TOWARDS A THEORY OF THE MOVE TO UNBIASED ELECTRONIC MARKETS: LESSONS FROM THE AIR TRAVEL INDUSTRY

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ABSTRACT
The electronic market hypothesis (EMH) in the Information Systems (IS) literature predicts that by reducing coordination costs, information technology (IT) will shift industrial organization from hierarchical to market-based forms of economic activity. While academic researchers and practitioners have witnessed these shifts with the advent of the Internet, there is little understanding about the process and the underlying forces that drive them. In this article, we explore the move of the air travel industry to unbiased electronic markets. We complement the EMH with market design theory to show how this transformation has been occurring. We argue that the presence of advanced ITs is not enough to explain the move from hierarchies to unbiased markets in the air travel industry. Other forces have also facilitated this move, such as the information-intensive nature of air travel products and pro-competition policies. Based on this analysis of the transformation of the air travel industry, we generalize our theoretical framework so that it can be applied in other settings and make a call for in-depth research on real world, technology-enabled moves to advanced forms of market-based organization.

KEYWORDS: Air travel industry, asymmetric information, consumer demand, electronic markets, market microstructure, market design, strategic pricing, market transparency.

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INTRODUCTION

A classic theoretical perspective in the information systems (IS) literature known as the electronic markets hypothesis (EMH), predicts that by reducing coordination costs, information technology (IT) will shift industrial organization from hierarchical to market-based forms of economic activity (Malone, et. al, 1987). Since the 1990s academics and practitioners have witnessed this phenomenon with the advent of the Internet, which has fueled the creation and transformation of electronic markets in multiple industries. A representative example is the emergence of shopbots (e.g., www.mysimon.com), Internet websites that aggregate product and price information (e.g., digital cameras of different manufacturers) so consumers can search and compare products, at the expense of brick-and-mortar retailers.

Although there are many examples of the move from hierarchies to markets in the Internet context, there has been little research or empirical evidence about this process and the underlying forces that make it happen. We call for in-depth research on real world, technology-enabled moves to advanced forms of market-based organization. By doing so, the IS field will lead the exploration of technology-driven changes in market structure. The opportunity to witness, document, and learn from these changes will be lost if such research is not conducted at this point in time. In this article we will demonstrate the rich insights that can be derived by analyzing technology-enabled transformations in the structure of business-to-business (B2B) and business-to-consumer (B2C) air travel markets.

The air travel industry has been at the forefront of IT innovations for product distribution, leading the move from electronic hierarchies to electronic markets. Airlines pioneered B2B electronic markets in the late 1970s through computer reservation systems (CRS) technology. CRSs became the de facto technology infrastructure for the sale of airline tickets, enabling the
electronic transfer of transaction information from the airlines’ pricing departments to the sales offices of travel agencies. More recently, the air travel industry has led the Internet revolution in the development of B2C electronic markets. While most industries have struggled to exceed the single-digit sales percentages through the Internet, in 2003 approximately 16% of airline tickets were sold online worldwide, led by North America with 40% (Airline Business and SITA, 2003).

The EMH predicts that IT-driven industry transformations will occur in stages, from *hierarchies* to *biased electronic markets*, and from biased electronic markets to *unbiased electronic markets*. The historical developments of B2B air travel markets in the 1980s and B2C air travel markets since the 1990s are consistent with these stages. However, we find that the EMH falls short of explaining *how* this progression occurs. Therefore, in our analysis we combine the EMH with *market design theory* to propose a theory of the move to unbiased electronic markets.

A key driver of the move to unbiased electronic markets in air travel is competition for *market transparency*, a core dimension of market design related to the product, price, and supplier information made available to market participants. For example, in 2001 five major U.S. airlines shook the industry’s structure with the launch of Orbitz (www.orbitz.com), an Internet-based travel agency or *online travel agency* (OTA) with a transparent selling mechanism. Within just one year after its launch, Orbitz became one of three major players in the industry. In the period January to April 2004, it ranked second among OTAs, with 57.7 million unique visitors (comScore Networks, 2004). Subsequently, other OTAs changed their selling mechanisms to try and match the level of market information that Orbitz offers to its consumers. We argue that this apparent competition for Internet-enabled market transparency, combined with pro-competition forces and the information-intensive nature of air travel, will lead to the
predominance of unbiased electronic markets. In addition, we provide an economic rationale to suggest that in the presence of a similar combination of forces, other industries will evolve in a similar fashion toward unbiased electronic markets.

To motivate our analysis and our call for research, in the following section we discuss the EMH and the literature on market transparency in greater detail. In the third section, we summarize the historical developments that occurred in the wake of the information and communication technology innovations in air travel distribution. In the fourth section, we analyze these historical developments and provide the economic rationale to explain how unbiased electronic markets prevail. We also generalize the theoretical framework used in the analysis of the air travel industry so that it can be applied in other industry settings. Finally, in the last section we draw implications for practitioners and researchers.

**ELECTRONIC MARKETS AND HIERARCHIES, AND MARKET TRANSPARENCY**

We next present the theoretical foundations for our analysis of IT-enabled structural changes in the air travel industry, in terms of the EMH and associated theory, and an evaluation of the existing literature on market transparency.

**The Electronic Markets Hypothesis (EMH)**

Research on the electronic markets and hierarchies theory predicts that IT reduces market coordination costs and causes a shift from hierarchical to market-based forms of economic activity. The basis for this claim is that IT reduces the costs of information processing related to trading and transaction-making activities, such as selecting suppliers, establishing contracts and buying supplies in the spot market. Moreover, IT makes it possible for the transaction-making process to require less asset-specific inputs and to overcome the difficulties associated with highly complex product descriptions. As a result, IT tends to favor market-based organization of
economic activities. Regarding the process by which these changes occur, the EMH posits that moves to electronic markets will occur in stages (Malone, et al., 1987). (See Table 1.)

