributors. They also tend to require specialized logistics and fulfillment mechanisms. Operating inputs, by contrast, are not parts of finished products. These include things such as office supplies, spare parts, airline tickets, and services (often called MRO items). Operating inputs tend to not be industry specific; most businesses need computers, copy paper, and cleaning services. As a result, they are frequently purchased from horizontal suppliers that serve all industries. And they are much more likely to be shipped through generalists like UPS.

The second distinction in business purchasing is how products and services are bought. Companies either perform systematic sourcing or spot sourcing (and sometimes they will do a combination of both). Systematic sourcing is where a company will enter into negotiated contracts with qualified suppliers. The contracts are more long-term and the buyers and sellers develop relatively close relationships. In spot sourcing, the buyer's goal is to meet an immediate need at the lowest possible cost. Some examples include commodity trading for oil, steel, energy, etc. Spot transactions rarely involve a long-term

relationship with the supplier; in fact, buyers may not even know whom they're buying the product from.

Kaplan and Sawhney[57], classify B2B hubs or marketplaces into four categories:

1. MRO Hubs – horizontal markets that enable systematic sourcing of operating inputs
2. Yield Managers – horizontal markets that enable spot sourcing of operating inputs
3. Exchanges – vertical markets that enable spot sourcing of manufacturing inputs
4. Catalog Hubs – vertical markets that enable systematic sourcing of manufacturing inputs

	What Businesses Buy	
	Operating Inputs	**Manufacturing Inputs**
How Businesses Buy	**MRO Hubs**	**Catalog Hubs**
Systematic Sourcing	Ariba Grainger MRO.com BizBuyer.com	Chemdex SciQuest.com PlasticsNet.com
	Yield Managers	**Exchanges**
Spot Sourcing	Employease iMark.com CapacityWeb.com	e-Steel PaperExchange.com Altra Energy IMX Exchange

In MRO hubs, the operating inputs tend to be low-value goods with relatively high transaction costs, so these marketplaces provide value largely by increasing efficiencies in the procurement/purchasing process. These markets give buyers access to consolidated MRO catalogs from a large number of suppliers. Because MRO hubs can use third party logistics suppliers (3PL's), they can bypass existing middlemen in the channel without having to develop the capability to move the goods themselves.

Yield managers create spot markets for common operating resources like manufacturing capacity, labor, and advertising. This allows companies to expand or contract their operations on short notice. These e-marketplaces add the most value in situations where assets can't be liquidated or acquired quickly, such as labor and manufacturing capacity.

Exchanges allow purchasing managers to smooth out the peaks and valleys in supply and demand by rapidly exchanging the commodities or near-commodities needed for production. The exchange maintains relationships with buyers and sellers, making it easy for them to do business without negotiating contracts or hashing out the terms of the relationship. In fact, in many exchanges, the buyers and sellers never even know the other's identity.

Finally, catalog hubs help to automate the sourcing process for non-commodity manufacturing inputs. They provide value by reducing transaction costs. Like MRO hubs, catalog hubs bring together many suppliers to one easy-to-use website. The only difference is that catalog hubs are industry specific. They can be buyer or seller focused. Because the products they offer tend to be specialized, catalog marketplaces or hubs tend to work closely with distributors to ensure safe and reliable deliveries.

1.4 Auction Theory

Auction markets are defined as markets in which products are bought and sold through formal bidding processes. The advantages of auctions are that they are likely to be less time consuming than one-on-one bargaining, and they encourage competition among buyers in a way that increases the seller's revenue. In addition, they offer the ability to value goods that might not otherwise be available, and as a result are useful when a seller is unsure of the price he can get.

The design of an auction, which involves choosing the rules under which it operates, greatly affects the outcome. A seller will want an auction format that maximizes the revenue from the sale of the product. A buyer, on the other hand, will want an auction that minimizes the expected cost of the product to be purchased. There are different ways to classify auctions. There are open auctions as well as sealed-bid auctions. There are auctions where the price ascends and auctions where the price drops over time. Four basic types of auctions are widely used and analyzed: English, Dutch, First-price sealed-bid, and Vickrey (second-price sealed-bid). Two other auction formats worth discussing are double auctions and reverse auctions. The opportunity for a seller to raise revenue and

for a buyer to obtain an object at a reasonable price depends not only on the auction format but also on whether the items being auctioned have the same value to all bidders (common-value) or different values to different bidders (private-value) and the information that is available to them.

1.4.1 English Auction

The English auction format is the most familiar type of auction. It is also known as the open-outcry auction or the ascending price auction and is used commonly to sell art, wine, and numerous other goods. In this format, the seller or auctioneer actively solicits progressively higher bids from a group of potential buyers. At each point, all participants are aware of the current high bid. The auction stops when no bidder is willing to increase the bid; the item is then sold to the highest bidder at a price equal to the amount of the high bid.

Competition is highest in the English auction with some bidders becoming carried away with enthusiasm. Winner's curse (paying more for an item than its value) is widespread in this type of auction because inexperienced participants bid up the price. However, the seller still may not receive maximum value. In an English auction, the underbidder usually forces the bid up by one small step. Thus, the winner may end up paying well under his valuation.

1.4.2 Dutch Auction

The Dutch or descending-price auction uses an open format like the English auction. This type of auction was developed in the 17^{th} century in Amsterdam for the sale of fresh flowers, and it differs from conventional auctions in that the price of the goods on offer descends and all bids are immediately successful. The seller begins by offering the item at a relatively high price. If no potential buyer agrees to that price, the seller reduces the price by fixed amounts. The first buyer that accepts an offered price buys the item at that price. The Dutch auction is believed to be superior to the English auction (from the seller's point of view) because the bidder might bid at or near his highest valuation.

Under this format, if the bidder with the highest interest really wants an item, he cannot afford to wait too long to enter his bid.

1.4.3 First-Price, Sealed-Bid Auction

The third auction type, first-price sealed-bid, has a primary characteristic of being sealed (not open-outcry like the English or Dutch varieties) and thus hidden from other bidders. A winning bidder pays exactly the amount he bid. Usually each participant is allowed one bid which means that bid preparation is very important. Generally speaking, a sealed-bid format has two distinct parts--a bidding period in which participants submit their bids, and a resolution phase in which the bids are opened and the winner determined (sometimes the winner is not announced).

In a first-price auction (one unit up for sale) each bidder submits one bid in ignorance of all other bids. The highest bidder wins and pays the amount he bid. When more than one unit is for sale, called a "discriminatory auction", sealed bids are sorted from high to low, and items awarded at highest bid price until the supply is exhausted. In this scenario, winning bidders can (and usually do) pay different prices.

1.4.4. Vickrey Auction (Second-Price, Sealed-Bid)

The second-price sealed-bid auction is commonly called the Vickrey auction, named after William Vickrey, winner of the 1996 Nobel Prize in Economic Sciences, who classified it in the 1960s. Like the first-price auction, the bids are sealed, and each bidder independently submits a single bid, without seeing others' bids. The item is awarded to the highest bidder at a price equal to the second-highest bid (or highest unsuccessful bid). In other words, a winner pays less than the highest bid. If, for example, bidder A bids $10, bidder B bids $15, and bidder C offers $20, bidder C would win, however he would only pay the price of the second-highest bid, namely $15. It is important to note that when auctioning multiple units, all winning bidders pay for the items at the same price (the highest losing price).

One might wonder why any seller would choose this method to auction goods. It seems obvious that a seller would make more money by using a first-price auction, but, in fact, that has been shown to be untrue. Bidders fully understand the rules and modify their bids as circumstances dictate. In the case of a Vickrey auction, bidders adjust upward. No one is deterred out of fear that he will pay too high a price. Aggressive bidders receive sure and certain awards but pay a price closer to market consensus. The price that winning bidder pays is determined by competitors' bids alone and does not depend upon any action the bidder undertakes. Less bid shading occurs because people don't fear winner's curse, and bidders are less inclined to compare notes before an auction.

1.4.5 Double Auction

Although not classified as one of the major four auction types, the double auction has been the principal trading format in U.S. financial institutions for over a hundred years. In this auction both sellers and buyers submit bids which are then ranked highest to lowest to generate demand and supply profiles. From the profiles, the maximum quantity exchanged can be determined by matching selling offers (starting with lowest price and moving up) with demand bids (starting with highest price and moving down). This format allows buyers to make offers and sellers to accept those offers at any particular moment.

A "continuous double auction" is one in which many individual transactions are carried on at a single moment and trading does not stop as each auction is concluded. The New York Stock Exchange and the pit of the Chicago Commodities market are examples of continuous double auctions.

1.4.6 Reverse Auction

In traditional auctions, such as the ones described above, sellers post products, and consumers respond with bids. In reverse auctions, however, buyers describe their needs, and suppliers respond with products and prices. In this kind of auction, the price tends to decrease over time as suppliers try to undercut their competition as the auction is about to close. Obviously, this kind of auction favors the buyer. Reverse auctions are most

appropriate for commodity items such as indirects, where a deep supplier relationship is not critical and the quality and nature of the goods is highly standardized.

1.4.7 Valuation and Information

People generally have one of two motivations for participating in an auction of any type, and people's bidding behavior changes depending upon which motivation is driving them. The first reason is when a bidder wishes to acquire goods for personal consumption and has no primary motive to resell (wine or fresh flowers). In this case the bidder makes his own private valuation of the item for sale. Each bidder knows his or her individual valuation or reservation price, and valuations differ from bidder to bidder. The bidder is motivated to pay up to a certain maximum, independent of the valuations made by others.

