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Problems and Prospects in the Segmentation of the STI Market

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Introduction

The relevance and applicability of marketing approaches to the design and dissemination of STI systems is hardly debatable. Our presence here—at a conference devoted to the marketing of STI—and the continuous National Science Foundation support of research in this area are strong indicators of the inroads marketing has made in this important industrial area.

Market segmentation, as one of the fundamental and most applied theories of the marketing discipline, is thus widely accepted conceptually as one of the key building blocks of any marketing strategy for STI systems. Yet, in practice, most of the STI marketing efforts have ignored the segmentation concept.

This gap between the conceptual acceptance and practical rejection of the segmentation concept can in part be due to the difficulties involved in *implementing* a segmentation research program and utilizing the results in the design of STI marketing strategies. The objectives of this paper, therefore, are to briefly review some of these difficulties and suggest some possible solutions. The discussion is organized around the five major research phases: (1) segmentation problem definition, (2) research design, (3) data collection, (4) data analysis, and (5) data interpretation and "translation" of results.

Segmentation Problem Definition

The segmentation problem definition stage is probably the most crucial and most neglected area of segmentation. This is the stage in which management should ask the question, "Why

segment the market?" In attempting to explicate an answer to this question, management and their researchers should develop a *segmentation model* that specifies the desired bases for segmentation as well as the specification of the desired descriptor variables. The selection of specific bases for segmentation depends on the way segmentation results are to be utilized. If, for example, management concern is with increased usage of STI service by current users, a natural basis for segmentation would be the usage status of organizations in the relevant market. (Note, however, that by restricting analysis to a "relevant market" management is, in fact, adding another level of segmentation. For example, if the relevant market is defined as High Intensity R&D Industries, this serves as an initial basis for segmentation—R&D intensive SICs [standard industrial classification] vs. other SICs.) In addition, possible descriptor variables have to be specified. These variables should include those that can help identify and reach the desired segments (Wind and Lotshaw, 1973).

The specification of a segmentation model is not a trivial task and requires the resolution of a number of major questions, including:

a. What should the unit of analysis be? Should it be the organization, individual respondent within the organization, or the buying center?

b. Can one assume intraorganization homogeneity (the commonly made assumption)? And if this assumption seems questionable (as suggested by some recent research for some products and buying situations), how should the intraorganization heterogeneity be identified and handled?

c. How stable are market segments? (How often do firms—individuals or buying centers—move from one market segment to another?) And should one undertake a large scale base line segmentation study or apply the segmentation concept on an ongoing basis to all the firm's research activities?

d. How "flexible" should the segments be? I.e., can the composition of segments change easily or does an organization (or individual), once included as a member of a segment, remain with this segment? Typical segmentation approaches have implicitly assumed a fairly permanent membership. Yet, recent

advances in the utilization of computer simulation in segmentation research enables the researcher to develop "flexible" segments. These flexible segments are based on the respondent's specific reaction to various marketing offerings (as measured, for example, via a conjoint measurement procedure [Green and Wind, 1975] and incorporated in a computer simulation, which results in a share of choices for each offering given alternative competitive strategies. For a discussion of this procedure, see Wind, Jolly and O'Conner [1975].)

Typical answers to these questions by the current segmentation studies of the STI market are summarized in the left column of Table 5.1. In contrast, the right hand column presents our belief as to the direction in which we should move in STI (and other organizational) segmentation studies.

Research Design

Market segmentation studies require research designs that are responsive to the requirements of the segmentation model. The more thorough the segmentation model the higher the likelihood that "standardized" research procedures will not be appropriate and the more creative and imaginative research design will be called for. Consider, for example, the research design implication of using the buying center as the unit of analysis and assuming intraorganization heterogeneity.

Some of the specific decisions involved in this stage include:

a. Conceptual and operational definitions of all variables (including specification of type of scales used—nominal, ordinal, or interval).
b. Determination of whether to employ a longitudinal or cross sectional design.
c. The selection of a laboratory or real-world study.
d. Sample selection.
e. Determination of respondents' task.
f. Selection of the analytical procedures to be employed.