Table 1. Evolution of Electronic Markets

<table>
<thead>
<tr>
<th>STAGE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic markets</td>
<td>Evolution from non-electronic or hierarchical forms to e-markets.</td>
</tr>
<tr>
<td>Biased</td>
<td>Suppliers bias information availability in e-markets to increase own rents.</td>
</tr>
<tr>
<td>Unbiased</td>
<td>Legal and competitive forces drive biased electronic markets out or reduce existing biases.</td>
</tr>
<tr>
<td>Personalized</td>
<td>Personalized decision aids help individual buyers select a supplier.</td>
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The EMH suggests that legal and competitive forces will drive the bias out of electronic markets. In the initial stages of IT-driven moves to electronic markets, participants with market power will strategically distort or conceal information. However, at a later stage this practice will be eliminated by specific forces as discussed later in detail, resulting in unbiased markets where no particular market participant is consistently favored. We contend that the **theory of market transparency** can be used to explain how these forces work in the air travel industry, and later expand our theoretical framework to include other industries. To begin, we provide some definitions to orient the reader to this new perspective.

**Market Transparency and Its Variants**

*Market transparency* is defined as the availability and accessibility of information about the trading process and the product being traded. It is composed of three elements: price transparency, product transparency, and supplier transparency (Morgan Stanley Dean Witter, 2000). *Price transparency* exists when information about prices and the trading process is made available. *Product transparency* is based on the revelation of information about the characteristics of the product. *Supplier transparency* refers to information about suppliers, such
as identity and cost structure. Each of these variants of market transparency provides opportunities for a seller to establish different competitive strategies to approach the marketplace in the presence of advanced ITs (Granados, et al., 2005b).

Most of the literature on market transparency is related to financial markets and financial intermediation. Since financial instruments are information-intensive products, the availability of information to market participants has long been the center of attention as a driver of market efficiency and liquidity. We next evaluate the related theory in this area.

**Market Transparency and Financial Market Design**

In neo-classical economics, the selection of prices that determine equilibrium between supply and demand occurs in a “black box.” In contrast, market design theory emphasizes that firms make explicit decisions to design selling mechanisms, select trading prices, and coordinate trading transactions. From this perspective, equilibrium outcomes are viewed as the aggregate results of individual actions by firms, including design choices of market mechanisms that enable trade.

A common concern among financial market design theorists is how market transparency influences market liquidity. *Liquidity* can be defined as the extent to which a buyer (seller) is able to find a seller (buyer) to complete a trading transaction in a reasonable amount of time at a reasonable transaction cost. In general, the larger the number of market participants, the higher will be the probability that matching of buyers and sellers will occur, supporting trade and exchange (Spulber, 1999).

In the sale of airline tickets, liquidity is driven by two forces. First is the ability of airlines to sell the “product,” an inventory of empty seats, at a profit. Second is the ability of travelers to find the product that maximizes their utility, based on the right combination of schedule, service,
and price. Market transparency can have an influence on both these drivers of liquidity. For example, a transparent OTA may attract airlines to the extent that they believe their prices are displayed correctly and with equal priority as those of other airlines. Also, a transparent OTA will attract consumers if it brings the best prices and products in the selection process to the market, regardless of the service provider.

Technology-enabled market transparency can play a major role in industrial organization as well. Due to existing information asymmetries, some market participants may be able to consistently appropriate value from a transaction due to an informational advantage that they hold. This is likely in a market where specific information about products or prices can be withheld from other participants or distorted. If advanced ITs transform the nature and extent of these asymmetries, both the market dynamics (e.g., price competition levels and discounting strategies) and industry structure (e.g., new entrants that disintermediate established players) may change. For example, Clemons and Weber (1990) studied the "Big Bang" at the London Stock Exchange, where floor-based trading was replaced by screen-based trading. This transformation changed the level of market transparency, and increased market liquidity and turnover, but reduced margins for the equity market-maker intermediaries. This led to large-scale transfers of wealth between the financial sector and the public.

Analogously, we contend that in the air travel context, technology-enabled market transparency is shifting the distribution of wealth in two ways. First, by reducing search costs, market transparency has a *direct* positive effect on consumer surplus. While in the past travelers depended on the few travel options offered by their preferred travel agent, they now have many more options for travel and prices at their fingertips by accessing the Internet. Second, there are *indirect* effects, depending on the variant of market transparency that changes. A market
mechanism which reveals more *product information* to the traveler will result in a higher level of consumer surplus. Consider a perspective that is consistent with what Akerlof (1970) theorized in his classic “Market for Lemons” article: a diminution in information asymmetry between buyers and sellers in product markets will help to “shore up” the fundamentals for a sound market. On the other hand, mechanisms that display more *pricing information* will allow travelers to transact at lower prices (Stigler, 1961). With the price dispersion that exists in air travel (Clemons, et al., 2002), the increased price transparency offered by OTAs may drive prices down, as consumers are able to discover and purchase the lowest available fares.

More generally, to the extent that different forms of market transparency—price, product, and supplier—are considered as design variables for the firm in its selling activities, there is a potential benefit relative to competitors that make different market design choices. In the next section, we provide a historical account of these developments in the air travel industry.

