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by

Jean-Marie Choffray* and Gary L. Lilien**

Working Paper 944-77 June 1977

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ABSTRACT

This paper presents the structure of an operational model of industrial response to marketing strategy. Four sub-models make up this structure -- an awareness model, a feasibility model, an individual evaluation model and a group interaction model. Methods of structuring and calibrating these submodels are discussed as are the associated measurements. The use of the new methodology to develop industrial marketing strategy -- including product design and positioning issues as well as communication program development -- are reviewed.

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1. Introduction

Both industrial marketing practitioners and academics are unsure how current models of organizational buying behavior (Robinson and Faris [22], Webster and Wind [30], Sheth [26] and Hiller [15]) can be used for the planning of industrial marketing activities.

Through lectures and seminars during the past few years, we have participated in many discussions about organizational buying. Participants, although reacting positively to the oft-mentioned conceptual models of organizational buying, raise the following questions:

- How can we, as current or prospective managers, make use of these models (aside from as a checklist of issues to consider) in the planning of industrial marketing activities?
- Why is industrial - as opposed to consumer - marketing characterized by a lack of operational decision-making tools for the planning of marketing activities?

There is considerable agreement about what is most needed in this area. Even academics recognize the need for operational models of organizational buying, which (1) isolate the major variables affecting organizational decisions; and (2) relate them in an explicit way to controllable marketing variables.

This paper proposes such an operational structure. First, we briefly review the literature about organizational buying. We then identify the major variables affecting organizational buying and show how these variables can be conceptually linked to the organizational buying decision process. This conceptual structure, which describes the decision process at the organizational level, provides the basis for our operational model.

The general structure of our industrial market response model is then described, along with issues raised by the modeling of its components. A measurement methodology which provides the necessary input to each of the model's components is also proposed. Finally, the potential uses for such a model-based methodology to assess industrial response to marketing strategy are discussed.

2. Background

The past few years have seen considerable progress in the use of management science methods in the marketing of consumer products (see, for example, Urban [29], Silk and Urban [27], Little [20]). Comparable development has not occurred for industrial goods, those products aimed at organizational customers - commercial enterprises, governmental agencies and other institutions.

Several reasons could account for this lack of development. Industrial products, from sulfuric acid to computer software and nuclear power plants, are more diverse than consumer products. Industrial companies tend to be production-oriented, and direct a smaller portion of their financial resources to marketing research activities than do consumer goods manufacturers. Most importantly, organizational buying behavior is far more complex and requires new and different modeling solutions.

For many industrial products - especially for capital equipment - a multiperson decision process is the normal mode of behavior. This decision process is characterized by the involvement of

- several individuals, with different organizational responsibilities, who
- interact with one another in a decision-making structure specific to each organization, and

- whose choice-alternatives are limited by environmental constraints and organizational requirements.

Previous work on industrial buying behavior has been essentially concerned with (a) the development of integrated conceptual models and (b) the empirical verification of hypotheses pertaining to specific aspects of this behavior.

Robinson and Faris [22] develop a descriptive model of industrial buying behavior which categorizes this process according to purchase situations. Webster and Wind [30] propose a descriptive model of organizational buying. They introduce the concept of a "buying center" which includes those individuals involved in a purchase decision. Response of the buying center is analyzed as a function of four classes of variables: individual, interpersonal, organizational and environmental. Sheth [26] develops a model which tries to encompass all industrial buying decisions. The model distinguishes three main elements of industrial buying: (a) the psychological characteristics of the individuals involved, (b) the conditions which precipitate joint decision-making and (c) the conflict resolution procedures affecting joint decision-making.

In addition, a number of empirical studies have dealt with certain aspects of industrial buying behavior. These studies are mainly (a) observations of actual purchase decisions (Cyert, Simon & Trow [9], Brand [2]), (b) analyses of the involvement of various organizational functions in industrial purchasing (Harding [11], Scientific American [23], Buckner, [3]), and (c) studies of the behavior and decision styles of individual decision participants (Lehman & O'Shaughnessy [18], Cardozo & Cagley [4], Hakanssan & Woods [10], Wilson [33], Sweeney et al [28], Scott and Bennett [24], Wild & Bruno [32], Scott & Wright [25]).

The most important consideration ignored in the published literature is that concerned with managerial use. Available models provide a detailed conceptual structure for the study of industrial buying behavior, but they are not operational and many of their elements have only been empirically validated in a limited way. Most importantly, these models give little attention to the role played by controllable marketing variables on industrial market response.

Empirical studies, on the other hand, involve a broad range of products and buying situations. Methodological problems compromise the integrity of many of the results as the studies have often been undertaken in isolation, on the basis of small samples often limited to purchasing agents. Empirical analyses of industrial buying behavior have so far contributed little to the development of a theory of organizational buying.

