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

Nelson Granados
Doctoral Program
ngranados@csom.umn.edu

Alok Gupta
Associate Professor
agupta@csom.umn.edu

Robert J. Kauffman
Professor and Director, MIS Research Center
rkauffman@csom.umn.edu

Information and Decision Sciences Department
3-365 Carlson School of Management, University of Minnesota
321 19th Ave. South, Minneapolis, MN 55455

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ABSTRACT

The electronic market hypothesis (EMH) 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 paper, we augment the EMH with market design theory to offer an integrated economic perspective that explains how IT impacts industrial organization. We introduce the theory of unbiased electronic markets, which suggests that IT alone does not lead to the predominance of unbiased markets. Other conditions are necessary, such as a competitive environment and an increased ability to represent products electronically. We then evaluate our theory in the context of the air travel industry, which has recently experienced significant IT-driven transformations. We conclude that, together with IT, the existence of pro-competition laws and the information-intensive nature of air travel products have triggered competition for market transparency among airlines and online travel agencies, which is leading to the emerging dominance of unbiased air travel markets.

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

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Nelson Granados is an IS Ph.D. candidate at the Carlson School of Management, University of Minnesota. His interests relate to the strategic and economic consequences of IT-enabled transparency in Internet-based selling. He is studying information transparency strategy, consumer demand and market prices in the online travel industry. His work appeared at INFORMS CIST in 2003 and is forthcoming at HICSS. He also co-authored a forthcoming book chapter on transparency strategy for an edited book, Advances in the Economics of IS. Prior to joining the Ph.D. program, he worked for Northwest Airlines in Japan, the U.S. and Europe in pricing and revenue management.

Alok Gupta is an Associate Professor of in the Information and Decision Sciences Department at the Carlson School of Management, University of Minnesota. Alok Gupta received his Ph.D. in MSIS from UT, Austin in 1996. His research has been published in various information systems, economics, and computer science journals such as Management Science, MISQ, ISR, CACM, JMIS, Decision Sciences, Journal of Economic Dynamics and Control, Computational Economics, DSS, IJFMS, IEEE Internet Computing, JOC and ITM. He received the prestigious NSF CAREER award in 2001 for his research on Online Auctions. He serves on the editorial boards of ISR, DSS and BEJE. He also serves on MISQ policy committee.

Robert J. Kauffman is Director of the MIS Research Center, and Professor and Chair in the Information and Decision Sciences Department at the Carlson School of Management, University of Minnesota. His research focuses on senior management issues in IS/IT-strategy, IT infrastructure and technology adoption, e-commerce and supply chain management, and interdisciplinary connections to Finance and Marketing. His research has been published in Organization Science, Journal of Management Information Systems, Management Science, MIS Quarterly, Information Systems Research, Decision Sciences, and other leading journals and conferences. He recently won best research paper awards at INFORMS CIST in 2003 and 2004 and HICSS in 2004.
INTRODUCTION

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). An example is the emergence of shopbots (e.g., www.mysimon.com), Internet sites that aggregate product and price information so consumers can search and compare products, at the expense of brick-and-mortar retailers. Advanced information and communication technologies such as the Internet are accelerating the pace of industry transformations, so there is an opportunity to witness, document, and learn from them at this point in time. We introduce a new theory of unbiased electronic markets, which is developed based on prior theory and observations of real world, IT-enabled industry transformations. We also evaluate the new theory in the context of the air travel industry.