**THE MOVE TO ELECTRONIC MARKETS IN AIR TRAVEL DISTRIBUTION**

We next analyze the developments that led to the current competitive scenario and market structure in the air travel industry in the United States. First, we review the industry prior to the advent of OTAs, with a focus on B2B market transparency, and the relative availability of information across competitors in the supply chain (i.e., airlines and travel agencies). Second, we examine the history of OTAs in the marketplace, with a focus on B2C market transparency and the relatively greater availability of information for consumers.

**B2B Electronic Markets in Air Travel Distribution**

**A Move to Electronic Markets.** Prior to 1978, the government exerted control over fares and airline routes. In 1978, the airline industry was deregulated and airlines have since been able to set fares and schedules based on competitive and demand forces. To deal with this new
competition, the airlines introduced three strategies (Copeland and McKenney, 1988). First was the implementation of strategic pricing strategies to increase revenues, which commonly lead to fare wars. The second approach was the development of computer reservation systems (CRSs) to automate the distribution of airline tickets. CRSs were installed at travel agency locations, accompanied by long-term contractual sales agreements (Duliba, et al., 2001). The third strategy was to use technological advantage to skew the information flow in favor of the airline owner of a given CRS. This led to biased electronic markets.

**Biased Electronic Markets.** Airlines typically took advantage of CRS technology to lock in travel agencies and create a “halo effect” for market share in their favor (Copeland and McKenney, 1988). This was accomplished through screen biases, the act of purposely positioning information on-screen to influence specific purchase behaviors that are beneficial to the airline owner of the CRS, but unfair to other airlines. Similarly, CRS owners developed co-hosting agreements with other airlines to provide preferential treatment of schedules in the screen displays for a fee (Global Aviation Associates, 2001). Finally, to further enjoy the benefits of economies of scale, CRSs expanded their reach. These extended systems are called global distribution systems (GDSs). They were widely recognized as a source of sustainable competitive advantage for their owners (Duliba, et al., 2001).

**From Biased to Unbiased Electronic Markets.** By 1983, 80% of tickets were sold by travel agencies through CRS terminals (Global Aviation Associates, 2001). As a result, CRSs became a critical asset for airlines and travel agencies to survive in the recently deregulated environment. Soon, however, allegations emerged suggesting that retail automation of airline tickets had not occurred in the public interest. In June 1983, the Civil Aeronautics Board concurred with these allegations and concluded that the airlines were demonstrating anti-
competitive behavior through built-in screen biases and preferential treatment. Subsequently, CRS business practices were regulated by the government, prohibiting the vendors to employ screen display biases and to charge discriminatory fees to rival carriers. In addition, CRSs were instructed to provide data on their flights and ticket prices to competitors, albeit for a fee. Although these measures curbed the alleged discriminatory behavior, industry participants still argued that the measures were not enough to eliminate the anti-trust concerns. By 1992, new regulations were introduced to further discourage anti-competitive practices.

**B2C Electronic Markets in Air Travel Distribution**

Since the advent of the first Internet travel website in 1995, there has been an unprecedented growth in online airline ticket sales. A 2003 industry survey estimated that the percentage of tickets sold over the Internet had reached 16% worldwide and 40% in North America (Airline Business and SITA, 2003). To provide an idea of how significant this percentage is, in 2003 the cross-industry e-commerce share of total retail sales was less than 2% (U.S. Census Bureau, 2004). We next describe the environment that led to the consolidation of the OTA industry, focusing on the innovative market designs that OTAs implemented in the battle for consumers.

**A Parallel Move to Electronic Markets.** In 1995, the Internet Travel Network (ITN) was launched as the very first online travel reservation Web site. In 1996, Sabre Holdings, operator of the CRS formerly owned by American Airlines, capitalized on the technological opportunities offered by the Internet and introduced Travelocity (www.travelocity.com). Soon after that, new market players emerged to perform fare searches and sell tickets based upon a customer’s booking request. Some non-travel firms set up capabilities to position themselves as *e-commerce-only intermediaries* in the OTA market (Chircu and Kauffman, 2000). For example,
Microsoft introduced Expedia (www.expedia.com). By using CRS-enabled search engines, these Web sites were able to offer fares from most airlines.

Travelocity and Expedia soon became market leaders, while other key players continued to emerge. In 1997, TravelBids was created to offer leisure price quotes. Although it failed to survive during the DotCom downturn, Travelbids was the first OTA to have a reverse auction mechanism, where travel agencies would bid to earn business from a customer with specific travel needs (Chircu, et al., 2001; Klein and Teubner, 2000). In 1998, Priceline.com (www.priceline.com) emerged as the first low-transparency OTA, by developing a selling mechanism that shielded product and price information from the customer until after the consumer commits to a contract-binding bid. Hotwire (www.hotwire.com), a low product transparency OTA launched by major airlines to compete with Priceline.com, began its operations in 2000. In 1999, ITN created GetThere.com (www.getthere.com), one of the first corporate travel OTAs, creating new market transparency for the segment (PhoCusWright, 1999). (See Appendix for screen displays of Travelocity, Hotwire, and Priceline.com.)

**Biased Electronic Markets Once Again.** With the proliferation of OTAs, competition became intense. There was an explosion of “look-to-book” visits to their Web sites, which also increased demand by consumers to book online. With these developments came more “comparison shopping,” as only 10% of online shoppers bought after visiting just one site (Regan, 2001). Moreover, this increase in online travel search also increased offline competition. In 2001, for every dollar of sales transacted via the Internet, OTAs generated an additional 60 cents via phone, fax, or in person (Nielsen NetRatings, 2001). To retain consumers, OTAs offered add-on services, such as Travelocity’s “Best Fare Finder” and “Online Trip Review.” The latter enables travelers to view up-to-date information on flight schedules,
weather, and travel destination maps. In addition, to increase revenues in this increasingly competitive environment, some OTAs, such as Travelocity and Expedia, pursued agreements with individual airlines to provide preferential display of their travel itineraries, resulting in biased offers to consumers.