The second reason for bidding in an auction is to acquire items for resale or commercial use. In this case, an individual bid is predicated not only upon a private valuation reached independently, but also upon an estimate of future valuations of later buyers. Each bidder of this type tries to guess the ultimate price of the item. In other words, the item is really worth the same to all, but the exact amount is unknown. This is called a common-value assumption. The bidders can only estimate the value, and their estimates will vary. Two examples of this might be purchasing a piece of artwork for resale or an auction of an offshore oil reserve. In the auction for the oil reserve, the value of the reserve is the price of oil minus the extraction cost, times the amount of oil in the reserve. As a result, the value should be about the same for all bidders. However, bidders will not know the amount of oil or the extraction cost – they can only estimate these numbers. Because bidders have different information, their estimates will differ possibly causing them to bid very different amounts to get the reserve.

1.4.8 Auction Strategies

The essentials remain the same regardless of the type of auction: bids are the lowest a firm believes will secure the lot. A bidder has to make a careful analysis of what the other bidders may do, which in turn will be dependent to some degree on what they think he

may bid. This is the realm of game theory. Game theory is a distinct and interdisciplinary approach to the study of human behavior and the manner in which people make decisions in situations of uncertainty and risk. It focuses on individual players' strategies and is useful when thinking about auction behavior. Using game theory economists examine rational behavior and decisions made in varying conditions.

A seller, on the one hand, is faced with choosing an auction type, and so he must predict the behavior of bidders. On the other hand, a bidder tries to predict the behavior of the other bidders. Each bidder makes an estimate of his own value of the object and also an estimate of what others will bid on it. Good bidding is often the result of correct predictions about the behavior of others and sometimes that means guessing the extent of someone else's information correctly.

1.4.8.1 From a Seller's Perspective

In any auction a seller can influence results by revealing information about the object. Intuitively, a bidder's profits rise when he has information not available to others. In general, the more information a bidder has, the more the price-dampening effect of winner's curse is lessened. So a seller's optimal strategy is to reveal information and to link the final price to outside indicators of value (an authoritative evaluation).

Theoretical literature shows that, under assumption of private value, all four basic auction types can be shown to yield the same expected price and revenue to the seller when bidders are risk neutral (people who bid exactly their valuations) and symmetric (they use the same distribution function to estimate valuations). This implies that auction choice is not crucial because each format yields on average the same payoff.

This revenue equivalence does not hold true under common value assumption, with risk-averse traders (people likely to raise their bids so that they have a greater chance of victory), or in auction markets of multiple goods when the bidders bid for more than one item.

1.4.8.2 From a Bidder's Perspective

Theoretical literature assumes that auction participants are homogeneous (risk neutral and symmetric). It assumes bidders all focus on maximizing profits and that only one item is being auctioned.

Milgrom[66] believes that "the most important lessons to be learned from both the theory and the experiments are that the returns in bidding come from cost and information advantages, that naive bidding strategies can squander these advantages, and that bidders without some advantage have little hope of earning much profit, but could with a little bit of carelessness suffer large losses".

In a private-value English auction, a player's best strategy is to bid a small amount more than the previous high bid until he reaches his valuation and then stop. This is optimal because he always wants to buy an object if the price is less than its value to him, but he wants to pay the lowest possible price. Bidding always ends when the price reaches the valuation of the player with the second-highest valuation. An advantage to English auctions is that a bidder gains information. He can observe and see not only that other players drop out, but also the price at which the competition abandons the bidding. That tells a bidder a great deal about the valuations of others and allows a bidder to revise his valuation on the fly. A player's strategy is his series of bids as a function of (1) his value, (2) his prior estimate of the other players' valuations, and (3) the past bids of other players. His bid can be updated as information changes.

The problem for the bidder in a Dutch auction is exactly the same as that facing a bidder in a sealed-bid auction. At some point in advance, the bidder must decide the maximum amount he will bid. He must decide when to stop the auction based upon his own valuation of the object and his prior beliefs about the valuations of other bidders. This auction type is strategically equivalent to a first-price sealed-bid auction because no relevant information is disclosed in the course of the auction, only at the end when it is too late. Bidders will employ the strategy of shading bids down slightly so as not to be caught by winner's curse.

It is difficult to specify a single strategy in a first-price sealed-bid auction because a profit-maximizing bid depends upon the actions of others. The tradeoff is between bidding high and winning more often, and bidding low and benefiting more if the bid wins (bigger profit margin). As in the Dutch auction, a bidder must decide in advance the maximum amount he will bid. Most bidders attempt to shade their bids to move closer to market consensus, again helping to avoid winner's curse.

Milgrom[66] suggests that the dominant strategy for a bidder in a Vickrey (second-price sealed-bid) auction is to submit a bid equal to his true reservation price (the lowest acceptable price) because he then accepts all offers below his reservation bid and none that are above. A participant who bids less is more likely to lose the auction and all that strategy accomplishes is to lower the chance of victory. Bidding high carries the risk of winner's curse. Neither affects the price paid if he wins. When each bidder adopts a strategy of bidding his true price, the outcome is that the item is awarded to the bidder with the highest valuation at a price equal to the second highest valuation. The existence of a dominant strategy means that bidder can determine his own sealed bid without regard for the actions of others.

1.4.9 Determining a Pricing Mechanism

One of the key characteristics of an e-marketplace is the manner in which the sales price is determined. The pricing mechanism should be determined based on buyers' and sellers' needs and a function of the products traded. Pricing mechanisms can be divided into two categories: set price which is determined by the seller or price discovery which is determined by buyer(s) and seller(s) together.

Set or posted prices are openly posted in a catalogue and do not vary as a function of individual trades. A set price mechanism is used for most purchasing. It is useful when the seller is constrained by the cost of goods and when the buyer doesn't want to spend time negotiating. This model is suitable in stable markets but does not adequately meet the needs in the markets that involve items and services with a significant amount of

price uncertainty. This uncertainty may stem from unknown or volatile supply and demand.

The options for setting the price of transactions between a seller and a buyer based on price discovery are negotiation, auctions, and exchanges.

Price Discovery Mechanisms

Many Buyers	Auction	Exchange
One Buyer	Negotiation	Reverse Auction
	One Seller	Many Sellers

Negotiated prices are suitable when sellers may not want to expose their inventory to everyone in the market. Buyers and sellers communicate privately to agree on a price, taking advantage of the communication efficiencies of the online medium.

There are many auction types; several were discussed previously. The traditional or straight auction category is where a single seller offers a particular item to multiple buyers. The term reverse auction is used to describe situations where a single buyer specifies the item he requires and then interacts with multiple sellers to determine the optimal provider. A double auction or exchange is when multiple buyers and sellers exist for the same type of good. When there is unknown or volatile supply and demand, auctions offer a superior means of trade. They focus the forces of supply and demand, in effect asking the market, "How much is this worth, and who should get it?" By ensuring that prices match current market conditions, auctions create value for both buyers and sellers.

Straight auction pricing mechanisms are appropriate when a product has different values to different parties, or when a product is perishable and needs to be moved quickly. These mechanisms are also useful when selling excess inventory or used capital equipment.

A reverse auction gives the seller with the most attractive offer the opportunity to meet a buyer's demand. It works best when a surplus of the product is available and when the product from different suppliers is indistinguishable. A request for quotes (RFQ), a common mechanism used for business procurement, is a form of reverse auction. It allows the buyer to negotiate price, product attributes, terms and conditions, and to collaborate with suppliers on the specification of services and custom goods. Therefore, RFQ's are the preferred mechanism for expensive items, custom goods, services, and direct goods (i.e., goods that are directly used in production).

An exchange or double auction is used when the items to be traded are standardized goods that can be bought purely based on specifications (dimensions, grade, etc.) and can be used to determine volatile commodity prices. It is suitable when numerous buyers and sellers are simultaneously interested in purchasing and selling commodity items. The price, the only differentiator, is determined by matching received bids and offers on a continuous or periodic basis.

The double auction market has tremendous advantages for trading primary and secondary commodities over the Internet such as bandwidth, energy, and agricultural products (meat, corn, wheat, and others). In some of the sell-side models, trading using the double-auction mechanisms provides sellers with a channel to get rid of excess capacity by posting offers and obtaining matches in real time. The exchange does a match of the bids and offers, and orders are placed automatically to the sellers. In B2B private exchanges, unlike the stock and commodities markets, the emphasis can be on multi-attribute bids and offers. A bid can specify the price, quantity, quality constraints (e.g., quality > 5.0), delivery constraints (e.g., delivery date <= June 10, 2003), and so on. For such a bid to be matched with one or more offers, a matching algorithm that takes into account attributes and constraints is required. The advantages are in their application to trading of complex

commodities such as petroleum, plastics, natural gas, and bandwidth, which typically contain multiple attributes for trading.

2.0 The Hype

While performing the research for this thesis, it was immediately apparent that there has been a shakeout in the B2B marketplace arena. This is evident by the shear volume of information that was written about this topic in the late 1990's and early 2000 versus what is being written about it today. As with anything, it is important to see where we've been to understand and get an idea of where we are going.