Too often, these decisions are made following the format used in some earlier studies. Although comparability with previous studies is important, it should not replace a systematic

TABLE 5.1

"CURRENT" SEGMENTATION MODELS IN THE STI MARKET VS. AN "IDEAL" MODEL

	"TYPICAL" CURRENT MODELS	
BASES FOR SEGMENTATION	· Org. Demographic · Product Usage · Needs	Cannot be determined in advance since it depends on specific management needs. Consideration should be given, however, to a 2-step approach to segmentation [Wind and Cardozo, 1974] and criteria used in purchase decisions [Wind, 1973].
UNIT OF ANALYSIS	· Organization · Individual	· Buying Center [Wind, 1977]
INTRAORG. HOMOGENEITY	· Assumed	· Tested for and procedures for dealing with intraorganization heterogeneity developed [Wind, 1976]
BASE LINE VS. ONGOING SEGMENTATION	· Base Line Studies	· Ongoing Segmentation Studies
DEGREE OF FLEXIBILITY	None	"Flexible"

and comprehensive evaluation of alternative courses of action. Consider, for example, the simple variable "STI usage"—how should it be defined? Should it be defined in terms of number of times an STI system is used over some time period? Should it be the cost involved? The number of searches conducted? The number of references provided? The number of times each individual used the system? The number of users? The time lapse between uses? The share of the STI system of all scientific and

technical information searched by a given individual or organization?

Furthermore, how should such data be collected—by questioning the user or the librarian? By keeping records of all actual searches? Or by some other unobtrusive measures?

Unfortunately most STI segmentation studies have given little attention to these and similar research design questions.

Data Collection

To date, most segmentation studies of STI systems have relied on primary data collection. Yet, the accumulation of various STI data banks might suggest the possibility of greater reliance on secondary sources.

No specific data collection procedure—personal, telephone, or mail, nor the use of pencil and paper, interpersonal, or computerized interactive interviewing procedure—can or should be singled out as the most appropriate. The selection of a specific data collection procedure should reflect the requirements of the research design, the various biases that might be associated with it, and management's time and monetary constraints.

As with research design, most STI segmentation studies have tended to be too conventional (and not very creative) in their data collection procedures. A number of attempts have been recently undertaken at exploring the feasibility of new approaches to the collection of STI data (Wind and Myers, 1977). Further work along these lines is required.

Data Analysis

Conventional segmentation research for consumer and industrial products and services, as well as for STI systems, has focused on two distinct analytical steps—the determination of the number of segments (either on an a priori basis or in post hoc type studies based on the results of some cluster analysis), followed by the establishment of the segments' profiles (using procedures such as multiple discriminant analysis, multiple regression analysis, and the like).

Despite the wide attention given to and usage of a priori and post hoc segmentation procedures, there seem to be a number of unresolved conceptual and methodological issues which

could affect the actual utilization of segmentation in the STI market. Consider, for example, the following problems (which affect not only the data analysis phase but the entire research design and all subsequent research phases):

a. *Intrasegment heterogeneity.* In a priori segmentation, one often finds that the segments *are* different in terms of their mean profiles. This type of data does not reveal, however, the presence of possible subsegments *within* the a priori segments. Consider, for example, the use of subscription status as a basis for segmentation. Members of a subscriber segment may subscribe to the STI service for different reasons; they may be quite heterogeneous in their background characteristics and information needs. Most a priori segments can be decomposed into subsegments or latent classes.

Latent class analysis (Lazarsfeld, 1950; Myers and Nicosia, 1968) can be useful in describing subsegments in terms of: How many are there? What is their relative size? And what are their background characteristics?

Recently Green, Carmone, and Wachspress (1976) proposed a multivariate model called SPA (Segment Partition Analysis), which combines features of latent class analysis and orthogonal array designs. The technique can be applied to any multiway contingency table (of reasonable dimensionality), revealing the extent of heterogeneity in a set of categorical data and the latent classes that make up the total group. Despite the conceptual attractiveness of this procedure, it has not yet been utilized in the segmentation of STI markets.

b. *Determining the number of target segments.* Cluster analysis of benefits, needs, or any other attitudinal or behavioral data results in the segmentation of a market into a number of segments. Statistically, the larger the number of segments the higher the homogeneity of the segments. Yet, from a managerial point of view, there is considerable advantage (in terms of costs and manageability) in selecting only a few target segments. The conditions under which different target market segments can be selected, for a given product and product line, are not well specified, nor are there clear-cut "rules" for the determination of the "best" number of segments.

c. *Comparability of results of various bases and methods for*

segmentation. Segmentation research projects vary widely with respect to both the bases they use for segmentation (benefits sought, needs, attitudes, etc.) and the research method they employ (Frank, Massy, and Wind, 1972). Most studies employ one or at most a few bases for segmentation and rely predominantly on a single research approach that reflects the researcher's preferences.