In their first stage response to the entrance of OTAs, airlines began to pursue reintermediation strategies by attracting consumers to their direct channel airline portals (e.g., www.delta.com, www.americanairlines.com), extensions of airline reservation offices that offered online ticket purchasing services. In 1996, airline portals accounted for about 21% of online air travel revenues (Salkever, 1999). Development of more service-oriented airline portal Web sites, including the new virtual check-in capabilities and an increased focus on frequent-flier programs with discounted online award bookings, brought the share of airline portal sales in the OTA market to 60% in 2001 (Zellner, 2001).

**From Biased to Unbiased Electronic Markets Again.** In 1999, five airlines—United, American, Delta, Northwest, and Continental—announced they would create a new OTA (Salkever, 1999). Dubbed “Orbitz,” the new Web site (www.orbitz.com) was launched in June 2001, and since then has grown into a technology leader in its quest to update the legacy systems of airline reservations. The airlines claimed that Orbitz would dramatically decrease the high costs of making reservations. For that purpose, Orbitz was designed and powered by ITA Software (www.itasoftware.com), a pricing and airfare shopping technology developer launched by researchers from the Artificial Intelligence Laboratory at MIT. This software is attractive because it obtains fares directly from the Airline Tariff Publishing Company (www.atpco.net), which collects and distributes fares from airlines worldwide, and it obtains airline travel schedules from the Official Airline Guide (www.oag.com). By using ITA’s software, Orbitz
avoids reliance on legacy system infrastructures and high CRS and GDS fees. Figure 1 shows the technological structure of fare distribution in the air travel industry in light of Orbitz.

**Figure 1. Technological Structure of Air Travel Distribution: Traditional Sellers and OTAs**

![Diagram of technological structure of air travel distribution]

**Note:** Before OTAs, the dominant electronic systems for air travel distribution were GDSs and CRSs. With Internet-based OTAs, however, a new technology-enabled distribution structure emerged. (See the dashed box.) In particular, Orbitz introduced technology to search for airfares and itineraries directly, without reliance on GDS and CRS distribution. Orbitz provides these services to other distributors such as travel agencies as well (Regan, 2002a and 2002b).

In addition to its state-of-the-art technologies, Orbitz has claimed that it is a price-transparent online travel site. Al Lenza, Northwest Airlines’s VP for distribution, claimed that Orbitz “will give the lowest published fares anywhere. Anything you find on the Web, we will have” (Salkever, 1999). This was achieved through “Most Favored Nation” agreements, wherein airlines agree to publish through Orbitz any publicly available fares. The senior management of Orbitz argued prior to its launch that the CRSs and GDSs were continuing the industry’s practices of display bias (Global Aviation Associates, 2001). They further asserted that, with Orbitz’s matrix-based presentation of information and its access to the appropriate data sources, it would be able to offer a truly unbiased search engine—and one that would provide a
transparent presentation of all the travel options and prices in a manner that would be clear and simple for the traveler. (See Figure 2 for a screen display of Orbitz’s selling mechanism.)

Orbitz committed to neutrally display all fares, regardless of whether it had a favorable contract with an airline or whether the airline had ownership interest in Orbitz (Mead, 2002).

Figure 2. Orbitz and its Matrix Display Selling Mechanism

Note: Orbitz’s matrix display summarizes fares by airline and number of stops. The traveler can click on any option to see further details. In total, 179 travel options were offered in this search. Source: www.orbitz.com, accessed September 2004.

Meanwhile, since the prospects of an airline-owned booking mega-portal appeared, the U.S. government began to closely scrutinize the business practices of Orbitz. But it has found no reason to regulate or restrict it. Both the U.S. Department of Transportation and the U.S. Department of Justice have concluded that Orbitz does not harm consumers nor reduce competition (Mead, 2000 and 2002; U. S. Department of Justice, 2003).
Although the market value of Travelocity and Expedia was eroded due to the future prospects of Orbitz’s continuing success, they continued as the top OTAs, with market shares slightly above 30% in 2002, excluding the airline portals. Travelocity also continued to be a model of customer service, introducing 24-hour customer phone support. Expedia has continued to grow its niche in the sale of travel packages as well. As of 2002, Orbitz was a close follower, with a share of approximately 25% (Mead, 2002), an indication of the inroads it had made in the market just one year after its launch. In addition, Orbitz consolidated its position as a direct competitor of the CRSs and GDSs, making itself the first Internet company to provide the technological means to bypass the traditional reservation systems (Regan, 2002b).