B2B exchanges were to revolutionize the way that companies do business and communicate with one another. Todd Hewlin from the Internet Capital Group (ICG), a company whose business model was to invest in B2B start-ups, help them grow and then take them public, wrote the following in 2000: "Ultimately, digital marketplaces promise to fundamentally transform industries and our global economy. They are already reducing both process and product costs. They are delivering higher revenues at reduced cost of sales. They are integrating supply chain transactions in unprecedented ways. And they are enabling business to outsource many non-core business activities to increase flexibility and reduce management complexity. In fact, once all of these outcomes of the B2B transformation are taken into account, many industries expect 15-30% reductions in end-to-end costs of their supply chain. Over the coming years, this profound impact on industry economics may well reflect the greatest incremental change in corporate productivity ever." ICG's share price reached $200 in January 2000, giving it a market capitalization in excess of $56 billion. Today, ICG's stock trades around $0.45 per share and its market capitalization is around $129 million.

In 1999, when B2B mania was all the buzz, some analysts predicted that more than 100,000 B2B exchanges would be operational by 2001. At that time there were probably around 300 B2B exchanges. By the end of year 2000, McKinsey was studying the e-marketplace arena and was looking at over 1000 B2B e-marketplaces. Gartner[34], the leading B2B analyst, was actively tracking nearly 2,000 B2B exchanges worldwide. In

early 2001, AMR Research forecasted that US business-to-business e-commerce would approach $3.4 trillion by 2004. And worldwide, Gartner was estimating that the industry would reach $8.5 trillion by 2005. An interesting and telling exhibit from e-Marketer[43] is shown below. It summarizes the estimates from leading analysts in the e-commerce arena from 2000 and 2001 and indicates what they felt was going to occur in the B2B e-commerce area worldwide over the next 5 years.

Figure 1: Future Estimates of B2B E-Commerce

Comparative Estimates: B2B E-Commerce Worldwide, 2000-2005 (in billions)

	2000	2001	2002	2003	2004	2005
eMarketer	**$278**	**$474**	**$823**	**$1,409**	**$2,367**	-
AMR Research	$371	$704	$1,375	$2,261	$3,350	$4,739
Computer Economics	$3,068	$5,232	$6,815	$9,907	-	-
Forrester Research	$604	$1,138	$2,061	$3,694	$6,335	-
International Data Corporation (IDC)	$282	$516	$917	$1,573	$2,655	$4,329
Gartner Group	$433	$919	$1,929	$3,632	$5,950	$8,530
Morgan Stanley Dean Witter	$200	$721	$1,378	-	-	-
Goldman Sachs and Co.	$357	$740	$1,304	$2,088	$3,201	-
Ovum	$218	$345	$543	$858	$1,400	-

Source:eMarketer, AMR Research, International Data Corporation (IDC), Gartner Group, 2001; various as noted, 2000

035563 ©2002 eMarketer.Inc. www.**eMarketer**.com

During 1999 and 2000, about 2,000 independent, dot-com exchanges were set up by entrepreneurs. Not to be left out, a number of large "bricks and mortar" companies decided to form their own B2B exchanges. Even competing manufacturers decided to work together to launch B2B exchanges (like the exchange Covisint which was started by GM, Ford, and Daimler-Chrysler). These types of exchanges are called "industry consortia" because they are formed by a consortium of existing buyers and sellers in a particular market or industry.

Since then, most start-up B2B exchanges have merged, run out of money, closed down completely, or been converted to software vendors. According to William A. Woods[88],

there have never been more than 2,500 B2B exchanges worldwide to date and, of those, only approximately 1,000 are still operating, and only around 250 are likely to survive as true exchanges. By early 2002, 50 of these 1,000 were industry consortia.

2.1 The Fall of B2B Exchanges

Shakeouts loom large in the landscape of all fast-growing markets, according to George S. Day and Adam J. Fein[36], authors of a paper titled "Shakeouts in Digital Markets: Lessons from B2B Exchanges". During the boom period an unsustainable number of competitors are attracted to enter the market because of forecasts for high growth and promises of exceptional returns. This can easily be seen with the market for B2B exchanges. Even when the market was already crowded more and more entrants kept coming. Eventually reality sets in and there's a bust with more than 80% of the players exiting the market either through failure or acquisition.

There was such hype and high expectations for B2B exchanges to revolutionize the way companies do business, and it was expected in two to three years. There was just no way they could deliver and meet those expectations. As a result, investors and Wall Street hammered many of these companies. Business executives too were disappointed. The major reasons for the disappointment caused by B2B exchanges so far are, according to William A. Woods[88], are as follows:

1. Failure to build sufficient liquidity
2. Failure to build-out the exchange and capitalize on "early mover" advantage
3. Underestimating the time required to integrate disparate IT systems
4. A miscalculation of the relative importance of "neutrality" versus market domination
5. The confusion of market turnover for revenue and profitability

Some liquidity is essential for exchanges, so it is important to build it as quickly as possible. A liquid market is a market where a large volume of trades can be quickly executed without major impact on the price. The most prominent service an exchange

provides is a centralized market space, and the more likely a buyer or seller is to make a satisfactory transaction on an exchange, the more likely they are to sign up and use that exchange over its rivals. A buyer wants to use an exchange with the most suppliers because it increases his chances of a favorable transaction. And a seller wants to sell his goods or services on an exchange with the most buyers because the bigger the market, the better his chances of selling his products. In System Dynamics terms, it's a positive reinforcing loop. The more sellers on an exchange, then more buyers come, which leads to more sellers, and so on. Many B2B exchange start-ups failed to generate sufficient liquidity to survive. In many cases, achieving critical mass was made difficult because of a proliferation of start-ups in the same market space. In addition, many exchanges faced cultural resistance to change in their market space and ran out of money before generating sufficient trading volumes and revenue.

In the beginning, most B2B exchanges focused on providing an online trading platform. Some second-generation exchanges, especially industry consortia, took it a step further and provided auction functionality, automated request-for-proposal, request-for-quote systems, and in a few cases continuous trading. But few start-ups focused on the back-end processes of fulfillment, clearing and settlement, and payment processing. To be successful, exchanges need to build-out and incorporate this additional functionality. They need to offer a suite of services, not just on-line trading capability. On-line trading works quickly for a subset of products that are fairly standardized or that are commodities (MRO and indirect suppliers such as paper and light bulbs). But the back-office functionality is needed for every product. Early movers in the B2B marketplace arena could have capitalized on their position and expanded their functionality, also increasing liquidity in the process.

To realize the full benefits of the Internet in business, there needs to be information sharing across the supply chain, not only within a company, but also between a company and its customers, its suppliers, and all parties involved with the transaction. This information sharing can be quite difficult and complex given that companies use different data formats, software packages, enterprise systems, and networks. It takes a lot of resources, both time and money, to integrate these disparate systems. Achieving the

necessary level of integration was one of the greatest challenges facing start-up B2B exchanges, and some simply ran out of cash before they could fully integrate with their users' internal systems.

A perception of neutrality is critical to the success of a B2B e-marketplace. This notion of neutrality attracts users (both buyers and sellers) and helps build a membership base to achieve critical mass that, as mentioned above, is extremely important and a critical factor for success. It's worth noting that neutrality in the e-marketplace arena does not mean "all or nothing". There are independent exchanges and industry-led consortia. The consortia have an advantage in that they bring tremendous liquidity to the exchange from the beginning. However, they especially must walk the fine line and establish sufficient operating neutrality for the exchange to succeed. For example, Covisint is an exchange of automakers. The major car parts suppliers were reluctant to join the exchange, the sole purpose of which seemed to them to be to combine the buying power of the automakers and drive down the suppliers' prices. So in 2001, Covisint changed to have independent management and most of the car parts suppliers have joined the exchange partly due to this increased perception of neutrality.

Like so many companies during the dot-com boom, investors got caught up in the hype and failed to properly evaluate businesses based on solid economic principles. During the Internet boom, many B2B e-marketplaces used their total trading volumes as revenues, rather than merely the profits earned on the trades. They forgot that it's not what you take, it's what you make that counts.

The following is a list of some of the B2B exchanges that have either failed to launch as announced, closed down, or completely revised their business plans to the point where they are no longer acting as exchanges.

Figure 2: Failed Exchanges

Marketspace	Company Names
Automotive	Autovia, Autotradercenter
Aviation / Aerospace	AviationX, Avolo, Skyfish, Aerospan, TradeAir
Chemicals	E-chemicals, Promedix, Chemdex
Energy, Oil, Gas, Electricity	Altra Energy Technologies (liquid gas trading acquired by ChemConnect), EnronOnline, Petrocosm, Silicon Valley Oil
Financial Services	Attriax, BondBook, Visible Markets, BondClick (merged with BondVision), BondConnect, BondUSA, CFOweb, Limitrader. BondLink has been acquired by MarketAxess
Freight	FreightWise
Hospital Suppliers	Neoforma
Insurance	Dotrisk, Global Risk Exchange, WISe
Intangible Assets	Techex
Metals, Minerals, and Mining	MetalSpectrum, Aluminum.com, Copper.com
Office Supplies	Onvia
Paper	PaperExchange, PaperX
Plastics	PlasticsNet
Retail, Consumer Packaged Goods	Novopoint, RetailersMarketXchange, FoodUSA, C-StoreMatrix, Packtion, ICSFoodone
Shipping	Shipdesk
B2B News	NetMarketMakers

Source: William A. Woods[88]

2.2 Glimmering Rays of Hope in the B2B Marketplace – Positive Indicators

Although there have been a lot of failed exchanges, disappointed investors, and unsatisfied customers, B2B exchanges are not going to disappear altogether. There are clearly some positive indicators with respect to B2B exchanges that give rise to hope for the future.

