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## **HOW NOT TO BUILD AN ONLINE MARKET:**

### **THE SOCIOLOGY OF MARKET MICROSTRUCTURE<sup>1</sup>**

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#### **ABSTRACT**

This paper examines the attempts to create new online markets for the trading of wholesale standardized goods during the late 1990's. The vast majority of these business-to-business ("B2B") exchanges failed. These failed attempts provide invaluable data on the necessary underpinnings of online commodity markets and the social dynamics that drive them. Focusing on the US market for propane as our case, we discuss the model that drove the development of many business-to-business exchanges, the social dynamics of the propane industry and the attempts to create an online propane market, the role of informal risk management, and some initial lessons about the design of markets. Ignoring the behavioral realities of markets led to designs and technology that in many cases were incompatible with the needs of market participants.

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Very little is known as to how a market actually operates in practice. (Fafchamps and Minten 2002)

## INTRODUCTION

There are precious few studies of markets in practice – the day-to-day details of how buyers and sellers accomplish a transaction and manage their risks and opportunities.<sup>2</sup> This is a great shame for both researchers and market participants, but also understandable. Gaining access to a market can be a serious challenge, both in terms of being accepted into what is often a closed community known to only a few, and in terms of becoming literate in the complex details of the products, industry, and the way deals are done.

Even more difficult is the effort to compare and contrast across a whole range of different markets in order to uncover unappreciated commonalities or to identify key distinguishing characteristics. And rarer still is the ability to observe markets at their birth, studying their emergence and learning from the successes and failures. Remarkably, we have been provided with just such an opportunity in the attempts in the late 1990's to build hundreds of new wholesale business markets online.

### *The Unplanned Experiment*

The attempts to build new online business-to-business markets – termed “B2B” – were fueled by many factors. Recent retail sites such as Amazon, Yahoo, and eBay were enjoying enormous success, and these markets paled in comparison to the size of wholesale business markets, suggesting an enormous opportunity. Cheap capital, in the form of “easily” obtained venture funding, and a land-grab mentality created a manic effort to fund and start up wholesale online exchanges in an astonishing array of industries.<sup>3</sup> Business-to-business markets were established in dozens of different sectors, including chemicals, metals, electronic components, bandwidth, lumber, paper, and various energy commodities. The hope was that these new exchanges would aggregate and streamline existing fragmented markets, providing much more efficient trading and increasing trading opportunities. There was also the hope that these efforts would generate a huge financial return for shareholders by taking the exchanges public in the IPO market. While the efforts became ludicrous at times<sup>4</sup>, there were many serious attempts to create new electronic markets, either as a supplement or a substitute for existing business markets.

The vast majority of these attempts failed. While this was a painful outcome for the employees and investors of these ventures, it also provided an historic opportunity to study the necessary foundations of markets and the social dynamics that drive them.

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<sup>2</sup> Important exceptions include the work of Baker (1984), Abolafia (1996), Uzzi (1996), Beunza & Stark (2004), and Bestor (2004).

<sup>3</sup> One venture capital firm at the time reported that their goal was to fund at least one new B2B exchange every week (personal conversation, 1999).

<sup>4</sup> Online business markets for such esoterica as Ferris wheels were even created. As we heard in hindsight, “Cheap capital makes you stupid.”

The first key opportunity the B2B effort provided was an entry into studying the inner workings of traditional business markets that had always operated in the shadows. Both greed and fear helped to open these markets up to study. For start-up firms wishing to create new online exchanges, the possibility of fantastic wealth was an effective motivation for enlisting the help and cooperation of industry experts in creating their markets. On the other hand, fear of these new entrants motivated many traditional businesses to create their own competing online exchanges, which required bringing in outside experts in technology and online transactions. Surrounding all of this activity was a roiling cloud of analysts from consultancy firms and investment banks who were turning out research reports on many different industries.

The second key opportunity was the ability to do these kinds of studies across a wide array of different industries. For those involved in the design and construction of B2B markets (which included the authors), there was a chance to study multiple markets simultaneously, which had the potential to uncover structural and cultural factors that accounted for commonalities across different industries.

The third key opportunity was to study the hundreds of attempts to actually launch new online markets. The very failure of most of these attempts point to vital lessons in the necessary underpinnings of markets. The B2B effort was an unprecedented naturally occurring experiment in market creation costing billions of dollars.

Making use of these opportunities, we begin to explore a set of nested empirical puzzles: What can help explain the failure of most of these efforts? What distinguishes the rare markets that thrived? And what can help account for the irregular achievements of even these successful markets? Through this exploration, our goal is to uncover key social dynamics in the microstructure of market.

### *Research Setting*

Within the broad area of B2B markets, our focus will be on commodity business markets for physical goods (such things as energy products, electronic components, bulk chemicals, lumber, processed food, etc.). These markets are extraordinarily important in the economy, have received relatively little attention from researchers, and exhibit interesting variations both across and within markets.

