ARTICLES

On-Line Searching: Costly or Cost Effective? A Marketing Perspective

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The value of acquiring and using information is not well understood. Decisions to purchase information are made on the basis of the perceived need for the information, the anticipated benefit of using it, and the price. The current pricing of on-line information services, which emphasizes the connect hour as the unit of price, does not relate the price of a search to the value of a search, and the education programs of on-line vendors and database suppliers concentrate on the mechanics of information retrieval rather than on the application of information to the customer's problem. The on-line information industry needs to adopt a strong marketing orientation that focuses on the needs of customers rather than the needs of suppliers or vendors.

FACTORS INFLUENCING THE VALUE OF INFORMATION

As marketing managers for Chemical Abstracts Service (CAS), we bring the perspective of marketing professionals to the question of the cost effectiveness of on-line searching. Marketing professionals are concerned with the processes through which people identify and satisfy their needs and desires. In particular, this paper is concerned with how people obtain the information services they need and want, why people buy what they buy, and what influences their decisions.

So the marketing question is "Why do people buy on-line services?" Is it because they are cost effective? That answer seems to make sense until one realizes that there have been, to our knowledge, no definitive studies of the value or cost effectiveness of on-line information services,[1] nor is cost effective a term defined in today's dictionaries. Thus, to continue the discussion, we need a useful working definition of the term "cost effective". One such definition is this: "When a customer perceives that the value received from an information service is equal to or greater than the cost of acquiring and using the service, the service is said to be cost effective".

To a marketing professional, the key concept in this statement is VALUE AS PERCEIVED BY THE CUSTOMER. Marketers of on-line information services must be sensitive not to what they think they are selling but instead to what *customers think they are buying*. It is customers' perception that determines their buying behavior. The cosmetics magnate Charles Revson once said, "In the factory we make cosmetics, but in the drugstore we sell hope". Discussions about perceived value and, by inference, the customer's willingness to pay for that value are prime marketing topics regardless of the product or service under discussion. Needs, perceptions, and behaviors of customers are the everyday fare of marketing professionals.

With these marketing ideas in mind, the original question can be restated as follows: "ARE ON-LINE INFORMATION DELIVERY SERVICES VALUABLE?" If they are valuable to the customer, then where does this value arise?

On-line services are not valuable in and of themselves. They merely ADD value to existing information through improved packaging and distribution. People do not use on-line services primarily because it is fun or interesting to operate a computer terminal. Instead, on-line services are used because they provide access to information, and it is *information* that users want and need. Thus, on-line delivery of information services adds incremental value to the basic information. To determine the additional value provided by having information available on-line, it is first necessary to consider the value, or the "cost effectiveness", of the acquisition and use of information in any form. Therefore, it may be helpful to discuss some of the factors that influence consumers' perceptions of the value of information. Six points taken from an article by Hayes and Erickson[2] address some of the important factors influencing a customer's perception of the value of information.

Evident Costs. First, the costs of acquiring information are evident. That is, information activities involve visible and measurable costs in staff, equipment, and purchases.

Uncertain Return. Unfortunately, while costs are obvious, information activities are characterized by very uncertain returns. Rarely are positive results of decisions directly attributable to availability of the information upon which they are completely or partially based. Good (and bad) decisions are often made without information; in some cases, decisions are made without regard to available information.

Long-Term Return. Third, even when the benefit of obtaining and using information is evident, it is likely that the benefit will be a long-term one, while the expense is incurred in the short term. Investments in information are long-term investments.

Not Directly Productive. While some information available on-line today is used directly in production processes, most on-line information resources have been valuable mainly for planning and research. Use of information can lead to better use of other resources, but it does not commonly contribute directly or measurably to production efficiency.

Overhead Expense. As a result of these factors, the information function has generally been viewed as overhead expense in most organizations. This has been true even when information specialists have charged back the cost of searching to departments that request searches, since that made the search a department overhead expense rather than an information center overhead expense. The view of information as an overhead has made information activities particularly vulnerable to overhead "cost cutting". (More organizations now appear to be charging on-line services as direct project costs, which might enhance the possibility of the services surviving cuts during "hard times".)