3. Major Intervening Variables Affecting the Industrial Buying Decision Process

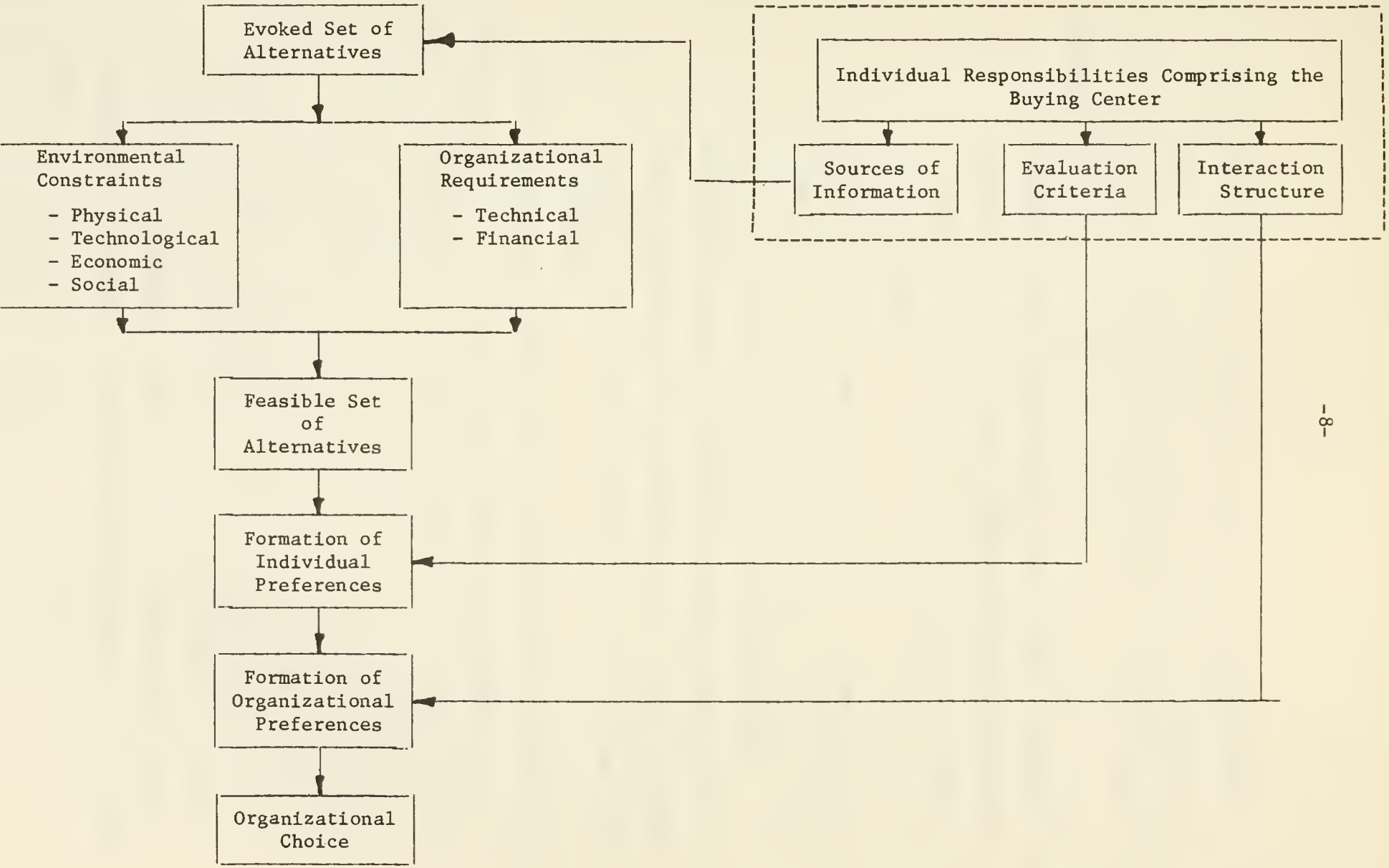
An important limitation of current models of organizational buying for an operational model-builder is their lack of parsimony. Typically, these models provide exhaustive lists of variables that might affect organizational buying. They do not, however, distinguish those variables with a consistently major influence across product classes from those whose influence is of lesser import, dependent on specific purchase situations.

Recognizing these limitations, the authors (see Choffray and Lilien [6]) develop a framework to model organizational buying which is more concise than the Webster and Wind [30] and Sheth [26] models. It focuses on the links between the characteristics of an organization's buying center and the three major

stages in the industrial purchasing decision process: (a) the elimination of alternatives which do not meet organizational requirements, (b) the formation of decision participants' preferences, and (c) the formation of organizational preferences. Figure 1 illustrates this framework.

Although simple, this conceptualization of the industrial purchasing decision process is consistent with the current state of knowledge in the field. It reflects our concern about operationalizing the concept of the "buying center" and explicitly deals with the issues of product feasibility, individual preferences, and organizational choice. Most importantly, this structure links important characteristics of the buying center to the various stages of the industrial purchasing process.

FIGURE 1: Major Elements of Organizational Buying Behavior



4. An Operational Model of Industrial Response to Marketing Strategy

A complete, operational model of industrial response requires that organizational heterogeneity be explicitly handled. The model proposed here addresses the following issues:

1. Potential customer organizations differ in their "need specification dimensions", that is, in the dimensions they use to define their requirements. They also differ in their specific requirements along these dimensions.
2. Potential customer organizations differ in the composition of their buying centers: in the number of individuals involved, in their specific responsibilities and in the way they interact.
3. Decision participants, or individual members of the buying center, differ in their sources of information as well as in the number and nature of the evaluation criteria they use to assess product alternatives.