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 business-to-business (B2B) electronic markets in the late 1970s through computer reservation systems (CRS) technology. CRSs were the de facto 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. The air travel industry also led the Internet revolution in the development of business-to-consumer (B2C) e-markets. While most industries have struggled to exceed single-digit sales percentages on the Internet, in 2003 about 16% of airline tickets were sold online worldwide, led by North America with 40% (O’Toole, 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 development of B2B air travel markets in the 1980s and B2C air travel
markets since the 1990s are consistent with these stages. However, the EMH falls short of explaining how this progression occurs. We combine the EMH with market design theory to propose a new theory of 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 available to market participants. For example, in 2001 five major United States airlines shook the industry’s structure with the launch of Orbitz (www.orbitz.com), an online travel agency (OTA) with a transparent selling mechanism. Within a year after launching, 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 match the market information that Orbitz offers to its consumers. This competition for Internet-enabled market transparency, combined with pro-competitive forces and the information-intensity of air travel, will lead to the dominance of unbiased e-markets. We provide a theoretical framework to suggest why other industries will evolve in a similar fashion toward unbiased e-markets.

In the second section we introduce our theory of unbiased electronic markets, based on the EMH and market design theory. Then, we present 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 based on the theory of unbiased electronic markets and provide a framework to explain how unbiased electronic markets prevail. In the last section we draw implications for practitioners and researchers.

TOWARDS UNBIASED ELECTRONIC MARKETS

In this section, we provide the theoretical foundations to suggest that the EMH requires
augmentation in order to fully explain IT-enabled moves from hierarchies to markets.

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 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. IT makes it possible for the transaction-making process to require less asset-specific inputs and to overcome difficulties associated with complex product descriptions. As a result, IT tends to favor market-based organization of economic activities. The EMH posits that moves to e-markets will occur in stages (Malone, et al., 1987). (Table 1.)

Table 1. Evolution of Electronic Markets

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic</td>
<td>Hierarchical supplier-buyer relationships are replaced by electronic</td>
</tr>
<tr>
<td>markets</td>
<td>markets, where prices are determined by supply and demand forces.</td>
</tr>
<tr>
<td>Biased</td>
<td>Suppliers bias information in electronic markets to increase own rents.</td>
</tr>
<tr>
<td>Unbiased</td>
<td>Legal and competitive forces drive biased electronic markets out or reduce</td>
</tr>
<tr>
<td></td>
<td>existing biases.</td>
</tr>
<tr>
<td>Personalized</td>
<td>Personalized decision aids help individual buyers select a supplier.</td>
</tr>
</tbody>
</table>


The EMH suggests that legal and competitive forces will drive bias out of e-markets. In the initial stages, sellers will distort or conceal market information in their favor, resulting in biased markets. At a later stage this practice will be eliminated by specific forces (discussed later), resulting in unbiased markets where no seller is favored. Market design theory can explain how these forces work. To begin, we give a synthesis of the theory to orient the reader.

Market Design Theory

In neo-classical economics, prices determine equilibrium between supply and demand 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 is viewed as the aggregate result of individual actions by firms, including design choices of market mechanisms that enable trade.

IT plays a role in market design because it influences information flows in the trading process. Advanced ITs enable innovation in informational dimensions of market design, such as price discovery, trading protocols, and market transparency (Madhavan, 2000; Schwartz, 1995).

**Price Discovery.** In *price discovery* buyers and sellers ascertain their willingness to trade at different prices. In general, dynamic pricing mechanisms such as auctions offer better price discovery than posted-price mechanisms. For example, in markets for used products, buyers are less certain about their product valuations and willingness-to-pay. Through effective price discovery, Internet-based auction mechanisms reduce this uncertainty, enabling new markets for used products. Another example is the sale of collectibles, where the ability to integrate fragmented markets is a driver of market performance. In these markets, players are also uncertain about their product valuation and willingness-to-pay. Internet-based marketplaces for collectibles integrate bids and quotes across geographical boundaries to facilitate price discovery.

**Trading Protocols.** *Trading protocols* are the rules of trading and transactional exchange that reflect ongoing business practices, government regulations, and membership fees. In some markets, trading protocols are key drivers of market performance. For example, due to the perishable nature of electric power, trading rules should reduce the risk that sellers are unable to sell electricity due to low demand or that buyers suffer from power outages due to lack of supply. The recent failure of government-led market designs for electric power underscores the need for trading protocols that reduce transaction risks for buyers and suppliers (Granados, et al., 2005a).
**Market Transparency.** *Market transparency* is the availability and accessibility of information about the trading process and the product being traded. It has three elements: price, product, 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 variant of market transparency provides opportunities for a seller to establish different strategies to approach the marketplace in the presence of advanced ITs (Granados, et al., 2005b).

