A Strategic Analysis of Electronic Marketplaces

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Abstract

Information systems can serve as intermediaries between the buyers and the sellers in a vertical market, thus creating an "electronic marketplace." A major impact of these electronic market systems is that they typically reduce the search costs buyers must pay to obtain information about the prices and product offerings available in the market. Economic theory suggests that this reduction in search costs plays a major role in determining the implications of these systems for market efficiency and competitive behavior. This article draws on economic models of search and examines how prices, seller profits, and buyer welfare are affected by reducing search costs in commodity and differentiated markets. This reduction results in direct efficiency gains from reduced intermediation costs and in indirect but possibly larger gains in allocational efficiency from better-informed buyers. The economic characteristics of electronic markets, in addition to their ability to reduce search costs, create numerous possibilities for the strategic use of these systems.

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Introduction

Buyers often face substantial search costs in order to obtain information about the prices and product offerings of sellers in a market. These costs introduce inefficiencies into market-intermediated transactions and detract from the ability of markets to provide an optimal allocation of productive resources. Interorganizational information systems can create "electronic marketplaces" by serving as intermediaries between the buyers and the sellers in a vertical market, in the process reducing the cost buyers must incur to acquire information about seller prices and product offerings. This article focuses on the role of buyer search costs and certain other economic factors that determine the practical significance and the strategic dynamics of electronic marketplaces in commodity and differentiated markets.

Simple microeconomic models typically assume that buyers can costlessly acquire full information about the prices and product offerings of sellers in a market. For example, this assumption underlies the central result of convergence to a unique competitive price-taking equilibrium in competitive markets. In certain oligopolistic settings, it leads to the result that sellers will not be able to keep prices above marginal costs and thus will realize zero profits, known as Bertrand's paradox. There is little disagreement that costless, perfect information about market prices is an unrealistic simplification. Yet the actual implications of deviations from this assumption for market prices and for the conduct and welfare of firms and consumers have been the subject of much debate. In real-world markets, the evident variability of prices and the emphasis on dissemination of information through advertising and other media suggest that the cost and the availability of price and product information are important determinants of economic behavior.

The goal in this article is to demonstrate how economic theory can provide insights into the benefits of electronic markets, the strategic options of the parties involved, and their likely strategic conduct. Although these questions have already

been addressed in the information systems literature (e.g., Cash and Konsynski, 1985), the contribution of this article lies in providing a supplementary line of reasoning grounded in economic theory; it emphasizes the underlying reasoning and the resulting strategic implications. The interested reader can find the model specifications that extend existing economic theory and the complete mathematical formulations in Bakos, (1987), chapters 6 and 7.

The next section reviews the concept and the role of electronic marketplaces. This is followed by a discussion of the implications of search costs in commodity markets and shows how in price-competitive markets, even a small cost of search on the buyers' part may enable sellers to maintain prices substantially above their marginal cost; in this scenario, the introduction of a market system providing price information can dramatically reduce seller profits and increase buyer welfare. Next is a discussion of search costs in differentiated markets. The heterogeneity of product offerings and consumer tastes in such a market allows sellers to exploit buyer search costs and enjoy increased profits. An interesting outcome in this setting is that an electronic marketplace improves allocational efficiency by enabling buyers to locate sellers that better match their needs; these efficiency gains are comparable in size to the reduction in search costs. Finally, the last discusses the implications of the economic characteristics of electronic market systems for the strategic conduct of buyers, sellers and intermediaries.

Electronic Marketplaces

We are witnessing an increase in the number and functionality of information systems that cross organizational boundaries, such as systems linking one or more firms to their customers and/or suppliers. The term *interorganizational information systems* (IOS), first introduced by Barrett and Konsynski (1982), is now widely used to characterize these systems. An electronic marketplace (or electronic market system) is an interorganizational information system that allows the participating buyers and sellers to exchange information about prices and product offerings. The use of the term "electronic marketplace" in this article has a narrower, system-oriented focus compared with Malone, et.al.'s (1987) more general use of the term "electronic market" in referring to the corresponding governance mechanism.

The role of electronic markets

As discussed in later sections of this article, the cost that buyers incur in order to acquire information about prices and product characteristics enables sellers to extract monopolistic rents in otherwise competitive markets and creates inefficiencies in the allocation of economic resources and the distribution of economic wealth. Electronic markets require major fixed investments in system development, but, once in place, they promise to reduce the marginal costs of interorganizational coordination and handle larger volumes of market transactions in a more timely fashion before they reach their point of saturation. If they are able to fulfill this promise, they are likely to proliferate because of these superior cost/performance characteristics. Furthermore, some authors have argued that information technology will favor coordination through market-based rather than hierarchical governance mechanisms (Malone et al., 1987), resulting in an increased role for electronic markets.

Real-world electronic market systems typically offer valuable features beyond the posting of prices and product characteristics. For example, airline reservation systems allow ticketing and billing in addition to their market-related functionality. In this article the focus is primarily on the role of electronic markets in bringing together a supplier and a customer; it is recognized, however, that once this relationship has been established, through an electronic market or by any other means, interorganizational information systems can play an important role in supporting the resulting bilateral relationship.

Economic characteristics of electronic market systems

In order to use economic theory to understand the strategic implications of electronic markets, we must focus on their most salient characteristics, especially the ones that distinguish them from other types of capital investments. In that context, five characteristics of electronic market systems can explain, from an economic perspective, their strategic potential as well as their impact on the structure and efficiency of markets.