Market Transparency and the OTAs

Based on an industry snapshot at the point in time when Orbitz was launched, OTAs can be classified in four major categories. (See Table 2.) Because Orbitz shows a high level of product and price transparency, we classify it in its own category. Second are inter-airline portals, such as Travelocity or Expedia. These Web sites offered multiple travel options at fairly reasonable prices, but they were limited in the number of options relative to Orbitz due to some of the technological limitations we explained earlier. In addition, these websites engaged in preferred arrangements with suppliers, similar to what the CRSs did with the airlines in the early stages of the airline B2B marketplaces. In a third category are the airline portals. Even though they offer multiple itineraries and price levels, they still are limited to product offers in the airline’s network (including flying partners). To this extent they are less product-transparent than inter-airline portals. The fourth category considers low-transparency Web sites, such as Hotwire and Priceline.com, which concealed product, supplier and/or price information until after the consumer commits to purchase.
Table 2. OTA Levels of Market Transparency as of 2001

<table>
<thead>
<tr>
<th>OTA TYPE</th>
<th>TRANSPARENCY TYPE</th>
<th>PRICE</th>
<th>PRODUCT</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orbitz</td>
<td>Very High</td>
<td>Very High</td>
<td></td>
<td>Unbiased, numerous alternatives per request</td>
</tr>
<tr>
<td>Inter-airline</td>
<td>High</td>
<td>High</td>
<td></td>
<td>Alternatives limited by GDS technology</td>
</tr>
<tr>
<td>(e.g. Travelocity)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airline portals</td>
<td>High</td>
<td>Medium</td>
<td></td>
<td>Alternatives limited to airline specific offers</td>
</tr>
<tr>
<td>(e.g. <a href="http://www.delta.com)">www.delta.com)</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opaque websites</td>
<td>Low</td>
<td>Low</td>
<td></td>
<td>Price and/or product information concealed until after purchase</td>
</tr>
<tr>
<td>(e.g. Hotwire)</td>
<td></td>
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OTAs have made moves to match the level of market transparency of Orbitz. Travelocity and Expedia started developing agreements with carriers to obtain the lowest market fares from carriers, analogous to Orbitz’s move towards higher price transparency. Priceline.com and Expedia introduced the matrix display selling mechanism to match the level of market transparency of Orbitz. Meanwhile, Orbitz has continued its strategy to be the most transparent, adding functionality for travelers with flexible travel dates and automatic displays of fares the day before and after the travel dates requested.

TOWARDS A THEORY OF THE MOVE TO UNBIASED ELECTRONIC MARKETS

In this section, we analyze the IT-driven competition for market transparency in the air travel industry and provide economic rationale to support our prediction that the aggregate outcome of individual firm moves will be the predominance of unbiased air travel markets. Thereafter, we extend our theoretical framework so that it can be applied in other industry settings.

A Move to Unbiased Electronic Markets for Air Travel

Analysis. The changes that have occurred in wholesale air travel distribution due to IT are generally consistent with the stages in the progression from hierarchies to markets predicted by the EMH. In B2B markets, airlines and travel agencies institutionalized electronic transactions
in the 1980s through the development of CRSs. Initially, the airlines capitalized on this technology by creating screen biases and preferred contractual arrangements with travel agencies to “lock in” their business, resulting in biased B2B electronic markets. Later, competitive pressures and government regulation of CRSs forced airlines to reduce the degree of screen bias and eliminate preferential agreements that could hurt smaller players, resulting in more unbiased B2B electronic markets.

We observe a similar evolution in the B2C sector of the industry. Initially, the market leaders, Travelocity and Expedia, had preferred agreements with certain carriers to display their fares. In addition, due to the technological shortcomings of the CRSs, these OTAs were only able to display a limited number of travel options, resulting in biased B2C electronic markets. Since 2001, this practice has been curtailed by the competitive pressure of Orbitz’s more transparent mechanism. The market leader, Expedia, has matched the transparent matrix display of Orbitz, which gives no preferential treatment to any carrier and displays all low fares by carrier in one screen. Priceline.com recently added the transparent matrix display used by Orbitz to its opaque “name-your-own-price” mechanism, offering the consumer a low price-low transparency option and a high price transparency option. (See Appendix.) This competitive effort appears to be a strategic move by Priceline.com to enhance its transparency strategy and overcome its disadvantageous competitive position. Figure 3 shows the evolution of the OTAs in the competition for market transparency, focusing on the product and price transparency dimensions.

As the figure suggests, all of the OTA moves that we have observed since the launch of Orbitz are towards higher levels of market transparency. This battle for market transparency has reduced the overall level of bias of in the OTA distribution channel, through the development of
Figure 3. The Evolution of Market Transparency in Online Air Travel

Note: This figure describes the competitive moves of different OTAs in the market transparency space, since the origin of Orbitz in 2001. The arrows denote the transparency strategy path that each OTA has taken.

innovative mechanisms that equitably display product and price offers from most suppliers.

While this trend so far has been extraordinary, the potential for even greater market transparency has not yet been fully exploited by the OTAs. The availability of new technologies should fuel additional competitive moves on the part of other firms to match the technological leadership that Orbitz has demonstrated. For example, we note the emergence of independent online agents that search for the lowest prices across multiple OTAs (e.g., www.farechase.com, www.sidestep.com). This competition for market transparency will lead to the emerging dominance of unbiased air travel B2C electronic markets. We next provide the economic rationale to explain how this process will occur.

Economic Rationale. Buyers generally favor an unbiased market mechanism because it provides them with access to information that maximizes the value of their purchases. Sellers, on the other hand, have incentives to maintain information advantages and explicit coordination in the form of biased electronic markets (Malone, et al., 1987). However, airlines have led the
move to unbiased electronic markets through the creation of Orbitz. Which forces drive sellers to implement unbiased electronic market mechanisms?

To answer this question, we next leverage market design theory—in combination with the EMH—to develop a market design-driven electronic markets and hierarchies theory (Granados, et al., 2005a). The key ideas of this hybrid theoretical approach can be characterized as follows:

“The driving forces in the move to unbiased electronic markets are IT, product characteristics that favor electronic trading, and forces that promote inter-firm competition. Together, these forces will lead to the emerging dominance of unbiased electronic markets.”