The consideration of these sources of organizational heterogeneity in an aggregate model of industrial response requires that members of the buying center be grouped into meaningful "populations". In this paper, we use "decision participant category" to refer to a group of individuals whose responsibilities in their respective organizations are essentially similar. Examples of such participant categories are "production and maintenance engineers," "purchasing officers," "plant managers", etc.

Our objective with this analysis is to gain leverage by analyzing similar situations together -- hence, we focus on areas where individual or organizational homogeneity allows meaningful aggregation. To this end, we assume:

A1. Within potential customer organizations, the composition of the buying center can be characterized by the categories of participant involved in the purchasing process.

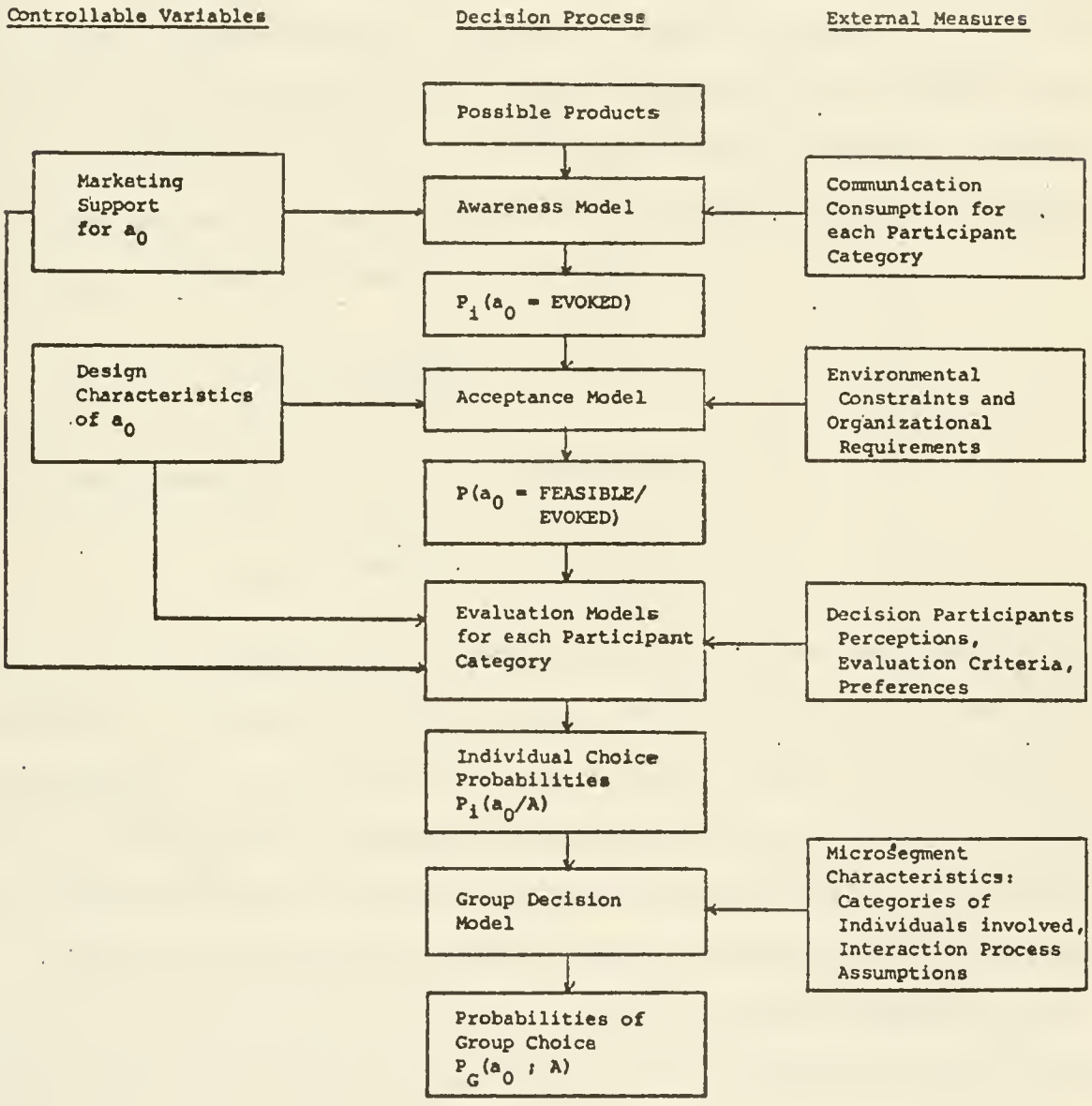
A2. Decision participants who belong to the same category share the same set of product evaluation criteria as well as information sources.

In recent work, Choffray [5] develops methods to measure what categories of participants are most likely to become involved in the adoption of new industrial products. He proposes methodology to abstract from this information "microsegments", or groups of organizations homogeneous in the categories of participants involved in the purchasing decision process.

