

**HOW HAS ELECTRONIC TRAVEL DISTRIBUTION BEEN TRANSFORMED?
A TEST OF THE THEORY OF NEWLY VULNERABLE MARKETS**

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Abstract. IT advances often create turmoil and disturb existing industry structures. In the travel industry, electronic distribution has existed for decades via the global distribution systems (GDSs), reservation systems that were introduced in the early 1980s on mainframe platforms. Yet with the Internet, new digital intermediaries have threatened the viability of these legacy GDSs. We examine this transformation of e-travel distribution to test the *theory of newly vulnerable markets*. It predicts how markets become vulnerable to fundamental changes triggered by IT. The tenets of newly vulnerable markets theory are supported. The GDS market became *newly easy to enter* due to a decrease in barriers to entry caused by the Internet and other technologies, *attractive to attack* due to their out-of-date and inefficient pricing mechanisms which made *opportunistic pickoff* possible across *customer profitability gradients*, and *difficult to defend* due to their lack of vision and strategic inflexibility. We use our findings to expand the application of this theory to newly vulnerable e-markets, in general.

Keywords: Electronic markets, meta-search agents, newly vulnerable markets, online travel agents, travel distribution.

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1. INTRODUCTION

For a long time, the travel industry has enjoyed stability due to the high barriers-to-entry imposed by the scale and expertise required to distribute travel products electronically, and the necessity of being able to post all prices and itineraries for air travel. Upon the emergence of mainframe computers in the late 1970s, e-travel distribution was introduced by airlines through computer reservation systems (CRSs). Based on millions of lines of code, CRSs annually construct air travel offers by combining prices and flight schedules for 30 million flights worldwide. The airlines used these systems to lock in travel agencies through long-term contractual agreements, upon the installation of terminals in travel agency offices [24]. CRS firms have enjoyed a stable position in travel distribution due to the high capital investment required for new entrants, and the high switching costs to test new forms of distribution. They included other travel products such as hotels and cars, which resulted in *global distribution systems* (GDSs).

After decades of high margins, the GDSs are facing unexpected threats in the new millennium, triggered by innovative and visionary competitors, advanced technologies, and more powerful computers. We will examine developments that have led to new competitive dynamics and increasing risk of disintermediation of GDSs. We will show how new ventures have emerged for travel distribution. They exploit the vulnerabilities of capital-intensive, inflexible infrastructures, and the lack of vision for future competition of the GDSs. New booking and search engines have nimble distributed architectures, and new *meta-search agents* (or *vertical search engines*) are capitalizing on these technologies to offer full transparency of travel products and prices.¹ (See Appendix 1.) In just a few years, the meta-search agents have reached more than 10% of travelers who search for tickets online, with a business model that can disintermediate existing reservation systems. Airlines and travel agencies have started using these technologies for their own booking and search tools. In the most audacious move of a new competitor to date, Air Canada (www.aircanada.com) announced in 2006 that it would develop a new reservation system in a partnership with ITA Software (www.itasoftware.com), one of the companies that has pioneered the new technological era of e-travel distribution [1]. Other companies that have undertaken similar efforts include Alaska Airlines, American Airlines, and Continental Airlines [9].

These developments in e-travel distribution offer an opportunity to test the *theory of newly vulnerable markets* (NVM) [14], which was developed to explain the vulnerability of firms due to fundamental changes including information technology (IT) advances, new regulations, shifts in consumer behavior, and the lack of vision of existing competitors. In many industries, e-distribution only emerged with the Internet in the 1990s. In many markets the online channel is still in its infancy. Thus, these e-markets

¹ *Meta-search* means a search of multiple search engines' results. The term *vertical* refers to industry structure, and implies that the meta-search engines will pick up results from players representing the full spectrum of the industry (e.g., airlines, online travel agencies, GDSs, non-airline intermediaries), but not the *horizontal* breadth of multiple industries.

have yet to develop to maturity, let alone be threatened by new e-commerce technologies. E-travel distribution is a real-world instance where an established e-market became vulnerable to new generations of e-platforms and intermediaries.

A theory-based analysis of the travel distribution sector will show how established e-markets are impacted by IT, and let us obtain a reading on the validity of newly vulnerable markets theory. Other works have used single or multiple case study analysis to evaluate different theories. These include Hess and Kemerer [36] and Granados et al. [30] on various aspects of the theory of electronic markets and hierarchies [39] and the move-to-the-middle theory [18], Han et al.'s [33] assessment of incomplete contract theory and interorganizational systems ownership in financial risk management, and Wigand et al.'s [51] study on industry technology standards in the mortgage market. In this way, we provide some of the first evidence in the information systems (IS) discipline to test the newly vulnerable markets theory.

2. IT ADVANCES AND THE TENETS OF NEWLY VULNERABLE MARKETS THEORY

IT advances have led to changes in travel distribution, bringing with them the vulnerability of the GDS sector. We lay out theory to explain how IT has made this market newly vulnerable based on three conditions: newly easy to enter, attractive to attack, and difficult to defend.

2.1. Newly Easy to Enter

Newly easy to enter is a precondition for a newly vulnerable market. Markets can become *newly easy to enter* if technological transformations decrease the barriers to entry or the market power of incumbents [12]. The Internet made many markets newly easy to enter in the 1990s. It offered a low-cost distribution channel for new entrants who could make a lot of profit, as incumbent firms chose not to explore the new channels initially. Examples include eBay and Sotheby's in auctions, Amazon.com and Barnes & Noble Bookstores in bookselling, and CDNow and Sam Goody in the music and entertainment arena. The distribution channels for electronic travel services became newly easy to enter, as the incumbents in the marketplace – the GDSs – failed to devote enough strategic attention, financial resources and efforts with technological innovation to move the capabilities of their sector into the future.