Market transparency is related to *bias*. Consistent with the EMH, we define the level of bias of a market mechanism as the extent to which product and price information from all sellers is presented equitably. A biased market mechanism offers information about a seller while concealing or distorting relevant information about other sellers. Other things being equal, the lower the level of bias of a market mechanism, the higher is the level of market transparency.

**Market Design and Market Performance.** A key measure of market performance among financial market design theorists is liquidity. *Liquidity* is the extent to which a buyer is able to find a seller to complete a trading transaction in a reasonable amount of time at a reasonable transaction cost. The larger the number of market participants, the higher will be the probability that matching of buyers and sellers will occur, resulting in higher liquidity (Spulber, 1999).

In the sale of airline tickets, liquidity is driven by two forces: the airlines’ ability to sell an inventory of empty seats at a profit, and travelers’ ability to find products to maximize utility, based on the right combination of schedule, service, and price. Market design can influence both. A transparent OTA may attract airlines with the belief that their prices are displayed correctly and with equal priority as those of other airlines. It also will attract consumers if it
brings the best prices and products in the selection process, regardless of the service provider.

IT-enabled market design can play a major role in industrial organization. Due to existing asymmetries, some market participants may consistently appropriate value due to an informational advantage that they hold. If advanced ITs transform these asymmetries, 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 and new trading protocols were introduced. This transformation improved the level of market transparency and price discovery for the average trader, but reduced margins for equity market-makers and intermediaries. Consequently, there were large-scale transfers of wealth from the financial sector to the public.

More generally, market transparency can shift the distribution of wealth in two ways. First, by reducing search costs, it can have a direct positive effect on consumer surplus. For example, in the past air travelers received one or two travel offers from preferred travel agents. Now there are more travel options and prices at their fingertips via the Internet. Second, there are indirect effects. A market mechanism that reveals more product information to the consumer will result in a higher level of consumer surplus. Consider a perspective that is consistent with Akerlof (1970): a diminution in information asymmetry between buyers and sellers will help to “shore up” the fundamentals for a sound market. On the other hand, mechanisms that display more pricing information will allow consumers to transact at lower prices (Stigler, 1961). For example, given the price dispersion in air travel (Clemons, et al., 2002), the increased price transparency offered by OTAs may drive prices down, as consumers discover the lowest fares.

**IT and Market Design.** There are trade-offs to be made because a design choice may benefit
a seller in one dimension but hurt it in another one. For example, a dynamic pricing mechanism such as an electronic auction may attract buyers through effective price discovery, but it may hurt sellers’ revenues as buyers enjoy higher levels of price transparency. When firms make market design choices, they consider these trade-offs for the existing technological environment. With new ITs, these trade-offs are transformed, which may lead the firm to seek new and innovative market designs. In particular, the EMH implies that IT increases the benefits of unbiased market mechanisms relative to biased ones, transforming the trade-off relationship.

However, real world observations and theories by several IS researchers suggest that the presence of IT does not necessarily lead to unbiased electronic markets. Hess and Kemerer (1994) analyze the mortgage industry and call for theoretical augmentation of the EMH because it does not clearly explain why hierarchies and biased markets remain. Alternative theories have emerged to explain why biased electronic markets may prevail. We refer to these hereafter as biased market theories. Clemons et al. (1993) introduce the move-to-the-middle hypothesis: buyers are willing to transact in biased markets to reduce transaction risks. Other risks that make buyers reluctant to transact in a market setting are demand-side and supply-side economic shocks (Kauffman and Mohtadi, 2004). Bakos and Brynjolffson (1993) offer an explanation based on the theory of incomplete contracts. So a buyer may limit the number of suppliers to increase their incentives to make non-contractible investments such as quality, responsiveness, and innovation.