In particular, for our case study here we will focus on the US market for propane. The propane market was one of the rare examples of a successful B2B exchange. Yet even here there were notable failures in trying to expand the exchange into certain geographical areas. Using propane as our initial case study turns out to be especially useful because there are key difference between the regional markets for propane that permit interesting comparisons.<sup>5</sup>

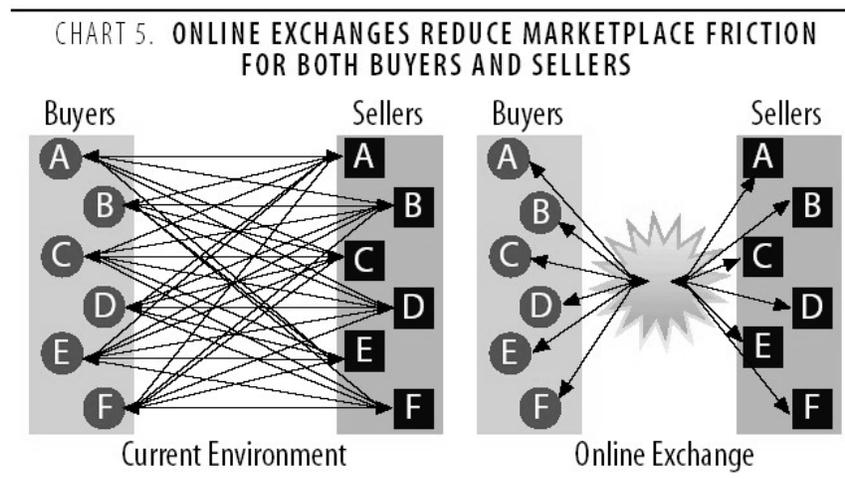
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<sup>5</sup> This study is based on several years of participation and analysis of commodity markets in the United States, in particular physical commodity markets in the energy industry. The first author has been involved as an observer and analyst in commodity markets (both physical and financial sectors) since 1997. For a three-year period (1999-2001), he worked full time at a Boston-based startup company focused on designing and building online commodity markets. A cofounder of the firm, he served as head of research and strategic planning. The second author has

Below we discuss the model that drove the development of many B2B exchanges, the social dynamics of the propane industry and the attempts to create an online propane market, the role of informal risk management, and some initial lessons about the design of markets.

## THE “B2B” MODEL OF THE MARKET

In making the case for the importance, profitability, and inevitability of online B2B markets, both analysts and entrepreneurs turned repeatedly to a particular visual icon, one version of which is reproduced here:<sup>6</sup>



On the one hand is a depiction of the current state of affairs as a tangled, messy, and inefficient market. On the other hand is the promise of a new efficiency that comes from gathering all the buyers and sellers at one “place” in an online exchange. This was sometimes described as the “Fat Butterfly” model of online markets – the wings of the butterfly corresponding to the group of buyers and sellers respectively, all brought together at the single point of the B2B exchange. It was known as the *Fat Butterfly* model because of the belief that the online exchange (as the body of the butterfly) needed to provide a whole host of services to be successful, not simply the matching of buyer to seller – services such as logistics and financial clearing.<sup>7</sup>

spent his career in the energy industry and in 1996 founded and became the Chairman of Altra Energy, a position he held until 2001. He was involved on a day-to-day basis with the actual launching and running of a number of online markets in the energy sector. These periods in industry correspond to the most intensive activity in the attempts to create new business-to-business online exchanges. Detailed research and interviews were conducted across a range of industries as both new entrepreneurs and traditional businesses worked to create online exchanges. Field observations of select markets were also conducted. This primary material was supplemented with information obtained through analysts at investment banks and consultancies, entrepreneurs, and venture capitalists, both one-on-one as well as at national and international conferences at the time on the topic of B2B exchanges. We examine a larger array of commodity markets in a forthcoming study (Kollock and Braziel Forth.).

<sup>6</sup> This version of the diagram comes from an analyst’s report in 1999 from Deloitte Consulting (Roddy 1999).

<sup>7</sup> The term was invented by the second author in an essay from 1999 (Braziel 1999), and prefiguring some of the arguments here, was “killed off” as a concept in a later essay (Braziel and McAfee 2001).

While other models of B2B markets existed, the Fat Butterfly model drove a great deal of investment and was at the core of the design of many B2B exchanges involving multiple buyers and sellers (e.g., Barlas 2000, Sculley and Woods 1999, Ellsworth 2001).<sup>8</sup> Because of its central role, it is important to dissect out the assumptions behind it.

### *Assumptions in the Market Model*

The first assumption of note was the very optimistic belief that deep, radical changes could be instituted in the way industries did business. But there is tremendous inertia in business practices that may have been in place for generations, and there were many reasons for existing market participants to resist. Buyers and sellers realized that B2B markets implied tremendous changes in how information would be disseminated, how transactions would be consummated, even who had the authority to conduct transactions. A key argument at the time was that B2B exchanges would create a level playing field, which is another way of saying that the powerful would lose some of their privilege. This led to challenges of these initiatives by some market participants looking to protect their market advantage. And the move to an online marketplace also implied great changes in the jobs of market participants in terms of how they were compensated, the personal rewards and satisfaction they derived from their jobs, and the skills that would be required – people who were adept at doing deals by phone and fax would need a different set of skills when trading online.

A second assumption was that it made sense to bring together previously unconnected buyers and sellers into a single market. That is, that it made sense to aggregate trading which had previously occurred in a dispersed way. Sellers, according to this logic, want to be where there are the greatest number of buyers, and buyers where there are the greatest number of sellers. Thus the gathering together of fragmented markets into one large pool of liquidity was a key goal. However this effort assumes that sellers and buyers in fragmented markets are actually trading “the same stuff,” which raises the issue of when goods can be truly commoditized. It turned out that in many cases markets were fragmented for a reason – the goods being exchanged were not in fact substitutable with goods from another sub-market. We discuss this important theme below.

