Marketing Research in the Scientific and Technical Information Services Industry: Development and Future Directions*

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The general availability of government-sponsored studies on scientific and technical information (STI) provides an opportunity to trace the development of "marketing research" in a specific industry. A review of this research tradition revealed two major orientations; a series of "user"-oriented studies, followed by "systems"-oriented studies. It is suggested that traditional STI user studies may have produced "myopic" research results, and systems studies may have produced "macropic" research results for STI policy decisions. An emerging "managerial" orientation is identified which espouses the definition of a more meaningful unit of analysis as the focus of future research efforts.

Introduction

The case of the scientific and technical information (STI) service industry provides an unusual opportunity to evaluate the development of marketing research within a specific industry. This is due in part to the involvement and support of the National Science Foundation, whose goals are parallel in general to those of STI service producers; that is, to provide STI users with the right kind and amount of information at the right time and place so they may effectively carry out their research efforts. In pursuit of these goals, the NSF has, in effect, sponsored a large proportion of the "marketing research" in this industry. Consequently, research, which is traditionally proprietary among marketers of industrial products and services, is available to the public in the case of STI.

Given the general availability of this research tradition, the purpose of this article is to track its development to identify major phases or stages which might be instructive to both STI marketing researchers and industrial marketing research in general. A review of this research tradition revealed two research orientations; a series of "user"-oriented studies, followed by more "systems"-oriented studies. A brief review of these two phases of development are presented in the following sections. Subsequently, a third and rapidly emerging "managerial" orientation is described. It is proposed that this last phase is a synthesis of the two earlier research orientations.

User Studies

The implicit assumption of user-oriented studies is that if one understands user needs and problems, one can design a satisfactory information system [1]. Consequently, beginning in the early 1950s, large numbers of user studies were undertaken; e.g., Davis and Bailey [2] cite 438 studies of usage behavior. Some of these studies are reviewed by Allen [3], Barnes [4], Brittain [5], Ford [6], Lancaster [7], Lin and Garvey [8], and Menzel [9].

These user studies are primarily descriptions of information needs, gathering habits, preferences, and usage behavior. Users have been studied by (1) subject discipline (chemistry, physics, biology, etc.), (2) type of scientist (pure, applied, technologist), (3) work experience (elementary to advanced research), (4) kind of organization (academic, industrial, etc.), and (5) stage of project completeness (beginning to end) [10]. Unfortunately, most of these studies present data relevant to library situations reflecting only local conditions, and lacking potential for generalizability [11].

Besides the typical user profiles, a few generalizations have emerged from these early user studies. For example,

(1) Substantial losses occur because potentially available information is not found in the early stages of the research project [12].
(2) For some purposes, abstracts offer no advantages over simple lists of titles and selected keywords [13].

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(3) There is a general low level of awareness of library services among potential users, as evidenced by low usage of abstracts, indices, card catalogs, etc. [11].
(4) Usage behavior follows the "80/20 rule": 80% of the demand for information can be satisfied by 20% of the stock in a library [14].

The problem with such generalizations from these kinds of user studies is that they do not provide information that can be used for decision-making or information system design in specific applications [15]. For example, a study by the Advisory Council on Scientific Study [16] indicated that scientists equally preferred "longer" *and* "shorter" papers and equally preferred papers with "more" *and* "less" detail in them. Individuals expressed clear preferences, but, in the aggregate, responses were contradictory and ambiguous. The implication is that individual differences exist among STI users, and that information needs and habits are far more complex than these studies have shown.

As Paisley [17] notes, part of the problem in obtaining conflicting and overly general results is due to methodological deficiencies in many of the earlier studies. Furthermore, the context or the system within which the user works had been neglected, hence ignoring critical variables which may affect user needs or preferences. For example, a scientist should not only be viewed as an individual with motivational and personality characteristics, but as someone embedded in a work group, a formal organization with unique structure and managerial style, membership and reference groups, an invisible college, a political system, a legal/economic system, and a culture. From these various levels of social structure, sets of relevant dependent and independent variables can be identified, operationalized, and studied to better understand STI usage behavior. Multivariate analyses of the various relationships among the variables would be necessary, and individual differences recognized and analyzed.