Due to these different observations, there is a need for a unifying theory. We next augment the EMH to better explain all these different outcomes and theoretical perspectives.

**The Theory of Unbiased Electronic Markets**

Buyers generally prefer an unbiased market mechanism because it offers products from all suppliers rather than just one or a few. In addition, unbiased market mechanisms offer buyers
more market information (e.g., market prices), with positive direct and indirect effects on their surplus. In contrast, sellers generally prefer to bias markets (Malone, et al., 1987; Grover and Ramanial, 1999), because they benefit from information advantages and a buyer lock-in effect. Moreover, despite buyers’ general preference for unbiased market mechanisms, biased market theories suggest that sellers can afford to compete with biased market mechanisms if buyers face trading risks due to product complexity, economic shocks, or incomplete contracts.

A move to unbiased electronic markets involves two forces. One set reduces the trading risks buyers face to make biased mechanisms less attractive to them. IT falls in this first category. By reducing product complexity and asset specificity, IT reduces the risks that buyers face, making biased mechanisms less competitive. However, although IT reduces the viability of biased markets, it alone does not induce sellers to implement unbiased market mechanisms. Therefore, a second set of forces is necessary to make markets more competitive, which will lead sellers to compete with unbiased market mechanisms to attract buyers. This effect of the interaction between IT and competitive forces will be stronger in markets for digital goods and other products that can be well represented electronically. Together, these forces eventually lead most sellers to forego information advantages in order to attract buyers, rather than incur losses from price competition. This leads to our unbiased electronic markets proposition:

□ Proposition 1 (The Unbiased Electronic Markets Proposition): The incentives for sellers to implement unbiased electronic market mechanisms increase in the presence of advanced ITs and forces that promote inter-firm competition. Together, these forces will lead to the dominance of unbiased electronic markets.

We next explain how IT and competitive forces interact in favor of unbiased electronic markets. We ground our rationale on market design theory and an air travel industry analysis.

THE MOVE TO ELECTRONIC MARKETS IN AIR TRAVEL DISTRIBUTION

In this section we provide a historical account of technological developments in the United
States air travel industry. First, we review the industry prior to the Internet, with a focus on B2B market transparency, and the relative availability of information across airlines and travel agencies. Second, we examine the history of OTAs, 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 B2B 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 led to fare wars. The second approach was the development of CRSs to automate the distribution of airline tickets. CRSs were installed by airlines at travel agency locations, accompanied by long-term contractual sales agreements (Duliba, et al., 2001). The third strategy was to skew market information in favor of the airline owner of a given CRS, which led to biased e-markets.

**Biased B2B Electronic Markets.** Airlines used CRS technology to lock in travel agencies and create a “halo effect” for market share in their favor (Copeland and McKenney, 1988). This was done through *screen biases*, the act of positioning information on-screen to influence purchase behavior in favor of the airline owner of the CRS. CRS owners also developed fee-based agreements with other airlines to provide preferential treatment of their schedules in the screen displays (Global Aviation Associates, 2001). Finally, to benefit from economies of scale, CRSs expanded their reach. These extended systems, called *global distribution systems (GDSs)*, provided sustainable competitive advantage to their owners (Duliba, et al., 2001).

**From Biased to Unbiased B2B Electronic Markets.** CRSs became a critical asset for
airlines and travel agencies to survive in the deregulated environment. By 1983, 80% of tickets were sold by travel agencies through CRS terminals (Global Aviation Associates, 2001). 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, concluding 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. 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**

We earlier pointed out that since the first Internet travel website was launched 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 (O’Toole, 2003). To provide an idea of how significant this percentage is, United States e-commerce in 2003 accounted for less than 2% of total retail sales (U.S. Census Bureau, 2004). We next describe the environment that led to the consolidation of OTAs, focusing on the innovative market designs that OTAs implemented in the battle for consumers.