The concept of a market becoming *newly easy to enter* builds on the theory of contestable markets [5], although the two are quite different. The *theory of contestable markets* suggests that in markets with monopolistic and oligopolistic structures where there is a continuous threat of new entry, incumbents will set prices as they would otherwise under perfect competition. New entrants can readily gain access to the market where the incumbents have been competing, but doing so profitably is not so easy. Most will fail. The *theory of newly vulnerable markets*, in contrast, focuses on changes in the market that make successful new entry feasible. The theory permits an understanding of the strategic implications for incumbents and new entrants [12].

2.2. Attractive to Attack

Markets are *attractive to attack* when there is a *customer, product, or customer service profitability gradient* such that incumbents subsidize unprofitable sectors of the business with profitable ones [14]. This can happen when entrants can target profitable customers, product lines, or similar activities at a lower cost due to the lack of necessity for cross-subsidizing less profitable aspects of the business. This is *cream-skimming* or *opportunistic pickoff* [12], a focus on the high-end of the customer profitability gradient. With it, a new entrant can rack up profits quickly. An example is the information-based strategy of Capital One Financial (www.capitalone.com), which in just a few years became the fifth largest credit card issuer in the U.S. and was second in growth [22]. Capital One took advantage of the customer profitability gradient of credit card customers to target the most profitable ones, especially customers with revolving credit and monthly payments. It did not want to acquire less profitable *max-payers* or *transactors* as customers, or the *revolvers* who pay off their loan balances each month. By exploiting the customer profitability gradient, Capital One succeeded even with its lower scale-size and inferior efficiency. Capital One changed the basis for competing through *opportunistic pickoff* and offering lower interest rates. It also was not subject to the cross-subsidies that established credit card market players (e.g., Citibank, Wachovia and Chase) incurred with a uniform interest rate that subsidized unprofitable credit card holders so they could earn more from profitable ones. Where the threat of entry is low, incumbent firms can run suboptimal operations and still achieve supernormal profits.

Clemons et al. [14] examined the vulnerabilities of established music and news industry players with cross-subsidies between the production and selling activities. They concluded that the economic imbalances from these cross-subsidies were driven by the market power of music producers and newspapers in these respective industries, but this market power has been challenged by technological innovation. We see similar forces at work in electronic travel distribution.

2.3. Difficult to Defend

Markets that have become newly easy to enter may be *difficult to defend* when the incumbents have impediments to their ability to responding effectively to the threats of new market entrants. These can be caused by new regulatory policies. The incumbents' existing pricing structures, strategic inflexibility, lack of vision and legacy systems may play a role too [10, 12, 14]. A locked-in customer based – possibly even the “wrong” customer base – may become troublesome to the incumbents. Strategic inflexibility and the presence of outdated IT infrastructures, coupled with a lack of business vision, can lead to naïve moves by incumbents [12]. Markets rarely become difficult to defend just because of low IT costs. The modest, but necessary IT investments of new entrants can be also be made by the incumbent firms: if they choose to do so. The interesting thing is that they don't always do this – whether because of their concerns about losing the value of the sunk costs they already have in their existing systems, or due to a lack

of managerial vision or unavailable resources to create the necessary business innovations.

3. COMPETING IN NEWLY VULNERABLE ELECTRONIC MARKETS

What are the possible competitive strategies in electronic markets that become newly vulnerable? The perspectives associated with technology-driven discontinuities, the role of strategic resources of the firm, and platform envelopment are useful to understand competition in the context of electronic markets.

3.1. Strategic Impacts of IT

IT advances can make markets vulnerable by creating disruptions or *discontinuities*, so the value of strategic resources and options for firms are suddenly transformed [19]. With an IT-driven discontinuity, IT innovations may be valuable resources to hustle after and leverage for competitive advantage [20]. E-markets rely on IT, so a technological breakthrough can be a source of a discontinuity and new vulnerability of market incumbents who are unable to harness its power or a new strategic resource. For example, the emergence of the Internet disrupted established physical markets for corporate supplies. The Internet allowed brick-and-mortar firms and new entrants, especially Internet-based intermediaries, to develop strategies for markets that had become newly easy to enter.

IT advances are typically accessible to incumbents to defend their position, if they demonstrate vision beyond their current business activities. In e-markets, when existing intermediaries have similar access to IT advances as new entrants, they should be able to defend their position. IT alone cannot account for the emergence of newly vulnerable electronic markets, because typically the incumbent will be able to defend itself from new entrants by capitalizing on the same innovation that created the discontinuity. Incumbents typically have “deep pockets,” business know-how, and extensive existing relationships with their customers and business partners, predisposing them to make the necessary changes.

3.2. Platform Envelopment Strategies

E-markets are *mediating platforms* for buyers and sellers to transact or exchange information and they typically exhibit *network effects* [4]. The value for a user of transacting increases as the number of participating sellers and buyers increases. There is a higher probability that the user will find the right party on the other side with which to transact. This network effect raises barriers to entry because incumbent intermediaries enjoy a critical mass of users that have no incentive to defect. So even though IT advances reduce barriers to entry by reducing the costs of e-intermediation, the market power and sustainability incumbents enjoy may remain. The same IT innovations that cause discontinuities in e-markets can be used by incumbents to respond to the threats.

The main path to success for new entrants is to implement a *pickoff strategy* – as we saw with Capital One and its focus on acquiring traditional credit card companies’ high-value customers, and then developing its business around them without cross-subsidizing the max-payers and other unprofitable customers.

In the longer term, new entrants can execute *platform envelopment strategies* that go beyond the boundaries of the initial pickoff strategy [26, 27]. We have seen this many times, though rarely in the early days of a new entrant's effort to develop its business niche. For example, Capital One, which focused on its core business for a decade after it was cut out of Signet Bank's credit card operations, only broadened its business platform beyond its core credit card offerings when it had achieved market leadership, strong profitability, and saw opportunities to plow earnings back into its business [22]. Rosenbluth Travel, which entered the business travel services marketplace earlier than other travel agencies and spent little on IT infrastructure, also did not go beyond its low-price pickoff approach to move into other segments of the market for business travel until it was successful [19].