First, B2B Exchange volume keeps growing. With the mergers and consolidation that has occurred, the remaining exchanges gain that volume as well as increased volume as companies become more familiar and comfortable with doing business on-line. In 2001, total e-business passing through B2B exchanges in the US, including private network

exchanges, exceeded $250 billion. This represented a 75% increase over 2000, which Gartner estimates was around $140 billion. The Global Web Trading Association (GWTA) has reported that trading through its 32 member B2B exchanges grew by several thousand percent in 2001 and exceeded $6 billion.

Second, B2B e-business continues to grow worldwide. B2B e-business is already much larger than on-line B2C commerce. According to a March 2002 US Census Bureau report, B2B transactions constituted 94% of e-business in 2000, with on-line sales to consumers making up the other 6%. Estimates from eMarketer predict strong growth in Europe, Asia, and Latin America over the next couple of years.

Third, there has been considerable consolidation. The market was not able to support the proliferation of B2B exchanges that occurred during 1999 and 2000. Over the last two years, there has been intense competition between many entrepreneurial B2B exchanges and industry consortia in various vertical markets. This resulted in mergers and consolidations, often leading to one dominant player in a specific industry. As mentioned before, this has the effect of rapidly increasing liquidity for the remaining exchanges, which is a critical factor for success. The chemicals industry is a prime example of where this consolidation has occurred. ChemConnect acquired Envera in 2001, merged with CheMatch in 2002, and acquired Altra Energy Technologies in 2002. Thus, ChemConnect has emerged as the leading B2B exchange in the chemicals and plastics industries.

Fourth, there have been productivity improvements in the B2B marketplace. B2B exchanges are already providing auction functionality that is significantly reducing purchasing costs for large companies. They are also focusing on the back-end processes like clearing and settlement, which will provide further productivity gains. And once the exchanges can provide integration with the user's internal applications and business processes, there will be even greater productivity improvements.

Fifth, private network exchanges are flourishing. They are web-based trading applications implemented by a single company with a select group of suppliers and customers. This

allows increased collaboration with established suppliers and customers and a better picture of that company's entire supply chain. Previously, these companies might not have been technologically advanced or ready to create their own exchange. Now, public exchanges are broadening their services by building and hosting private exchanges. For instance, CATEX, the insurance B2B exchange, has significantly broadened its base of services by assisting in the creation of several private insurance networks. Even big exchanges such as Covisint and E2Open are building private exchanges for specific users. Building private exchanges leverages off of the sunk costs of the public exchange's infrastructure build-out and is an important revenue source for developing B2B exchanges. B2B exchanges can charge software license fees, customization fees, and transaction-based fees, for use of the exchange's core technology in the private network. In addition, there are a host of vendors (Ariba, IBM, Microsoft, PeopleSoft, Blue Martini, SAP, etc.) that sell e-commerce software in areas such as content management, order management, and catalog management. This allows small to medium businesses to purchase the software to run an exchange as opposed to having to develop it in-house. Large companies are also developing these private networks. Wal-Mart is a leading example of the evolving private network. Wal-Mart chose not to invest in the two major consortia exchanges in the retail industry, Worldwide Retail Exchange and GlobalNetXchange. Instead Wal-Mart moved its existing supply chain infrastructure, SupplierLink, to the Internet. This new private network enables its 10,000 suppliers to collect information about sales and inventory levels in every store. Wal-Mart plans to consolidate purchasing worldwide, create global collaboration, establish real-time information flows, bring suppliers online to compete for contracts, and negotiate better deals.

Sixth, B2B exchanges are expanding their suite of value-added services. Many are not simply providing on-line trading, but realize that other functions of the purchasing process are very important and key to expanding their community of participants (both suppliers and buyers). Some are providing workflow management and back-office processing such as clearing and settlement. Riskclick is an example of an exchange that is heavily focused on these items and where on-line trading is just one component in its

suite of value-added services. Cordiem is another example of an exchange that has expanded its services. Cordiem is an exchange for the aviation industry and is jointly owned by buyers and sellers. It provides on-line trading in aircraft parts and service, catering materials, fuel procurement, and non-operational materials. Cordiem offers other services such as catalog and inventory content listing, inventory collaboration, and supply chain management services which all support the on-line trading. In essence, many B2B exchanges are expanding their business model from a pure auction or on-line trading format, thereby increasing their viability and chances for long-term success.

Finally, B2B exchanges are better funded now than they were three years ago. Previously they were funded by venture capital, an early IPO, or by industry consortia. Now, venture capital has gotten a lot harder to come by. A solid business model is needed in order to obtain capital, not just a .com at the end of a company name. Early IPO's were also used to fund many of these exchanges. But with that come increased scrutiny, higher expectations for performance, managing investor relations, and more rigorous reporting and accounting requirements. If the company doesn't meet the expectations and meet them fast enough, investors bail and share prices dive which exacerbates the problem even further. Now B2B exchanges are remaining private until they can show sustainable profitability. Industry consortia, then and now, still have a major advantage in terms of funding in that they are usually well funded by their bricks and mortar companies. With the increased scrutiny on the business models, the exchanges that are able to obtain funding have a better chance of success.

2.3 The B2B Marketplace Still Has a Bright Future – Benefits

Even though there has been a shakeout in the B2B marketplace and the common perception in the media is that B2B exchanges have failed, many B2B exchanges are still operating and are building true value for their owners, their users, and the industries in which they operate. There are still great benefits to be had for both buyers and sellers engaging in B2B exchanges.

Because of the Internet, sellers can reach buyers all over the world, and buyers can access sellers from all over the world. In the physical world, businesses and individual consumers often have to pay a higher price or buy an inferior product simply because that is the only service available in their physical location. But B2B exchanges are able to bring fragmented buyers and sellers together without them having to incur search and travel expenses or high commissions for using intermediaries. Dovebid, an auction house for surplus assets, now offers its auctions on-line allowing bidders all over the world to bid on its items without the bidder having to be physically present at the auction. Three consortium-backed exchanges, Covisint, Exostar, and GlobalNetXchange, have established offices in Europe and Asia reinforcing the notion of exchanges having global reach.

B2B exchanges can enable companies to automate the procurement of goods and services from multiple suppliers (e-procurement). E-procurement benefits include: easier monitoring of purchases, a reduction in redundant or repetitive purchases, easier management of the approval process leading to tighter controls over spending, easier to process transactions, increased price transparency, easier to find new suppliers, and the ability to participate in dynamic pricing mechanisms.

B2B exchanges allow a forum for dynamic pricing. Normally most prices are set by one-on-one negotiation or by the seller. The seller might publish a hard copy or on-line catalog with set prices that are non-negotiable. Instead, dynamic pricing brings all of the potential buy and sell orders together and lets those competing offers set the highest price or the price which maximizes the amount sold. Most stock exchanges use this approach. Increasingly, B2B exchanges are using dynamic price-setting mechanisms for business-to-business transactions and can bring together bids and offers from all over the world because of their global reach as discussed above.

Auctions in the B2B e-marketplace can benefit both the buyer and the seller. Seller driven auctions are what most people are familiar with. The seller lists the item or service and multiple buyers bid on the item or service, thereby increasing the price. These auctions allow the seller to get the highest price for his goods and reach a large number of

potential buyers. Seller driven on-line auctions work well for unique or differentiated items which are relatively simple to describe and understand. One example is excess inventory. Businesses that use on-line auctions sites to liquidate their excess inventory report, on average, a 30% improvement in sales. Buyer-driven or reverse auctions are where buyers specify the items they want and multiple sellers compete for the buyer's business in an auction format. Reverse auctions are most appropriate for commodity items such as indirects, where a deep supplier relationship is not critical and the quality and nature of the goods is highly standardized. These on-line reverse auctions help companies significantly lower their procurement costs.

B2B exchanges are revolutionizing supply chain management and providing collaborative communities. William Woods[88] says that B2B exchanges are delivering the most value in the area of supply chain management. A manufacturer can either build its own supplier-relationship management strategies or work through a B2B exchange as a central hub to tie all the parties together. The exchange can set the communications standards and enable users' applications to talk to each other. Tying all the parties together can lead to a collaborative process that generates greater efficiencies in product design and significant reductions in the time and cost of manufacturing. So these exchanges become collaborative trading communities that not only bring buyers and sellers together, but also can lead to major process improvements.

2.4 Survivors in the B2B Marketplace

As discussed above, it is not all gloom and doom in the e-marketplace arena. There are positive indicators of the future of B2B exchanges, and there are real benefits to be had for companies. Just as there have been exchange failures, there have been survivors. Below is a table of some of the survivors. It is not meant to be an exhaustive list.