Differential Use. Finally, experience suggests that most use of scientific and technical information services, particularly

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on-line services, is made by a few people—those who, at least intuitively, already know the value of information and how to use it. People who do not understand the value of information tend not to use information services. As a result, they do not have the opportunity to learn about the value of information.

These points suggest strongly that information does not have quantifiable economic value. Managers cannot say, "I know it is a good business decision to spend $X for this printed product or for that on-line search because the return on investment will be Y%".

How then do individuals make their purchase decisions for information services? All purchases start with a need, or at least a desire. The customer may need to know, for example, whether a given line of research has been previously explored, whether a change in manufacturing technology is likely to yield lower costs or higher profits, or whether a given family of chemicals has been tested. To help answer such questions, customers need to identify and retrieve certain information or to determine that the information does not exist. The need for information and the anticipated benefit of using information are two major driving forces in the decision to purchase an information resource.

Price, or ability to pay, is another important factor. If need or benefit is great compared to price, the customer will probably decide to buy the service. High need and low price will almost certainly produce a sale, and low need and high price almost as certainly will result in a "no sale". The other possible combinations—low need and low price and high need and high price—produce unpredictable results.

With on-line searching, price may be known, but the anticipated benefit is not quantifiable. Performing an on-line search is like a game of chance. You may or may not win. You may or may not find the information you are looking for. This means that on-line searching has an element of risk. Therefore, the searcher's sensitivity to risk is another factor that determines whether he or she will or will not perform the search.

Different people have different views about the importance of these factors. One person's need for information, ability to pay, and attitude toward risk are almost certainly different from anyone else's. This leads to another complication in considering the value of information, namely, that a person's perception of value depends on job responsibilities, position within the organization, and personal biases. These considerations are not independent, and they combine, in each individual, to give a unique perspective of value.

PURCHASERS, SEARCHERS, AND CONSUMERS

People may assume any of three roles in the process of acquiring and using information services. An individual's view of the value of information depends on whether he or she is a purchaser, a searcher, or a consumer of information.

There is, in each organization, at least one *purchaser*: the person who authorizes payment for information services. In simple terms adequate for this discussion, a *searcher* is "the person who formulates search strategies and uses on-line systems to carry out searches". The *consumer* is the individual who causes searches to be done and actually puts the results to use.

Purchasers may not be directly associated with an organization's information group. They may or may not have an understanding of the value of the service whose cost the purchaser must approve. Clearly, this type of individual has a unique view of need, price, and risk. One example—a real one—can illustrate this unique point of view. Our organization, as a vendor of on-line services, has been asked by high-level purchasers to guarantee not only completeness of retrieval but also accuracy of the records retrieved. In other words, these purchasers, who were responsible for spending money for their organization, wanted a guarantee from the vendor that the information retrieved would be 100% accurate. CAS endeavors to be both complete and accurate in its coverage of chemical and chemical engineering publications, but we, and most of our users, realize we cannot be absolutely complete or 100% accurate, nor can anyone guarantee that any search, manual or on-line, will retrieve all references pertinent to the question. But from the perspective of the "pure" purchaser, it makes perfectly good sense to request perfect information.

Searchers have a different set of concerns, but by no means do all searchers have the same concerns. Searchers usually have the best grasp of the immediate cost of performing a search. In many cases, they can make quick decisions as to the likelihood of finding requested information, and they can estimate, from experience, the likely cost. Their view of the need may vary greatly depending upon the importance of the person who requested the search and that person's relative position in the organizational structure. To searchers, price and risk are most likely to be related directly. From their perspective, low price often equals low risk and high price equals high risk.

Consumers—some call them "users" or "end users"—apply the search results. Some consumers know the nature of searching and some do not. Some appreciate the limitations of various information services and some do not. Some can weigh need, price, and risk and others cannot. The idea that unites all consumers is that they have an information problem and they want a solution. The considerations of price and risk often take a back seat to their immediate information problem.