1. **An electronic market system can reduce customers' costs of obtaining information about the prices and product offerings of alternative suppliers as well as suppliers' costs of communicating information about their prices and product characteristics to additional customers.**

This cost reduction is likely to affect the monopoly power of the suppliers or the monopsony power of the customers in a vertical market that is moved "on-line" by the introduction of an interorganizational information system. It will also have implications for the efficiency of that market in terms of the search costs experienced by buyers and their ability to locate appropriate sellers.

2. **The benefits realized by individual participants in an electronic market increase as more organizations join the system.**

This property, known in economics as *network externalities* (Katz and Shapiro, 1985), can affect the dynamics of the introduction and adoption of electronic market systems, e.g., by favoring the first intermediary introducing such a system.

3. **Electronic markets can impose significant switching costs on their participants.**

Electronic markets may require sizable investments from their participants in hardware, software, employee training, and organizational transformations. Such investments may become worthless should the organization decide to join a different system or to revert to the previous mode of operation. Competing intermediaries may need to compensate potential system participants for their switching costs or invent technology that minimizes these costs in order to lure them away from rival systems.

4. **Electronic market systems typically require large capital investments and they offer substantial economies of scale and scope.**

An intermediary usually must incur large system development and maintenance costs (both fixed and variable); it will then face relatively small incremental costs for each additional transaction until the capacity of the system is approached, resulting in substantial economies of scale. Furthermore, technological and organizational resources and expertise acquired during the development and operation of one system may be transferable to other systems, resulting in economies of scope.

5. **Potential participants in electronic markets face substantial uncertainty regarding the actual benefits of joining such a system. Occasionally this uncertainty remains even after an organization joins the system.**

This uncertainty can affect the strategic behavior of buyers, sellers, and potential intermediaries, by inducing them to adopt a "wait and see" strategy where they delay introducing or joining a system in the hope that they will learn from the experiences of other organizations.

Competitive moves and technological developments can affect the strategic significance of the above factors. In some markets, for example, competition among systems, new technology, and even

government regulation are increasingly limiting the ability of intermediaries to exploit switching costs. Furthermore, while the above economic characteristics determine the strategic potential of electronic marketplaces, they are not exclusive to these systems. The reduction in buyer search costs is the single attribute that is most specific to electronic marketplaces; in other aspects, especially in terms of the last two characteristics above, electronic market systems may not be very different from other types of capital investments, including investments in strategic information systems.

For instance, better transportation systems or advertising media can decrease the search cost of buyers. Competing standards in the personal computer and workstation markets offer network externalities, because the wide adoption of a standard results in increased availability of hardware and software products as well as large numbers of other compatible users. Adoption of any computing platform, creates switching costs due to the cost of converting software and retraining users. Several industries require large capital investments as the price of entry, and most new technologies are characterized by uncertainty about their actual benefits. Electronic marketplaces, however, are unique that they typically exhibit all five of these characteristics.

Information systems researchers face the task of extending economic theory in the appropriate areas, drawing the proper conclusions, and bringing the relevant results into the information systems field (Bakos and Kemerer, 1990). In this spirit, the following two sections focus on the ability of electronic marketplaces to reduce the cost buyers face in obtaining price and product information, and they illustrate how economic analysis can be applied to study the forces driving the economic and strategic implications of this technology. The discussion is subsequently expanded to include the strategic impacts of three other characteristics of electronic marketplaces identified above: large fixed costs, network externalities, and switching costs.

Commodity Markets

Products in commodity markets are essentially identical across all sellers, as is often the case, for example, in the markets for agricultural grain products or gold bullion. Buyers will typically choose the seller with the lowest total cost, which will usually include the price paid to the seller plus any search, transportation, and other similar costs. This section examines how buyers behave when they search for a seller in a commodity market. Because of the simple structure of a commodity market, most search models in the literature can be used to study the impact of electronic marketplaces by examining their outcome when the marginal cost of search is substantially reduced. The key insight offered is that under virtually any assumptions about the nature of the market and the search process, electronic marketplaces are likely to destabilize profitable monopolistic outcomes, thereby, reducing seller profits and increasing buyer welfare.

Rules of search in commodity markets

The perfectly competitive or monopolistic markets of simple microeconomic theory assume that buyers are fully informed about the prices of all sellers. This leads to a single market price and offers buyers no incentive to compare the prices of different sellers. Stigler's (1961) seminal work titled "The Economics of Information" stimulated economists to ask how firms and individuals behave, and how markets function, when buyers and sellers do not have perfect information about the consequences of their actions. In the case of search costs, it can be shown that sequentially rational rules (i.e., rules that describe a strategy that rational economic actors would want to follow to the end) will be based on a reservation price, which is set so that the expected gain from searching once more equals the cost of the search (Rothschild, 1974).

Several authors have pointed out that the actual distribution of seller prices may be unknown at the beginning, or it may change over time. For example, when there is only a small number of sellers,

finding the price of one seller may change the expected price distribution for the remaining sellers. Search models can be extended to cope with these contingencies by allowing for the dynamic updating of buyer beliefs (Rothschild, 1974). Another concern is that in some real markets it may be unrealistic to expect buyers' prior beliefs to reflect accurately the actual distribution of seller prices, in which case rules based strictly on a reservation price are not robust and can lead a buyer with inaccurate expectations to a grossly suboptimal outcome. Gastwirth (1971) proposed combining the two into hybrid rules that are both robust and preserve the reservation price property: buyers will search up to a certain maximum number of times or until the best price discovered is less than their reservation price (which gets dynamically updated as new information is gathered about seller prices).

The impact of search costs in commodity markets

Most search rules proposed in the literature, including the ones reviewed above, have the following properties: (1) seller prices decrease as the cost of search decreases; (2) the amount of search increases as the cost of search decreases; (3) the amount of search increases as seller prices become more dispersed; and (4) *ceteris paribus*, as seller prices become more dispersed, buyers' total costs decrease (buyers need to search more when there is a wide variety of seller prices, but they are compensated by better deals).