**A Parallel Move to Electronic B2C Markets.** In 1995, the Internet Travel Network was launched as the very first online travel 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, multiple market
players emerged to create competition. The fast early growth in the online travel agency (OTA) industry was facilitated by CRSs, which served as readily available search engines for new entrants based on per-transaction fees. In particular, some non-travel firms took advantage of CRS technology to quickly establish themselves as *e-commerce-only intermediaries* (Chircu and Kauffman, 2000). For example, in 1996 Microsoft introduced Expedia (www.expedia.com).

Travelocity and Expedia soon became market leaders, while other key players emerged with innovative selling mechanisms. 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 B2C Electronic Markets.** 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 new virtual check-in capabilities and frequent-flier pricing offers, brought the share of airline portal sales in the OTA market to 60% in 2001 (Zellner, 2001).

From Biased to Unbiased B2C Electronic Markets. 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.itasoft.com), a pricing and airfare shopping technology developer launched by researchers from the Artificial Intelligence Laboratory at MIT. This software 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). Therefore, by using ITA 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](image)

**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 distribute airline tickets directly, without reliance on GDS and CRS distribution. (See arrows in bold). 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.)

**Figure 2. Orbitz and its Matrix Display Selling Mechanism**

![Image of Orbitz's matrix display](image)

<table>
<thead>
<tr>
<th>Airline</th>
<th>0-stop</th>
<th>1-stop</th>
<th>2-stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continental</td>
<td>$326</td>
<td>$394</td>
<td>$498</td>
</tr>
<tr>
<td>American</td>
<td>$409</td>
<td>$412</td>
<td>$462</td>
</tr>
<tr>
<td>Delta</td>
<td>$734</td>
<td>$737</td>
<td>$753</td>
</tr>
<tr>
<td>NW Airlines</td>
<td>$753</td>
<td>$753</td>
<td></td>
</tr>
<tr>
<td>US Airways</td>
<td>$753</td>
<td>$753</td>
<td>$753</td>
</tr>
<tr>
<td>Midwest Airlines</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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](http://www.orbitz.com), accessed in September 2004.

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. 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. Departments of Transportation and Justice concluded that Orbitz does not harm consumers nor reduce competition (Mead, 2002; U. S. Department of Justice, 2003).

Although the value of Travelocity and Expedia was eroded due to the prospects of Orbitz’s future success, they continued as the top OTAs, with market shares above 30% in 2002, without the airline portals. Travelocity continued to be a model of customer service, introducing 24-hour customer phone support. Expedia continued to grow its niche in the sale of travel packages as well. By 2002, Orbitz was a close follower, with a share of about 25% (Mead, 2002), an indication of the inroads it made just one year after its launch. In addition, Orbitz consolidated its position as a direct competitor of the CRSs and GDSs, becoming the first travel agency to offer technology that bypasses the traditional CRS distribution structure (Regan, 2002b).

**Market Transparency and the OTAs**

OTAs can be classified in four major categories. (See Table 2.)

**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>Unbiased, numerous alternatives per request</td>
<td></td>
</tr>
<tr>
<td>Inter-airline (e.g. Travelocity)</td>
<td>High</td>
<td>High</td>
<td>Alternatives limited by GDS technology</td>
<td></td>
</tr>
<tr>
<td>Airline portals (e.g. <a href="http://www.delta.com">www.delta.com</a>)</td>
<td>High</td>
<td>Medium</td>
<td>Alternatives limited to airline specific offers</td>
<td></td>
</tr>
<tr>
<td>Opaque websites (e.g. Hotwire)</td>
<td>Low</td>
<td>Low</td>
<td>Price and/or product information concealed until after purchase</td>
<td></td>
</tr>
</tbody>
</table>

Orbitz is in its own category, with the highest levels of product and price transparency. Inter-airline portals, such as Travelocity or Expedia, are second. They offered multiple travel options, but they were limited in the number of options relative to Orbitz due to the technological limitations of CRSs. In addition, these websites engaged in preferred arrangements with airlines, similar to what the CRS firms did in the early stages of the airline B2B marketplaces. In a third
category are the airline portals, which offer travel itineraries only in a specific airline network. Therefore, they are less product-transparent than inter-airline portals. The fourth category is low-transparency Web sites, such as Hotwire and Priceline.com, which conceal product, supplier and price information until the consumer commits to purchase.