Although this discussion has separated the roles of purchaser, searcher, and consumer, these roles are combined in all possible ways in real life, further complicating perception of value. The same person may be both a purchaser and a searcher, or both a consumer and a searcher, or perhaps both a purchaser and a consumer. In some cases, one person may play all three roles. From a marketing point of view, however, this confusion of roles can disappear if one thinks in terms of the composite purchaser/searcher/consumer as the "customer".

Consider now how the suppliers and vendors of information services have acted to influence customers in two important aspects of one-line information that relate directly to the customer's perceived value of information. These aspects are pricing and education, and they are, to the marketing professional, tools of the marketing trade not only in on-line services but elsewhere. And it is a fundamental of marketing—perhaps *the* fundamental—that sellers can act in various ways to influence behavior of customers.

PRICE

Prices have symbolic aspects that affect a customer's perception of value. On the surface, it would seem that we should judge value independently of price. However, we have been conditioned to believe that items that are inexpensive are "cheap" and items that are expensive are "valuable". How many times do consumers opt for a more expensive item over a less expensive one with the feeling that, because it is more expensive, it certainly must be of higher quality? In fact, there is often no evidence to support such assumptions. Because one cannot be a totally informed customer—there is too much to know—when in doubt, customers tend to rely on the symbolism of price and opt for the highest priced item they can afford. Thus, consciously and unconsciously, we allow the price of a service to influence our perception of its value. Moreover, customers tend to interpret prices on the basis of implicit

assumptions. For example, customers must assume that the items they pay for are the items of value. But in the delivery of on-line information, the customer often pays for something that is *not* the item of value, i.e., the information. Vendors and suppliers of on-line information have created a real problem for customers in evaluating the value of information. In traditional on-line systems, the item that customers pay for is the connect hour. Today, $45 per hour is thought a low price; $100 per hour is perceived as a high price. Customers of on-line services are therefore encouraged to believe that the connect hour, not the information, is the item of value. This is an example of poor marketing by both suppliers and vendors.

How ingrained this common misconception has become was graphically demonstrated to us when, in 1980, prior to the introduction of the CAS ONLINE service, CAS conducted some market research to gather information about acceptability of new methods of pricing on-line services. One proposed new method of pricing was to charge a fixed fee for every search, rather than a fee for each hour of connect time. One of our market researchers discussed this proposal with a customer who was a knowledgeable information specialist in a major U.S. firm. Thinking aloud, the customer said, "With your new pricing scheme, I could perhaps get a search done in 30 minutes for $100. This type of search is worth $100, and at 30 minutes each that would be $200 per hour, a little high, but worth it for the information I could get. But," she said in a startled tone, "if I did the same search in only 15 minutes, using this new price scheme, it would still cost me $100 for the search. At 15 minutes each I could conduct 4 searches in 1 hour and that would be $400 per hour! At that price your service is just too expensive". Not only did this individual believe that the value was in the connect hour, she also did not consider the cost savings of completing a certain amount of work in 15 minutes instead of 30. Overemphasis on the connect hour by vendors and suppliers has caused many customers to believe that connect time is the item of value in on-line searching, not the search and its results. Charging for connect hours is analogous to charging for diamond rings by finger size instead of by stone size.

Connect-time pricing also affects customers' behavior by encouraging search habits that do not make optimum use of on-line technology. Searchers tend to rush through searches and use inefficient search strategies so as to minimize connect time. In addition, many searchers do not take the time for the on-line equivalent of browsing, a process by which valuable information is found serendepitiously in printed services.