Figure 3: B2B Marketplace Survivors

Marketspace	Company Names
Agriculture	**Agristar Global Networks, Farms.com, XSAg.com**
Automotive	Covisint
Aviation / Aerospace	Exostar, Cordiem, Aeroxchange, Airparts, Partsbase
Chemicals	ChemConnect (merged with Envera and CheMatch), Elemica, Omnexus
Collaboration	**Agile Software, IBM, MatrixOne, SAP**
Computers	**Alibaba.com, CDW Computer Centers**
Construction	**Bricsnet FM, BuildOnline, Construction.com**
Electronics	E2open, Converge, TraderFirst
Energy, Oil, Gas, Electricity	**Intercontinentalexchange (ICE),** HoustonStreet, Trade-ranger, Pantellos, ChemConnect
Excess Inventory	**Dovebid, Liquidity Services, RetailExchange**
Financial Services	CrediTrade, eSpeed, BrokerTec, TradeWeb, MarketAxess, Currenex, FX Connect, Fxall
Food, Fruits, Fish, Cattle, etc.	Agribuys, eMerge, Interactive (cattle), PEFA
Freight	NTE
General Trading	BayanTrade, DaewooTrade, Eficentrum, FreeMarkets, Goodex, ProcuraDigital
Health Care	**Cerner, McKesson, WebMd**
Insurance	Catex, Inreon, RI3K, Riskclick, eReinsure
Intangible Assets	The Patent and License Exchange (pl-x)
Metals, Minerals, and Mining	e-Steel (now part of NewView Technologies), MSA MetalSite and MSA ScrapSite, Quadrem
Logistics & Transportation	**G-Log, Vastera, GT Nexus,** Freightquote.com, Nistevo, Balticexchange, Levelseas, ShipyardXchange, Inttra
Paper & Forest Products	PaperSpace, **E-Paper, ForestExpress**
Plastics	ChemConnect, Omnexus, Satyamplastics
Retail, Consumer Packaged Goods	CPGMarket, **GlobalNetXchange, UCCnet,** WorldWideRetailExchange (WWRE), **Transora**
Web Services	**IBM WebSphere, Iona Technologies, WebMethods**
B2B News, Research, and Analysis	B2Bwatch (www.factpointgroup.com), Line56.com, Communityb2b.com, eaijournal.com, emarketect, eMarketer, Gartner, Goldman Sachs, www.b2bexchanges.com

Source: eMarketer.com, Forbes.com B2B Directory List, and William A. Woods. Companies in bold made Forbes' 2002 Best of the Web list.

2.5 Critical Factors for Success

One can learn valuable lessons and critical factors for success from the boom and subsequent burst of the high-tech bubble and the B2B marketplace. Some key factors for a successful B2B exchange are as follows:

1. Market identification is key – specialize on a vertical market within an industry
2. Play to win and dominate that market
3. Liquidity, liquidity, liquidity
4. Establish and maintain neutrality
5. Ensure transparency and integrity
6. Add value by expanding suite of services and build a virtual community

As with any business or company, it is crucial to identify and target a specific market and industry. In the initial phases of developing a B2B exchange, it is important to target a specific industry in which the company has strong expertise and then specialize even further on a vertical market within that industry. A vertical market can be defined by geography, regulations, or product characteristics. Specialization enables an exchange to dominate that space quickly, which creates liquidity, and then helps a company to scale up quickly. An example of this might be an exchange that chooses to operate in the transportation industry, and then specializes on marine transportation. Inttra is an exchange that does just that. Once domination of the chosen vertical has been achieved, then the company can start to widen its scope and move into other verticals within that industry. For example, Inttra may choose to add trucking transportation to their exchange as most ocean shipments involve truck (or rail) shipments to and from the port. In the business to consumer world, Amazon.com is a great example of just this strategy. They first focused on selling books. Once they had built up liquidity and expertise in that area, they began to expand to sell all types of products, while leveraging their existing network and customer base. So market identification is critical, and it is best to specialize on a vertical market within an industry.

Given that specialization is a key factor to success, there have already been many mergers and acquisitions in the B2B marketplace. Thus, the conclusion can be drawn that

there will be only one major winner in each vertical sector. This means that a successful exchange must try to be one of the first to market in its chosen vertical and then to dominate that market. It's not simply enough to be the first mover. An exchange has to improve and grow and provide more value to its members than its competitors. It's not good enough to come in second or third place while trying to avoid losing market share. There is no point in trying to compete with each other; instead they should merge and seek overall domination.

As has been mentioned several times before, liquidity in B2B exchanges is absolutely critical in achieving dominance. The number of users and the volume of trades are both important, however building the volume of trades is more important at the start for an exchange. So exchanges should target key players who are likely to trade the most and get them to join early. Building a critical mass of users as quickly as possible also enhances liquidity. An exchange can achieve this by waiving the standard subscription fees or transaction fees in the early stages. Obviously this can put a lot of financial pressure on an exchange making it even more critical that an exchange is very well funded, which is one of the positive trends discussed above. The bottom line is that exchanges can only generate liquidity if they are structured to maximize satisfaction of the users and potential future users (both buyers and sellers).

Because an exchange provides a centralized marketplace for multiple competing members, it must stay neutral in order to be credible and build trust. Again, the concept of neutrality for B2B e-marketplaces does not mean it is all or nothing. Many exchanges work with strategic partners, or in fact are founded by a consortium, as this is one of the easiest and quickest ways to achieve liquidity, which is so vital to the success of an exchange. On the surface, one may feel that this is anything but neutral. But in fact, working with these partners does not have to poison the exchange, as long as it remains commercially neutral. This means that no one user group should be seen to control the market. An advisory board of the different user groups can be set up. In the case of industry consortia, independent management can be hired to run the company. This idea of neutrality must be considered across all aspects of the exchange, from its design, the

way it operates, the way it secures users' confidential information, and the development of its trading rules.

B2B exchanges, whether independent dot-coms or industry consortia, are being set up as "for profit" neutral marketplaces, and are seeking to be neutral and independent markets with open access to all players in that industry. A fair and open market should be the goal of any exchange and that is one that is transparent and built on integrity. It should be readily understood and free from deceit. All transactions made on the exchange should be reported promptly to the exchange with full details on price and volumes. Pricing transparency creates a more efficient market, which often leads to lower prices and greater liquidity. In addition, transparency is important with regards to the products traded on the exchange. Sellers must disclose full information about the items that they are selling in order to enable buyers to make assessments of the true value of the products. Integrity of the pricing mechanism is absolutely crucial since the centralized pricing system is one of the most important functions of the exchange. Some key elements of a fair pricing system are: equal access (every trading member has equal access to the trading system regardless of size or duration of membership); rules which determine order priority (highest price or largest order quantity), equivalent orders are treated on a first in first out basis, effective procedures in place to ensure seller's products are posted correctly and buyer's bids are transmitted accurately; and that trades are executed according to the published rules. Finally, an exchange must take the necessary steps to ensure systems and data integrity. A system failure, breach in security, or a leak of sensitive and confidential member information, can be extremely damaging to an exchange and its members trust and confidence.

To help ensure long-term success, an exchange should grow to offer a suite of community services, not just a trading floor. By providing the services that allow people in the same vertical to network effectively and to access all the business information they require in one place, the exchange becomes a powerful collaborative community. This helps to make an exchange more valuable, to edge out the competition, and to dominate their chosen market space. Building the community means extending the value proposition for users to include services such as private networks (implemented by a

single company with a select group of suppliers and customers), fully integrated clearing and settlement functionality, supply chain management, derivatives trading, and web-based services (tools for integrating software between businesses).

2.6 Success Stories – Examples of Successful Exchanges

There was a lot of discussion and hype about the tremendous value that B2B e-marketplaces can add to a company's purchasing capabilities and in fact across a company's entire supply chain. Then the industry experienced a shakeout leaving many investors and customers disappointed. But it's worth noting and discussing that there are successful business-to-business marketplaces. They range from independent B2B exchanges to private exchange networks to industry consortia to more complex collaborative communities. Three successful exchanges are discussed in detail below. They were chosen because they represent both independent and industry consortia, operate in different industries, reflect both auction and exchange price discovery mechanisms, have each adopted a strategy of expanding its suite of services to provide more value, and all meet the critical factors for success.

The first, Dovebid, is an example of an independent B2B marketplace. Dovebid was a successful auction house decades before the advent of the Internet and is using the Internet to expand its business. Its core business, off-line and on-line, is auctioning off surplus assets.

The second successful exchange to be explored is ChemConnect. It began as an industry consortia in the chemicals industry and launched its first trading platform in 1999 followed by on-line auction capability and its commodities exchange in 2000. It continues to expand its service offering with the goal of helping companies optimize their purchasing and sales processes.

The third success story is Intercontinental Exchange (ICE). ICE is a consortium of major energy companies and is a fully electronic trading platform for energy and metals commodities. It allows users to trade virtually the entire over-the-counter energy complex

(oil, power, and natural gas) across a single platform and on a global basis. It is an example of a true exchange using the double auction pricing mechanism.

2.6.1 Dovebid

Inventory overstock is a $60 billion drag on U.S. businesses. But some companies are turning the problem into an opportunity. One example of a successful independent exchange doing just that is Dovebid. Dovebid is an auction house for surplus assets and sells off the remains of defunct companies (they sold Enron's "E" sign for $44,000 and auctioned off Napster's remaining assets). It covers used capital assets in more than 20 asset categories and performs auctions on behalf of corporations, government agencies, and financial institutions. Unlike most early B2B exchanges, the firm is not an upstart online marketplace that focuses solely on hammering suppliers on price. It began in 1937 as an auction house for used appliances and became well known in the 1980's for selling the assets of a bankrupt company, Osborne Computers. When Dovebid went online in 1999, it used the Internet not to replace but to improve its existing business. According to their website, "Today, DoveBid combines the reach and power of the Internet with generations of expertise in the sale and appraisal of used capital assets to offer a portfolio of asset disposition solutions that includes live webcast auctions, around-the-clock online auctions, sealed bid Internet sales, and private treaty Internet sales". More than half of the Global 4000 have participated in their programs. Some of their repeat customers include notable companies such as Allied Signal, Apple Computer, AT&T, Boeing, Daimler Chrysler, GE Capital, General Electric, Ford Motor Company, Hewlett-Packard, Lockheed Martin, Lucent, Motorola, Nortel Networks, Packard Bell NEC, Raytheon, Sun Microsystems and Xerox.