In summary, early STI user studies were characterized by descriptive investigations of user needs. Data were primarily collected by self-report questionnaires, analyzed with simple statistical tabulations, and reported at the aggregate level. This produced frequently contradictory results, overlooking the complexity and diversity of user behavior.

System Studies

Though the user studies provide a broad base on which to build, research using more sophisticated methods began to emerge in the late 1960s and 1970s. Borrowing concepts and methodologies from the behavioral sciences, investigators focused on the user in an environmental or systemic context. Some selected findings are presented below:

(1) Perceived accessibility is the single most important determinant of the extent to which an information channel is used [18].
(2) "Technological gatekeepers" act as organizational boundary agents for the flow of technical information from outside sources (i.e., a two-step information flow hypothesis [19].
(3) Use of informal contacts as sources of information is high relative to formal sources (i.e., the "invisible college" hypothesis [20]; however, this varies according to the user need or problem. Scientists use formal sources for facts and theories, and informal sources (e.g., personal communication) for procedures, techniques, materials, and apparatus [21].

The focus of STI user studies changed from isolating and describing the user to studying the relationship of the user to his or her environment (social and informational). Concern with methodology, operationalization of variables, and the development of "middle-range" theories is evident. The user is viewed in a work group, in organizations, across geopolitical boundaries, and with respect to the kind of informational problem experienced. There has even been concern with psychological information processing of users. For example, Levine and Brahlek [22] used an experimental setting to evaluate information seeking under realistic conditions relevant to the design of information systems. A series of four experiments were conducted in the following areas: (1) rate of information arrival, (2) number of alternatives, (3) resources available for information purchase, and (4) unknown limits to the availability of information. Such studies utilizing alternative research designs to the standard survey questionnaire show promise in the development of models and findings related to STI usage behavior.

Evaluation and Synthesis: A Managerial Orientation

Although the system studies represent theoretical and methodological improvements over earlier user studies, both kinds of studies tend to ignore the link between the decisions of STI marketing managers and the behavior, satisfaction, attitudes, and effectiveness of STI users. Simply focusing on user needs and behavior, as an individual or as an individual in the context of an environment, does not guarantee satisfactory product and service design and ultimately organizational purchase decisions. There are other relevant organizational members besides users who may have significant input to the decision to acquire an STI service. Consequently, the focus on users alone or in a systems context may be a myopic view of the problem of better designing and marketing STI services to firms which are potential buyers. A synthesis of the two views into a managerial orientation is recommended—and there is some evidence to indicate support for this orientation.

Several recent events have given impetus to the view that libraries and information centers require the application of modern management techniques to operate ef-

fectively [23]. One event in particular is the "Management Review and Analysis Program" launched by the Association of Research Libraries [24]. This involves a review of (i) environmental effects on libraries, (ii) basic managerial functions (planning, budgeting, organizing, marketing, staffing, etc.), and (iii) the generation of recommendations to bring present library operations more in line with goals and objectives.

Knowledge of environmental effects (political, economic, legal, cultural, technological, etc.) on information center management and relevant decisions is limited. Baumol and Marcus [25], considering the effects of inflation on library management, provide an illustration of this type of study. Most efforts on the economics of information have focused largely on the information structure of markets; i.e., the goal of these type studies is to incorporate information flows into models of markets to rigorously assess the impact of information on market performance [26]. Additional studies can be expected which will examine not only the value of information, but the effects of the general economy on STI management and the nature of the STI sector as a developing marketplace [27].

The failure of user studies to result in clear policy decisions for STI systems design, and the general reluctance of users to "use" libraries, compelled some information theorists to consider the managerial function of marketing. Veazie and Connolly [28], concerned with the effects of a service charge for hitherto "free" information to users, recast the STI problem into a marketing framework (consumer markets and the "marketing mix"). Similarly, Keuhl [29] notes four specific areas in which marketing can make contributions to information science: (1) consumer behavior research, (2) channels of distribution, (3) organization theory, and (4) market segmentation.

The treatment of major marketing decision variables is scant in the STI marketing literature, but with a decided skewness to promotion. For example, Murdock [30] considers information as a "product" with subjective value, hence subject to a wide variety of economic analyses. Weinstock [31] discusses product planning and system design for the *Social Science Citation Index* of the Institute for Scientific Information (ISI). Cawkell [32], also reflecting on ISI's marketing, discusses the role of marketing research prior to new product introduction.