Next, we explain how these forces interact in each stage of the move to unbiased markets in the air travel industry, as depicted in Figure 4.

**Figure 4. Driving Forces of the Move to Unbiased E-Markets in the Air Travel Industry**

Note: The stages in the electronic markets and hierarchies theory are shown in the dotted box. The key forces that influence the move to markets are IT, product characteristics, and public policies that promote industry competitiveness and market transparency. The arrows characterize the interactions observed in the air travel industry.
**Link A—Electronic Markets and Hierarchies.** Reservation systems and Internet technology have reduced product complexity in favor of market-based economic activity in the B2B and B2C air travel markets. In B2B markets, electronic commerce technology has made it easier for travel agencies to obtain accurate trip descriptions and prices. Prior to the advent of CRS systems, air ticket distribution was a cumbersome process of paperwork and phone calls to complete reservations and ticketing of passengers.

In B2C markets, before the new OTAs emerged, travel agencies played an important role as intermediaries who reduced the complexity of CRS-based product descriptions for the consumer. A typical fare availability screen in a CRS was filled with codes for city pairs, inventory availability, and fare types, making it a tool that was mostly for expert users. Consequently, consumers had very little control over the information they were given about possible trips and fares. Instead, they had to rely upon airline reservation offices and travel agents to interpret the results of CRS-based search requests. With a new ability to reach consumers via the Internet, OTAs seized the opportunity to display CRS output in a user-friendly manner. (See Appendix.) As a consequence, markets were created that bypass the traditional hierarchical relationships between travel agencies and travelers, enabling the move to electronic B2C air travel markets.

**Link B—IT Generates Market Transparency Options.** By unleashing the potential for innovative design of electronic markets, advanced ITs create competitive pressures for suppliers and intermediaries to compete for market share with transparent market mechanisms. Also, by reducing product complexity, IT limits the viability of hierarchical relationships and biased market mechanisms. For example, we observe that OTAs are competing aggressively for market transparency positions in the battle for well-informed travelers, taking advantage of the options offered by Internet technology. This leads to our first proposition:
□ Proposition 1 (The IT-Market Transparency Proposition). In the presence of advanced ITs, sellers will implement innovative electronic market mechanisms to compete for market transparency.

Proposition 1 recognizes the pressures that arise when IT expands an industry’s strategic alternatives. In the market transparency dimension, sellers can opt for transparent or opaque market designs, as we observe in the OTA industry. While sellers have incentives to compete with transparent mechanisms to attract consumers and create market liquidity, they also have incentives to distort and conceal information to obtain benefits from information advantages (Grover and Ramanial, 1999). Proposition 1 highlights the incentives firms have to implement transparent market mechanisms, but falls short of suggesting that they will prevail. *We contend that other forces must be present that eliminate or inhibit sellers’ incentives to conceal market information from buyers.*

**Links C, D, E and F—Other Forces.** Competition for transparent market mechanisms is more likely in an environment where incentives by sellers to distort and conceal market information are reduced. This is the case in competitive industries, where attempts by firms to be less transparent in their own benefit are quickly offset by competitive moves to steal share. (See Link E in Figure 4.) In the air travel industry, the high level of competition is fueled by the *perishable* nature of airline inventory, where revenue is lost if a seat goes out empty. In addition, air travel is increasingly becoming a *commodity*, so there are fewer differentiation strategies that airlines can adopt instead of price competition. (See Link D in Figure 4.)

Other inherent characteristics of a product may facilitate market transparency. The information-intensive nature of air travel purchases, for example, facilitates electronic or digital representation, making transparent market mechanisms feasible. (See Link F in Figure 4.) Also, the complexity of air travel products can decrease with technologies that allow accurate and user-friendly representation, such as Orbitz’s matrix display. Finally, public policy that prohibits anti-
competitive behavior and regulates CRS screen biases may also play a role in the high level of competition. (See Link C in Figure 4.) This leads to our second proposition:

□ **Proposition 2 (The Other Forces Proposition).** Together with IT, the presence of price competition, pro-competition policies, digital product characteristics, and low product complexity facilitate the move to unbiased electronic markets.

Proposition 2 recognizes the limitations that IT alone exhibits as a force to eliminate the bias in electronic markets. It complements the EMH by making explicit the forces that, together with IT, favor unbiased electronic markets. The core argument for Proposition 2 is that sellers have economic incentives to create and maintain information advantages, so other forces must be present to reduce or eliminate these incentives. The case of the air travel industry suggests that, without these forces, a move to unbiased electronic markets would likely be inhibited.

**Link G —Sellers Favor Transparent Market Designs.** Buyers value transparent markets where relevant product information is made available (Johnson and Levin, 1985). On the other hand, while self-interest may encourage sellers to maintain information advantages by concealing or distorting information, the combined effect of IT and competitive forces in information-intensive industries with low product complexity will align suppliers’ interest for market transparency to that of buyers. In the absence of the possibility for explicit collusion, sellers will avoid price competition by adopting transparent market mechanisms to engage in *tacit collusion*. The rationale for this claim is that the potential losses from price competition among sellers may be higher than the losses from reducing information advantages in favor of buyers. This argument is consistent with the effort of airlines to lead the industry in the adoption of transparent market mechanisms through Orbitz. Transparent OTAs are beneficial to air travel suppliers because they allow competitors to follow each other’s moves. This leads to:

□ **Proposition 3 (The Transparent Market-Unbiased Market Proposition).** In the absence of the possibility to explicitly collude, sellers will favor transparent market mechanisms that allow tacit collusion, leading to the predominance of unbiased electronic
markets.