A third assumption related to this point was that the appropriate goal for B2B exchanges was to model mature markets for highly commoditized goods, as exists in financial exchanges such as the Chicago Board of Trade or the New York Stock Exchange. These financial exchanges were often held up as ideal models, and some of these financial institutions started to court B2B exchanges in order to offer partnerships and expertise. The desired goal was a highly liquid market of anonymous buyers and sellers trading commoditized goods.

The idea of bringing together buyers and sellers in a single efficient market driven by price in anonymous exchange reveals an implied fourth assumption: that identity and the network of social relationships are unimportant to the functioning of a market. This runs counter to one of the defining themes in economic sociology that networks of personal relationships are not simply

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<sup>8</sup> Note that our focus here is on markets involving multiple buyers and sellers, in contrast to one-sided auctions or purchasing systems.

empirically ubiquitous, but also often important for the healthy functioning of a market (e.g., Granovetter 1985, Uzzi 1997).

And there is an additional assumption that is not represented in this particular diagram, but came out clearly in the discussion of the time (Lux 1996, Mack 1997, Xavier 1999, Riley 1989) – that B2B markets would greatly reduce or eliminate intermediaries (traders, brokers, dealers, etc.) and allow buyers and sellers to transact business directly.

### *The “Demise” Of The Middleman*

For a period of time, the theme of disintermediation became a key concept in the discussion of online commerce in general and the promise of B2B markets in particular (Mack 1997, Taylor 1998, Kuttner 1998, Hof 1999). Intermediaries were assumed to be a source of friction that would be eliminated in the new online exchanges. The presumed cost savings of eliminating intermediaries was supposed to be one of the key returns for buyers and sellers participating in the new online exchanges.

But “disintermediation” is a cold, clinical term, and there was more than dispassionate analyses of efficiency that drove this trend. The love-hate relationship with the middleman across many industries is striking, even carrying with it an emotional and moral tone at times. In our research we repeatedly heard stories disparaging or condemning intermediaries, and those who served as middlemen sometimes went to great lengths to avoid the stigma. In more than one industry we found traders who maintained physical assets (e.g. a lumber yard) even though essentially all their business came from trading goods that they never took delivery on. A key reason was to avoid the hated label of “broker” (Kollock & Braziel Forth). But as disliked as they may be at one level, clearly brokers, traders, and dealers often provide services that are essential to a market.<sup>9</sup> Suppliers and end users value these services at the same time they disparage the providers.

Perhaps the most fundamental of these services is the facilitation of transactions which would not otherwise be consummated. Buyers and sellers are often not in synch in terms of the basic elements of a transaction:

- A seller wants to deliver in Seattle, but the buyer wants delivery in Los Angeles.
- A seller want to move product today, but the buyer is not in the market until tomorrow.
- A buyer is willing to pay a premium over the current price to cover an unexpected shortfall, but does not want any of her regular contract suppliers involved.
- A seller want to move surplus product outside his franchise territory.
- A buyer wants 3,000 tons, but the seller only has 1,000 tons to sell.

In such common situations, intermediaries can step in to consummate a transaction that might otherwise not have occurred. For example, the intermediary might find a way to move the seller’s product from Seattle to Los Angles, store the product today for sale tomorrow, disguise a buyer’s or seller’s identity, or combine multiple sellers’ products to meet the demands of one

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<sup>9</sup> A point that journalists and analysts came to realize as well (e.g., Alsop 1999, Hammer 2000).

large buyer. Intermediaries can provide other important services as well, such as supplying market information to clients.

All of these assumptions were wrong in the majority of cases: change was resisted, aggregation often did not make sense, mature financial markets were a poor model to aim towards, and intermediaries were central to the effective functioning of markets. The model that drove much of the development of B2B markets in the 1990's was a grave caricature that ran counter to the behavioral realities of how commodity markets actually function. We use a particularly rich case study to illustrate these points – the US market for propane.

## THE SOCIAL LIFE OF PROPANE

### *The Texas Propane Hub*

Propane is one of several hydrocarbons that are isolated from natural gas (known as natural gas liquids, or NGLs). It is used primarily for heating and in *cracking* -- the manufacture of plastics. Propane is a true commodity. Essentially all propane is manufactured to a single standard, termed HD5. Who manufactured the propane is irrelevant as long as it meets this standard. The great majority of the propane in the US is stored in gigantic underground salt caverns in Mont Belvieu, Texas. Flowing into and out of this area is a vast network of pipelines, which is by far the cheapest way to transport propane. Transportation by rails car or truck also takes place, but is significantly more expensive.

Underscoring its nature as a commodity, propane from many different sources is stored commingled at this storage facility. When someone buys propane and has it shipped from Mont Belvieu, they have no idea where the propane originally came from, nor do they care. At this wholesale market level where propane is traded as a commodity, there is no “branded” propane, no “made by” indicator on a quantity of propane. In the commodity market, propane is propane is propane.

Mont Belvieu serves as the most important hub of propane storage and transactions in the US and is the pricing point for both this country and the world. As a result, there are hundreds of buyers, sellers, and intermediaries that do business around this hub.

### *Altra Online Exchange*

It is within this Texas energy market that one of the few successful B2B exchanges emerged – Altra Energy. Altra succeeded at two things that few other B2B exchanges accomplished: it built a liquid market online and it turned a profit.<sup>10</sup>

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<sup>10</sup> A market is liquid if there are enough transaction opportunities to give buyers and sellers the ability to get a deal done quickly at a “fair” price. More formally, liquidity is composed of two elements: (1) the ability to immediately execute a standard size market order (termed *immediacy*), and (2) the ability to execute a large order without a large change in price (referred to as *price resiliency*) (Kollock and Jaycobs 2001; Braziel 2001).