The search costs faced by buyers allow the sellers to maintain prices at equilibrium substantially above their marginal cost; it can be shown that, under certain assumptions about buyer behavior, at equilibrium all sellers charge the same price, and it is the one that would have been charged by a monopolist. The first half of this result was first proved by Diamond (1971) and the second half by Salop and Stiglitz (1977). What happens in this case is that if search costs are high enough, each seller will slightly increase his or her price knowing that the unfortunate buyers that visit will prefer to pay the slight premium rather than embark into another expensive search. The result is that all sellers gradually raise their prices to reach the monopolistic level. At this point no seller has an incentive to lower the price; because of the high search costs he or she will not be able to attract enough additional demand.

These models of buyer search are limited to the extent that they offer a theory only about the buyers' side of the market. The variability of seller prices is exogenous and usually disappears when one tries to close these models by allowing profit-maximizing behavior on the sellers' side; at equilibrium, all sellers charge a single price. Buyers then do not have to search, undermining the motivation for the development of these theories. On the other hand, these models can demonstrate how even modest search costs can lead to prices substantially higher than marginal costs, even in commodity markets and when the sellers behave competitively (i.e., without any collusion). More recent work in this area suggests that the key in avoiding the above problems lies in introducing asymmetries in the buyer and seller sides of the market (i.e., allowing for heterogeneous buyers and sellers).

For example, in the real world not every buyer has access to an electronic market system. Salop and Stiglitz (1982) have studied a setting with two types of buyers who face different search costs. This is similar to a scenario in which certain buyers have access to an electronic market that provides information about seller prices at a low cost, while buyers without access to the electronic market system face higher search costs. Their analysis suggests a mixed price equilibrium in which certain sellers charge high prices to take advantage of buyers with high search costs. Buyers with low search costs induce the entry of low-priced sellers. As the proportion of buyers with low search costs increases, the average price charged by sellers gradually decreases from the monopoly price to the competitive price.

We have seen that in almost any setting, as the cost of buyer search decreases, it becomes more difficult for sellers to

sustain high prices. Reducing the cost of obtaining information about seller prices in a commodity market may thus undermine a monopolistic outcome. Under certain assumptions, for example, prices are monopolistic for high enough search costs and become indeterminate (no equilibrium) when search costs fall below a certain threshold (Bakos, 1987). As long as the cost of search is still significant, sellers are still likely to enjoy some excess profits, although smaller than under the monopolistic equilibrium. If the search costs decrease enough, all profits enjoyed by the sellers eventually are competed away. In either case, the result is a net welfare gain from improved search efficiency (as fewer resources are expended in non-productive search activities) and from the reduction or elimination of inefficiencies that characterize monopolistic markets (such as pricing marginal buyers out of the market). Finally, lower prices result in a transfer of wealth from the sellers to the buyers. Electronic market systems are socially desirable when their net welfare gains outweigh their development and operating costs.

The role of electronic marketplaces

A commodity product bought from different sellers can differ only in its price. We have seen that sellers can still realize substantial profits, however, as long as comparison shopping is costly for their customers. As computer and telecommunications technology in the form of electronic market systems make the distribution of information more efficient, the opportunities for fat and easy profits will shrink. Commodity markets may be destabilized by price wars that wipe out any excess profits enjoyed by the sellers. As articulated in the following quote by John Phelan Jr., at the time chairman of the New York Stock Exchange, "Technology and communication bring efficiency. Money is made in inefficiency" (Hansell, 1989, p. 92). Sellers may thus attempt to delay the arrival of electronic market systems, or they may try to control their development.

A case in point is the European market for government and blue chip bond issues. At the Eurobond market's 1987 annual meeting in Oslo, Salomon Brothers led the big American trading firms into successfully opposing proposals for a computerized real time price-quotation system for the trading of Eurobonds (*Economist*, 1987). Such a system would have made market information available instantly to all subscribing investors and traders, regardless of their size or location, and could have marked the beginning of the end of big trading profits[1].

Similarly, in the domestic market for U.S. government fixed income securities (which has a daily turnover of over $100 billion), big bond dealers had a virtual monopoly in real-time bond prices in the mid-1980s. Thus, they enjoyed an edge in trading and were able to profit by charging a price differential to their customers. Despite the fact that a General Accounting Office study in 1987 called for better public access to bond prices, these dealers were understandably opposed to an open trading system that might threaten their monopoly profits. Improvements in computer and telecommunication technology, however, allowed financial data vendors to gain access to timely bond price data in the late 1980s. As a result, these vendors, including Reuters Holdings PLC, Telerate, and Quotron, made inroads in that market by posting bond price data and eventually by matching smaller buyers and sellers. In an ironic twist, the opposing bond dealers eventually were forced to join these electronic systems themselves to take advantage of their superior efficiency, in the process paying millions of dollars in fees (Herman and Power, 1990).

In agreement with the economic arguments presented, the government bond business turned from a gold mine to

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[1]More recently, other developments have combined to severely damage profits in the Eurobond market, while actions taken by the dealers to protect these profits caught the attention of the regulatory authorities; the profitability of this market has suffered as a result.

a mine field in just two years; several dealers are losing money, and the rest enjoy razor-thin profit margins (Herman and Power, 1990). Although the electronic market systems were not the only structural change (for example, the entry of many more participants, including several Japanese houses, has made that market more competitive), these systems seem to have played a significant role in that process. As discussed in more detail later in this article, there is gradually a consensus being formed among major bond dealers that they need to control electronic trading, especially because they provide much of the data on which such trading is based. It may be difficult to achieve this goal, however, without provoking government regulation.