We next elaborate on Proposition 3, by showing how the aggregate effect of competitive market forces drives sellers’ transparency strategies, resulting in unbiased electronic markets.

**How the Battle for Market Transparency Unfolds**

Consider two competitors, Firm LT and Firm HT. Firm LT has a *low transparency* market mechanism and Firm HT has a *high transparency* market mechanism. Under the assumption that buyers value market transparency, these firms should price based on the relative level of market transparency of their market mechanisms. If Firm LT is less transparent, it should have a lower price than Firm HT to maximize revenue (Granados, et al., 2003). Therefore, Firm LT has two possible strategies to improve its competitive position. It can adjust its pricing levels, or alternatively, adjust the level of market transparency of its selling mechanism. (See Figure 5.)

**Figure 5. Market Transparency and Pricing Scenarios**

Note: The utility of buyers in the price-market transparency space is higher with lower price levels. Therefore, in this figure, a lower indifference curve implies higher utility, such that $U_2 > U_1$. Firm LT has two options to improve its competitive position relative to Firm HT: lower its price level (arrow A) or increase the level of market transparency of its selling mechanism (arrow B).

**Adjusting the Pricing Strategy.** Assume Firm LT’s level of market transparency is fixed. For example, Priceline.com’s business strategy was based on the use of the patented “name-your-own-price” mechanism which is, by its own nature, an opaque selling mechanism. In these situations, if Firm HT introduces a mechanism with a higher level of market transparency (e.g.,
Orbitz), Firm LT must lower its price levels to compensate for its lower level of market transparency. In this manner, firms will engage in service differentiation based on the level of market transparency.

**Adjusting the Level of Market Transparency.** However, in competitive markets it may not be an option for the less transparent Firm LT to maintain lower prices than its competitors. If firms are not allowed to explicitly collude, it is likely that Firm LT’s lower price levels will be matched by competitors (Morrison and Winston, 1996) in order to elicit tacit collusion or to remain competitive. Thus, the alternative strategy for Firm LT is to increase the level of market transparency of its selling mechanism in order to improve its competitive position. For example, Hotwire was more transparent than the “name-your-own-price” mechanism of Priceline.com, because it reveals a limited set of price offers up front. (See Appendix.) Even though Priceline.com used to offer a lower level of transparency than Hotwire, it was likely to receive similar net fares from the airlines as Hotwire does. Therefore, Priceline.com may have been effectively pricing itself out of the market due to a disadvantageous price - market transparency strategy choice with respect to Hotwire. To wit, in February 2002, when Hotwire announced it had doubled the number of new unique visitors with respect to Priceline, CEO Karl Peterson stated: “We are gaining on our competition fast, because we don’t require customers to bid … our consumer experience is far superior to Priceline, and it shows in the number of new users coming to our site” (Hotwire, 2002). The shift of Priceline.com’s transparency strategy to match that of Orbitz, the most transparent competitor, may have been a reaction to their uncompetitive position. This leads to the following more general proposition:

□ **Proposition 4 (The Market Transparency-Price Competition Proposition).** In response to an uncompetitive market transparency position, sellers will increase the transparency of their selling mechanism rather than engage in price competition.

Proposition 4 implies that, for example, OTAs which target similar segments must consider
their market transparency level relative to competition, or face the threat of a more transparent competitor offering the same price and stealing customers. This was the case of Orbitz, which stole significant market share from its competitors in a short period due to its more competitive price–market transparency strategy. OTAs will need to develop an effective combination of market transparency and pricing strategies to compete effectively.

We predict that additional increases in market transparency by the OTAs will continue to attract new consumers who are willing to purchase airline tickets online, and the aggregate outcome will be the predominance of electronic markets that equitably display product and price offers from most suppliers.

A Generalized Theoretical Framework of the Move to Unbiased Electronic Markets

We also contend that there may be a similar set of forces that will drive other industries to become unbiased. For this purpose, we next enhance the theoretical framework in two ways so that it can be applied in other industry settings. (See Figure 6.) First, we recognize that the importance and interaction among IT, competitive forces, and product characteristics may vary across industries. Therefore, we offer a general framework that relaxes the assumptions about the interaction of these forces.

Second, other information-related design variables enabled by IT may also influence the move to unbiased markets in other industries. Market transparency is naturally a key design dimension for information-intensive products such as air travel, since it is related to the degree of information that firms are willing to strategically disclose when trading. So it is reasonable to assume that in information-intensive industries, market transparency may be a driver of the move to unbiased electronic markets. However, in other industries, different dimensions may take the front stage. Examples of other information-related market design
Figure 6. Generalized Framework for an IT-Enabled Move to Unbiased E-Markets

Note: To generalize the framework so that it can be applied to other industries, specifics are relaxed regarding the interaction of competitive forces and product characteristics that affect market design choices. In addition, we recognize that other market design choices may be relevant, such as price discovery and trading protocols.

dimensions are price discovery and trading protocols (Madhavan, 2000; Schwartz, 1995).

**Price Discovery.** *Price discovery* is the mechanism by which buyers (sellers) ascertain their willingness-to-pay (willingness-to-sell) and market prices. In the sale of used products, price discovery is important, because sellers and buyers are less certain about the value levels at which they are willing to transact. The recent proliferation of auction mechanisms on the Internet for used products may be better explained by the ability of these mechanisms to help buyers and sellers ascertain product valuations, rather than by their level of market transparency. In fact, many auction mechanisms have succeeded despite the ability of auctioneers to distort or conceal information and commit fraud (Federal Trade Commission, 2003).