The second assumption is consistent with current knowledge. Sheth [26] contends that individuals whose task orientation and educational backgrounds are similar tend to have common expectations about industrial products and suppliers. Recent work by Choffray and Lilien [7] indicates that meaningful differences exist in both the number and nature of the evaluation criteria used by various decision participant categories.

Figure 2 presents the general structure of our industrial market response model. It closely parallels our conceptualization of the organizational purchasing process described in Section 3. Four submodels comprise this structure, each of whose purpose, structure and method of calibration are briefly described below.

FIGURE 2: GENERAL STRUCTURE OF AN INDUSTRIAL MARKET RESPONSE MODEL



4.1 The Awareness Model

4.1.a. Purpose

The awareness model links the level of marketing support for the industrial product investigated a_0 -- measured in terms of spending rates for such activities as Personal Selling (PS), Technical Service (TS), and ADvertising (AD) -- to the probability that a decision participant belonging to category i, (say production and maintenance engineers), will evoke a_0 as a potential solution to the organizational purchasing problem. Let

$$P_i\ (a_0 = \text{EVOKED})$$

denote this probability. Hence, we postulate that

$$P_i(a_0 = \text{EVOKED}) = f_i(\text{PS},\text{TS},\text{AD}).$$

Implicit in this formulation is assumption A2 which states that individuals who belong to the same participant category share essentially the same sources of information. It is reasonable to expect, however, that the awareness functions $f_i(\cdot)$ will exhibit substantial differences across categories of decision participants as a result of their different levels and sources of information.

When several decision participant categories are involved in the purchasing process for each of a group of customer organizations the probability that product a_0 will be evoked as an alternative is the probability that at least one member of the buying center will evoke it. Thus:

$$P_G\ (a_0=\text{EVOKED}) = 1 - \prod_i [1 - P_i(a_0=\text{EVOKED})]$$

where index i covers all decision participant categories characterizing the purchasing process of this particular microsegment of customer organizations.

4.1.b. Analytical Structure

The functional form of each of the awareness functions $f_i(\cdot)$'s can either be derived empirically through a field study or can be provided by the product manager judgmentally. In the first case, a survey can be performed for a sample of individuals from each participant category, exposed to various levels of the control variables PS, TS and AD. Individuals would be asked what brand(s) of product in the class they are aware of, their media consumption patterns, the last time they saw a salesman, etc. (See Morrill [21] for a description of a large scale study of this nature.) This set of measurements would allow for the development and calibration of analytical forms for each of the $f_i(\cdot)$'s.

In many cases, however, the second approach will be used due to time and cost constraints. It is based on a "decision calculus" approach (see Little [19]) which relies on the manager's experience with the product and its market to infer what the $f_i(\cdot)$'s are for each decision participant category.

4.2 The Acceptance Model

4.2.a. Purpose

The acceptance model relates the design characteristics $\underline{X}_0$ of product a_0 to the probability that it will fall in a potential customer's feasible set of alternatives. This submodel accounts for the process by which organizations in the potential market screen out "impossibles" by setting product selection requirements (e.g. limits on price, reliability, payback period, number of successful prior installations, etc.). Let this probability be denoted by

$$P_G(a_0 = \text{FEASIBLE} \mid \text{EVOKED}) = g(\underline{X}_0).$$

Although organizations in the potential market may differ in their need specification dimensions, as well as in their requirements along these dimensions, the acceptance model g(·) assumes that the process by which organizations eliminate infeasible alternatives is essentially similar across potential customer organizations.

4.2.b. Analytical Structure

The notions of feasible set of alternatives and of organizational need specification dimensions suggest that the models most suitable at this level are of the conjunctive type. Conjunctive models are multiple cutting-point models in which a set of acceptable levels is defined by each potential customer organization along its relevant set of need specification dimensions. To be feasible to a given organization, a product alternative has to fall in the acceptance region along each of these dimensions.

Several models can be used to approximate the process of organizational elimination of infeasible alternatives. Choffray and Lilien [8] propose two convergent approaches to specify g(·). Both approaches require information about the maximum (or minimum) requirement along each relevant need specification dimension from a sample of organizations in the potential market. The first approach is probabilistic and derives the multivariate distribution of organizational requirements from the values observed in the sample. The second approach uses simulation and logit regressions to relate the fraction of organizations for which an alternative is feasible to its design characteristics.

Independent of the approach followed, the elimination function g(·), once specified, can be input to a simulation which (1) provides insight into product design trade-offs, and (2) allows accurate prediction of the rate of market acdeptance.

4.3 The Individual Evaluation Models

4.3.a Purpose

Individual evaluation models relate evaluation of product characteristics to preferences for each category of decision participants. The models permit the analysis of industrial market response to changes in product positioning. They therefore feed back important information for the development of industrial communication programs that address the issues most relevant to each category of participant. Let

$$P_i(a_0; A \mid \text{FEASIBLE, EVOKED})$$

denote the probability that an individual belonging to category i will choose a_0 from the set of feasible alternative A. It is developed as:

$$P_i(a_0;\ A \mid \text{FEASIBLE, EVOKED}) = h_i(\underline{E}_{oj})$$

where $\underline{E}_{oj}$ refers to individual j's evaluation of alternative a_0 along performance evaluation criteria $C_i = \{c_i, \ldots, c_{in}\}$ common to all individuals belonging to category i.

