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PROBLEM ANALYSIS-- A CONSUMER-BASED METHODOLOGY FOR THE DISCOVERY OF NEW PRODUCT IDEAS

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ABSTRACT

In view of the very high failure rate for new consumer products, improved methods of new product development are badly needed. It is argued that, in order to minimize the risk of consumer rejection, the potential buyer must be allowed to play a more active role in the initial stages of the process. This paper presents a methodology for increasing consumer participation in the generation of ideas for new products. Instead of deriving new product ideas from the loosely defined concepts of consumer needs and wants, the method focuses on problems experienced by consumers in using existing products and services.

INTRODUCTION

In examining the literature on new product development, it is clear that, regardless of the multitude of articles and books on the subject, there is no real consensus about a superior methodology to develop new products. In view of the high failure rate of new products and frequent consumer criticism and/or rejection of new market offerings, improvements in methodology for new product development are badly needed. This paper presents an approach to product development that appears to hold significant promise in terms of generating new product ideas with strong consumer support.

Kotler (1977) has developed a model which consists of ten stages of product development (see Figure 1). A main problem area is located in

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Insert Figure 1 here

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stage three of this flow. While other stages have been refined into an almost routine-like schema, both practitioners and academicians continue to struggle with different methods for idea generation. This paper is no exception and will describe a new methodology for consumer input into the process. As is well documented, the mortality rate of new consumer products is extremely high (Booz, Allen & Hamilton, Inc., 1968; Buzzell and Nourse, 1966; Hopkins and Baily, 1971; Crawford, 1977). In light of the many stages that constitute the development process that a new product passes through, it is obvious that new product management is a difficult and delicate task. Faulty judgment in any of the stages is likely to result in consumer rejection and market failure.

The literature in the field suggests a multitude of reasons for the poor performance of new products. Most of the reasons put forth can be

categorized into one of three categories: poor marketing research (see Crawford, 1977), poor product marketing (see Paschkler, 1976), and organizational weaknesses (see Davidson, 1976).

An area which has generally been overlooked is the relationship between failure rate and the type of consumer input used for idea generation. In this paper we will discuss different types of consumer information input, and the essence and limitations of these inputs. We will then present a new methodology: consumer problem analysis. Problem analysis offers, as we shall see, some distinct advantages compared to other methods. Although the methodology is still in its infancy as far as empirical testing is concerned, it does have strong intuitive appeal and some theoretical support.

INPUT FOR IDEA GENERATION

Both quantitative and qualitative techniques can be used to aid creativity in the product development process. Among the consumer-based qualitative techniques that are frequently associated with idea generation are consumer focus groups, consumer advisory panels, and consumer in-depth interviews. While brainstorming is also frequently employed for the generation of new product ideas, it seldom allows any consumer participation.

Quantitative techniques are sometimes criticized for their failure to grasp underlying explanations and the "true" motivations of individuals. This criticism is misdirected because, in fact, the very purpose of several quantitative methodologies is to uncover those nonobservable variables that can help us understand why people act in certain ways. Instead of asking consumers how they evaluate products and

what product attributes they consider important, techniques such as multidimensional scaling and factor analysis can be used to infer what product attributes are perceived as salient and what underlying dimensions are used as evaluative criteria. These quantitative techniques primarily use consumers' perceptions, preferences, and choices.

Multidimensional scaling can be used to generate perceptual maps which show the relative distance of competing brands, often with a hypothetical "ideal brand" included in the configuration. New product possibilities are found by looking at "gaps" in the map of the existing products or by developing product concepts that come close to an "ideal brand." These new product concepts are defined as new combinations of attribute levels which were inferred through the mapping of the existing products. Factor analysis can be applied to perception, preference, or choice data, but does not in itself suggest new products. It is typically employed to discover what underlying attributes determine choice or preference among products.

Conjoint analysis is another group of quantitative techniques which is relevant in the context of new product development. These techniques can be very useful in the prediction of consumer choice by estimating the structure of consumer preferences, but they are less suitable for initial idea generation. This is because they require a set of predetermined alternatives (existing products or product concepts) with prespecified levels of attributes to which consumer input can be applied.

CONSUMER INPUT: ESSENCE

Both the qualitative and the quantitative techniques mentioned are designed to provide consumer input into the new product development process. Naturally, the techniques differ in terms of the type of consumer input desired. Yet, the literature on product development has, by and large, avoided the issue

of what information from consumers is most useful. This is surprising, since behaviorally meaningful information is a prerequisite for any empirical model that purports to predict and/or explain consumer behavior.