Seldom, if ever, are the results of a number of alternative bases for segmentation and alternative research approaches compared. Yet, if the results are found to be stable (across methods and bases), it would increase the researchers' and users' confidence in, and encourage the implementation of, the results of the segmentation study.

d. *Stability of results.* The question of segment stability—whether members (individuals or organizations) of a given segment remain in the same segment over time—is often a major deterrent to the utilization of the results of segmentation studies. Since no theoretical guidance can be provided, management has to resort to empirical testing for segment stability by continuously monitoring the market. A longitudinal design would enable the assessment of the nature and degree of mobility among segments, and the conditions under which segment stability is likely to prevail.

Componential Segmentation: An Alternative Approach to Segmentation

Componential segmentation (Green, Carroll, and Carmone, 1975; and Green, 1977) represents a different philosophical and modeling approach to the study of market segments. Unlike a priori or post hoc methods, componential segmentation is concerned with the attributes that underlie the segments, rather than with the specific segments themselves. In principle, componential segmentation can make predictions of how a segment composed of more basic components would react to a test stimulus, such as a new product or service also composed of more basic components.

In a priori or post hoc segmentation, interest is focused on a *fixed set* of specific segments. In componential segmentation, interest centers on the *components* of these segments. In com-

ponential segmentation, parameter values are developed for both background characteristics (demographics, product usage, benefits sought, and so on) and stimuli (such as structural or functional properties of STI products). These parameter values are estimated from data obtained from a limited number of selected respondents' evaluations of a limited number of designed stimuli.

Componential segmentation is still a new idea and only a few applications have been carried out. Yet, based on the limited evidence to date, it would appear that it represents a most efficient data collection procedure if one is severely limited in terms of a sample size—a situation typical of most STI studies.

In addition, it provides rigorous insight into the most desirable product characteristics, as developed from conjoint scaling, for each customer segment. The application of componential segmentation to the STI market seems, therefore, to be a natural extension of earlier segmentation studies that utilized conjoint measurement for the determination of respondents' utilities for various features of STI systems (Wind, Grashof, and Goldhar, 1975).

Data Interpretation

The situation in which segmentation based marketing recommendations are ignored by management is not an uncommon one. To reduce the likelihood of ignoring the results of segmentation studies, it is essential that the interpretation stage—"translation" of results into action—be conducted jointly by the researchers and the relevant management team.

This stage requires the ability to translate a segment profile into guidelines for marketing strategy. Consideration should be given here to:

a. ***Product line*** (vs. single product strategies), i.e., development of a product line in which each product (or a number of products) is designed (and positioned) for different segments (Wind, Grashof, and Goldhar, 1975).
b. ***"Self selection"*** (vs. controlled) communication strategies (Frank, Massy, and Wind, 1972).
c. Strategies for segments of current STI users ***and*** segments of nonusers.

Concluding Remarks

Given that the STI market is heterogeneous with respect to needs, perceptions, preferences, usage, and dissemination patterns, the concepts and techniques of market segmentation can, and should, play a significant role in increasing the relevance and effectiveness of information dissemination systems. Better understanding of the segmentation research process and resolution of the conceptual and methodological problems raised in this paper (and others) will hopefully lead to the increased practical utilization of segmentation research in the STI market. The market for scientific and technical information *should* be segmented, target market(s) selected, information dissemination systems designed to meet the needs of the selected target segments, and a marketing program developed to best reach the target market(s) (Frank, Massy, and Wind, 1972; Wind, Grashof, and Goldhar, 1975). Such efforts should not be limited, however, to the traditional segmentation research efforts. The problems associated with these approaches should be identified and new approaches examined and tested.

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