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 introducing a lowest fare guarantee of $50 if a traveler finds a cheaper fare for a given itinerary elsewhere in the Internet.

UNBIASED ELECTRONIC MARKETS: ANALYSIS AND THEORETICAL FRAMEWORK

We now analyze the IT-driven competition for market transparency in the air travel industry. We predict that the outcome of individual firms’ moves will be the dominance of unbiased air travel markets. We offer the economic rationale to support our prediction, which leads to a theoretical framework that can be applied in other industry settings.

Analysis of the Move to Unbiased Electronic Markets for Air Travel

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 them in, resulting in biased B2B electronic markets. Later, competitive pressures and government
regulation of CRSs forced airlines to reduce screen bias and eliminate preferential agreements that could hurt smaller players, resulting in *unbiased B2B electronic markets*.

We see a similar evolution in the B2C sector. Initially, the market leaders, Travelocity and Expedia, had preferred agreements with certain carriers to display their fares. And due to the technological shortcomings of the CRSs, these OTAs were only able to display a limited number of options, resulting in *biased B2C electronic markets*. Since 2001, this 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 also 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.) Figure 3 shows the evolution of the OTAs, focusing on product and price transparency. (See Figure 3)

**Figure 3. The Evolution of Market Transparency in Online Air Travel**

![Figure 3](image_url)

**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 paths that OTAs took.

All of the OTA moves since the launch of Orbitz are towards higher levels of market
transparency. This battle for market transparency has reduced the overall level of bias among OTAs, through the development of 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 ITs 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 dominance of unbiased air travel B2C electronic markets.

A Theoretical Framework of the Move to Unbiased Electronic Markets

Figure 4 shows the interaction of forces that lead e-markets to become unbiased. It includes specific forces that explain the move to unbiased markets in air travel distribution. (See Figure 4.)

Link A—From Hierarchies to Electronic Markets. Reservation systems and IT have reduced product complexity in favor of market-based economic activity in the B2B and B2C air travel markets. In B2B markets, e-commerce technologies have made it easier for travel agencies to obtain accurate and timely trip descriptions and prices. Prior to CRS technology, the airline reservations and ticketing process was a cumbersome mix of paperwork and phone calls.

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.

**Figure 4. Framework: The Move to Unbiased Electronic Markets—Air Travel Industry**

**Note:** The stages in the EMH are shown in the dotted box. The key forces that influence the move to unbiased electronic markets are IT, product characteristics that favor electronic trading, and forces that promote industry competitiveness. The arrows characterize the interactions between these forces. In the case of air travel, CRS systems in B2B air travel markets and the Internet in B2C air travel markets have fueled the move to unbiased electronic markets. The existence of pro-competitive regulations and the inherent characteristics of the air travel product have triggered competition for market transparency among sellers, which will eventually lead to the predominance of unbiased electronic markets.

**Link B—IT Generates Market Transparency Options.** By unleashing the potential for innovative design of electronic markets, advanced ITs create competitive pressures for sellers 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. We observe that OTAs are competing for market transparency positions in the battle for well-informed travelers, taking advantage of Internet technology. This leads to a second proposition:

Proposition 2 (The IT-Driven Market Transparency Proposition). In the presence of advanced ITs, sellers will implement innovative electronic market mechanisms to compete for market transparency.

Proposition 2 recognizes the pressures that arise when IT expands an industry’s set of 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 2 highlights the incentives firms have to implement transparent market mechanisms, but falls short of suggesting that they will prevail. Other forces must be present that inhibit sellers’ incentives to conceal market information.