Needs and Wants

Intuitive logic may suggest that once consumers' specific "needs" and "wants" have been identified, the likelihood of the successful derivation of ideas for new products is enhanced. The problems of product design and construction notwithstanding, all the good product designer has to do is to meet consumer "needs" and "wants." But there is a problem with this reasoning. The concepts of "needs" and "wants" are extremely difficult to define operationally. What is a "want"? What is a "need"? First, there is no obvious logical distinction between the two, except at very fundamental levels where human survival is at stake. As we move up to higher order "needs," beyond what is absolutely and biologically necessary to stay alive, "needs" and "wants" become increasingly inseparable. Consequently, product development in advanced societies seldom relates directly to pure "needs."

The confusion about the difference between needs and wants is exemplified in basic marketing textbooks. Most introductory texts used to distinguish between the two (McCarthy, 1975; Stanton, 1975; Kotler, 1972), whereas later editions of the same textsand newer texts no longer make this distinction (Stanton, 1978; Kotler, 1976; Enis, 1977).

What happens when consumers are asked about their "wants"? Experience shows that the responses are not likely to be very useful. When asked about what he or she wants in a dandruff shampoo, the reply is typically . . . one that removes dandruff. When asked about wants concerning a cake mix, the answer is likely to be what comes first to mind, such as good taste or moistness (Dillon, 1978). The problem, of

course, is that the products that meet these "wants" already exist. In other words, asking the consumers about their needs and wants is not likely to generate new ideas.

Consumer Problems

In addition to focusing on consumers' needs and wants, qualitative approaches often penetrate consumer problems. While questions of needs and wants generally elicit responses that describe known features, often from competing products, problems (for the respondent) assume experience with the frustration of satisfaction blockage. A problem, broadly defined, is something that prevents, delays, or makes it difficult or costly to obtain goal satisfaction. Contrary to what has been suggested in earlier management science formulations (e.g., Ackoff, 1962), the existence of a problem as experienced by an individual does not presume that alternate courses of action are specified or outlined.

The first attempt to develop a formal methodology for consumer research with consumer problems as input was made by a group of mathematicians and social psychologists at the BBDO advertising agency. Apparently, the idea was born out of a frustration with the overly complex and inoperationalizable models of consumer behavior in the literature, and the observation that people could communicate their problems and discontent more clearly than their wants. Tom Dillon, chairman of BBDO, explains the notion of simplicity:[1]

> What I suggested (to Don Wells) was that maybe a human being was too difficult to model--that we might take a simpler form of life, the one-celled amoeba. From my few shreds of knowledge of biology, I remembered that one of the few things about an amoeba is that it pokes around in liquid using its little psuedopods in an apparently aimless fashion...aimless except for one thing. If you put a sharp object like a needle into the solution with the amoeba, the amoeba

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[1] Personal communication to the first author, September 17, 1978.

will back off the sharp point with some vigor. I suggested to Don that we experiment with the notion of treating consumers as simple pain-avoiding mechanisms in order to simplify our thinking.

You may remember that in the history of science one of the great hang-ups was the apparent existence of two apparently opposite entities--heat and cold. It was only after it was finally perceived that cold was not an entity, but merely the absence of heat, that thermodynamics made any progress.

We recognized, of course, that an amoeba probably doesn't think ahead very much, whereas our human model does. So we have to contemplate current pain avoidance and also avoidance of future pain, made possible by the human brain. Pain seemed to be a bad word in this connection, so we shifted over to the word problem.

And, addressing the issue of operationalization, Dillon suggests:

"Just as it was easier to work out the path of electric current flow by measuring units of resistance instead of conductivity, it appears that pain avoidance provides more practical measurements than pleasure.

Not only do people's description of their "wants" turn out to be quite different from their list of problems, but their behavior turns out to correlate far better with their problem list.

If you ask people what they want in a new house and also ask them what are their problems with their present house, you will get distinctly different subject matter on each list. If you then observe their subsequent behavior, it becomes clear their problem list is a far better predictor than the want list.

At least part of the reason for this appears to be that in answering questions about wants and needs there is a disposition to deal in broad generalities. There is also the inclination to give socially acceptable answers. When the questioning relates to problems, the consumer responses are far more concrete and come into clear focus.

Quite noticeable is the shift from parroting brief generalities of their culture to a highly personal and richly detailed report of their own experiences.

Possibly this is because notions of wants and needs are originally generated when the thinking process is in reverie mode and ideas tend to be fleeting and amorphous in concept. When the thinking process shifts over to problem-solving mode, ideas become concrete and are more easily retained in permanent memory.