Altra began as a project with Williams Energy called *Chalkboard* (an allusion to the physical chalkboard that traders used to keep track of prices).<sup>11</sup> There was little interest in the platform at first, but over the course of a number of years, liquidity was built up in the market to the point that the great majority of Mont Belvieu propane transactions were done through the system (other energy products were also traded through Altra).<sup>12</sup>

Altra approximated a number of the ideals in the B2B model of the market: It dealt with true commodity markets involving many buyers and sellers, meaning that aggregating transactions on a centralized exchange made sense. It permitted market participants to trade anonymously, which had been difficult or impossible before, and which was desired by the market participants so that they could transact without signaling their market activities to their competitors. And trading online did indeed eliminate some of the inefficiencies of phone and fax trading. Altra also provided a number of services beyond simply matching trades, following the logic of the Fat Butterfly model that it helped establish.

However, there were a number of crucial ways in which Altra's marketplace differed from the idealized vision of the B2B market. First, even in this commoditized and often anonymous market, social relationships were still important and were not precluded by the online system. The fact that traders were now completing their transactions online did not mean they had suddenly stopped using the phones. Traders continued to be on the phone constantly, talking with other market participants to get a sense of what was going on in the market ("market color"), as well as getting a sense of what a fair current price was by asking around.<sup>13</sup>

Second, while anonymous trading was a key feature of the exchange, the identity and reputation of traders were still taken into account. Altra faced a very interesting design challenge. On the one hand, the buyers and sellers of the marketplace were interested in trading anonymously so as to not communicate their market activities. On the other hand, they were very worried about committing to a transaction with a counterparty who they deemed untrustworthy – something that wasn't a problem in phone and fax trading where one explicitly chose one's counterparty based on past experience and reputation. The challenge was how to combine anonymous trading with a concern for reputations. The elegant solution was a system that allowed market participants to rate the possible counterparties in the market prior to a transaction. Participants could go down a list and note for each player whether they would be willing to do a deal with them and even whether they would be willing to extend credit and under what terms. Participants could then go into the anonymous marketplace and complete transactions knowing that the counterparty would be acceptable to them, even if they didn't know the actual identity until after the transaction had occurred.

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<sup>11</sup> Chalkboard remains an important fixture of the market for propane and other NGLs. Currently the market is operated by Chemconnect.

<sup>12</sup> How liquidity in a market is actually created is a separate discussion, though we note in passing that the dynamics of getting a market started are typically completely different (and much more capricious) than the dynamics of maintaining liquidity in a market. The long period of time it takes to achieve the inflection point in liquidity is a common feature in the history of many markets, although this fact was "forgotten" during the most manic period of funding and building B2B exchanges.

<sup>13</sup> Note that arriving at a sense of "what-the-market-is-doing" is a social, conversational process, and that traders are concerned with evaluating the fairness of posted prices, not simply a direct economic evaluation of the bids and offers. We deal with the issues in detail in Kollock and Braziel (Forth.).

Third, there was no attempt to exclude or eliminate intermediaries from the market. While the system was originally launched to serve the needs of the producer and end user of the commodities, great effort was taken to get the intermediaries involved, and they became by far the biggest uses of Altra. This was good for the intermediaries and good for the exchange as the intermediaries were a crucial source of liquidity in the market. Altra was an intermediary friendly B2B exchange, in sharp contrast to the early rhetoric of how B2B markets should be built.

Managers at Altra and users of the system felt strongly that these characteristics – which respected or even encouraged the existing networks of social relationships – were very important in Altra’s success. However, even with all of its experience, Altra had some striking, and instructive, failures.

### *The Puzzle of California Propane*

While most of the country’s propane is stored and traded in Texas, there are other regional markets for propane and it made sense for Altra to encourage those markets to join its B2B exchange and use its trading platform. In particular, many attempts were made to get the buyers and sellers from the California market involved.

The California market for propane is much smaller than the Texas market as there are no big producers or users of propane. Whereas hundreds of buyers and sellers are involved in the Texas propane market, there are fewer than two dozen key individuals closely involved in propane transactions in California. It is also geographically isolated, not simply in terms of its physical distance from Texas, but also in regards to the easiest and cheapest way of transporting the commodity: in the vast network of propane pipelines that cross the US and Canada, there are no pipelines that link California to Texas or any of the other propane hubs.

Altra had already created a very successful online propane market centered in Texas. It also had an intimate understanding of the industry and had developed a number of services for its market participants that allowed them to trade anonymously, interact with a greater number of potential counterparties, manage prices more successfully, and effectively organize the large volume of trades that sometimes occurred. Altra took all of this experience and these services into the California market and failed miserably. Whereas the majority of the country’s propane transactions occurred on Altra’s exchange, almost no transactions ever occurred involving the California market.

The successful trading platform that Altra had developed – incorporating many of the ideals that were put forth for the design of B2B exchanges – was unsuited to the way business was actually conducted in California. Each of the key strengths and services it offered to traders in Texas were in fact irrelevant or actually harmful in the California market.

Altra offered the opportunity to transact with a greater number of buyers and sellers in an aggregated, centralized market. But that is an advantage only if market participants are trading “the same stuff.” While the propane in Texas and the propane in California were physically

identical (manufactured to the same HD5 standard), in practice they were different goods because of the great expense of transporting propane to California. The fact that there was plenty of propane at a good price in Mont Belvieu was irrelevant to the buyer in California.<sup>14</sup>

A second key feature of Altra was that it permitted market participants to trade anonymously. This worked well in Texas, where there were a great number of buyers and sellers. However, in a market where there are fewer than two dozen key people involved, it is difficult or impossible to transact anonymously even on an electronic system. While a bid or an offer on Altra's exchange did not explicitly identify the party, in a market like California propane, a knowledgeable participant could guess with a high degree of confidence who was actually behind the trade.