Thus, most companies that attack a newly vulnerable market do not do so initially with a platform envelopment strategy. We have seen this in more mature and digitally-converging marketplaces too. For example, networked markets often have firms with platforms that are *functionally-unrelated* or *functionally-related*. An example of an attack by a functionally-unrelated platform in the marketplace was by Apple Computer, which bundled its iPod with a smart phone to produce the iPhone, effectively penetrating the unrelated phone market in 2007 [44]. We stress that Apple was only able to do this after it had achieved enormous profits and gained business know-how for other segments of consumer electronic products and PCs. Functionally-related attacks involve *weak substitutes* or *complements* for different kinds of technologies and business processes [37]. An example occurred between LinkedIn (www.linkedin.com) and Monster.com (www.monster.com). LinkedIn is a professional social network that added professional job listings to its capabilities in 2005, while Monster.com is a job listing service that added social networking [38]. Another example occurred between Google and eBay in 2006. Google bundled its paid search platform with a payment system called Google Checkout (checkout.google.com). This let Google compete in the payment systems marketplace with players like eBay's PayPal [34].

Platform envelopment strategies can help explain why, despite the incumbents' access to IT and network effects from an established customer base, they may be subject to highly successful follow-on attacks from new entrants. Once a new entrant has moved on an attractive customer profitability gradient, it may be able to build a "war chest" of cash from operations, and use it for longer-term investments that broaden its initial platform. In the long run, it may be difficult for incumbents to defend their positions, if they are slow to replicate the vital business vision that led to the transformation of their markets in the first place. For example, cell phone companies will have a difficult time competing with the iPhone because they do not possess the brand and know-how Apple has accumulated over the years of development it has devoted to the iPod. Similarly, Microsoft recently made an attempt to purchase Yahoo! to set up the technical infrastructure and acquire the know-how to support the profitable exploitation of the auction market for advertising keywords and the traditional market for banner and sidebar advertising. Its failure

to consummate that acquisition has left it far behind Google and Yahoo! – in spite of the billions of dollars it retains in its corporate coffers.

4. ELECTRONIC MARKETS IN TRAVEL DISTRIBUTION

We next examine the supply chain of electronic travel distribution, which initially was developed in the 1970s. This context permits us to illustrate how established electronic intermediaries can be threatened by new entrants who deploy market-transforming technologies.

4.1. GDS-Based Travel Distribution

Using mainframe technologies, the major airlines participated in the development of CRSs in the 1970s. They were used as co-specialized assets to lock in business from travel agents [25]. Airlines placed terminals at travel agencies to support their operations, in return for preferred contractual arrangements based on sales quotas and volume discounts. The CRSs were airline-specific platforms. They had to be installed separately in travel agencies to enable comprehensive offerings. Eventually, the CRSs employed two platform envelopment strategies to establish a strong foothold in global distribution. Each CRS included flight information from competing airlines [6]. Later, complementary services were added, such as hotels and car rentals. These systems came to be known as *global distribution systems* (GDSs), and four major players emerged: Sabre (www.sabre.com), Worldspan (www.worldspan.com), Galileo (www.galileo.com), and Amadeus (www.amadeus.com).²

The strategy of the GDSs was successful. In the 1980s, they reached 80% of air travel sales [29]. They exploited some barriers to entry:

- *know-how* necessary to build travel itineraries for air travel;
- capacity to provide *all-or-nothing comprehensive coverage* of flights and itineraries;
- *capital investments* in IT to deploy reservation systems for airlines, hotels and rental cars; and,
- a *global customer base* of travel agencies and airlines.

Due to its barriers to entry, the GDS sector was an oligopolistic market. Up until 2000, they had ROI in excess of 30%, the highest among the players in the air travel industry, including the aircraft manufacturers, aircraft leasing companies, ground logistics services providers, the metropolitan airports and even the caterers [48]. Airline ROI was negative though. The dominance of the GDSs was felt by the major airlines and leading hotel chains, which would find it difficult to reintermediate e-distribution. Once the barriers to entry decreased to make the market newly easy to enter, new players emerged to attack.

² Regulations to curb alleged anti-competitive behavior took away much of the advantage that the GDSs provided to the airlines, so they were for the most part spun-off or sold. Today, Galileo, Worldspan, and Orbitz Worldwide are held by Travelport (www.travelport.com). Orbitz's brands include Orbitz (www.orbitz.com), CheapTickets (www.cheaptickets.com) and RatesToGo (www.ratestogo.com).

4.2. E-Travel Distribution: Newly Easy to Enter

Next, we analyze the technological developments that led to new forms of travel distribution and the increased vulnerability of GDSs in the U.S. market. (See Figure 1.) These developments are a product of the discontinuity in the value of strategic resources for travel distribution caused by technological innovations in the online channel.

INSERT FIGURE 1 ABOUT HERE

Supplier Portals: Shorter Value Chain. With the Internet came new and cheaper ways to distribute travel products. Suppliers developed online portals to offer their inventories of airline seats, hotel rooms, and rental cars. These portals became the disintermediators of travel agencies and GDSs, since they are mechanisms suppliers use to transact directly with consumers. They act as an electronic extension of the suppliers' reservation offices, which are available for consumers who prefer to purchase their products directly.

The bypass of travel agencies is an instance of an IT-driven newly vulnerable market [15]. The sector became newly easy to enter with the emergence of online travel distribution technologies. It was also attractive to attack due to the customer profitability gradient of profitable leisure travelers that subsidized the cost of serving more demanding business travelers. Finally, it was difficult to defend due to the inability of travel agencies to price-discriminate with the capped commissions imposed by the airlines, and because dropping the fees to compete against the supplier portals would eliminate any remaining profits from leisure travelers. This entire segment — easy-to-serve retail — may be permanently lost to the traditional agency channel, leaving agencies solely serving the more complex, service-intensive portion of this market.