> But whatever the reason, the evidence is clear that you cannot infer problems from wants and needs. They may overlap, but the sets do not match.

CONSUMER PROBLEM ANALYSIS METHODOLOGY

Despite its absence from the marketing and consumer research literature, the problem analysis approach has found some limited application in new product development. Terra Firma, a Swedish consulting company, has developed a methodology that corresponds to the first five stages in Kotler's list (Figure 1). The methodology (called the Opus-Method), which is built upon the idea of consumer problem detection, involves five steps (See Figure 2).

Insert Figure 2 here

Determining Task Environment

Not all consumer problems can be resolved successfully by a single firm. The purpose and resources of any one organization set effective limits to the area of consumer concerns that the firm can handle. In a competitive environment, the profit-seeking business firm will rely upon some sort of specialization. The ability to draw upon its unique competence within that specialization, be it in marketing or production, as it relates to the resolution of consumer problems, determines both consumer satisfaction and the long-term success of the organization.

> Companies interact with their environment, and the conditions of their survival and success are to be found in the establishment of a favorable balance in their relations with the surrounding world. This balance can be achieved by a kind of specialization: the company selects a certain segment of the external environment--the task environment--and carries out certain types of transactions with it.

> The choice of task environment, and of the type of transactions to undertake, must be approached with great care and in such a way that the company can learn to handle what it takes on (Normann, 1976, p. 41).

In the Opus-Method, task environment is determined by the listing of a number of essential requirements relevant to new product development projects. It is necessary that these requirements be spelled out at an early stage in order to avoid a subsequent misfit between the product to be developed and the firm's field of expertise, experience, and resources. In other words, the objective of the first stage is to determine appropriate product category. Once this is done, secondary data on market size, structure, trends, nature of competition, buyer behavior, etc., are compiled and analyzed. From the results of this analysis, a decision is made whether or not to proceed to the next stage.

Identifying Heavy Users

A frequent and serious bias in survey research utilizing random sampling of consumer populations results from the assumptions that each respondent is knowledgeable concerning the issue under study, and that he or she is interested and willing to convey his or her opinions on the matter. The apparent tenuousness of these assumptions increases with the lack of respondent experience and familiarity with the product category. For less biased estimates of consumer problems it seems advantageous to turn to those consumers who are frequent or heavy users. If there are significant and unresolved problems for consumers regarding a certain product category, the assumption is that the heavy users are most likely to be concerned and capable of communicating those concerns.

In a large number of markets, the consumers who account for a majority of the purchases constitute a small proportion of the public. For example, 20 percent of total adult females account for approximately 70 percent of total regular

shampoo usage. For movie films, 5 percent of adult males account for 82 percent of total usage, four percent of adult males account for 54 percent of total hard-cover book purchases. Similar ratios are found for beer, instant coffee, fabric softeners, movies, and many other products and services. Key respondents, such as heavy users, can be identified via field surveys prior to the problem generation.

Generating and Analyzing Consumer Problems

In contrast to methodologies that use consumer needs, wants, or perceived product benefits as input, the Opus-Method asks consumers about the dissatisfactions, drawbacks, and annoyances associated with buying and using items in the prespecified product category. Instead of building a model on product benefits or preference, the objective in problem analysis is to estimate consumer problem magnitude.

It is important to realize that consumer problems are fundamentally different from wants and needs. As pointed out before, answers to questions on consumer wants usually do not reveal anything new, and consumers often come up with unoriginal ideas about product features available through competing products. In contrast, consumer problems deal with actual experiences of dissatisfaction. This is why data on problems are likely to be more valid and meaningful than data on needs and wants.

Data collection. Initial problem list generation can be accomplished in several ways: from previously published industry reports, from group discussions with consumers and company personnel, and from interviews with individual consumers or with representatives of intermediary firms such as wholesalers or retailers. The Opus-Method relies on consumer group discussions to find relevant problems. The survey data collected in stage 2

are utilized as an aid to form groups of eight to ten individual consumers who are heavy users of brands in the product category under consideration. For most products, it can be expected that between 50 and 150 consumer problems can be generated (Martin, 1978). The larger the problem list, the greater the possibility that all salient dimensions are represented, but also the greater the risk of significant problem overlap. As a matter of fact, with a large number of problem statements pertaining to a single industry or product category, it seems likely that some of the problem statements might be a mere rephrasing of others--the substance is the same, only the terminology is different. We will return to this issue in the discussion on analysis.