Although it now conducts online auctions, its more striking innovation was the development of its webcast service. With DoveBid's proprietary webcast technology, bidders around the world can bid on an auction from the convenience of their home or office through the Internet. Webcast allows these off-site participants to virtually bid real time against bidders who are on the auction floor. All an off-site bidder needs is a computer, Internet access, and a touch-tone phone. Prior to the auction, the assets for

auction can be previewed online via digital photos and are accompanied by detailed product descriptions. During the auction, the off-site participant can view the current asset being sold on his computer screen, listen to the auctioneer live on the telephone, and then use the phone keypad to place bids (pressing 1 to raise his paddle and the # key to end his bid). These webcast auctions add value for both buyers and sellers. This technology gives buyers all over the world access to assets that they would not have had access to unless they traveled to the actual auction location. Suppliers are happier because there are more bidders. By increasing the number of bidders, there has been more competition resulting in price premiums up to 90% compared to on-locations only.

DoveBid has conducted over 5,000 capital asset auctions and sold over $5 billion of assets taking an average 10% commission. They have done many of the things identified previously as key factors for success. First, they have specialized in a **specific vertical market** in the auction industry in which they have domain expertise. And they continued to build on that expertise over the last few years by acquiring eighteen US and international auctioneering, appraisal, and asset management firms. With these acquisitions, DoveBid has enhanced its leadership position in the capital asset appraisal and auction arena, extended its presence worldwide, and strengthened its vertical domain expertise. This moves them towards being able to **dominate the market**. DoveBid has been able to achieve the **liquidity** that is so crucial for an exchange. They have an existing base of more than 500,000 buyers, many of whom are major purchasers. More than half of the Fortune 500 has participated in the company's asset disposition programs, and many have signed national contracts with DoveBid. The shear nature of their business establishes their **neutrality**. DoveBid is neither a buyer nor seller of the capital assets. They act as the auctioneer and appraisal firm. Finally, DoveBid has **expanded its suite of services** to facilitate transactions and has provided its corporate clients with everything necessary for their asset disposition needs. Their portfolio of services includes live webcast auctions, featured on-line auctions, a corporate marketplace, trading services, on-location auctions, sealed bid Internet sales, private treaty Internet sales, valuation services, marketing resources, and asset management. This full service capability, industry knowledge, active and worldwide buyer lists, and leading-edge

proprietary technologies offer convenience and simplicity for customers making it easier for them to do business with DoveBid and harder for them to do business with a competitor.

2.6.2 ChemConnect

Chemical companies were early converts to the power and potential of online marketplaces. The most active hubs are backed by big companies. About 40 players, primarily suppliers, in the chemicals industry, started ChemConnect. It was founded as a bulletin board site in 1995. They launched their first trading platform in late 1999, launched online auction capability in early 2000, and launched their commodities exchange in late 2000. Since then they have established themselves as a leader in helping chemical companies optimize their purchasing and sales processes for chemical feedstocks, chemicals, plastics, and related products through the use of e-commerce.

In the first quarter of 2001, AMR Research named ChemConnect, Envera, and CheMatch "Best in Class". In the second quarter of 2001, ChemConnect and Envera merged. Envera was set up by a group of buyers in the petroleum and chemicals industries. The merged exchange, therefore, brought together potential willing buyers and sellers in one e-marketplace and created a stronger sense of neutrality. ChemConnect then bought rival CheMatch in a stock swap, in February 2002, to help cement its market dominance in chemical and plastics. In April 2002, ChemConnect acquired Chalkboard, the natural gas liquids (an important subcategory of chemicals) platform of Altra Energy Technologies. ChemConnect now has more than 9,000 member companies from 150 countries, 60,000 products in its database, and 2002 transaction volume in excess of $8.8 billion for approximately 16,000 transactions.

There are clear benefits for both buyers and sellers. ChemConnect's members can access reliable market information, reduce process inefficiencies, and improve profitability. Using ChemConnect's tools and services helps a company optimize its entire transaction process by streamlining transactions, eliminating paper-based processes, shortening cycle times, and lowering overall transaction costs. ChemConnect helps buyers: make better

purchasing decisions using reliable market information; find and qualify new suppliers quickly and cost-effectively; negotiate faster using online reverse auctions or automated request for quotes/proposals; achieve lower prices for MRO items, raw materials, and indirect materials; and lower costs by electronically exchanging data with suppliers in order to streamline order processing. ChemConnect claims the average results for their buyers are as follows: an average 8-12% reduction in MRO, raw and indirect material prices, shorter cycle times with negotiation time cut by 50%, substantial returns on investment of up to 10 times the cost of a single online auction, and order processing costs reduced by 30% through the identification and resolution of errors early in the process. ChemConnect helps sellers: make better informed sales decisions by using current market information; extend market reach by growing a worldwide customer base; find new customers by responding to requests for quotes/proposals; better manage working capital by selling off-prime and prime inventory faster and at better market prices; and increase revenue and customer satisfaction while lowering order processing costs through streamlined back-end document exchange.

ChemConnect continues to expand its suite of services bringing even more value to its members. As discussed above, ChemConnect provides e-procurement functionality and extensive auction products/tools. ChemConnect offers a trading center where users can: automate requests for quotes, requests for proposals, and search for new suppliers; negotiate more efficiently with their existing business partners as well as with new companies they meet in complete privacy; selectively invite other users from over 7,500 companies to negotiate; access the ChemConnect database containing more than 60,000 chemicals and plastics products; and identify new trading partners around the world. ChemConnect's online auction and reverse auction products enables a user to: configure the auction to meet its specific needs; gather all of its trading partners in the same place at the same time; negotiate every aspect of the deal all at once (including price, specifications, terms, and delivery); and create competitive bidding dynamics that get the user to a firm market price faster. ChemConnect's commodity markets platform is designed for pre-qualified members who complete deals for standard, high-volume commodity chemicals and plastics in a firm "bid/ask" model.

Recently, ChemConnect has expanded their services by partnering with Global exchange Services (GXS) and ForestExpress. GXS will provide document exchange services. ChemConnect uses the CIDX (Chemical Industry Data Exchange) standard, but its customers communicate with their customers in different formats and different industry standards. GXS can take transactions from any company connected to the network, and translate them (could be EDI, a proprietary data format XML, or flat files) into the CIDX format. That means that members of ChemConnect don't have to establish costly point-to-point connections with each company they want to trade with. This allows trading partners from different vertical industries to connect with each other. A variety of industries (paper, automotive, rubber, and consumer packaged goods) are customers of chemical companies. So ChemConnect members can now identify any number of trading partners with whom they want to exchange documents, and ChemConnect and GXS will provide the appropriate mapping and routing. ChemConnect's link with ForestExpress is an extension of ChemConnect's goal of connecting trading partners across different industries. ForestExpress is the transaction-processing network for the forest products and allied industries. The two companies are going to have a hub-to-hub connection enabling their members to exchange electronic business documents, again without having to establish costly one-on-one connections. Many companies are moving towards integrated relationships with their key suppliers, establishing private exchanges or extranets, and integrating business processes. These ChemConnect partnerships help allow that collaboration and promote supply chain efficiency. Within the last two months, ChemConnect has added clearing and settlement services and leveraged procurement solutions to its repertoire. ChemConnect announced on March 31, 2003 that Guaranty Clearing Corporation (GCC) will offer clearing and settlement services for a variety of contracts transacted on ChemConnect's natural gas liquids Commodity Markets Platform, Chalkboard. These services will involve forwards, swaps, and options contracts. On April 28, 2003, ChemConnect introduced new Leveraged Procurement Solutions designed to optimize the purchasing of smaller volumes of product by consolidating them in logical lots as a means to increase buying power and enhance seller value.

As was done with the successful exchange Dovebid, it is worth linking ChemConnect's success in the B2B marketplace to the critical factors for success discussed previously. ChemConnect clearly began **specializing in the chemicals vertical market**. They were later able to expand into the plastics and natural gas markets. Through its mergers and acquisitions, ChemConnect is playing to win and **dominate** these markets and has established itself as a leader in chemical and plastics e-commerce solutions. Analyst Leif Eriksen of AMR Research said that ChemConnect, a survivor of the massive public marketplace consolidation of recent quarters, "is the last game in town as far as public marketplaces [in the chemicals vertical]". With over 9,000 member companies, 2002 transaction volume in excess of $8.8 billion, ChemConnect has been able to establish **liquidity** that is so vital to buyers and sellers as well as establishing and maintaining **neutrality**. **Price transparency and integrity** in their negotiation tools are crucial and without them, ChemConnect would not be able to achieve the success that they have. Finally, they have been **expanding their services** to offer a complete, yet modular solution, to help their customers manage one, several, or all phases of the transaction cycle (assessment, negotiation, and fulfillment).

2.6.3 Intercontinental Exchange

A third successful exchange worth examining is Intercontinental Exchange (ICE). It was founded in March 2000 as an Internet-based trading platform for over-the-counter (OTC) precious metals and oil. Initial partners included BP Amoco, Deutsche Bank AG, Goldman Sachs, Morgan Stanley Dean Witter, Royal Dutch/Shell Group, SG Investment Banking, Totalfina Elf, and Continental Power Exchange -- which provided the trading technology and management team. Additional equity partners shortly followed (American Electric Power, Aquila, Duke, El Paso, Mirant, and Reliant Energy) and ensured that ICE had large firms to support active trading. This created the world's largest on-line, OTC market for energy and metals. Back in 1999, Forrester Research reports indicated that of the approximately 2.7 billion-megawatt hours and 154 billion cubic feet of natural gas traded in 1999, only 0.2% of electricity trades and 2% of natural gas trades were conducted online. The overwhelming majority of trading in the OTC power and

natural gas markets, as with precious metals and oil products, was conducted via telephone. But Forrester predicted these online trading figures would increase up to 25 percent and 11 percent, respectively, by 2004. Forrester also predicts that energy trading will grow to $3.6 trillion in 2005.