Disintermediation of the travel agencies also diminished the intermediary role of GDSs in the value chain. Bypassing travel agencies created pressure on GDS profits because airlines avoided GDS intermediation with only the threat of retaliation [21]. The bypass of travel agencies by suppliers started eroding the GDSs' customer base. For example, in 2005 the GDS-based air travel bookings share was 54% [48], but that was down about thirty market share points relative to the 1980s.

Online Travel Agencies: Cybermediation. The early online travel agencies (OTAs) such as Travelocity and Expedia emerged in the mid-1990s to turn the functionality and information provided by GDSs into user-friendly interfaces for travelers [16]. OTAs enabled consumers to access the offerings provided by the GDSs electronically at a low cost. They represented another disintermediation risk for offline travel agents, which had performed the information brokerage role between GDSs and consumers. By providing higher market transparency of travel products to consumers, the OTAs and supplier portals were able to capture a substantial share of travel distribution [30]. Fast forwarding to a decade later, in 2007 online travel bookings surpassed offline bookings, while in other U.S. retail industries, online sales

as a share of total sales was still in the single digits [41].

In contrast to the negative impact of supplier portals on GDS-based bookings, the first OTAs (i.e., Travelocity, Expedia) favored the entry of GDSs into the online channel. They were operating a browser-based view of GDS travel search results and an electronic interface for GDS-based booking and ticketing. Different OTAs used different GDSs, which may explain the price dispersion across OTAs that was observed [16]. The infrastructure investment and the development to power OTAs with a GDS-based platform was large, so the OTAs were locked into specific GDS suppliers. In one instance, this development was an intentional platform envelopment strategy by an incumbent. In the mid-1990s, Sabre Interactive, a division of AMR Corp. which owned the Sabre GDS, launched Travelocity as the first OTA powered by Sabre to hustle into the online channel. Travelocity obtained an early lead in the market and remained the leader until 2001 [8].

The new entrants have capitalized on reductions in barriers to entry for e-travel distribution. Microsoft launched Expedia in 1996 under the Worldspan GDS, using its Internet know-how. After June 2001, Expedia grabbed first place in the OTA sector, and has maintained its position [23]. More generally, as the OTA sector matured, it was subject to platform envelopment attacks by new entrants, including technology firms with functionally-unrelated platforms.

4.3. GDS-Based Distribution: Attractive to Attack

In the 1990s, GDSs profit margins were around 13%, compared to 5% for U.S. airlines and travel agencies [29]. The GDSs have been historically subsidized by suppliers and other intermediaries, which makes them attractive to bypass. It is attractive to attack because there is a recognizable *customer profitability gradient* in e-travel distribution. Airline suppliers began to bypass the legacy GDSs at the end of the 1990s. Until then, there were few alternatives other than to not list their flights. Southwest Airlines, now the largest carrier in the U.S., took another tack with its strategy to not syndicate its fares any search engine. It used its first-generation web site, www.iflyswa.com, and later www.southwest.com, to generate about 50% of its bookings until 2006 and then 70% in 2007 and later [41].

Customer Profitability Gradient. *Itinerary pricing* and *search* are more profitable intermediation activities because they require only basic computing power. Support for the *purchase process* requires a transaction-booking mechanism with access to airline inventory, a ticketing transaction mechanism with payment validation, accounting reconciliation, and infrastructure for post-purchase services. Here, the customer profitability gradient could have been leveraged via the intermediary role that GDSs played compared to sales via airline ticket offices or supplier portals. Some airlines have indicated an interest in presenting unbundled airline ticket pricing (e.g., takeoff at a particular time of day, a limited number of stopovers, a seat with or without a lunchbox, incremental pricing for baggage handling, etc.). Some business activities are more profitable than others for the airlines, yet the GDSs have simple fixed-fee pricing

structures for the kinds of information support they provide for airline ticket booking transactions. So they end up cross-subsidizing different activities with different profitability levels, and have risked losing their most sophisticated customers with the highest willingness-to-pay for unique services that require business process and technological innovations.

Some other facts further illustrate this idea of cross-subsidies that affect the GDSs. When air travel is purchased by consumers through travel agents, airlines must pay booking fees to the GDSs. This fee was about US\$13 per round-trip ticket in 2005. Also, the airlines also had to pay commissions to travel agencies [40]. Airlines pay similar fees for sales via GDS-based OTAs. But the margins of the airlines in the U.S. have seen the fees eat up their profits. One interpretation is that the airlines are cross-subsidizing sales via GDSs with sales from other direct channels such as their own online portals, based on the preferences of consumers to transact in the online channel versus by phone or at a travel agency. The GDSs are doing something similar with the airlines and the OTAs. This will not be sustainable for the GDSs, as the airlines struggle with over-capacity, skyrocketing fuel costs, and increasing demand for higher quality.

Orbitz and ITA Software: A New Channel for E- Distribution. In 2001, some major U.S. airlines reintermediated e-travel distribution by launching Orbitz (www.orbitz.com) [50], an OTA that uses search technology developed by ITA Software (www.itasoftware.com) for its pricing and search engine [3]. ITA Software employs the same database as the Airline Tariff Publishing Co. (www.atpco.net) and the Official Airline Guide (www.oag.org). These are used by the GDSs to combine prices and flight schedules into travel offers. Its platform involves a distributed IT architecture with powerful servers and Linux-based applications to provide a more comprehensive set of travel search results at a lower cost. Using this technology, Orbitz increased transparency levels for consumers by displaying a higher number of search results in user-friendly Web interfaces. This move by Orbitz led to a battle for *market transparency* to the benefit of consumers [31].