Some signals about the identity of a counterparty were the result of the different physical infrastructure in California. A key feature of Mont Belvieu is that the propane is stored commingled, which means one can't tell who owned it from the location of the product one is buying. But in California, there is no similar central storage hub – if the propane is coming from the ExxonMobil Torrance refinery, it's reasonable to assume that it's ExxonMobil who is trying to sell the propane.

Other information about the likely identity of counterparties came from the simple fact that there were only a small number of players involved in California, which meant that everyone knew each other – and their business – extremely well. Like a very small town, everyone knew just about everything. The limited number of alternative trading partners also meant it was very difficult to hide what one did in the market, especially if the transaction was unusual. As one market participant commented: “If I've always been a seller and suddenly I call you as a buyer, you know something has happened – probably that a production unit has gone down – and that you've got my ass.”<sup>15</sup> It would have been much better to go to a supplier who didn't know the trader, in the hope of completing a deal without signaling the situation. In Texas, where the trader might be able to choose from 50-80 sellers, that's a real possibility (whether done online or by phone). But in California, everyone knows everyone.

A third advantage Altra offered was the ability to manage a high volume of transactions more efficiently than could be done by phone or fax. In the Texas market this was an important feature, as participants had to deal with a large number of possible trading partners and frequent transactions. However, in California the deal flow is much lower, so the need for automated trade processing isn't acute. And in terms of the search costs involved in finding a counterparty for a deal, if there are only 10-20 likely players to contact, it can easily be accomplished the old-fashioned way – by phone.

Altra's exchange offered a platform that allowed traders to manage the price of their transactions more successfully. But a fourth key difference between the two propane markets was that managing prices turned out to be relatively less important in California than Texas for some very significant reasons.

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<sup>14</sup> On rare occasions, propane is in fact shipped to or from Texas to California via rail cars, but because of the expense this only occurs when there is a very significant price difference between the two markets.

<sup>15</sup> Quotes in this paper from market participants come from field observations and interviews by the authors.

A key function that market participants fulfill in markets like commodity propane – whether buyer, seller, or intermediary – is solving problems. Inevitably, things go wrong and someone is charged with fixing the problem, typically as quickly as possible and sometimes under great stress. In a market such as Texas, problems can be solved primarily with price, but in a market such as California, problems are frequently solved with favors. Contrasting price-based with favor-based risk management leads to a crucial point in understanding the dynamics of markets and the types of technology that are appropriate.

## **RISK MANAGEMENT VIA FAVORS**

### *“Things Go Wrong”*

Forget the antiseptic, well-lighted budget sets and markets of economics textbooks. Real-life markets are rough, murky, tumultuous places where commodity attributes shift, supply is uncertain, prices volatile, and information imperfect. (McFadden 2006)

Because there are only about two dozen key people involved in the California propane market, they are able to get to know each other very well. And because they are deeply interdependent, they *have* to get to know each other well and develop strong relationships. The simple reason is that things go wrong, and when they do a key part of the market participant’s job (some have said the most important part) is to solve the problem as quickly and cheaply as possible. Keeping their job – and earning their bonus – is closely tied to solving the problems that inevitably arise. And a key way these risks are managed is through an informal economy of reciprocal favors.

A producer may manufacture iso-butane (another natural gas liquid) and require 20,000 barrels for the month. If the producer’s iso-butanizer goes down, who can he turn to in order to make up the difference? While a large anonymous market exists in Texas, the cost of transporting it by rail cars almost certainly rules that out. Instead, the producer turns to a friend from within the California market. As one participant described a typical transaction: “So you call your friend at ExxonMobil and ask, ‘Hey Margaret, can I get 10 tank cars of iso from you?’ Margaret says, ‘I can’t do 10, but I can do 5.’ You ask, ‘What do you think the price is?’ Margaret responds, ‘Ah, I don’t know, it’s about 72 cents.’ ‘Fine,’ you say. ‘I’ll take care of you,’ Margaret says.”

Margaret has bought a favor (and it is sometime described in just those terms by the market participants). This is crucial because one day Margaret will have a problem that her boss is looking for her to solve immediately, and she will have someone to turn to. As we have heard participants in this market say, “it’s important to take care of each other.”

Interestingly, viewed from the outside, Margaret may be an employee of a competitor of the company the producer works for. But what is most important for the participants (and their bosses) is that the problem get solved as quickly as possible. The fact that the problem was solved by going to a friend at a “competitor” is not a concern for the immediate people involved,

who are charged with doing whatever it takes to solve the issue. Indeed, there is a strong sense of identity as a member of the natural gas liquids market that is independent of – and sometimes eclipses – one’s identity as an employee in a particular firm. In terms of their careers in the propane market, many buyers and sellers may switch employers but often remain in the same market. In such cases, they are NGL market people first, and employees of a particular company second.

The behavioral realities of trade in this market are much more fluid than would be suggested by the formal boundaries of companies or their roles as competitors. As one participant in the California propane market said, “Everybody is your customer, your supplier, your competitor.”

### *Solving Supply Problems*

A key use of favors is to manage various supply risks: the problems of having “too little stuff,” “too much stuff,” or “the wrong stuff.” An example of having a shortfall in a needed commodity was discussed above, but there is also the problem of having an excess amount of a commodity.