Intercontinental Exchange had tremendous liquidity from the beginning because of its thirteen big equity owners. The six North American power and gas trading companies alone accounted for roughly 37% of electricity and 27% of natural gas traded in 1999 in the United States. In July 2001, ICE acquired London's International Petroleum Exchange (IPE) and a cut of IPE's $2 billion in daily oil and gas trades. Then in November 2001, Enron along with its digital trading platform EnronOnline, collapsed. This caused ICE's growth to accelerate even faster. Intercontinental Exchange now has 8,000 registered users from 450 firms, who can trade in more than 600 types of listed commodity and over-the-counter derivatives contracts. The commodities range from crude oil, refined oil products, natural gas, power, and precious metals to weather derivatives and emissions allowances, and new products are continually being added. The exchange does not just simply have a lot of participants, but there is a high level of trading activity. Recent statistics measured during peak usage hours indicate that over 3000 users are typically logged on simultaneously, a user floats an instruction to the system every 0.5 seconds, and a transaction occurs every 2.5 seconds. ICE is running at about 40% pre-tax profit on revenues of about $120 million, and their revenues are growing fast.

According to their website, the Intercontinental Exchange is an open, many-to-many system, where every user has equal access to price quotes and trading functionality. The exchange is available to all commercial market participants. There are no memberships, no artificial restrictions, and no dues or fees beyond those incurred in the trading itself. Intercontinental does not take title or any participatory interest in any transactions on the exchange. They act as a neutral, third party provider. It's a level playing field for all, without favoritism or control by a chosen few. Any user can view all quotes posted by him and other users in real time, trade on quotes posted by others, and post his own prices and quantities for others to trade. All quotes posted by users on the exchange are live and

firm. They can be acted on with full assurance of a completed transaction. To ensure transparency and integrity, ICE has developed and implemented policies, practices and controls to ensure the quality, security, consistency and availability of services. Ernst & Young has evaluated ICE's assertions via their CyberProcess Certification program and awarded Intercontinental Exchange this certification.

In addition to the trading platform, ICE also offers other services such as electronic confirmations, clearing and credit, and market data. In April 2002, ICE launched its electronic trade confirmation service, eConfirm, which replaces the manual process for managing paper trading confirmations. This service improves efficiency, reduces errors, and improves internal controls for the users of its exchange. eConfirm users are seeing a 95% trade match ratio. That means that 95% of the trades submitted achieve a fully executed confirmation within minutes or hours of trade completion. The old, manual, paper process could take weeks or months to complete. ICE also offers real-time credit and clearing services. It allows credit and risk managers from all registered companies to specify and pre-clear credit for trading with each other. This is done using the Counterparty Credit Facility. The exchange will not list potential trades on a trader's screen if execution would break a preset credit limit. In addition to bilateral credit, ICE supports daily clearing services for some major products via the London Clearing House. Finally, Intercontinental Exchange offers its users market data from the 10x Group. Subscribers of this service can get real-time access to prices on the ICE (every bid, every offer, and every trade), daily energy market business reports, and the latest prices sent to Blackberry Wireless System users.

Electronic trading offers customers more efficiency, more speed, more liquidity, more transparency, more security, more flexibility, and more impartiality. It eliminates many of the inefficiencies and expenses that are involved in the traditional phone and fax system of trading. Intercontinental Exchange has emerged as the leader in the global digital energy, metals, and derivatives markets. ICE, like the other two examples of successful B2B exchanges, exhibits the critical factors for success: specialization in a market, working towards domination of that market, high liquidity, a position of neutrality, price transparency and integrity, and an expanding suite of services to

continually bring value to its customers. ICE's level of success is reflected in its 2002 financial results. The company had record results in transactions, revenues, and profits for 2002, its second full year of operations. On a consolidated basis, Intercontinental achieved 2002 revenues of $125.5 million with pre-tax profits of $52.3 million and cash flow from operations of $50.7 million. Also during 2002, Intercontinental was recognized as Derivatives Exchange of the Year by Energy Power Risk Magazine; received the Excellence in Risk Management award by Commodities Now; was deemed as the Best Non-bank Commodity Site by Euromoney, and was on Forbes' Best of the Web list. Jeffrey Sprecher, Intercontinental's CEO and Chairman, was recognized as one of Business Week's Top Entrepreneurs of the Year for 2002.

3.0 Conclusion

Over the last few years, journalists, scholars, and self-proclaimed experts have written volumes about business-to-business commerce. B2B e-marketplaces were to revolutionize the way that companies do business and communicate with each other. Approximately 2,500 B2B exchanges were either formed or planned at the peak of the B2B mania. Since then, there has been a major shakeout and most have merged, closed down, or been converted to software vendors. Even so, B2B exchanges can still offer great benefits and add value for their customers if they are built upon carefully planned and executed business strategies.

Through the course of this research, several trends for the future emerged:

1. Independent exchanges, which currently represent the largest proportion of exchanges, are at the most risk of extinction. Many face huge ongoing technology investments, competition-driven price erosion, and limited liquidity. With so many competitors and venture capital funding increasingly scarce, they must have a clear value proposition that appeals to both buyers and sellers. Niche players have the best chance of survival.
2. The e-marketplaces formed by consortia, a small proportion of the total today, appear to have the strongest base. If they can truly integrate the services required

for a particular industry, consortium-based e-marketplaces are most likely to grow into defensible full-service operators.

3. Private Networks are becoming popular and represent the newest phenomenon. They give companies the opportunity to provide services to customers and thereby differentiate themselves from competitors. They also allow companies to strengthen relationships and work with key suppliers. Private networks are also beneficial if companies are reluctant to put product through public marketplaces. They will not drive a fundamental restructuring of an industry, but may consume resources that could otherwise support the independent and consortium-based exchanges.
4. There will likely be a continuation of mergers leading to one dominant exchange in each vertical market. For an exchange to survive, lasting impact and value must be delivered to buyers not just in the short term. It also must be a win-win for both suppliers and customers.
5. Exchanges are playing a critical role in setting the technology standards that allow all the players in a particular industry to integrate their electronic systems. Examples are the CIDX standard in the chemical industry and papiNet in the paper and forest products industry.
6. Exchanges continue to expand their suite of value-added services including fully integrated clearing and settlement, supply chain management, derivates trading, and logistics services among others. This helps to make an exchange more valuable to its users and edge out the competition.
7. Liquidity is crucial, but in and of itself, is not going to equate to success.
8. In some cases, the failure to generate transaction volume through their systems drove many exchanges to refocus their efforts on providing software applications to companies on a service bureau basis – as application service providers.

B2B digital marketplaces reduce transaction costs by automating purchasing and sales processes. They reduce information inefficiencies by making prices more transparent and aggregating relevant real-time industry news into one easily accessible place. Geographic limitations are diminished as searching costs are reduced, allowing sellers to find buyers

beyond the reach of their traditional sales channels. Successful B2B exchanges are helping to provide the platforms for on-line collaboration across the supply chain and for improving trading efficiency.

References

1. "2002 winner: Derivatives Exchange of the Year – Intercontinental Exchange". Risk.net website. http://db.riskwaters.com/public/showPage.html?page=2101. May 2003.

2. Adhanda Enterprises. "B2B Logistics: Space to Watch". Community B2B Website, February 2003.

3. Adhanda Enterprises. "B2B Transaction Management". Community B2B Website, February 2003.

4. "A Market for Monopoly?". The Economist, June 15, 2000.

5. Andrews, Whit. "B2B Technologies and Initiatives Start Making Sense". Gartner, June 12, 2001.

6. Andrews, Whit. "E-Commerce Finally Outweighs Its Hype". Gartner, September 17, 2002.

7. Andrews, Whit. "E-Commerce: Real Strategies, Real Benefits". Gartner, September 17, 2002.

8. Andrews, Whit; Perlstein, Larry. "E-Commerce: Enterprises Identify ROI, but Need Vision". Gartner, November 12, 2002.

9. Andrews, Whit; Perlstein, Larry. "2002 Sell-Side E-Commerce Magic Quadrant". Gartner, November 15, 2002.

10. "Auction – First-Price, Sealed Bid (Discriminatory)". Agorics.com website. http://www.agorics.com/auctions/auction4.html. September 12, 2000.

11. "Auction Strategies". Agorics.com website. http://www.agorics.com/auctions/auction8.html. September 12, 2000.

12. "Auction – The Vickrey Auction (Uniform second-price)". Agorics.com website. http://www.agorics.com/auctions/auction5.html. September 12, 2000.

13. "Auction Types - Dutch". Agorics.com website. http://www.agorics.com/auctions/auction3.html. September 12, 2000.

14. "Auction Types - English". Agorics.com website. http://www.agorics.com/auctions/auction2.html. September 12, 2000.

15. "B2B Exchange". http://www.indiangypsy.net/b2b.html. February 2003.

16. "B2B Exchange Madness". http://www.forbes.com/2000/04/03/mu3_print.html. February 2003.

17. "B2B Exchanges: The Container Case". The Economist, October 19, 2000.

18. "B2B Exchanges: Time to Rebuild". The Economist, May 17, 2001.

19. "B2B Markets for Transportation". http://www.business.com/directory/transportation_and_logistics/b2b_markets. February 2003.