Differentiated Markets

Certain markets, like government bonds or most agricultural and mineral products, deal in commodity products, yet the majority of markets are characterized by differentiated products. Differentiated markets are commonplace because buyer preferences are heterogeneous for most types of products. Furthermore, these markets are attractive to sellers because they offer substantial profit opportunities. Differentiated markets involve a variety of product offerings and consequently the search problem becomes more complex; buyers need to consider both the price of a particular seller and the characteristics of the corresponding product offering. In this section we focus on describing a model of search in differentiated markets appropriate to study the implications of electronic marketplaces.

Models of product differentiation

Economists have been interested in differentiated markets since the late 1920s. A number of models have been proposed for their study, which generally fall in two categories:

- *Spatial differentiation* models trace their origin to Hotelling's (1929) formalization of spatial competition. In that class of models, product attributes are treated as choices of location in an *n*-dimensional space. Consumer preferences determine the location of their ideal product or product mix, and some type of distance metric in the product attribute space is used as a proxy for consumers' utility loss when they are not able to purchase their ideal product or product mix.

- The brand substitution formalization of product differentiation is often attributed to Chamberlin (1933). In this class of models, consumers may purchase several brands, according to a brand's prices, desirability, and the ability of any given pair of brands to substitute for each other.

The advantage of brand substitution models is that they allow multiple brands to compete for the attention of any particular consumer; in spatial models consumers consider only the products closest to their ideal product vector and typically buy the one most desirable. Spatial models on the other hand focus more clearly on product characteristics and on the dynamic aspects of competition through the reformulation of existing brands or through the introduction of new ones (Perloff and Salop, 1985; Schmalensee, 1978). Their typical assumption that consumers purchase only one product at a time is acceptable in most real markets.

Modeling search costs in differentiated markets

The economic literature on search costs suggests that heterogeneity of consumers and product offerings is central to the ability of sellers to exploit buyer search costs and thus extract monopolistic rents (Reinganum, 1979; Shilony, 1976). It is thus appropriate to extend standard models of differentiated markets to take account of search costs.

One good candidate is the "unit circle" or "city around the lake" model of spatial differentiation (Salop, 1979) in which seller offerings and buyer preferences are located along a unit circle; buyers face a

"transportation"[2] cost when they buy from a seller whose offering is not identical to their preference. Bakos (1987) modeled the impact of search costs by requiring each buyer to incur a certain cost in order to be informed about the location (i.e., the product attributes) and the price offered by some seller; he must then decide whether to purchase one of the products already identified, keep searching, or give up.

At the unique symmetric equilibrium each seller charges a price that depends on the search and transportation costs; the higher these costs, the higher the prices and profits enjoyed by the sellers (Bakos, 1987). Each buyer searches until a product close enough to his preferences is located. As the search cost decreases, buyers become more demanding and keep searching until they find a product closer to their ideal preference. If the search cost becomes zero, buyers look at all product offerings and purchase the one best serving their needs, resulting in a socially optimal allocation. If there is a large number of products, seller profits will be low but still not zero because product differentiation prevents all-out price competition. If a higher degree of product differentiation can be sustained e.g., through advertising, buyers become less willing to purchase an offering significantly different from their ideal product (i.e., their "transportation" cost increases). In that case, sellers will enjoy an increase in profits, which may partially or completely offset the decrease caused by lower search costs.

The ability of electronic marketplaces to improve market efficiency is particularly evident when high search costs threaten the very existence of a market. In differentiated markets, a sufficiently large search cost will force buyers to stay out of the market even if they are offered a zero price; they would find the expected cost to locate an acceptable seller too high, even if they knew that such a seller is guaranteed to exist. It follows then that high search costs can lead to a market breakdown. This is in contrast to the case of free information, where some buyers may stay out of the market because of high transportation costs, but sellers always service their "local" markets. An important implication of this analysis is that electronic market systems providing product and price information may generate *substantial allocational efficiencies* by enabling customers to locate suppliers that better match their needs.

As search costs decrease, so do price premiums and seller profit margins. The best strategy for a buyer in such a market is to determine a "price and inconvenience" threshold and keep searching until a satisfactory product is located. Consequently, customers with lower search costs become more demanding and are willing to make fewer compromises concerning their ideal product. Buyers are better off in two ways: first, they enjoy lower prices because of the increased competition among sellers; second, and potentially more important, they enjoy allocational efficiencies from being better informed about the available products, thus making purchases that better suit their needs.

Role of electronic markets

It was argued that an electronic market system in a differentiated market is likely to promote price competition and reduce the market power of sellers. It may thus create a net welfare gain by lowering the search cost of buyers and also enabling them to locate products better matching their needs. If the search cost becomes low enough, buyers will look at all product offerings and purchase the one best serving their needs, resulting in a socially optimal allocation. It follows that such a system will be socially desirable when

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[2]The term *transportation cost* originates from the spatial interpretation of the unit circle model, where the buyer must travel to the seller's location or have the product shipped, the larger the distance between buyer and seller, the higher will be the transportation cost. In the context of the model presented here, the transportation cost formalizes the fact that the more a product offering differs from a buyer's ideal preference, the less desirable it become for that buyer.

these welfare gains outweigh its development cost.