In a gasoline refinery, one of the byproducts is propane, which is held in a storage tank as it is sold off. Propane, and the people who deal with it, are peripheral to the main business of the refinery, which is the production of gasoline. However, if the propane tank gets full, it can shut down the entire operation. As one market participant described the scenario: “The refinery manager will say ‘We’ve got to flare propane in California and have the environmentalist crawling all over us, or we’re shutting the refinery down and we’re already short of gasoline – somebody is going to get fired!’ The problem is usually a lack of rail cars and the manager will tell the propane guy, ‘Get me some goddamn tank cars in here tomorrow or I’ll find somebody who can!’ It’s time to call in some favors, and you better have some favors to call in.” Whoever does those favors earns a great deal of gratitude and an informal line of credit they can call on in the future when they’re in need.

Another category of problem is physical contamination – ending up with “the wrong stuff.” An example of using favors to manage this type of situation comes from a California manufacturing plant that routinely sent feedstock (petrochemicals used as raw materials) to different refineries by pipeline. The plant had recently laid off many employees and was in the midst of shutting down some of its operations. As a result, a batch of feedstock was contaminated and sent off by mistake to one of the refineries. The refinery was very upset, but ultimately did the manufacturing plant a great favor by agreeing to keep the poor-quality feedstock and slowly use it up. Two weeks later, the plant made the same mistake and was about to send additional contaminated feedstock to the refinery. This occurred during the weekend, when only the operations staff were working. The head of operations for the plant (who had been there for 30 years), called a friend at a different refinery and asked him if he would be willing to take the shipment, which had already started down the pipeline. His friend was willing to receive the contaminated feedstock, which avoided a grave problem with the first refinery. As one of the participants said: “And now there’s a real chit to be repaid over at [the second] refinery.”

The informality of risk management is at two level here: First, an operations manager is not “supposed” to make these kinds of decisions, which impact the commercial side of the business.

Second, his friend at the second refinery is not “supposed” to accept an unplanned shipment, and certainly not a shipment for contaminated product.

Importantly, in each of these cases the information about what happened does not remain private knowledge – the stories are told within the network of traders and it becomes widely known that Person A took care of Person B (or that Person A *didn't* take care of Person B).

### *Favors in the Texas Market*

The use of favors as a risk management device dominates the dynamics in the California propane market. In the Texas market there are other alternatives to solving a supply problem – because of the large and often anonymous market, one can solve the problem with price by simply buying or selling into the larger market. Because of the huge and centralized storage facilities, there are a number of ways to solve supply problems, and because there are so many more players involved (trading a product that is generic and substitutable), there are more alternatives to go to, and one may be able to take care of the issue without signaling to the market that you have a problem.

But favors are still important in the Texas market for particularly acute situations and for unusual transactions. Going to the market to solve a problem takes time, and the very reason you have a supply problem may mean you don't have time to deal with it yourself. If a key piece of manufacturing equipment has gone down, you'll be held captive in a series of safety meetings as people work to figure out what happened and what the implications are.

The size and composition of the Texas market provides another way of solving this problem. There are a great many intermediaries in the Texas propane market, and there are certain intermediaries with whom one does a lot of business and has a long-term relationship. These more trusted intermediaries can serve a very important problem-solving function (cf. Uzzi 1997).

Lacking the time to do it himself, the producer contacts a trusted intermediary, tells him what happened and that he needs 10,000 barrels *today*. While it is implicitly understood that the intermediary will not leak this information to the market, the producer may underscore the point: “If I hear this coming back to me in the next two days, you'll never get another call from me as long as you live.” The intermediary can turn to the five other traders in the room and have them make the 50 calls that are necessary in short order. Importantly, the intermediary also knows the producer's decisions rules because of their long-standing relationship (e.g., what range of prices the producer is likely to consider fair, which counterparties he would prefer, which counterparties to never do business with, and so forth). This makes it very efficient for the producer to hand over the problem to the intermediary without having to spend time talking about the different dimensions of the transaction and what combinations would be acceptable.

As one producer recounts a typical example: “I'll call back and ask ‘How many people did you talk to?’ He might say ‘I talked to 20 in the last hour.’ I'll ask ‘What kind of range in prices did you get?’ ‘I got everything between 21 to 22.’ I'll ask, ‘Who's the 21 from?’ and say OK, do the deal.” The favor is solving the problem at a reasonable price, and in not letting the market know what has happened so that the price does not move adversely. This is not to say that the

intermediaries are altruistic. They carefully honor their relationships with core clients, but will also charge for their service.<sup>16</sup>

Solving a problem with favors in the Texas market will also occur for unusual situations. All propane is manufactured to one standard specification, but what happens if because of contamination or other reasons one has a quantity of “non-spec” propane that needs to be moved? There is no liquid market for non-spec propane and no producer deals with it enough to know the best way to get rid of it. However, one intermediary in the Texas market has specialized in this issue and figuring out how to deal with non-spec product, so he is the individual producers turn to for a favor to “make this stuff go away.”

## THE PREVALENCE OF FRAGMENTED MARKETS

If the California propane market was an exotic exception, this would be an interesting story about an outlier but without greater theoretical or practical importance. However, our experience and research suggests that markets with a structure similar to California propane are the rule rather than the exception. It is markets resembling Texas propane that are the empirically rarer case.

### *“It’s Not The Same Stuff”*

There are many markets that at first glance seem to be large markets involving true substitutable commodities, but in fact when examined at the behavioral level are composed of many sub-markets which rarely trade between each other. An example from the energy industry is motor gasoline.