4.3.b. Analytical Structure

The development and calibration of individual preference models assume an n-dimensional "evaluation space" common to each category of decision participants. The axes in this space are independent and

express how individuals in that group structure product attributes into fewer, higher-order evaluation criteria. An individual's evaluation of a product can then be represented as a vector of coordinates in that space.

Considerable research has been done on the ways to abstract the evaluation dimensions along which individuals perceive and assess products (see Hauser [12] for a review). These methods, based on factor analytic and nonmetric multidimensional scaling procedures, are relevant here. Recently the authors (see Choffray and Lilien [7]) provided new, formal tests to assess whether different categories of participants differ in the number and/or composition of their evaluation criteria.

Several approaches can be used to model the formation of individual preferences. Hauser and Urban [14] distinguish (1) expectancy values models, (2) preference regression models, (3) conjoint analysis (4) logit models and (5) utility theory models.

To estimate preferences for product alternatives, the preference regression approach offers some advantages (see Allaire [1]). Following Allaire, we believe that for each category of participant, several functional forms should be calibrated and the best one retained. Such analysis leads to identification of decision style differences among participant categories.

The authors, (see Choffray and Lilien [7]), recently developed new methods to analyze the evaluation space of categories of decision participants. Their analysis, based on data collected on the preferences and perceptions of 132 decision participants in the adoption of a new type of industrial cooling system, indicates that participant categories differ substantially in the

number and composition of their evaluation criteria. Moreover, the study showed that preference regressions estimated for each participant category provide substantially different results than would have been obtained from a more aggregate analysis.

Once calibrated, models of individual preference formation are used to predict preference for product alternatives. These preferences, in turn, are transformed into individual probabilities of choice. (See Hauser [12] for a review of probabilistic models of individual choice.)

4.4 The Group Decision Model

4.4.a Purpose

The last element of the industrial market response model is the group decision model which maps individual choice probabilities into an estimate of the group probability of choice:

$$P_G(a_0;A) = z\{P_i(a_0;A \mid \text{FEASIBLE, EVOKED}),\ i = 1,\ldots, r\}.$$

Here index i covers all participant categories that are consistently involved in the purchasing process within a microsegment of the potential market.

4.4.b. Analytical Structure

The authors (see Choffray and Lilien [6]) propose four classes of descriptive probabilistic models of group decision-making. They

distinguish a Weighted Probability model, a Proportionality Model, a Unanimity Model and an Acceptability Model. These models encompass a wide range of possible patterns of interaction between decision participant categories and offer representation of this process for most industrial buying decisions. Depending on the manager's understanding of the interaction process within a particular microsegment, any of these models, or a combination of them can be used to assess group choice.

An alternative to explicit modeling is to simulate the impact of different interaction assumptions on the estimate of group response. This approach is particularly suitable when neither the manager in charge of the product nor sales people have an accurate understanding of the interaction process which characterizes decision-making within each microsegment. This approach allows them to consider various types of assumptions and assess the sensitivity of group response to these assumptions.

4.5 Linking the Submodels

Combining the four submodels just presented, we get a general expression for the unconditional probability of organizational choice.

$$\Pr[a_0 = \text{ORGANIZATIONAL CHOICE}] =$$

$$\Pr[a_0 = \text{GROUP CHOICE} \mid \text{INTERACTION, FEASIBLE, EVOKED}]$$

$$\times \Pr[a_0 = \text{FEASIBLE} \mid \text{EVOKED}]$$

$$\times \Pr[a_0 = \text{EVOKED}]$$

The measurements needed for the calibration of these models as well as their use for industrial marketing decision-making are explored next.

5. Implementation of the Industrial Market Response Model

Implementation of the structure described above requires a measurement methodology which provides input to the various submodels. This section reviews the measurement steps involved in a typical implementation of the response model. These measurements are summarized in Figure 3.

5.1 Measurements at the Market Level

The first measurement step, called macrosegmentation following Wind and Cardozo [35], specifies the target market for the product. The purpose of macrosegmentation is to narrow the scope of the analyses to those organizations most likely to purchase the product. Bases for macrosegmentation might be as general as S.I.C. code classification, geographic location, etc. The output of this measurement step is an estimate of the maximum potential market for the product. Let Q denote that maximum potential.

5.2 Measurements at the Customer-Organization Level

Two major types of measurements have to be obtained at this level. If the potential market for the product contains a large number of customers, a representative sample can be drawn. In other cases, gathering data from all potential customers might be considered.