Although Orbitz was launched by the airlines to reintermediate the OTA market, ITA Software was created as an alternative for e-travel distribution. It effectively used advanced technologies to *pick off* the pricing and search activity, leading to its successful entry into the e-travel distribution. The GDSs were left with the less profitable purchase process, the primary source of their business earnings, but they also have had to perform these processes at a higher cost due to their outdated IT infrastructures. In 2005 ITA Software's chief executive officer, Jeremy Werthheimer stated that ITA "will charge airlines 40 cents per segment booked through its new alternative GDS ... [t]hat's about 10% of what the traditional GDSs charge" [2]. ITA Software became one of the first major competitors of the GDS sector, supporting Orbitz, other OTAs, some supplier portals such as Continental and Air Canada, and even conventional travel agencies. Most recently, ITA Software has embarked on a joint project with Air Canada to develop their full-fledged CRS [1, 47].

Customer Profitability Gradient. In e-travel distribution there is another *customer profitability gradient* beyond the leisure-business customer gradient. It is between major network carriers and low-cost carriers. Intermediating the bookings of network carriers is more complex and expensive than the low-cost carriers, which mainly work with point-to-point itineraries and operate smaller route networks. Yet low-cost carriers were subject to high GDS fees due to the lack of other distribution alternatives.

Farelogix and Navitaire: New Alternatives for Low-Cost Carriers. New entrants, Farelogix (www.farelogix.com) and Navitaire (www.navitaire.com), entered the distribution market by picking off e-distribution services for the low-cost carriers like Spirit Airlines, AirTran, and JetBlue. The carriers' infrastructures are founded on flexible and advanced Internet platforms, and provided ideal opportunities for opportunistic pickoff of targeted customers, who are not able to benefit from the GDSs' pricing and services [17]. In 2006, ITA Software and Farelogix announced a partnership for ITA Software's content to be distributed via Farelogix, in direct competition with the GDS content [43].

4.4. The GDS Market: Difficult to Defend

The high capital investment required to develop a GDS, which originally raised barriers to entry to new entrants and provided a sustainable advantage, no longer works for these firms in the presence of new e-commerce technologies. The GDSs are faced with making investments to update their technologies, despite revenue decreases due to new competition. They still enjoy profits and could potentially compete by modernizing their IT infrastructure. So why haven't the GDSs made a bold move to completely revamp their IT platforms to effectively compete? A GDS executive in our 2007 field study reflected on the inability of GDSs to deter entry with IT innovation:

"The primary emphasis has been [the] converged capability to accelerate overall cost reduction across the business units. While innovation has always been conveyed, it generally takes significantly less priority. If it aligns [with] a desired business need ... or if it dramatically reduces cost, or even improves stability or performance, it may see the light of day."

This quote symbolizes the strategic inflexibility that the GDSs face: the supremacy of *cost reduction* over *business transformation*. This is in line with what Clemons et al. [12] label the *death spiral* of incumbents in newly vulnerable markets. The problem is that due to the great emphasis on legacy practices to make the most out of the existing GDSs, their strategic emphasis has been to *milk the cow* [48], rather than to *find new pastures to grow the herd*. This is more a problem of managerial vision than it is a problem of constraints on making the requisite technology investments. For example, Citibank or Chase could have matched Capital One's approach to the new credit card systems it used. Managers have struggled to get fundamental restructuring efforts or the revamping of their IT infrastructures onto the "main" strategy and technology agendas of their firms. In turn, the use of outdated IT platforms to provide services made the GDS market ripe for opportunistic pickoff by new entrants, who targeted the most profitable customers and activities in travel distribution with modern technologies, better service, and a lower cost of opera-

tion – and most important, with no need to cross-subsidize other less attractive and less profitable business activities [17].

New pricing and search technologies, exemplified by what ITA Software now has to offer, have enabled innovative customer-centric mechanisms for suppliers to offer lower-cost distribution compared to GDS-based distribution. This has exposed the full spectrum of customer profitability gradients in travel distribution. However, it is crucial (continuing our analogy) to point out that the *cows have horns*. The GDSs still have a massive lead in the installed customer base of travel agencies, their worldwide presence and the knowledge they can bring to exploit new opportunities. Remember, the air travel industry saw the development of Expedia by American Express Travel and Microsoft, and E-Travel and GetThere.com by industry entrepreneurs. They have multi-year contracts with the airlines for distribution. This locks in the airlines to GDS-based distribution. But the latest round of contract renewals with the airlines, which happened in 2006, led to lower fees. As a result, they have little incentive to compete on price with low-cost distribution alternatives like Farelogix. This will create further pressure to reduce fees for the major carriers. For these reasons, the GDSs appear to be riding out the storm by digging their existing strategies and IT infrastructures in deeper. The GDSs are caught in a vicious cycle created by their interest to milk outdated technology platforms, postponing the necessary reformulation of their business strategies.

5. APPLICATION OF NEWLY VULNERABLE ELECTRONIC MARKETS THEORY

The e-market in which the GDSs operated meets the three conditions of newly vulnerable markets. They became *newly easy to enter* due to a decrease in barriers to entry triggered by the Internet and other e-commerce technologies, and the incumbents' lack of strategic vision for innovative new business practices that would transform the sector's business processes. They become *attractive to attack* due to the existing cross-subsidized customer activity gradients in electronic travel distribution, making it so that opportunistic pickoff was possible. They became *difficult to defend* by the incumbent firms, the GDSs, due to strategic and infrastructural inflexibility, and their reluctance to devote financial and systems resources to building new business processes. The newly vulnerable markets theory is supported by our observations of the transformation of e-travel distribution.

The GDS sector and its e-market platforms are now threatened by the emerging players. The GDSs, meanwhile, are caught in the death spiral predicted by newly vulnerable markets theory [12]. We next extract some of the highlights of our industry case study findings, and we offer some propositions that apply or extend newly vulnerable markets theory to *newly vulnerable electronic markets*.