Through the 1970’s gasoline was reasonably standardized, with only three key grades: regular, leaded regular, and premium. As the seasons change, more butane is put into gasoline in areas where it is cold, so there was some customization of the product for different geographic areas, though each of the few geographic areas the country was divided into still represented very large markets.

However, the introduction of the Environmental Protection Agency in the 1970’s led to much greater customization of gasoline, involving additional additives such as ethanol and dividing the country into many more geographical areas for which custom blends were produced. What this meant was that gasoline was no longer “gasoline” – buyers and sellers were involved not with a generic product, but with, e.g., “12 Reid Vapor Pressure gasoline with .3% ethanol deliverable in Poughkeepsie.”

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<sup>16</sup> Sometimes covertly – the intermediary may “front-run” the client a little, by completing a trade for their own account prior to the client’s trade in order to take advantage of the anticipated price move. The market in Texas is large enough that the client is unlikely to find out about this (although they understand it sometimes happens), as long as the intermediary acts with restraint. Front-running would be very unlikely in the California market, because the client would almost certainly find out, leading to a very angry response.

At this level of specificity there were typically no more than a dozen key people involved in the buying and selling in each of these sub-markets. By many measures, motor gasoline seemed like a reasonably homogenous and gigantic market – much larger than the propane market, for example. In fact, the market in practice was a set of fragmented specialized markets that resembled California propane more than Texas propane. Altra Energy worked very hard to develop the gasoline market for its B2B exchange, but with only modest results. While it wasn't appreciated at the time, the challenges Altra faced in gasoline were structurally similar to the challenges for California propane: anonymity was difficult or impossible given the limited number of players, and identity and reputation were key, especially as problems might have to be solved with favors since there was no large liquid market one could turn to for the particular blend of gasoline one needed.<sup>17</sup>

What was true for motor gasoline was true for many other products that seemed at first to be true fungible commodities. There were a number of attempts to create B2B exchanges for steel, for example, but one of the challenges these new markets faced was that there is no such thing as generic steel – it is a very highly customized product with different mills being able to produce only certain grades.

In other industries, long-standing efforts to standardize products through detailed specifications led to the hope that aggregating transactions on an online exchange would be both valuable and a natural extension of the existing market. As an example, this was attempted in the wholesale food industry (Kollock and Braziel Forth.). There is a national market for chicken parts that flow to grocery stores and restaurants. The attempt to build a B2B exchange in this sector assumed that, e.g., chicken wings were standardized enough that bringing together dispersed buyers and sellers from different geographic areas could create new opportunities and a more efficient market. In practice, the products turned out to be less standardized than anticipated. Even though many processing plants produced chicken wings, they were not simply substitutable in the eyes of the buyers. Processing plants differed in terms of the kind of growers from which their supplies came, how the chicken was cut, and the quality of the end product. There were certain plants buyers preferred not to do business with, and for other plants buyers varied the amount they were willing to pay depending on where it came from. This meant that information about the identity of their counterparty was crucial, and the fine-grained knowledge they had acquired about the quality of different processing plants did not transfer to other geographic region. Again, the market more closely resembled California propane rather than Texas Propane, and the design elements that were suitable for a large commodity market with fungible goods were not a good fit here.

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<sup>17</sup> The view of the gasoline market as a large homogenous market was encouraged by the fact that a very successful futures contract on the price of crude oil (the key ingredient in gasoline) is traded at the New York Mercantile Exchange (NYMEX). The contract is successful because although the different blends of gasoline are not substitutable in use, their prices move in a highly correlated way, meaning one can have a single, liquid futures contract that allows various market participants to manage price risk. From the perspective of those trading the financial instrument, it's all one huge market. But for the buyer in Poughkeepsie who has to deal with the actual physical good, it not the same product at all – he needs a particular, customized blend of gasoline. The prices move the same across the different sub-markets, but the product is not the same in actual use.

## LESSONS IN THE SOCIOLOGY OF MARKET MICROSTRUCTURE

### *The Importance of the Middle Ground*

Up to now, economists have focused primarily on individuals and institutions.... For a long time they did well by ignoring the middle ground, the networks of personal relationships that oil the system and bring it to life. (Fafchamps 2002)

The middle ground of social networks has been neglected not only by analysts of markets, but also by those who attempted to build new markets. Investors and entrepreneurs often ignored networks of social relationships in markets or considered them the source of friction from which B2B exchanges would emancipate us. Certainly there were cases of true friction to be dealt with, and cases of market participants resisting these initiatives for the sole purpose of maintaining their imbalanced market power. But aside from underestimating the inertia and resistance to change in various industries, efforts to create unmediated markets ignored the many key functions provided by middlemen and social networks that support the market.

As has been discussed, buyers and sellers are often not in synch with regard to time, location, or amount, and an intermediary can facilitate transactions that would otherwise not occur. Intermediaries also provide important market information to their clients, provide a means of trading anonymously, can solve acute problems (for at least favored clients), and can serve as a buffer in case of supply or price shocks.