When the problem list has been compiled, a sample of consumers provides the additional data for analysis. Each problem statement is printed on a card. In a personal interview, the respondent is asked to place the cards into four piles according to "the extent of problem annoyance" (EPA) the problem causes him or her. The procedure is repeated with "frequency of problem occurrence" (FPO) as the sorting criterion. If relevant, a third set of variables measuring consumer "awareness of presently available solutions" (APS) (i.e., products, services) to remedy the dissatisfaction is included. Specifically, the question here is: "Do you believe that there is a product presently available on the market that offers a solution to this problem?" Responses are registered on a three-point scale ("No solution is presently available," "A partial solution is presently available," "A complete solution is presently available").

Analysis and model specification.[2] The first task is to reduce the number of problems that now occupy the four different piles. This

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[2]This section describes an extension (of the original BBDO approach and the Opus-Method) developed by the first author.

is necessary because, as was mentioned before, some statements are probably overlapping. Therefore, we want to find a smaller set of unrelated major problems. Consequently, factor analysis (Principal Components) is applied to the scale measuring problem annoyance. In order to enhance factor interpretability, the solution is rotated in an orthogonal fashion with the objective of maximizing the variance of factor loadings within factors (Kaiser's varimax rotation). The constraint of orthogonality in factor extraction will result in factors that are uncorrelated. Even though the original problem statements may have been interrelated, each factor will represent an independent and separate consumer problem. Thus, the complication of overlapping problem statements has been resolved.

Using the conventional criterion of eigenvalues equal to or greater than 1 will result in fewer factors than original problem statements. The authors' experience suggests that one factor for every four to eight variables in the set will capture a reasonable proportion of variance (i.e., 60 to 80 percent) of the data. To estimate the magnitude of each separate consumer problem (factor), the mean score on problem annoyance is multiplied by the corresponding squared factor loading, summed over relevant problem statements and divided by the number of relevant statements. The size of the factor loading determines the relevance of a problem statement in a factor (an often used cutoff criterion is .30).

Formally, the model is described by four (1-4) equations:

$$(1)\quad F_k = \sum_{j=1}^{q} (L_{jk})\ (EPA_{ijk}) + u_{ij}\ ,$$

where F_k is the factor score (per consumer) expressed as a composite problem annoyance. This, in turn, is a linear combination of EPA_{ijk}, which represents extent of problem annoyance j for individual i on composite problem k. Additionally, in equation (1), L_{jk} is the

factor loading of problem annoyance j on composite problem k, and u_{ij} is the residual variance. It has a value of zero if q is equal to the number of EPA variables. Since one purpose of the analysis is to reduce the amount of data, this will not be the case here.

Equation (2) gives the definition of average problem annoyance (APA) over the sample:

$$(2) \quad APA_k = \frac{\sum_{j=1}^{q} (\overline{EPA}_{jk})\ (L^2_{jk})}{q} ,$$

$$\text{where } \overline{EPA}_{jk} = \frac{\sum_{i=1}^{N} EPA_{ijk}}{N}$$

and N is the sample size.

A more complete picture of the depth of the problem may be obtained by multiplying the average problem annoyance with the average frequency of problem occurrence. This means that we estimate total problem volume (TPV) by multiplying APA with a frequency weight derived from equation (3):

$$(3) \quad TPV_k = \left[\frac{\sum_{j=1}^{q} (\overline{FPO}_{jk})\ (L^2_{jk})}{q}\right] APA_k ,$$

$$\text{where } \overline{FPO}_{jk} = \frac{\sum_{i=1}^{N} FPO_{ijk}}{N} \text{ and } FPO_{ijk} \text{ is individual i's score on the frequency}$$

of problem j's occurrence.

Subsequently, we can compute the seriousness of the problem (PS) by multiplying TPV by a weight reflecting the absence of products to solve the problems (as perceived by the consumer). The formula is given in equation (4) :

$$(4) \quad PS_k = \left[\frac{\sum_{j=1}^{q} (\overline{APS}_{jk})(L_{jk}^2)}{q} \right] TPV_k$$

where $\overline{APS}_{jk} = \frac{\sum_{i=1}^{N} APS_{ijk}}{N}$ and APS_{ijk} is individual i's perception as to the existence of a solution to problem j.