20. Baljko, Jennifer. "Market Meltdown Leads to Evolution Among B2B Firms". http://www.ebnonline.com. February 3, 2003.

21. Barlas, Demir. "ChemConnect Acquires NGL Platform". Line56.com, http://www.line56.com/articles/default.asp?articleid=3518. March 26, 2002.

22. Barlas, Demir. "ChemConnect Partners GXS". Line56.com, http://www.line56.com/articles/default.asp?articleid=4115. October 22, 2002.

23. Barlas, Demir. "ChemConnect Doubles Transactions". Line56.com, http://www.line56.com/articles/default.asp?articleid=4343. January 21, 2003.

24. Batchelder, Robert. "Eastman Chemical: A Formula for Web Services Success". Gartner, August 8, 2002.

25. "Best of the Web: B2B Directory". Forbes.com website, http://www.forbes.com/bow/b2b/main.jhtml. April 2003.

26. Boulton, Clint. "Hutchison, Oracle Forge B2B Transportation Exchange". http://www.internetnews.com/ec-news/print.php/327931. March 27, 2000.

27. "Business-to-Business Exchanges: Life after Dotcom Death". The Economist, October 3, 2002.

28. "Business to Business Marketplaces to the Transportation Industry Providing Exchange Services". http://www.sourceguides.com/markets/byI/trans/byC/B2B/byS/ex/Exchanges.html. February 2003.

29. Case, James. "Mathematical Challenges of Combinatorial Auction Design". SIAM News, Volume 34, Number 5. May 2003.

30. Champion, David; Carr, Nicholas. "Starting Up in High Gear". Harvard Business Review, Vol. 78 Issue 4, p93. July/August 2000.

31. ChemConnect.com website. www.chemconnect.com

32. "Collusion and Tricks". Agorics.com website. http://www.agorics.com/auctions/auction11.html. September 12, 2000.

33. Community B2B Website http://www.communityb2b.com/about_categories.cfm. February 2003.

34. Daikoku, Gale. "Debunking the Myth: E-marketplaces are not dead!" GartnerG2 Report, October 2001.

35. Dar, Vinod K. "Announcement-Ware Is Achieving Its Purpose In the Exchange Business". Energy E-COMM.com website. April 2003.

36. Day George S.; Fein, Adam J; Ruppersberger, Gregg. 2003. "Shakeouts in Digital Markets: Lessons from B2B Exchanges". California Management Review Winter 2003 Edition, Vol. 45, No.2, published by the Haas School of Business at the University of California Berkeley.

37. Deloitte Research. "The Future of B2B: A New Genesis". 2000.

38. "Dovebid: A B2B exchange runs on a healthy mix of old and new economy". ebusinessforum.com. October 3, 2002.

39. Dovebid.com website. www.dovebid.com

40. "Duke Energy Admits to 23 Bogus Power Trades". Fox News Channel website. http://www.foxnews.com/story/0,2933,57833,00.html. July 16, 2002.

41. "e-Business@Dow: Connecting with Dow". Dow Chemical Company Website. http://www.dow.com/ebusiness/what/s-chemconnect.htm. May 2003.

42. "E-management: Older, Wiser, Webbier". The Economist, June 28, 2001.

43. eMarketer. "E-Commerce Trade and B2B Exchanges Report". March 2002.

44. "E-Marketplace Survival Strategies". CNET News.com http://news.com.com/2009-1122-979040.html. January 5, 2003.

45. "E-strategy Brief: General Electric. While Welch Waited". The Economist, May 17, 2001.

46. Ericson, Jim. "B2B Exchange Aids Disaster Scene". http://www.line56.com/print/default.asp?ArticleID=2940. September 13, 2001.

47. Ericson, Jim. "B2B Exchange Boil Down". http://www.line56.com/print/default.asp?ArticleID=4175. November 11, 2002.

48. Ferrant, Marc. "Ariba, Sabre Form B2B Travel, Transport Exchange". Network World Fusion, http://www.nwfusion.com/news/2000/0302ariba.html. March 2, 2000.

49. "Fixed vs. Dynamic vs. Exchange Models for B2B Trading". http://www.prekshana.com/biwkupd/b2b/b2bsn06_04.htm. May 2003.

50. "Game Theory". http://cepa.newschool.edu/het/schools/game.htm. May 2003.

51. "Going...Going...Gone". Agorics.com website. http://www.agorics.com/auctions/auction1.html. September 12, 2000.

52. Harting, Morgan. "Business Exchanges". KPMG Consulting. May 2003.

53. Huttenlocher, Daniel. "An Entrepreneur in the Valley: Creating Electronic Trading Systems". Wharton Program. April 2002.

54. IBM Global Services. "Creating a Successful Business-to-Business e-Marketplace". IBM Executive Strategy Report. http://www-5.ibm.com/services/uk/e-strategy/csuccbtob_5.html. May 2003.

55. IntercontinentalExchange.com website. http://www.intcx.com

56. Kaneshige, Tom. "ChemConnect Buys CheMatch". Line56.com, http://www.line56.com/articles/default.asp?articleid=3294. January 11, 2002.

57. Kaplan, Steven; Sawhney, Mohanbir. "E-Hubs: The New B2B Marketplaces". Harvard Business Review, Vol. 78 Issue 3, p97. May/Jun2000.

58. King, William. "Game Theory: An Introductory Sketch". http://william-king.www.drexel.edu/top/eco/game/intro.html. May 2003.

59. Klemperer, Paul. "Auction Theory: A Guide to the Literature". Journal of Economic Surveys. March 1999.

60. Kumar, Manoj; Feldman, Stuart I. "Internet Auctions". IBM Research Division. May 2003.

61. Kyte, Andy. "Smart E-Sourcing Users Look Beyond Reverse Auctions". Gartner, February 6, 2003.

62. Landry, Julie. "Energy Rivals Cook Up B2B Exchange". Red Herring. March 23, 2000.

63. Laseter, Tim; Long, Brian; Capers, Chris. "B2B Benchmark: The State of Electronic Exchanges". Booz Allen Hamilton Research. May 2003.

64. McAfee, Andrew. "The Napsterization of B2B". Harvard Business Review, Vol. 78, Issue 6, p18. November/December 2000.

65. McKinsey & Company. "Coming in to Focus Using the Lens of Economic Value to Clarify the Impact of B2B e-Marketplaces". 2000.

66. Milgrom, Paul, "Auctions and Bidding: A Primer". Journal of Economic Perspectives, Vol. 3, pp. 3-22. 1989.

67. Morgenthal, JP. "Which B2B Exchange is Right for You?" http://www.softwaremag.com/archive/2001feb/SelectingB2Bexchange.html. February 2001.

68. Nickerson, Jack A.; Owan, Hideo. "A Theory of B2B Exchange Formation". June 5, 2002.

69. Perlstein, Larry. "DuPont Paints a Pretty Picture for an E-Commerce Portal". Gartner, September 11, 2002.

70. Pindyck, Robert S.; Rubinfeld, Daniel L. Microeconomics Textbook, Fifth Edition. 2001.

71. Rader, Linda K. "More Than 42 Billion Served". Energy Markets, http://www.energy-markets.com/previous/0900/editorial.htm. September 2000.

72. Rosall, Judith. "E-Commerce Software Initiatives on the Rise in the United States". Gartner, May 15, 2002.

73. Sairamesh, J.; Mohan, R.; Kumar, M.; Hasson, L.; Bender, C. "A Platform for Business-to-Business Sell-side, Private Exchanges and Marketplaces". IBM Systems Journal, Volume 41, Number 2. January 9, 2002.

74. Seewald, Nancy. "B2B's Struggle to Stay Afloat; Alliances May Be Best Strategy". Chemical Week, Volume 165, Issue 5, Page 18. February 5, 2003.

75. Sullivan, Brian. "GE Sells its B2B Exchange for $800 Million". Computer World, June 24, 2002

76. Tedeschi, Bob. "Some Business-to-Business Marketplaces Showing Staying Power". New York Times on the Web, July 16, 2001.

77. "The Double Auction". Agorics.com website. http://www.agorics.com/auctions/auction6.html. September 12, 2000.

78. "Too Few Pennies from Heaven". The Economist, June 29, 2000.

79. Underwood, Kim. "B2B Buy-Side (E-Procurement) Internet Commerce: Overview". Gartner, January 8, 2003.

80. Varon, Elana. "The ABCs of B2B". CIO.com website. http://www.cio.com/research/ec/edit/b2babc.html. May 2003.

81. Wakeham, Julian. "Will Emerging B2B e-Markets Fulfill Their Promise?" The Capco Institute Journal of Financial Transformation. May 2003.

82. White, Andrew; Peterson, Karen; Daikoku, Gale. "CPG/Retail Global E-Marketplaces Are Going Nowhere Fast". Gartner, June 17, 2002.

83. White, Andrew; Peterson, Karen; Lheureux, Benoit. "New P2P Solutions Will Redefine the B2B Supply Chain". Gartner, February 1, 2003.

84. White, Andrew; Peterson, Karen. "The Public vs. Private Debate Continues in E-Marketplaces". Gartner, February 3, 2003.

85. Wilson, Debbie. "TrendLines". Community B2B Website, August 29, 2002.

86. Wise, Richard; Morrison, David. "Beyond the Exchange: The Future of B2B". Harvard Business Review, Vol. 78 Issue 6, p86. November/December 2000.

87. Woods, Jeff. "Transportation Sourcing Requires Complex, Emerging Tools". Gartner, June 19, 2002.

88. Woods, William A. B2B Exchanges 2.0 Not All e-Markets are "Dot-Bombs". ISI Publications, 2002.