5.1. E-Markets That Become Newly Easy to Enter

Lower Capital Investments. A few decades ago, the complexity of pricing and search for travel products could only be managed by mainframe computers. With the diffusion of the Internet, advances in

processing power that enabled distributed hardware architectures, and the decreasing cost of computing, the large capital investment necessary to compete with the GDSs was significantly reduced. Firms such as ITA Software use affordable hardware and software to perform the task of pricing millions of flights and prices, optimally selecting among thousands of itineraries to display the best options to the consumer.

The GDSs have benefited from co-specialized IT assets that allow them to perform the complex task of distributing travel products. Technological progress increased the affordability of these assets by potential new entrants. Meanwhile new platforms designed and tailored for distribution via the Internet have entered the market, such as Navitaire and Farelogix. Lower capital investments required to intermediate the travel sector will continue to threaten the position of the GDSs.

Lower Switching Costs. Though the capital investments required to develop e-markets for travel distribution have decreased, they nonetheless are complex and capital-intensive for small businesses and startups. Open-source software and information standards like XML have allowed ITA Software to easily connect their pricing and search engines to OTAs and meta-search engines [49]. The consequence is that, despite the inability of innovators to develop their own pricing and search engines, new vendors can provide this IT infrastructure at a lower price than the GDSs. New entrants thus are able to outsource pricing and search to launch their operations in a fraction of the time and with less effort than it would take to develop proprietary systems. Other players in the online channel are also taking advantage of the benefits of advanced pricing and search capabilities. Both Orbitz and ITA Software license their booking tools to offline travel agencies now. The low cost of deploying these technologies, together with the enhanced functionality and flexibility of the search engines, makes these services attractive to both offline and online travel agencies. This leads us to assert a first proposition on the application of newly vulnerable markets theory to e-markets:

- **Proposition 1 (The Easy to Enter Electronic Markets Proposition).** *Technological progress and a lack of business vision on the part of incumbent firms make electronic markets newly easy to enter, creating an opportunity for new entrants to succeed as high-cost, low-price and innovative, profitable attackers* (adapted from [21]).

5.2. Attacks by New Entrants in Electronic Markets

In e-markets (e.g., those involving the GDSs), IT advances are likely to expose existing customer, product, and activity gradients. IT will spur innovation by new entrants that will increasingly threaten the stability of the established players. Given the technological emphasis of strategies in e-markets environment, the IT-driven dynamics of competition are much more intense than in traditional markets. For the new entrants to succeed, however, they will need to find new ways to capture value in the marketplace, and move quickly before the incumbents shift resources to impede their progress.

Lower Search Costs for Prices. A key element of playing the game in markets that may become newly vulnerable is for the incumbents to stay ahead of the game, through business innovations and tech-

nology investments. Intermediaries such as Orbitz and Kayak, which are powered by ITA Software, are able to offer higher price transparency to the consumer – something that many incumbent firms did not attempt to do early on in e-travel distribution – by displaying a comprehensive set of priced itineraries. GDSs are constrained by the limited ability of the mainframe-based search engines they use to price different itineraries. Some have argued that they simply cannot compete, due to the new architectures of the entrants’ systems, even though they could have afforded to invest in them all along. Our analysis of a sample of search results showed that ITA Software-powered Kayak and Orbitz displayed more itineraries in a shorter time than GDS-based Travelocity, and they did better at offering the lowest market fares.

The different transparency levels across OTAs and meta-search agents provides some clues about the key managerial issues that established players face when new intermediaries compete with advanced technologies. They face the challenge of competing with outdated mainframe-based technologies in the face of new entrants who are seeking to pick off the others’ most attractive customers. Competition from new entrants will make it possible for them to extract new value from the marketplace. Over time though, the most successful new entrants will face diminishing profits in the newly vulnerable market, as the opportunistic pickoff of targeted customers moves from the most attractive ones, to the moderately attractive ones, to the least attractive ones. New entrants will still be able to come into the newly vulnerable market, but their prospects for profitability will diminish. With time, the most successful new entrants will broaden their technology base and infrastructures to build envelopment platforms in support of different products, channels, or market segments to provide the most comprehensive set of air travel prices and itineraries. This leads to us to assert:

- **Proposition 2 (The Limits to Vulnerability Proposition).** *Successful new entrants in a newly vulnerable electronic market will find that the market will become less attractive over time, as the attacker’s strategy results in more efficiency pricing and constrained opportunities to exploit the customer value gradient benefits that made the market attractive to attack in the first place (adapted from [21]).*

Capitalizing on Gradients and Cross-Subsidies. Innovators in e-travel distribution are taking advantage of customer profitability gradients to enter the market with advanced e-distribution technologies. But the competition also has been felt downstream in the value chain. The search capabilities of the established GDSs and GDS-based OTAs consist of basic sorting and filtering options that do not fully address the different information requirements of more sophisticated customers, including business travelers. In contrast, advanced meta-search agents are built on advanced platforms that enable them to offer a product valuation experience to their customers, in addition to the traditional search facilities for the lowest price. Low price is hardly the most relevant piece of information for air travelers, particularly business travelers who look for differentiation in travel products [16]. In this sector, the complexity of prices interacts with other kinds of information (e.g., takeoff times, stopovers, availability of first-class seats, etc.) The chal-

challenge for e-intermediaries is to attract consumers with information about all the product offerings, coupled with the ability to practice *resonance marketing* techniques [11, 13]. These allow consumers to find products that best fit their needs.

When the new meta-search agent entrants became successful, they changed the dynamics of the sector through new business processes and new products. This enabled them to achieve strong and secure positions in the market, in spite of all the changes that were occurring. We suggest:

- **Proposition 3 (The Successful Attackers' Secure Market Position Proposition).** *In newly vulnerable electronic markets, successful attackers are able to obtain resource advantages that make their success sustainable through access to innovation know-how, scale-size effects that lead to line extensions and platform envelopment, and development of large-scale IT infrastructures that cannot be cheaply replicated* (adapted from [19]).