Organizations' need specification dimensions have to be identified first, and then the requirements of each firm in the sample along these dimensions must be assessed. Identification of these dimensions follows discussions with potential decision participants. Group interview methods

FIGURE 3. MAJOR MEASUREMENTS NEEDED FOR CALIBRATING THE INDUSTRIAL MARKET RESPONSE MODEL

DATA TYPE	SOURCE	TARGET
1. Hard	1.1. Market	1.1.1 Macrosegmentation: Target Market Definition
	1.2. Organizations	1.2.1 Identification of Need Specification Dimensions; Measurement of Organizational Requirements.
		1.2.2 Microsegmentation: Grouping of Organizations on the Basis of Buying Center Composition
	1.3. Decision Participants	1.3.1 Product Awareness and Communication Consumption Patterns
		1.3.2 Product Evaluations and Preferences
2. Soft	2.1. Industrial Marketing Manager	2.1.1 Judgmental Estimates of Interaction Process

(see Wells [31]) are particularly suitable for this purpose. It is the authors' experience that such interviews with members of the buying center of a few (3-5) potential customers are generally sufficient to identify the set of relevant specification dimensions.

Survey questions are developed next. The authors have used questions requesting the maximum (or minimum) value along each specification dimension beyond which the organization would reject a product out of hand. In order to reduce individual response bias, respondents are allowed to use any information sources in their organization (including collegues) to provide their answers. These answers are the main input to the acceptance model.

Next, information is collected on the composition of the buying center and the respective organizational responsibilities of its members. This information allows the development of a decision matrix (see Figure 4 for an example) which requests the percentage of the task responsibilities for each stage in the purchasing process associated with each category of decision participant. This instrument has been shown to give consistent estimates of involvement in the decision process when completed by different members of the same organization, (see Choffray [5]). This corraborates earlier observations by Wind [34] and Kelly [17].

Choffray [5] also provides methodology based on cluster analytic procedures which uses this information to identify microsegments of potential customers which are relatively homogeneous in the composition of their buying centers. Call the microsegments identified at this stage $S_1 \ldots S_n$ and the percentage of companies in the potential market that fall in each $V_1 \ldots V_n$.

	Decision phases / Decision Participants	1 Evaluation of a/c needs, specification of system requirements	2 Preliminary a/c budget approval	3 Search for alternatives, preparation of a bid list	4 Equipment and manufacturer evaluation *	5 Equipment and manufacturer selection
COMPANY PERSONNEL	Production and Maintenance Engineers	%	%	%	%	%
	Plant or Factory Manager	%	%	%	%	%
	Financial controller or accountant	%	%	%	%	%
	Procurement or purchasing department	%	%	%	%	%
	Top Management	%	%	%	%	%
EXTERNAL PERSONNEL	HVAC/Engineering firm	%	%	%	%	%
	Architects and Building Contractor	%	%	%	%	%
	a/c equipment manufacturers	%	%	%	%	%
	COLUMN TOTAL	100 %	100 %	100 %	100 %	100 %

**Decision phase 4 generally involves evaluation of all alternative a/c systems that meet company needs while Decision phase 5 involves only the alternatives (generally 2-3) retained for final selection.*

FIGURE 4: Sample Decision Matrix: Industrial Cooling Study

Within each microsegment, the general structure of the buying centers composition is statistically assessed. Let microsegment S_q be characterized by the set of participant categories, $DEC_q = \{D_i, i = 1....r_q\}$, that are usually involved in the purchasing process. For instance, in segment S_1, corporate managers along with design engineers might be the major categories of participants involved. In S_2, production engineers are involved too, etc.

5.3 Measurements at the Decision Participant Level

For each category of decision participant, product awareness, perceptions and preferences are measured at the individual level.

Product awareness can be obtained through survey questions asking each potential decision participant what product(s) or brand(s) of product they think of in a specified product class. Several other methods commonly used in consumer goods marketing to measure brand awareness (see Johnson [16]) can also be used. In addition to brand awareness, media consumption patterns are measured. Both measurements are used to calibrate the awareness submodel.

The measurement of individual perceptions, evaluations and preferences for product alternatives requires more complex methods. In industrial markets it is often difficult to expose potential buyers to a physical product due to transportation and time constraints. For this reason, the use of concept statements, accurately describing each product in the class considered, is a reasonable alternative. Due to the technical orientation of potential buyers, the use of concept statements to measure individual

perceptions and preferences seems as suitable in industrial markets as in consumer markets where the method has been used with considerable success (Hauser and Urban [13]).

Individual product perceptions can then be recorded along each of a set of perceptual scales which include the relevant attributes used by individuals to assess products in this class. Methodology is proposed by Choffray and Lilien [7] to reduce this set of attribute scales to a smaller set of independent evaluation criteria. They also provide tests to assess whether different participant categories differ in the number and/or nature of their respective evaluation dimensions.

An important assumption inherent to the measurements of individual perceptions and preferences is that these measurements are obtained from actual decision participants. To minimize this potentially important source of bias, the authors suggest a two stage sampling procedure. First, a member of top management in each company in the sample is identified using published sources of information. He is asked to specify those members of his organization that, in his judgement, would be most likely to participate in the purchase of a product in the class. Only individuals identified at this second stage are interviewed or mailed a copy of the survey instrument.

5.4 Measurement at the Managerial Level

The measurements described above are used to calibrate the three first components of the industrial market response model. Development of group choice models, however, requires assumptions about the type of interaction which takes place between decision participant categories.