Another example is the sale of rare items such as collectibles, where the ability to integrate fragmented markets in order to provide liquidity is a key driver of market performance. In these markets, players are also uncertain about their product valuation and their willingness-to-pay.
Therefore, technology-enabled mechanisms that allow price discovery through automated display of bids and quotes may facilitate a move to advanced forms of market organization, as observed in Internet electronic market places for collectibles.

**Trading Protocols.** Trading protocols are the rules of trading and transactional exchange, which may reflect ongoing business practices, government regulations, and membership fees. Certain products exhibit characteristics that demand careful design of trading protocols. For example, due to the perishable nature of electric power, trading rules should reduce the risk that sellers dispose electricity due to unavailable demand or that buyers suffer from power outages due to lack of supply. The recent failure of government-led market designs for electric power in the U.S. industry underscores the importance of trading protocols that reduce transaction risks for buyers and suppliers (Granados, et al., 2005a).

The list of market design dimensions discussed here is not exhaustive. Nevertheless, this generalized framework illustrates the applicability of our theory to other industry settings. In this manner, we offer a theoretical perspective to understand and predict technology-enabled moves to unbiased electronic markets. We next discuss some of the implications for practitioners and researchers.

**IMPLICATIONS FOR PRACTITIONERS AND RESEARCHERS**

In this section we derive implications of the market design-driven electronic and hierarchies theory. First, we discuss implications in the context of the air travel industry. Thereafter, we discuss more general implications for practitioners and researchers.

**Implications for the Air Travel Industry**

We have shown how in the air travel industry “[p]roducers who start out by providing an electronic hierarchy or a biased electronic market will eventually be driven by competitive or
legal forces to remove or significantly reduce the bias” (Malone, et al., 1987, p. 492). Together with forces that support a more competitive environment, technologies such as CRSs and the Internet will continue to induce airlines and travel agencies to design innovative and transparent selling mechanisms. In aggregate, these strategic moves will drive the industry towards the predominance of unbiased electronic markets.

More generally, from the recognition that market transparency is a key driver of market transformation in the air travel industry, practitioners should monitor transparency moves in the industry to compete effectively. With advent of the Internet, there are numerous strategic alternatives that airlines and intermediaries can adopt to compete. Participants that are able to leverage their market transparency design choices for air travel distribution will continue to play major roles in the technological and strategic development of the industry. On the other hand, those players that do not sufficiently acknowledge the strategic nature of market transparency are apt to be left behind and will struggle to survive.

**Implications**

We have presented a theoretical framework to explore how advanced ITs lead to the implementation of innovative market mechanisms that influence an industry’s structure. At the core of this framework, exemplified by the air travel industry case, is that IT not only reduces product complexity and asset specificity, but it also expands the possible competitive strategies that firms can adopt. In particular, IT increases the market design choices firms can make. We predict that, in the presence of advanced ITs, information-intensive industries will tend to strategize on the transparency dimension of market design. On the other hand, other industries may concentrate in different dimensions such as price discovery and trading protocols.
Moreover, in the presence of a competitive environment and product characteristics that facilitate IT-enabled market mechanisms, the aggregate result of sellers’ market design choices will be the predominance of unbiased electronic markets. (See the Other Forces Proposition.) The presence of these forces helps explain how air travel electronic markets are evolving to become unbiased. On the other hand, the absence of any of these forces may inhibit the move to unbiased electronic markets in other settings such as the mortgage industry (Hess and Kemerer, 1994) or the bond market (Granados, Gupta and Kauffman, 2005a).

The opportunities to witness and document changes caused by the digital revolution are numerous and the IS academic field stands to make some interesting contributions of new knowledge. In particular, the design of market mechanisms in electronic commerce is increasingly playing an important role in the strategic behavior of firms. Therefore, we call for in-depth research on the advanced moves to electronic unbiased markets to uncover the alternatives, incentives, and decisions that firms make in the presence of advanced ITs. Significant research opportunities arise as firms increasingly adopting IT-enabled strategies in addition to the traditional low cost or differentiation business models. For example, innovative ways of collecting and presenting product information creates transparency, which offers the opportunity to explore the impact of systems design on market performance and competition. Along the price dimension, mechanism design also may impact price transparency and price discovery, which represents another key direction for research. To explore these emerging IT-enabled strategies related to the design of market mechanisms, in-depth case studies can be performed. In addition, we propose the development and refinement of analytical models that consider the forces that may influence strategic behavior of firms in their effort to capitalize on the opportunities offered by advanced ITs.
REFERENCES


APPENDIX: ILLUSTRATION OF OTA MARKET MECHANISMS

To illustrate the level of transparency associated with different OTAs, we include screen shots of travel search results for Travelocity, Hotwire, and Priceline.com.
A. The Longstanding Inter-Airline Portal, Travelocity


B. The Semi-Transparent Leisure Market Entrant, Hotwire

Source: [www.hotwire.com](http://www.hotwire.com), accessed in April 2004. For Hotwire, the airline name and itinerary are only shown after a purchase is made. Only a few travel options were provided.
C. The Semi-Transparent Name-Your-Own-Price Market, Priceline.com

- **The Name-Your-Own-Price Mechanism (prior to the launch of Orbitz)**

  ![Priceline Mechanism Diagram](image)

- **The Name-Your-Own-Price Option Plus Matrix Display of Fares (after the launch of Orbitz)**

  ![Priceline Matrix Diagram](image)