Links C, D, E and F—Other Forces. Strategies to implement transparent market mechanisms are 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 public policy that prohibits anti-competitive behavior and regulates CRS screen biases. (See Link C in Figure 4.) On the other hand, industry competitiveness may vary depending on the nature of the product. For example, because airline inventory is perishable, airlines tend to compete aggressively in markets with excess capacity and during low travel seasons. Also, 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.)
However, the degree of competition for market transparency may vary across industries based on the product’s informational characteristics (See Link F in Figure 4.). The information-intensive nature of air travel purchases, for example, facilitates electronic or digital representation, making transparent market mechanisms feasible. Also, low product complexity enables competition for market transparency. For example, Orbitz offers numerous travel options to the consumer through a simple, user-friendly matrix that displays information regarding the airline, number of stops, and prices. (See Figure 2.) This leads to:

- **Proposition 3 (The Competitive Forces Proposition).** Together with IT, the presence of a competitive market environment, digital product characteristics, and low product complexity facilitate the move to unbiased electronic markets.

Proposition 3 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 3 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, 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 4 (The Tacit Collusion 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 4, 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, Seller LT and Seller HT. Seller HT has a high level of market transparency relative to Seller LT. 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 Seller LT is less transparent, it should have a lower price than Seller HT to maximize revenue (Granados, et al., 2003). Therefore, Seller 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 this price-market transparency space is higher with lower price levels. Therefore, in this figure, a lower indifference curve implies higher utility, such that $U_2 > U_1$. Seller LT has two options to improve its competitive position relative to Seller HT: lower its price level (Arrow A) or increase the level of market transparency of its selling mechanism (Arrow B).
**Arrow A—Adjusting the Pricing Strategy.** Assume Seller LT’s level of market transparency is fixed due to a technological limitation or a strategic imperative. 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, Seller LT (e.g., Priceline.com) must lower its price levels relative to Seller HT (e.g., Orbitz) to compensate for its lower level of market transparency. In this manner, firms will position and differentiate themselves based on the level of market transparency.

**Arrow B—Adjusting the Level of Market Transparency.** However, in competitive markets it may not be an option for the less transparent Seller LT to maintain lower prices than its competitors. If firms are not allowed to explicitly collude, it is likely that Seller 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 Seller 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 combination of price and market transparency strategies 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 5 (The 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 5 implies that firms 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 have shown how the interaction between advanced ITs and competitive forces lead to a battle for buyers among sellers. These forces tilt the trade-off between biased and unbiased market mechanisms in favor of the latter, leading to the dominance of unbiased e-markets.

IMPLICATIONS FOR PRACTITIONERS AND RESEARCHERS

In this section we derive implications of the theory of unbiased electronic markets. 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 competitive environment, ITs such as CRSs and the Internet will
continue to induce airlines and travel agencies to design transparent selling mechanisms. These strategic moves will drive the industry towards the predominance of unbiased electronic markets.

More generally, from the recognition that IT-enabled 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. Participants who can leverage their market transparency design choices for air travel distribution will play major roles in the technological and strategic development of the industry. On the other hand, those players who do not 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. 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. These forces help explain how air travel e-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 markets to uncover the alternatives, incentives, and decisions that firms make in the presence of advanced ITs. Significant research opportunities arise as firms increasingly adopt IT-enabled strategies in addition to the traditional low cost or differentiation business models. For example, innovative ways of presenting product information creates transparency, which offers the opportunity to explore the impact of systems design on market performance and competition. Mechanism design may also impact price transparency and price discovery, which represents another key direction for research. To explore these IT-enabled strategies for the design of market mechanisms, in-depth case studies can be performed. Finally, in light of our theory of unbiased electronic markets, we propose the development and refinement of analytical models that consider the forces that influence strategic market design choices in the presence of IT.

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)

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