Greenberger et al. [33], in considering the marketplace for information services, discuss distribution and pricing:

> In a wholesale and retail system, the retailer provides local aid and information to customers and charges a markup to cover the costs of this support. Present-day computer centers operate as combined wholesale–retail outlets. When joined with a facilitating network they can provide retail outlets to local users for distant network wholesalers, and at the same time, can serve as wholesalers to the network. Because the economics of these two functions are different, there may be an evolution toward a more clear-cut distinction between wholesaling and retailing in the future. Some high volume users with little need for user support may not be willing to pay the overhead burden currently charged for support services at many computing centers and may prefer to deal directly with specialized wholesale facilities. The much larger group of users is likely to continue to require good retailer support services.

There have been a number of authors concerned with the promotion of information services. Stern et al. [34] discuss and evaluate three methods of promoting SDI (selective dissemination of information) services: (i) opinion leadership (word-of-mouth advertising), (ii) blitz (direct mailout with follow-up), and (iii) direct telephone solicitation followed by meetings and trials of the service. Blitz and telephone solicitations appeared to be more effective than personal contact (i.e., word of mouth). Somewhat contradictorily, Carmon and Park [35] found word of mouth to be effective. This contradiction may be explained by the stage of the buying process which the potential buyer is in. For example, the effectiveness of promotional efforts may vary according to whether the buyer is beginning an information search for STI alternatives or is evaluating the alternatives for a purchase. Clearly, further research is needed to better understand the effects of various promotional methods.

Tell [36] found that for in-house marketing, the use of sales letters, selective mailing of brochures, and trade journal advertising had little effect, whereas training seminars proved the most effective promotional tool. Hansen [37] found that users were reluctant to switch from CT (Chemical Titles) to CA (Chemical Abstracts) condensates even though CT retrieved only 25% as many references as CA. This possibiliy indicates the relative importance of habit as a characteristic of users.

While these studies are not definitive, they signal the development of a body of managerially oriented research designed to address the problems of disseminating STI in an efficient and effective manner. For example, two recent volumes edited by King and Zaltman [38] and Mason and Kreps [39] contain numerous studies and conceptual papers which reflect a managerial orientation. In addition, Wind and Thomas [40] focus on a number of issues related to the study of organizational buying behavior as the basis for making STI marketing decisions. In particular, the concept of an organizational "buying center" [41] is viewed as the key to understanding the buying behavior of organizations.

The buying center concept implicity recognizes that the user is but one of a number of organizational (and, perhaps, nonorganizational) members in one or more departments which may be involved in the purchase of an STI service. This is a managerially relevant approach in that it defines the boundaries of the "system" under study in terms of a subsystem of those involved in buying. It

goes beyond the limited scope of "user" studies and makes the expansive scope and complexity of "systems" studies more manageable. Thomas [42] provides an overview of several organizational buying behavior concepts and their importance in making STI marketing decisions.

Conclusion

The purpose of the preceding review has been to outline briefly the development of marketing research in the STI industry. The development has proceeded in two recognizable phases: from a focus on the individual (user) unit of analysis to more aggregate systems level of analysis (organization, culture, environment, etc.). By focusing on the objectives and decisions of managers involved in developing STI services, the unit of analysis can be defined more meaningfully in terms of those in organizations involved in the acquisition and use of STI, i.e., the organizational buying center.

To the extent that the development of marketing research in other industries parallels the STI industry, few generalizations can be made. Nevertheless, this review suggests that the determination of the relevant unit of analysis in marketing research may be a far more important decision in the marketing research process than heretofore thought. Unfortunately, as evidenced in the STI case, it is possible to conduct myopic, and even "macropic," marketing research. The role of marketing research in implementing a "managerial" approach to improving the dissemination of STI is fundamental. Consequently, future marketing research efforts in the STI, and in other industries should include a definition of the research problem in terms of the appropriate unit of analysis. In this way, the information obtained can be utilized to make decisions more in consonance with the objectives of the parties involved. That is, producers of STI services can design their product and market it based on information better reflecting the needs of potential "buyers" of the service, and improving the likelihood of a favorable purchase decision.

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