On-line services have fluorished despite the pricing policies of vendors and suppliers, not because of them. The history is tangled, but the primary reason for this pricing problem is the traditional, parochial roles of database suppliers, vendors, and customers. Suppliers are interested in providing information to customers and in receiving appropriate monetary return. However, suppliers for the most part have chosen to remain naive about on-line delivery of information. There are two reasons: lack of technical expertise and unwillingness to place resources in an area that has generated relatively small amounts of revenue. For too long, suppliers ignored on-line delivery. Vendors, however, are very interested in on-line delivery mechanisms and, by comparison, not very interested in database content. They price according to something that is of value to them—connect time, which is simply a surrogate for computer use. But connect time really is an item of no intrinsic value, of no value to suppliers, and of consequence to customers only in that it determines the price of a search in a way unrelated to value of the search. Customers are interested in buying information services and usually do not differentiate between the delivery system and the information it contains in the same way vendors and suppliers do. The result is that customers may find it difficult to perceive a clear relationship between the price of on-line information services and the value they deliver.

EDUCATION

Education refers not to training customers in mechanics of on-line searching but, instead, to a much more sophisticated process in which suppliers and vendors learn about information needs of customers and then teach customers about how on-line services can help meet those needs. Suppliers and vendors, if they are to survive in their present roles, need to change their thinking about the learning and education process in the on-line industry. They must improve their understanding of how customers perceive the true value of on-line information services. In short, they must adopt a marketing orientation. For the past 10 years, the on-line industry has emphasized search techniques, database content, and mechanics. Suppliers and vendors alike emphasized what could be delivered, not what customers wanted. Our business is old enough and mature enough now to overcome its infatuation with the technological novelty upon which it was originally based and to become objective and analytical about applying technology to true wants and needs of customers.

Before we can do this, however, two aspects of the on-line industry's education process need substantial improvement. (1) Vendors and suppliers need to recognize that they do not understand needs and problems of customers. They must act to educate themselves. (2) Vendors and suppliers need to work together more closely to develop educational programs and customer-support activities that address those needs and problems effectively.

We believe these improvements will come faster because of the vertical integration that is now taking place in the information industry. Some vendors are creating their own databases, some suppliers are entering the vending business, and "instant vertical integration" has occurred when one company purchases both a major vendor and several database suppliers. The motives for these actions may vary, but the effect on the educational problem is positive, primarily because the inherent problems and artificial barriers of the three-way supplier/vendor/customer triangle are removed. The integrated information supplier/vendor is in a position to take a broad view of customers' needs and problems.

CONCLUSIONS

What does all this say about the original question "IS ON-LINE SEARCHING COST EFFECTIVE?" A marketing professional should be willing to infer the answer from user behavior. The rapid growth in use of on-line services is adequate evidence that customers find on-line searching to be cost effective. That is, customers who use on-line searching perceive its value to be in excess of its cost. Again, however, the fundamental value is not that information is on-line but, instead, is intrinsic to the information itself. However, putting information on-line does add value.

There are three major marketing problems with today's systems for producing and delivering information on-line. First, the *value* of acquiring and using information in *any* form is not well understood, is not factored into management's decision processes, and does not lend itself to simple analysis. Customers perceive value, but cannot say how great that value is. The second major problem is that current pricing techniques—emphasizing connect hour as the unit of price—are counterproductive. That is, they inconsistently and randomly relate the price of a search to the value of a search. They encourage customer behavior that does not take advantage of the full benefit of the information resource. Finally, the education programs of on-line vendors and database sup-

pliers are inadequate. The industry has concentrated on teaching and learning the mechanics of information retrieval rather than the fundamentals of applying information to customers' problems.

Much of the confusion about the value of on-line searching has been created by database suppliers and on-line vendors. Lack of cooperation between vendors and suppliers works to the detriment of customers. The on-line information industry needs to adopt a strong marketing orientation that focuses on the needs of customers rather than the needs of suppliers and vendors. Until we, as an industry, focus on the needs of customers, we will not be able to give meaningful answers to questions about the cost effectiveness of on-line searching.

REFERENCES AND NOTES

(1) The Committe on Corporation Associates of the American Chemical Society undertook a study of the cost effectiveness of information systems in the late 1960s prior to the advent of on-line services and developed a semiquantitative measure of the cost effectiveness of the systems in use at that time. See "Cost-Effectiveness of Information Systems". A Report on the Subcommittee on Economics of Chemical Information of the Committee on Corporation Associates American Chemical Society; American Chemical Society: Washington, DC, 1969.