The interconnected networks of relationships were important because of the structural roles of intermediaries, but these networks were also key because of the informal economy of favors that flowed through these social relationships. Solving problems is a central function of many market participants, and the key risk the individual is concerned with is career risk – the extent to which their job or their bonus is on the line. Having friends in the network to turn to for favors in order to solve problems is critical. Economies of goods rest on economies of favors.<sup>18</sup>

The informal insurance that comes from the flow of favors is a particularly important example of relational contracting – “informal agreements sustained by the value of future relationships” (Baker, Gibbons, and Murphy 2002; cf. Macaulay 1963). Contracts can be a formal means of dealing with some of the risks of transactions, but informal means of managing risks are fundamentally important for at least two reasons. First, contracts simply cannot cover all the possible things that can go wrong.<sup>19</sup> Second, formal approaches to dealing with the risks of transactions can be exceedingly, even prohibitively, expensive. A transaction that does not rest at least in part on trust and the flow of favors is an expense that can rarely be afforded

This social capital approach to risk management is an important feature even in the centralized Texas market, and dominates the dynamics of sub-markets such as California propane. To date,

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<sup>18</sup> This phrase is thanks to Paul DiMaggio, from his comments during a presentation of an earlier draft.

<sup>19</sup> More formally, contracts are necessarily incomplete “if human agents are subject to bounded rationality and if contracts are executed under conditions of uncertainty” (Williamson 1985: 181-2), as will inevitably be the case.

the study of the informal economy and informal risk management has focused more on such setting as traders in the slums of Ghana (Hart 1988) or agricultural traders in Madagascar (Fafchamps and Minten 2001), but first-world energy markets may have more in common with third-world agricultural traders than might first be thought. This is not to say that markets in the US are more “backwards” than is commonly thought, but to make the point that an informal layer in markets is both inevitable and often provides key functions for the successful operation of the market. As the former CEO of a B2B bandwidth exchange commented:

Somehow around the peak of the boom we forgot something. That lowly phone broker who knew how to make money in the market. ... They didn't talk about efficient systems. They talked about talk, [the] guy they knew they could extend credit or cut a deal [with] because they knew they would get it back when they needed it. Just like the phone brokers from a couple of years before, they knew markets were relationships. Markets are social. (Mayfield 2005)

### *Different Markets Require Fundamentally Different Structures*

Stated so baldly, this point seems like a simple truism. But the extent to which markets differ and the dimensions along which they differ has not been fully appreciated. Our research and experience repeatedly showed that true fungible commodities were much less common than had been expected in the effort to create online exchanges. When examined at the behavioral level, many markets were “fragmented” not because of antiquated practices or inefficient communications, but because the markets were trading goods that were not (or rarely) substitutable. Aggregating such markets in a centralized exchange made little sense, at least as it was operationalized on many B2B exchanges. The design requirements for the more common sub-markets were vastly different than what was needed in the large centralized markets.

Even true fungible commodity markets (propane, DRAM, grain, financial instruments) seem to require different structures at their birth. The designs, tools, and infrastructure for mature high-volume markets may be inappropriate or even harmful for nascent markets.<sup>20</sup> Even for financial instruments, the very early days of a market may be closer to a negotiation over a very wide variety of products than a continuous double auction of generic, standardized contracts. The user interface, technology, hours of operation, and market design are likely to be very different in a nascent market than in a mature one.<sup>21</sup>

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<sup>20</sup> Portions of this discussion are taken from Kollock and Jaycobs (2000).

<sup>21</sup> Ironically, this is a case in which the very efficiencies of the Internet led to inappropriate designs. The fact that the Internet makes it possible to create a market that is open all-day-everyday led many to design their markets in this fashion as a “feature.” But of what use is an always-open market if the few initial users do not find each other? Historically, markets often emerge at first as call markets, in which “all traders trade at the same time when the market is called” (Harris 2003: 90). More than 50 years passed between the emergence of call markets at the New York Stock Exchange and the establishment of continuous trading. Call markets served to concentrate transaction density in order to create periods of liquidity and lower the participation costs of traders.

### *The Technology Needs to Match the Sociology*

The behavioral realities of markets and how people actually trade were ignored by many of the efforts to create online B2B exchanges. The goal in many cases was to create something approximating a mature financial market, and the technology was build with this in mind, assuming high volume, centralized, anonymous trade. The technology did not match how many markets operate, and even for true fungible commodities, did not acknowledge that the early days of a market may require a different structure than a mature market.

Certainly there is a place for technology to augment how trading is done in sub-markets. Interestingly, ad hoc solutions were cobbled together by the traders themselves. Rather than technology that resembled the trading screens of financial markets, what was needed was something closer to Instant Messaging (IM), which preserves the identities and network relationships that are so important. In fact, both gasoline traders and crude oil traders have come to use IM for trading a significant portion of their deals.<sup>22</sup> One of the motivations for doing so is that many companies have been downsized, meaning that one person is doing the work that used to be done by several others. With more people to contact, telephone calls can become cumbersome, but IM makes it possible to stay in touch with a larger circle of traders.<sup>23</sup>

### *Future Work*

This study represents an initial effort to explore the lessons that come out of the online market-building efforts of the 1990's, and to use this opportunity to tease apart the social dynamics of market microstructure.

It is important to extend this analysis in two directions. First, to examine the details of this particular case study in greater depth, documenting the practices of the market and addressing such concerns as liquidity, commoditization, the role of trust & fairness, and the effects of different compensation systems. The second direction is to conduct these analyses for different industries in order to identify how general these processes are and to identify distinguishing characteristics. We explore both these directions in a forthcoming study.

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<sup>22</sup> Though on different systems: AOL Instant Messaging is used in the gasoline market, while Yahoo Instant Messaging is used in the crude oil market.

<sup>23</sup> An attempt to build online technology that matched the trading behavior in sub-markets was attempted by the second author in 2001, though the economic climate at the time was unfavorable to new technology initiatives.

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