It is interesting to note that when informational inefficiencies prevail, a large number of sellers does not need to result in a competitive and efficient market. Under certain circumstances the market may become *more monopolistic* as the number of sellers increases! This can happen, for example, if a buyer can acquire information about a product only by purchasing it. In this case, buyers often but from the first seller they visit. As a result, individual sellers do not have a strong incentive to lower their prices because they would attract few buyers and even these buyers may interpret the lower price as a signal of poor quality. As the number of sellers increases, it becomes more difficult for buyers to locate any specific discounter, This decreases the incentives of individual sellers to cut their prices and thus results in a more monopolistic market. This behavior is likely in certain markets with little or no advertising and no cheap way to assess quality *ex ante* (or even *ex post*), e.g., professional markets for legal and medical services. In a setting of this type, electronic market systems could disseminate product information e.g., through a rating service that promotes the sharing of buyer experiences with the product as well as provide price cutters with the means to reach a larger fraction of the buyers; the monopolistic nature of these markets could be undermined as a result.

Airline computerized reservation systems (CRS) fit well the model of electronic market systems in differentiated markets discussed earlier, and they have been increasingly prominent in recent years. The two dominant systems were developed by American Airlines (SABRE) and United Airlines (Apollo).[3] The preceding discussion suggests that these systems should be expected to promote price competition, reduce the airlines' market power, and result in more demanding customers who are less willing to compromise on their preferred product. Airlines have experienced all these impacts (Smith, 1987).

We saw that in a differentiated market sellers can take advantage of buyers' search costs. Although no formal distinction was made between the role of price and product information, it is actually the price information that is most damaging to sellers' profits. In that context, sellers have an incentive to manipulate electronic markets in order to increase the cost of obtaining price information. When this is combined with readily available information on product characteristics, it discourages buyers from searching for price deals and results in higher profits for the sellers. In the airline industry, for example, American and United attempted to bias CRS screen displays to discourage price comparisons; in a similar tactic, most airlines now offer a wide gamut of thousands of active fares and promotions to confuse these comparisons. Another approach is to increase the degree of product differentiation, which was the major objective in the introduction of frequent flier programs. Finally, sellers and intermediaries operating electronic market systems can appropriate some of the buyers' gains through user fees. For example, airlines are imposing transaction fees beyond a certain level of CRS utilization, both to generate additional revenues and to discourage searching for the lowest-priced fares (Dahl, 1991).

Increased competition, fueled by the deregulation of the airline industry and the computerized reservation systems, was adversely affecting the profitability of flight operations for most airlines in the early 1980s. The airlines that pioneered reservation systems, however, were enjoying high profits from system-related revenues. In 1980-1982, American Airlines commanded a 40 percent gross margin on its SABRE revenues, while flight operations yielded as little as 5 percent. TWA made more money in the same period on PARS (its reservation system, which eventually was merged into WorldSpan in a joint venture with

[3]United spun off Apollo into a subsidiary named Covia, now owned jointly with several other airlines.

Northwest and Delta) than from its airline. As a result, airlines with established reservation systems enjoyed stock price premiums as recently as mid-1987 (Smith, 1987). As these systems have started competing among themselves, however, operating margins have been falling, and current SABRE profit margins have declined to the low teens. Air travelers are the only group made unambiguously better off as a result of these systems.

Finally, it may be interesting to note that the implications of search in differentiated markets are consistent with the traditional transaction cost analysis of appropriate governance structures. It was suggested, for example, that market inefficiency (deviation from a Pareto optimal outcome) increases when the cost of obtaining information about a specific product offering is high, which is typically the case for complex products. If this inefficiency has resulted in hierarchical governance structures, an electronic marketplace may promote market-based governance mechanisms, suggesting that electronic marketplaces may favor markets over hierarchies, in accordance with Malone, et.al.'s (1987) predictions.

Strategic Conduct in Electronic Markets

The preceding sections discussed how interorganizational information systems can create "electronic marketplaces" by serving as intermediaries between the buyers and the sellers in a vertical market, reducing the buyers' search costs in the process. Also discussed were the implications of this reduction in search costs and the potential of electronic markets to affect the efficiency of interorganizational transactions and the market power of buyers and sellers. We now turn to the strategic potential of electronic markets and inquire whether their economic characteristics are likely to favor early movers and large intermediaries.

Market power and the introduction of electronic marketplaces

It was argued in the previous two sections that electronic markets usually favor the buyers by lowering buyer search costs and thus reducing sellers' profits and market power. This may create a problem for sellers in markets where technological developments make a market system feasible, or even imminent. In the long run it may be impossible to avoid some loss of market power, especially when this power is based on exploiting high buyer search costs. System revenues may compensate for this decline in the short-run, but, as several systems are introduced, their profits are likely to be competed away. In SABRE's case, for example, even customer lock-in through legally binding contracts did not prevent the eventual loss of market share; competitors would offer to foot the travel agencies' legal bills to induce them to switch to their systems (Smith, 1987). If the sellers collude to prevent an electronic market, they may induce buyers to introduce such a system themselves, or they may encourage a third-party intermediary to enter the picture.

The potential profits of electronic markets can actually put sellers in a prisoner's dilemma situation. We saw that sellers *as a group* have no incentive to introduce a system offering price and product information, which makes them all worse off. Yet each of them individually might benefit from introducing such a system, because the revenues that can be gained by charging buyers directly and indirectly for the system's services would probably outweigh the lost profits of an individual seller due to increased competition. This may explain why sellers often precipitate the introduction of electronic market systems, in spite of the potential of these systems to reduce their market power.

The best strategy for sellers may be to control the type of system that is eventually introduced. If they orchestrate the introduction of systems that emphasize product rather than price information, buyers will use these systems to locate the most appropriate product in the market. Sellers would be able to maintain their profits and in addition appropriate some of the buyers' benefits through user charges. Such systems may

be able to support a certain degree of implicit collusion and thus maintain a relatively cooperative outcome: other sellers could "get the message" and stay away from systems that emphasize price information. Established systems can raise the barriers of entry for third-party information providers and thus delay or avoid the competition from systems offered by non-industry participants.