(2) Haynes, R. M.; Erickson, T. "Added Value as a Function of Purchases of Information Services". *Inf. Soc.* **1982**, *1* (4), 307-338.

Cost Effectiveness of On-Line Searching of Chemical Information: An Industrial Viewpoint†

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Cost comparisons and the cost effectiveness of on-line searching of information are reviewed. Topics discussed include on-line vs. manual searching, charge-out of search costs, efficacy of on-line searching, on-line vs. batch computer searching, vendor system comparisons, networking, searcher productivity, telecommunications, role of the intermediary, search transmission rates and on-line charges, editing of recorded searches, and increasing cost of on-line searching of chemical information.

In the 10 years that on-line searching has been more or less readily available, there have been several publications and presentations on the cost effectiveness and cost comparisons of various aspects of on-line searching. Two papers by Almond and Nelson[1,2] are key papers for evaluation of cost effectiveness of chemical on-line searching. These papers describe formulas for calculating and evaluating on-line search performance. The formulas are for on-line usage in general, but the specific examples cover chemical databases and patent searching in particular.

Logically, the first papers to appear on the cost effectiveness of on-line searching dealt with comparisons between on-line and manual (or printed index) searching. Most authors reached the conclusion that on-line was more cost effective,[3] and most of the subsequent discussion revolved around what costs were to be included.[4]

Of course, some of the costs involved in searching of any kind vary greatly depending on place and person, so potential on-line searchers had to apply and adjust the conclusions of others to their own professional and budgetary environment. The hardest decisions to make were for those information professionals attempting to justify on-line searching in an environment where no searching service was previously provided because it was too expensive, not staffed for, or both. Those institutions that already provided searching services and charged their customers for the service probably had an easy time justifying on-line searching. Qualitative comparisons could be made by experienced searchers in the course of providing the service, and with a charge-out system already in place, the service could be paid for by the customer.

That was the situation at the Amoco Research Center. As soon as subscription fees were dropped by the on-line vendors in July 1973, a contract was signed, and the Information Services Division at Amoco has been using on-line ever since.

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Although charging for on-line searching services can inhibit to some extent experimentation and learning experiences by the searcher, those organizations that charge the customer for all searching costs probably began searching on-line earlier and were better able to justify on-line searching services to their management. By all searching costs, I mean out-of-pocket costs (results of charges made from outside the immediate organization including computer service charges, both corporate and from outside the corporation) plus charges for the searcher's time (made at the current corporate rate). For those organizations that only charge for out-of-pocket costs, on-line searching may also be harder to justify because staff is probably budgeted on overhead while nonpersonnel costs may be budget-line items and more vulnerable to budget restrictions.

On-line searching should be justified on overall effectiveness as well as cost effectiveness. At the Spring 1975 ACS meeting, for example, Buntrock compared searching *Chemical Abstracts Condenstates* on-line and using the printed *Chemical Abstracts* indexes.[5a]

Those who have only searched on-line, and have never searched manually, often seem to think of on-line searching as an end rather than a means to the end. On-line searching should be considered a tool, albeit a very valuable tool, in providing searching services. I believe a typical chemist or engineer should first consult "arms-reach" references to answer everyday questions, books on their shelf, the colleague next door, etc., and then consult secondary sources, especially on-line, only when the material cannot be found in the readily available sources or if it is known that it cannot be found there.

On the other hand, some are not yet aware of all that can be found in on-line sources, including the answers to many so-called reference questions. A real-life example at Amoco was a request for the papers by Smith at Stanford on artificial intelligence. Although one approach would be to use reference works such as *American Men and Women of Science* and *Directory of Graduate Research*, one readily finds that only an on-line search of *Chemical Abstracts* works. Dennis Smith has never appeared in *American Men and Women of Science*,

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