Our propositions offer starting points to make sense of changes that are occurring with intermediation in e-travel distribution. The findings from our study of GDSs may be applied more broadly to other industry settings. Our rationale is that meta-search agents search the online channel to aggregate and display products to consumers. Consumers often prefer the *lowest price* for a product, and the functionality addresses this need. Sometimes, a *fair price* is preferable but still may not be enough: some consumers will be attracted to intermediaries that ease the process of finding the products that offer the best fit [11]. In these markets, successful intermediaries will be best at matching the most desired travel products.

5.3 Newly Vulnerable Electronic Markets: Difficult to Defend

The emerging threat of meta-search agent sites are a testament to the market weaknesses that the incumbents faced when they did not proactively pursue innovation strategies and visions of future markets that were dramatically changed through IT. Their markets became difficult to defend against the entry of other technology and business process innovators.

The drivers of the inflexibility and lack of appropriate and rapid reactions on the part of the GDSs and OTAs that made their markets difficult to defend seem to have come from different sources. For the GDSs, for example, they had lucrative long-term contracts with the major air travel suppliers, and those contracts seemed as they would not be disturbed or extinguished. The traditional basis for profitability, in their view, would continue. This is where the problems arise for incumbents. They may focus on current strategies based on competencies that have been profitable, with a solid customer base, and where there are long-term contracts with special partners. For the OTAs, the difficulty to defend against threats by the meta-search agents was driven by their dependence on technologies that they outsourced. This is reminiscent of American Express Travel's initial two-year partnership with Microsoft that began in 1997. It produced the precursor to Expedia, American Express Interactive (AXI). But Amex was unable to defend its marketplace for online travel booking when Microsoft pulled out in early 1999. American Express began to license the technology to other competitors, and then launched Expedia. E-intermediaries that out-

source their core platforms face an inherent weakness that makes their markets difficult to defend. With their dependency on the technological innovations of other providers, they will have a diminished ability to strategize about how to produce the innovations that will move them forward.

6. CONCLUSIONS

In contrast to traditional physical markets, in e-markets outdated technological platforms will inevitably be displaced by newer ones. This contention is straightforward: older generations of automobiles, televisions and other consumer goods have been replaced by new ones, irrespective of how long it takes. What is more interesting is how it happens, and the ways that industry practices, processes, and structure change. We found support for the newly vulnerable markets theory to explain how the business environment of the GDSs in e-travel distribution was transformed. The e-market associated with the GDSs became a newly vulnerable electronic market. We have shown how the three key conditions associated with the theory were met: newly easy to enter, attractive to attack, and difficult to defend.

We also have shown how the GDSs were threatened by new B2B e-market players at the wholesale level. The new entrants offered competing services with new technologies and a forward-looking strategic vision. Some have achieved significant earnings through their innovative strategies. They found ways to opportunistically pick off customers from the cross-subsidized customer profitability gradients of the GDSs. Platform envelopment theory helped to understand the transformation of e-markets too, but this is more of long-term interpretation of what will happen. Platform envelopment is rarely the first step that new entrants take to gain success. They will only do this as their resources and the profitability associated with the initial customer profitability gradients and targeted customers starts to diminish. Based on our field study, we also proposed how newly vulnerable markets theory applies to e-markets more generally. We next reflect on these findings to make some predictions and propose some new avenues for future research.

6.1. Predictions

Due to their lack of vision and underinvestment in the technology necessary to compete, the GDSs have seen their margins threatened due to increased competition. This has led to outdated technology platforms that are costly and inefficient. The higher costs, coupled with the loss in sales volume, has created pressures to maintain higher prices to locked-in customers, but it is only a matter of time before the loyal ones start to defect. The lower quality in e-distribution functionality of the GDSs and its OTA clients will continue to open the door to new entrants and to intense attacks from existing competitors. This death spiral will continue until the legacy technologies are displaced and the GDSs find new bases for business innovation.

This does not mean that the firms that own these technologies cannot put up a good fight. To avoid the negative consequences of the demise of a generation of e-markets, the incumbent GDSs will need to innovate like the new entrants. They possess the financial resources to build new technology platforms, but they will need to free themselves up from their dependency on legacy sources of profits. Also the new technologies have created disintermediation risks for GDSs and OTAs, though the impacts of travel meta-search entrants are only small and diffusing. The changes have not yet reached the proportions in terms of shifting profitability that we saw with Amazon.com's disintermediation of Barnes & Noble Bookstores, or E-Trade and Charles Schwab relative to Merrill Lynch. It is likely that the OTAs and the GDSs will create new innovations to compete, and invest in reintermediation strategies. We have seen with Amadeus (www.amadeus.com) after 2001. It invested €300 million to renovate its IT platform, and continues build a stronger basis for long-term profits [42]. The GDSs are offering more favorable pricing terms in the latest round of distribution contracts with the airlines. They are developing ancillary functionalities for customer-centric online interfaces too. But they must make investments to meet the technological demands of enhanced meta-search and resonance marketing techniques.

6.2. Generalizability and Future Research

We recognize the difficulty in generalizing based on a study of one industry sector. The work of Clemons and Thatcher [21] in the credit card industry suggests that other contexts are likely to exhibit similar newly vulnerable market characteristics. Though we found support for the theory of newly vulnerable markets in e-travel distribution, more research is needed in other industries. Also, our explanations do not touch on the issue of *ownership*, which is likely to provide additional insights for how support for product transparency and enhanced meta-search have ensued. Yet given the fast transformation of the travel sector in the last ten years, our study brings new insights as to the way in which electronic markets in other industries may evolve. We next discuss the applicability of our findings to electronic markets in other contexts and offer ideas for future research.