Naturally, buyers have the opposite incentives and would like to create an electronic market that facilitates comparisons among sellers' prices as well as product offerings. The functionality of an electronic market is therefore likely to depend on whether it is introduced by a buyer or a seller. In a market that is more concentrated on the seller side, like most consumer and several industrial markets, a single buyer may be too small to introduce a market system, may not be sufficiently interested, or may lack the clout to induce seller participation. Sellers, on the other hand, have higher stakes in such markets, leading to stronger incentives to introduce a market system. This provides another explanation for the observation that most electronic market systems are pioneered by sellers, although, theoretically, such systems are most beneficial to the buyers. Buyers may form coalitions, however, and introduce jointly owned systems, or a third party organization with the necessary technological expertise may enter the market.

It is more difficult for sellers to control the outcome in commodity markets. In the case of the domestic government bond market, big bond dealers refrained from introducing an electronic market system, which allowed financial data vendors to make inroads in that market, as discussed earlier. In order to reassert its position, Merrill Lynch, which has a minority interest in Bloomberg Financial Markets, has transformed this system into an electronic marketplace by making it available to other dealers (Clemons, 1991). Bloomberg has become the premier source of real-time data for trading in corporate bonds and also gets price feeds for government bonds through the primary dealers. Meanwhile, other big bond dealers formed the Electronic Joint Venture (EJV) group, which came to be known as the "Gang of Six" and currently includes Salomon, Goldman Sachs, Morgan Stanley Group, CS First Boston, Citicorp, Shearson Lehman Hutton, and possibly others. It has been reported that group members are ready to commit up to $100 million to launch their own electronic market, and they plan to provide research, analysis, and related news in an attempt to differentiate themselves from the other competing systems (Herman and Power, 1990).

This effort faces several obstacles, however, as the Electronic Joint Venture group is likely to encounter conflicts of interest with current or potential members. For example, Citibank owns Quotron, and any attempts to recruit Merrill Lynch could be stymied by the latter's interest in Bloomberg Financial Markets; both Quotron and Bloomberg would be likely competitors with an EJV system. Furthermore, there is fragmentation among the sellers in the bond market because a group of bond brokers is planning to introduce its own proprietary system; this will result in competition between six or more systems serving the bond market.

Early mover advantage

The focus thus far has been on the impact of introducing an electronic market system on market prices and profits. As pointed out earlier, however, electronic marketplaces may be able to generate substantial efficiencies, which can be translated into profits for the system operators. This is likely to create interest among potential intermediaries, thus introducing competition to the market for electronic intermediation. A well-known result of microeconomic theory is that firms in competitive markets earn no profits in the long run, except for a fair return on their capital assets. Excess profits are possible, however, under such deviations as informational inefficiencies, the ability of some firms to create and exploit barriers to entry, or the technological sophistication that allows other firms to enjoy profits from innovation even if they lack any significant market power. In this context, three

characteristics of electronic marketplaces identified earlier may allow intermediaries that move early in offering electronic market systems to maintain a competitive advantage: large requirements for capital investment resulting in substantial economies of scale and scope, switching costs imposed on their participants, and network externalities.

Capital investment

The large investments in sunk and fixed costs that are required to develop electronic market systems are likely to play an important strategic role. These costs can raise barriers to entry (Spence, 1979) and can offer advantage to early movers (Fundeberg and Tirole, 1983;, 1985). Incumbent firms may overinvest in the beginning and keep investing sufficiently to discourage new entrants (Bernheim, 1984). Traditionally, the final outcome in such competition based on strategic investment is determined by the underlying economies of scale, which typically favor established entrants (Coursey et.al., 1984), and by the uncertainty about technological and demand characteristics (Arvan, 1986). In the case of electronic marketplaces, network externalities (discussed later) are likely to be just as significant, if not the dominant factor. Uncertainty about the actual capacity of the market may induce intermediaries to offer more systems than the market can support; in that case consolidation and a war of attrition are the likely outcomes.

The dominance of American's SABRE and Covia's Apollo in the market for airline reservation systems illustrates the significance of strategic investment. These systems are profitable, yet their underlying technology could certainly be duplicated by a sophisticated intermediary. It is also unlikely that a new entrant could legally be denied access to the needed information, and, subject to contract-term limitations recently established by the U.S. government, it takes only 30 days for a travel agent to switch to a new reservation system (Hopper, 1990). The economics of the large communication networks and massive transaction processing centers required to support a CRS result in start-up costs of hundreds of millions of dollars for a new entrant in that market. The saturation of the existing market (virtually all travel agents subscribe to a CRS), the relatively low marginal costs enjoyed by the existing players, and the possibility of a retaliatory response create enough uncertainty about the benefits of entry to deter new systems and limit the aspirations of marginal players.

Switching costs

Firms connected to an electronic market system may face substantial technological and organizational costs if they decide to switch to an alternative system; such switching costs can play an important strategic role. The study of the strategic implications of switching costs has emerged as an active field in economics with the work of Farrell (1985), Farrell and Shapiro (1987), and Klemperer (1986;, 1987a; 1987b), and von Weizsaker (1984). Analytic models of switching costs usually predict aggressive behavior of early movers, who try to build a locked-in customer base that can be subsequently exploited.