As suggested earlier, the measurement methodology relies on the marketing managers' experience with the product class. The final input to the industrial response model consists of the manager's specification of those models of interaction which best reproduce his understanding of the purchasing decision process for the companies which fall in each microsegment.

In terms of the models proposed by Choffray and Lilien [6], the manager's estimates for microsegment S_q might be:

Model		Fraction of Segment S_q Using this Model
Weighted Probability Model	:	α_{1q}
Proportionality Model	:	α_{2q}
Unanimity Model	:	α_{3q}
Acceptability Model	:	α_{4q}

with $\sum_e \alpha_{eq} = 1$ for each microsegment q. If the manager considers that the companies within a particular microsegment exhibit considerable homogeneity in the nature of their interaction process, only one $\alpha_{eq} = 1$, and the others = 0.

6. Assessing Response to Industrial Marketing Strategy: Integrating Measurements and Models

The information provided by the measurement methodology and fed into the various models components leads to an estimate of market response. $M_q(a_0)$ denote the estimated share of microsegment S_q that finally purchase product a_0. Hence

$$M_q(a_0) = \sum_e \alpha_{eq} P_r[a_0; A/MOD_e, DEC_q]$$

where $P_r[a_0; A/MOD_e, DEC_q]$ denotes the probability that a_0 is the organizational choice, given the involvement of decision categories DEC_q and an interaction model MOD_e.

Given a maximum potential sales of Q for product a_0, we can estimate expected sales of a_0 by computing

$$Sales(a_0) = Q[\sum_{q=1}^{S} V_q M_q(a_0)]$$

The operational model presented here provides a sensible framework to assess response to industrial marketing strategy for many industrial products. The model is quite general and its components can be easily adapted to account for the different problems of specific industrial products. In particular, the model clearly encompasses single person decision making as a special case. In fact, any of the submodel can be deleted where they become irrelevant, resulting in model simplifications as well as in fewer measurements. So, the group decision model would be ignored in case of single person decision-making as would the microsegmentation methodology. The acceptance model and associated measurements, on the other hand, become irrelevant for industrial products which lead mainly to straight-rebuy situations, and can therefore be omitted from the model.

7. Assessing Response to Industrial Marketing Strategy: Uses of the Procedure

The industrial market response model, along with associated measurements, provide key input for the design of industrial products and for the development of marketing communication strategies. This section illustrates how the measurements and output of the submodels can be used for industrial marketing decision-making.

7.1 Improving Product Design

An important problem in the development of a new industrial product is the determination of those specific features which the product should incorporate. The product acceptance portion of the structure provides actionable information for making such decisions.

First, the analysis forces management to identify and evaluate organizational need specification dimensions. Second, the acceptance model assesses design tradeoffs in terms of market potential. Figure 5 shows iso-acceptance curves of tradeoffs between maximum initial investment cost (price) and minimum system expected life for industrial cooling systems.

The acceptance model forces industrial marketing managers to explicitly analyze product design and pricing decisions. Moreover, given data about R&D, production, and distribution costs, a complementary model can optimize industrial product features within the firm's constraints.