Analogous to the GDSs, with technological advances many e-markets are likely to be stripped of their protective barriers – including their ability to price to keep other marginal cost competitors out. These markets will be difficult to defend due to the legacy systems and strategic inflexibility of the dominant players. Yet there may be cases where existing e-markets are able to sustain market power and remain viable. For example, established Internet players such as Amazon.com and eBay have built a critical mass and positive network externalities. They enjoy market power and sustain entry deterrence. Future research should examine the conditions under which firms remain strong in the e-market niches they serve.

In newly vulnerable electronic markets in which products are hyperdifferentiated, we foresee meta-search players emerging that offer integrated product and services comparisons for resonance marketing. The applications will be for hospitality and rental car services. Although their infrastructures are differ-

ent, they report prices through GDSs, and there are multiple offers for vertical product categories [11]. Another application is pricing travel product bundles: “weekend get-away,” “honeymoon travel” and other bundles involving a flight, hotel stay and car. The decision-making for travel services becomes more difficult when consumers have *combinatorial needs*, just as combinatorial auctions require more complex informational support than simple single-item auctions. There is surely additional innovation in the offing.

For markets other than travel, we predict that similar trends will emerge for newly vulnerable e-markets when hyperdifferentiated marketing strategies are employed in different industries. The functionality of meta-search is ready for technological innovations that permit the reporting of diverse consumer preferences across multiple dimensions of product features, and where suppliers offer differentiated product versions along all these dimensions too. For example, Yahoo! Inc. applies its Smart Ad functionality for automobile and retail markets. Yet another avenue for future research is related to newly vulnerable e-markets in which the marketing efforts do not involve product and service hyperdifferentiated. We see this with commodities (e.g., office paper) and products that are differentiated along just a few features (e.g., bed blankets and microwave ovens). Here, the benefits of meta-search and personalized ads are not so evident.

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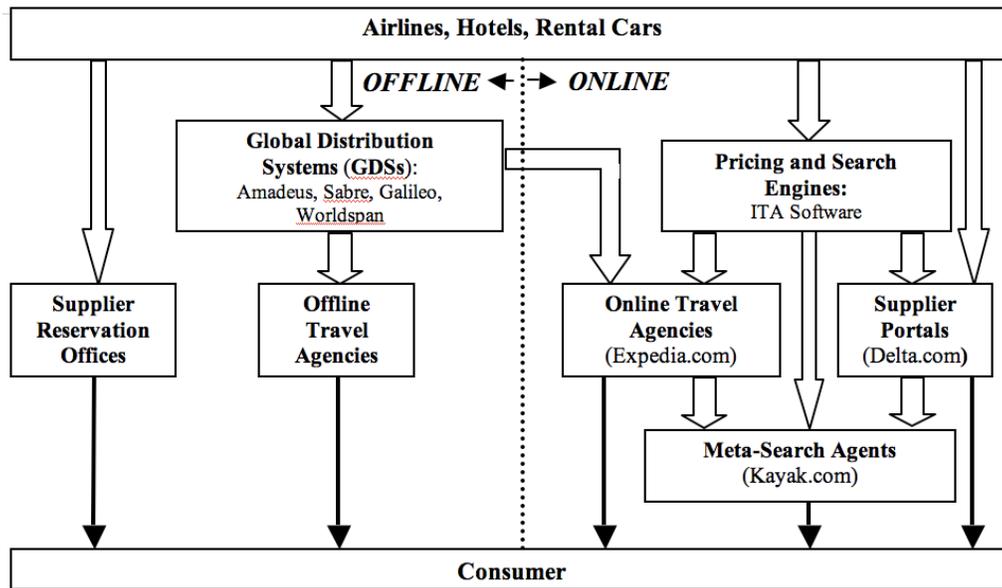
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Figure 1. U.S. Travel Distribution Information Value Chain



Note: This represents the U.S. travel distribution supply chain, with the online channel at the right of the dotted line.

APPENDIX 1. Table A1. Salient Characteristics of the Leading Travel Meta-Search Agents

META-SEARCH AGENT	BACKGROUND AND DESCRIPTION	STRENGTHS AND WEAKNESSES
Kayak – Sidestep [46]	Launch: Kayak in 2005, Side-step in 2000. Technology: ITA Software for air travel data and Ajax-based interface. Sectors: Air, hotel, cars, and cruises. Market leader with 5,839,858 unique visitors in 1/2008, 4,968,393 in 4/2008. ^(a)	Ajax allows quick results filtering, so consumer knows the <i>value ladder</i> across product offerings [28]. Use of ITA Software data and others avoids need for screen-scraping online travel sites. Search time higher than OTAs with exhaustive search.
Farechase [45]	Launch: 2000. Acquired by Yahoo! In 2004. Technology: Ajax-based interface, XML feeds, advertiser-approved screen-scraping. Sectors: Air, hotel, cars. 5,414 monthly unique visitors in 1/2008 and 2,838 in 4/2008 ^(a)	Similar benefits from Ajax. Screen scraping limits search coverage across online sites.
Farecast [35]	Launch: 2006. Focuses on fare prediction. Technology: ITA Software and Ajax. Sectors: Air and hotel. 956,335 unique visitors in 1/2008 and 1,019,870 in 4/2008. ^(a)	Similar benefits from Ajax. Fare prediction is innovative, and has good consumer responses.
Mobisimo [7]	Launch: 2004. Technology: Screen scraping of domestic, international online travel sites. Sectors: Air, hotel, and cars. 187,387 unique visitors in 1/2008 and 283,892 in 4/2008. ^(a)	International scope is a competitive distinction. Screen scraping limits search coverage.

Notes: ^(a) The data were sourced via queries made at Compete.com (www.compete.com), April 11, 2008 and May 14, 2008.

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