It is often assumed in the information systems literature that interorganizational information systems create substantial switching costs because of sunk investments in hardware, software, user training, and organizational changes, as well as non-technology barriers such as trust in organizational partners or long-term contracts (e.g., Bakos and Treacy,, 1986; McFarlan, 1984). The larger the switching costs, the fiercer the competition to recruit uncommitted users and the larger the proportion of system benefits appropriated by the intermediaries in the long run.

On the other hand, the ability of switching costs to create early mover advantage in electronic marketplaces is mitigated by technological progress when technology facilitating access to competitive systems becomes available or when the changeover to a new generation of the technology offers an opportunity to switch to a new intermediary. Similarly, the arrival of new potential users can spark competition among intermediaries to recruit these users to their systems; if

intermediaries cannot price discriminate between new and existing users, their ability to profit from switching costs is significantly reduced. In view of mounting evidence that system participants are often able to overcome high switching costs, an interesting topic for future research in this area is the identification of the switching costs imposed by different types of electronic market systems on their participants and the integration of these results with the economic theory of switching costs.

Network externalities

Electronic market systems with large installed bases create more value for their participants, who are provided with a wider selection of potential buyers and sellers. These "network externalities" create an early mover advantage (Katz and Shapiro, 1985) because early movers enjoy the opportunity to build a larger installed base. Unless the technology evolves in a way that subsequently penalizes early movers or removes access barriers between different systems, late movers are at a disadvantage.

Network externalities can interact with switching costs to reinforce each other, increasing the aggressiveness of intermediaries in the early stages of introduction and the advantage of successful early movers. Network externalities make established systems more attractive to new users, reducing the need for intermediaries to compete for these users on a price basis. This is significant because competition for newcomers is one of the major checks in the ability of intermediaries to exploit switching costs.

Sustainability of early mover advantage

Experience suggests that any advantage gained by moving early in offering an electronic market system will most likely create only a window of opportunity. Advantage based purely on technological sophistication is difficult to sustain because of the open and rapidly evolving nature of the technology. When interorganizational information technology becomes commonplace, profits are competed away and the technology becomes a "strategic necessity" (Clemons and Kimbrough, 1986). Sustainable advantage based on information technology typically requires leveraging unique resources that cannot be easily replicated or leapfrogged by potential competitors (Clemons and Row, 1987) or continuous innovation that will keep the system a moving target beyond the reach of its competitors. In the case of electronic marketplaces, specific industry expertise, a locked-in customer base, or the ability to deal with certain organizational and system complexities are promising areas to look for sustainable advantage.

Early movers may be stranded with a bad technology and offer a system that soon becomes obsolete, diminishing the advantage of their strategic investment. Technological and market developments, such as falling processing costs and the increasing availability of software-defined networks (SDNs) and the integrated services digital network (ISDN), may reduce the cost of the infrastructure required to offer an electronic marketplace. Early movers may also find to their chagrin that technology has been developed that reduces the switching costs they worked hard at imposing and diminishes the role of the standards they have established. Finally, a successful early system enjoying network externalities may leave no alternative to other industry participants but to form a coalition and offer a credible competing system.

Citibank, for example, was a leader in introducing automated teller machines (ATMs) in the New York market. Its extensive ATM network allowed it to lower its operating costs and played an important role in the revival of Citibank's Individual Banking Unit, which enjoyed an increase in its retail market share from 4 percent in 1977 to 13 percent in 1988. However the strategic impact of this ATM network did not last long. Citibank's commanding technological leadership induced the other major consumer banks to cooperate and offer a competing network of compatible ATMs. This seems to have left Citibank without a durable advantage from its ATM network as its

competitors were able to match its installed base of ATMs (Glaser, 1988).

In the eastern Pennsylvania market, Girard Bank started installing ATM machines in 1975, and it soon introduced its proprietary George ATM network, expecting to capitalize on its traditional strength in the retail market. Philadelphia National Bank (PNB) rapidly responded to Girard's George ATM network with MAC, its own ATM network; although PNB was not able to match George's ATM base on its own, it made participation in MAC available to other banks since MAC's initial launch. In 1982 Girard was acquired by Mellon Bank of Pittsburgh; George was merged with Mellon's Cashstream and evolved into a shared ATM network as well (Clemons, 1990). Possibly as a result of the rapid responses in this market, these ATM networks generally did not provide any competitive advantage to their participants, as confirmed in a study by Banker and Kauffman (1988); the systems had become a "strategic necessity."

In the airline reservations market, CRS operators have lost their ability to impose severe switching costs and have seen the benefit of network externalities dwindle because of government regulations limiting contract terms and requiring airlines to equally provide their flight information to all intermediaries. Malone, et.al. (1989) have argued that this ability to benefit from an uneven playing field tilted to the intermediary's advantage will eventually diminish in all electronic marketplaces; intermediaries who attempt to keep their customers at a disadvantage will see their market share dwindle. Responding to this trend, an in an attempt to sustain its competitive advantage through continuous innovation, American Airlines is shifting its focus from CRS operation to superior utilization of the information provided by the SABRE system (Hopper, 1990).

In the financial industry, Barclays de Zoete Wedd (BZW) has leveraged its unique ability to provide coverage for the widest range of securities in the London market,. It enjoys a sustainable advantage from its TRADE system for automatic order execution (Clemons and Weber, 1990a). This advantage is likely to persist as long as BZW's coverage advantage can be maintained, a remarkable achievement in view of the fact that the deregulation of London's financial markets, known as the Big Bang, has resulted in a drastic decrease of revenues for London brokerage firms (Clemons and Weber, 1990b). Similarly, Bloomberg Financial Markets and the EJV group hope to control real-time prices for bond issues traded outside the exchanges by virtue of their position as the major dealers in several issues; if they succeed in defending this control against regulatory challenges, their systems could enjoy a sustainable advantage compensating them for the reduction in their trading margins.

