

MARKET-ENABLING INTERNET AGENTS

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Abstract

The growth of the Internet offers a vision of ubiquitous electronic commerce. A particularly exciting feature of Internet commerce is the ability to automate the search for price or other product information across multiple suppliers by using an “agent” to retrieve the relevant information. The use of such agents has the potential to dramatically reduce buyers’ search costs. We argue that such agents effectively transform a diverse set of offerings into an economically efficient market and that their use should therefore be analyzed in these terms.

In this paper, we present a simple model of the competitive effects of agents used to support purchasing. The model suggests that agents can be successful for diversified goods but resisted for commodities and near-commodities. We illustrate our model by analyzing the situation of current electronic commerce ventures on the Internet.

1. INTRODUCTION

Networks bridge geography, distance and culture, creating new opportunities for interaction and competition. Debate is increasing on how the on-going digital and communications revolution will change the nature of commerce in particular. The growth of commerce on the Internet has attracted special interest. Since the Internet is a public network, and increasingly ubiquitous, it neatly addresses the problem of connectivity between potential trading partners (Neches et al. n.d.), extending even to the general consumer.

Clearly there are many potential obstacles to Internet commerce — the need for security, authentication and payment schemes are frequently mentioned, as are the lack of negotiation protocols or even commonly accepted business practices — but these are rapidly being addressed. As a result, it is predicted that on-line sales will be \$3.4 billion in 1996 and grow to \$230 billion by 2000 (Burger 1996); transactions on the Internet itself were estimated at \$436M in 1995, up from less than \$20M in 1994, and are expected to grow to \$46B by 1998 (ActivMedia 1996).

Even so, there are already numerous Internet merchants, selling products including music CDs and computer hardware and software. The existence of multiple suppliers for some goods leads to the possibility of an electronic market for these goods (Benjamin and Wigand 1995), in the specific sense of multiple suppliers whose prices and offerings are compared for each sale. Following Wigand, Picot and Reichwald (in press), we define a market as the collection of “all goal-seeking firms, government agencies or individuals producing some commodity, as well as all firms, government agencies or individuals purchasing the commodity.” Wigand, Picot and Reichwald note two characteristics of a market that are important for our analysis:

1. many buyers and sellers, meaning that single individuals or firms do not greatly influence the price of the good,
2. homogeneous products, meaning that buyers do not have strong preferences about which supplier they buy from.

Electronic markets are those in which transactions, such as inquiry about products and services offered, comparison of offers and purchases, are carried out using information technology and telecommunications networks. Note that we do not consider as electronic markets a single merchant who stocks multiple products or a “mall” hosting multiple merchants but lacking features for making price or other comparisons across merchants. This definition excludes many self-called markets, such as Industry Net.

A particularly exciting feature of electronic markets is the ability to automate the search for price or other product information using an “agent” to retrieve the relevant information. The use of such agents has the potential to dramatically reduce buyers’

search costs (Bakos in press). We argue that the use of such agents effectively transforms a diverse set of offerings into an economically efficient market and that their use should therefore be analyzed in these terms.

Electronic markets have been the subject of extensive research, mostly economic, and this work provides a useful starting point for the analysis of agents. However, agent-created markets differ significantly from “traditional” electronic markets in two ways. First, since the Internet is non-proprietary and public, switching and investment costs are dramatically reduced. In particular, such markets may not require any explicit pre-agreement between buyers and sellers. Second, because agents can potentially search multiple suppliers in parallel, the marginal cost of searching (although not the average cost) is essentially zero.

In the remainder of the paper, we discuss the function of market-search agents, and develop a simple model for the role of such agents in electronic commerce. The model focuses in particular on decisions by suppliers to cooperate or resist the use of agents. We believe that analysis of the incentives for participation in an electronic market is a necessary precondition for their development. In this, our goals are similar to those of Reimers (n.d.), who analyzed the institutional and incentive structure pre-conditions for electronic markets. We then use that model to predict the kind of goods for which agents are likely to be successful and compare these predictions with examples of current Internet commerce to illustrate and test the model. We believe that the model, simple as it is, provides a theory-based explanation of experiences with electronic markets by individuals and organizations, as well as a starting point for further research and formalization.

2. ELECTRONIC AGENTS ENABLE ELECTRONIC MARKETS

An agent is a program, simple or “intelligent,” that operates autonomously to retrieve and process information on a user’s behalf. (Other researchers, e.g., Etzioni and Weld [1995], add additional characteristics such as personality or mobility but these attributes are not critical for our analysis.) Many simple agents are already available to assist in navigation, information retrieval, etc. (e.g., O’Lary 1996). In this paper, we focus on use of agents to support a potential purchase decision. The idea is that a computer program can retrieve (or even negotiate, e.g., Chavez and Maes n.d.) price, availability and other product information for a desired good and identify the supplier with the lowest cost or best set of features, thus automating part of the purchase process and increasing market efficiency. When such an agent operates across the range of suppliers offering a product (what Yovovich [1995] referred to as a buy-side agent, versus a sell-side agent), it enables an electronic market comprising the offerings of multiple suppliers.

There is evidence that even simple agents reduce a buyer’s search cost. For example, Doorenbos, Etzioni and Weld (1996) report on the use of an agent called ShopBot in a trial with seven users. They compared the performance of users using only ShopBot, those given a list of twelve supplier URLs and Internet search tools, and those using only the search tools. Users with ShopBot finished much more quickly (13 minutes versus 112 and 59, respectively) and found generally lower prices. Of course, the small sample size precludes conclusions of statistical significance, but the magnitude of the differences indicates the promise of this technology.

It is clear there are already many examples of electronic markets for specific goods, e.g., airline reservation systems, stock markets, as well as electronic markets for electric power (Johnson 1995), airliner parts (Malone, Yates, and Benjamin 1989, p. 167) and even seeds (SeedQuest OnLine, <http://www.seedquest.com/>). Agent-created markets may evolve from these or existing single-source electronic channels, as predicted by Malone, Yates and Benjamin (1989, p. 166), but differ in at least two significant ways.

- First, the increased connectivity offered by the Internet and smart agents makes it possible to create markets without extensive pre-agreement among suppliers on technical or even business issues. The use of a public network and non-proprietary standards significantly reduces the capital investments needed for joining a market that results in barriers to entry and essentially eliminates switching costs. In fact, a market may even be formed without the explicit agreement or cooperation of the suppliers, making it much more difficult for them to control the market.