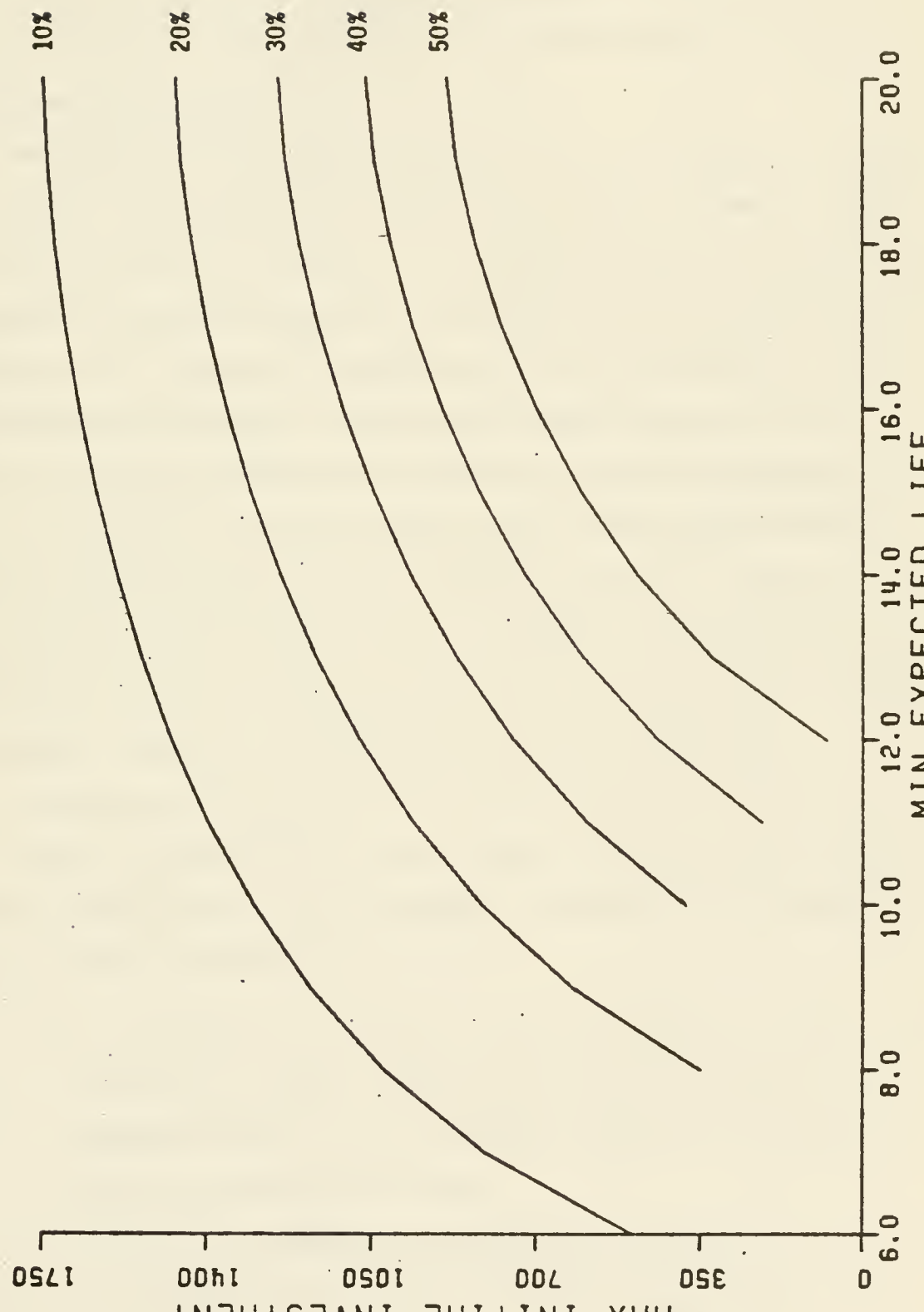


Figure 5: SAMPLE TRADEOFF CURVES FOR THE ACCEPTANCE MODEL: INDUSTRY COOLING STUDY

7.2 Developing and Testing Communication Programs

Industrial communication programs, including advertising and sales presentations, affect response through the awareness model and the individual evaluation models.

The analysis of individual preferences, for each category of decision participant, allows analysis of product positioning. For example, Figure 6 provides a qualitative description of the evaluation space used respectively by Plant Managers and Corporate Managers to assess industrial cooling systems (see Choffray [5]). Preference regressions in that study showed that the two dimensions were essentially as important for Plant Managers but that dimension one was substantially more important to Corporate Engineers. From this analysis, it therefore appeared that Plant Managers were more concerned about low operating cost, additional protection offered by the system and substitutability of its components than were Corporate Engineers. The latter category of participant, on the other hand, placed considerable emphasis on the system's first cost and reliability.

Following identification of the relevant evaluation criteria for each category of participant, average product evaluations can be assessed for each product in the class investigated. Results of this analysis can be used in three different ways:

- to identify those attributes of product a_0 which are not perceived by certain categories of decision participants as management wants, so that corrective action can be taken in a product communication strategy.
- to develop a communication program which addresses the specific needs of each group of decision participants.

- to simulate the impact of changes in communication content on the preferences of each category of individuals.

7.3 Targeting Industrial Communication Programs

The microsegmentation methodology tells what categories of decision participants are most likely to become involved in the purchase decision. By isolating homogeneous microsegments of organizations, the measurement methodology provides an accurate description of the structure of the purchasing decision process. For example, in the industrial cooling study, Choffray [5] identified four microsegments in the potential market for a new solar powered cooling system. These microsegments showed substantial differences in terms of:

- the number of decision phases in which each category of participant is involved;
- the number of participant categories involved in each stage of the process;
- the frequency of involvement of each category of participant in each decision phase.

This information allows development of differentiated communication strategies, targeted at those categories of individuals most influential in the various microsegments. Typically, the microsegmentation results can be used to:

- eliminate from a communication program categories of individuals that are involved in the decision process less often than management expected.

- concentrate communication efforts on those categories of individuals that are involved in the purchasing process in the largest microsegments.
- predict the structure of the decision process for a specific firm on the basis of its external characteristics.

In addition, as categories of decision participants differ in their level and sources of information, the microsegmentation analysis provides additional help in the selection of communication vehicles.

8. Conclusion

This paper proposes an operational model to assess industrial response to marketing strategy. The model explicitly addresses issues of product feasibility, individual preference formation and organizational decision-making. It provides a new framework to operationalize the concept of the buying center.

The model is linked to a measurement methodology which provides input to each model component. The methodology provides tools to measure involvement in the purchasing decision process and uses this information to abstract microsegments of organizations homogeneous in decision-making structure.

To date, the procedure has been used to:

- develop a market introduction plan for an industrial air-conditioning system powered by solar energy,

- design an "intelligent" computer terminal and develop a supporting communication program.

Some of the submodels are still being improved, as are some of the measurement tools. The general structure, however, is currently operational and can produce much needed information for better industrial marketing decisions. As such, the model and associated measurements should be viewed as a first, but important step in the development of better tools for industrial marketing.

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