Clemons (1990) proposed system topology as an important factor affecting the ability of electronic marketplaces to generate profits for their operators; he argues that the point of customer contact is a critical resource in determining the appropriability of system benefits and the sustainability of these profits. Intermediaries are more likely to appropriate system benefits, and to sustain this appropriation, in systems where they control the market transactions and the access to customers (such as the airline reservation systems); these benefits will be less sustainable in systems where the suppliers or the customers retain control over individual transactions and provide themselves with the link to the intermediary (as is the case of inter-bank ATM networks).

Role of information intermediaries

Economies of scale and scope in the development of electronic marketplaces and in the provision of electronic intermediation services may become an important element of the competitive game. Four areas where such economies may arise include the following (Bakos, 1991): (1) building and managing systems of substantial size and functionality relying on complex communication networks, requiring large investments in sunk costs and specialized expertise; big intermediaries can leverage this investment over a larger number of

system participants; (2) system development which is often characterized by a steep learning curve that allows the development of subsequent systems at a smaller cost; (3) economies of scope, especially in development expertise, the sharing of operational facilities, and data collection (where data collected during system operation becomes a valuable asset); and (4) network externalities as the number of participants in an electronic marketplace increases, the market becomes more successful, providing more benefits (e.g., liquidity) to its individual participants.

The typical strategy to secure economies of scale and scope in intermediating electronic markets is to achieve dominant market share in an industry or provide intermediation services across a number of industries. As traditional technology with low entry costs is replaced by systems based on information technology, which has large fixed costs, the new economics of intermediation may favor firms with access to a wealth of resources, which can leverage their know-how in different industries and defray their development expenses among several systems. Firms with related organizational and technological expertise are attempting to build on their customer bases, establish themselves as information utilities, and dominate the provision of intermediation services. IBM, General Electric (through its GEISCO subsidiary), and General Motors (through its EDS subsidiary) are emerging as major players among the firms positioning to compete in this arena.

These information intermediaries are likely to enter individual markets in partnerships with industry participants that can provide industry-specific expertise. Conversely, buyers and sellers in a number of industries are discovering that they cannot develop these systems competitively without the help of a partner with systems expertise. Even well-established, sophisticated players like the providers of airline computer reservation systems are succumbing to this trend. As maintenance costs increase and systems require major upgrades to incorporate developments in communications and user interface technology, airlines find that they need partners. For example, Texas Air has agreed to sell to EDS 50 percent of its System One (the fourth-largest CRS) for over $250 million as part of an agreement that would outsource to EDS the operation of most of Continental's computer systems. AT&T is negotiating with TWA, Northwest, and Delta for a piece of third-largest WorldSpan. Even AMR (the parent of American Airlines) has indicated a willingness to sell up to 50 percent of SABRE, the largest CRS, at $15 million for each 1 percent, placing on it a total value of $1.5 billion (*Business Week,* 1990).

A substantial part of the economies of scale and scope enjoyed by large intermediaries comes from the computer and communications networks underlying all electronic marketplaces. If access to the necessary infrastructure becomes available, players with expertise in particular industries may introduce market systems, resulting in a proliferation of such systems. The government-sponsored infrastructure of the Minitel system in France illustrates this possibility, having sparked thousands of intermediation services, ranging from matching buyers and sellers of vintage wines to brokering industrial parts.

Similarly in the U.S. market, intermediaries like AT&T, MCI, SPRINT, the regional phone companies (RBOCs) and other third party value added network providers are increasingly offering access to their network infrastructures through expanded telecommunications services, such as high capacity switched digital services, ISDN, and complete customized network management. As network services become commodity offerings with relatively low fixed charges, they are likely to cease being a major factor in the provision of electronic market systems. The advantage currently enjoyed by big intermediaries is thus likely to dissipate, except possibly in the offering of very complex large scale systems spanning wide geographical areas.

6. Conclusion

This article focuses on the potential of electronic marketplaces to reduce buyer

search costs as their salient characteristic. It identifies certain other characteristics as relevant to a strategic analysis of these systems, namely network externalities, technological uncertainty, switching costs,, and economies of scale and scope. While a detailed theoretical treatment of these characteristics lies outside the scope of this article, an attempt has been made to address their most important strategic implications.

With the notable exception of the economics of system development, the applicability of these economic characteristics to electronic marketplaces has not been empirically documented in the information systems literature. Although we assumed the validity of these characteristics based on existing anecdotal evidence, a formal verification of their relevance for electronic marketplaces and other types of information systems is an important direction for future research.

Electronic marketplaces are a fact of life and are becoming more prevalent every day. Economic theory supports the common argument that these systems hold great promise for improving interorganizational coordination in market settings. These economic efficiencies can create potential opportunities for information intermediaries; yet when the technology becomes commonplace, profits will be competed away for intermediaries who have not achieved some form of sustainable advantage. The underlying economies of scale may enable certain firms to leverage their system development expertise, installed networks, and customer bases in order to become information utilities and possibly donate the provision of intermediation services.

Electronic market systems are likely eventually to become a strategic necessity and part of an industry's infrastructure; it seems that neither size nor being the first mover will guarantee a sustainable advantage or the appropriation of a favorable share of system payoffs. Clemons and Row's (197) view that sustainable advantage requires the control of unique resources has been supported by a number of case studies of interorganizational systems, such as the one by Clemons (1990) and Clemons and Weber (1990a; 1990b). Intermediaries who do not achieve some form sustainable advantage can try to exploit profit opportunities for as long as they last and may attempt to control the transition to a more competitive environment and bias the final outcome in their favor.

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