A computational example. To illustrate the analysis methodology, assume that we have determined the product category to be "bank service." For the sake of simplicity, let us also assume that we can exhaust the total domain of consumer annoyance in this category from eight problems. Table 1 shows consumer i's scores on the scales EPA, FPO, and APS. Assume that these scores are also equal to the mean scores for the sample; that is, consumer i represents a "perfect" average. From a factor analysis of the EPA scores, we obtain the rotated factor loadings in the last three columns of the table. Thus, three factors are assumed to retain a significant portion of the variance.

The loadings are used to interpret the factors. Factor 1 seems to imply problems of "depersonalized services," factor 2 involves "difficulty in understanding bank services," and factor 3 appears to represent "irritation with waiting in line." Thus, the factor analysis has helped us identify three composite and separate consumer problems associated with bank services. Now, we would like to find out the importance attached by the consumer to each of these problems. Accordingly, we will use the formulas for estimating Average Problem Annoyance (APA), Total Problem Volume (TPV), and Problem Seriousness (PS).

Place Table 1 here

Equation (2) with .30 as a cutoff point for the loadings (L_{1j}, L_{2j}, L_{3j}) gives us APA:

$$APA_{depersonalization} = \frac{3x.55^2 + 4x.65^2 + 3x.38^2}{3} = 1.01$$

$$APA_{understanding} = \frac{4x.60^2 + 3x.75^2 + 3x.68^2}{3} = 1.5$$

$$APA_{waiting} = \frac{1x.50^2 + 2x.68^2}{2} = .59$$

Given the nature of the scales, caution should be exercised in the interpretation of the above figures. Yet, it is probably safe to conclude that, for this hypothetical sample, problems of depersonalized bank services and lack of understanding are of more concern to consumers than are waiting in line. Since the CPA scores for the former problems are substantially higher than for the latter, it seems wise to exclude consumer irritation with waiting in line from further analysis.

Total problem volume (TPV) for the remaining two problems is obtained from equation (3):

$$TPV_{depersonalization} = \left(\frac{3x.55^2 + 4x.65^2 + 4x.38^2}{3}\right) 1.01 = 1.07$$

$$TPV_{understanding} = \left(\frac{3x.60^2 + 4x.75^2 + 3x.68^2}{3}\right) 1.5 = 2.36$$

Equation (4), finally, gives us the Seriousness of the Problem (PS):

$$PS_{depersonalization} = \left(\frac{2x.55^2 + 3x.65^2 + 3x.38^2}{3}\right) 1.07 = 1.76$$

$$PS_{understanding} = \left(\frac{3x.60^2 + 3x.75^2 + 3x.68^2}{3}\right) 2.36 = 3.28$$

From the calculations above, it seems that the difficulties involved in understanding bank services are the most pressing problem facing the consumer. However, the PS values are not as precise as the numbers may imply. To suggest that the problem of "understanding" is almost twice as serious as the problem of "depersonalization" is an inappropriate interpretation unless we invoke the assumption that EPA, FPO, and APS are measured on interval scales and that the squared factor loading reflects the contribution of each consumer problem statement (EPA) to a composite (factor) consumer concern that is clearly interpretable.

Idea Generation and Forecasting

In some cases, ideas for new products or services become evident as a direct result of the problem analysis. If this is not the case, the Opus-Method prescribes the assembling of a small group of experts and individuals known for their creativity. Guided by the findings of phase 3, the objective of the group discussions is to arrive at realistic ideas for new products (or services) that would resolve the consumer problem(s).

Given the results in the example, it would appear that instituting a consumer education program, simplifying forms, and establishing a consumer advisory desk may be worthwhile projects for a bank to consider in attempting to reduce or resolve the problems encountered by consumers in trying to understand the complexity of the bank's services.

The last and fifth phase in Figure 4 is forecasting. Having developed new product or service concepts, the firm will want to get an idea of probable sales and market share the products would enjoy if they were introduced to the market. In the Opus-Method, a survey of consumer buying intent is used. The percentage of consumers who indicate that they would definitely buy the product is used as an estimate of probable market share. Certainly there are more sophisticated and more reliable methods of predicting market share, but in some cases a rough

estimate may suffice--particularly if that estimate suggests a much greater market share than would be necessary for the product's financial success.

CONCLUSION

The literature reviewed suggested that the high failure rate among new consumer products can be traced to such things as poor marketing research, poor product marketing, and organizational weaknesses. The problem analysis philosophy makes the charge that a serious drawback of other research methodologies is that they do not incorporate a critical variable: consumer problems. Problems are different from preferences. They are also different from perceived product attributes. And, the reasoning goes, an understanding of consumer problems will lead to better predictions of consumer behavior as well as to the development of better consumer products, services, and marketing programs.

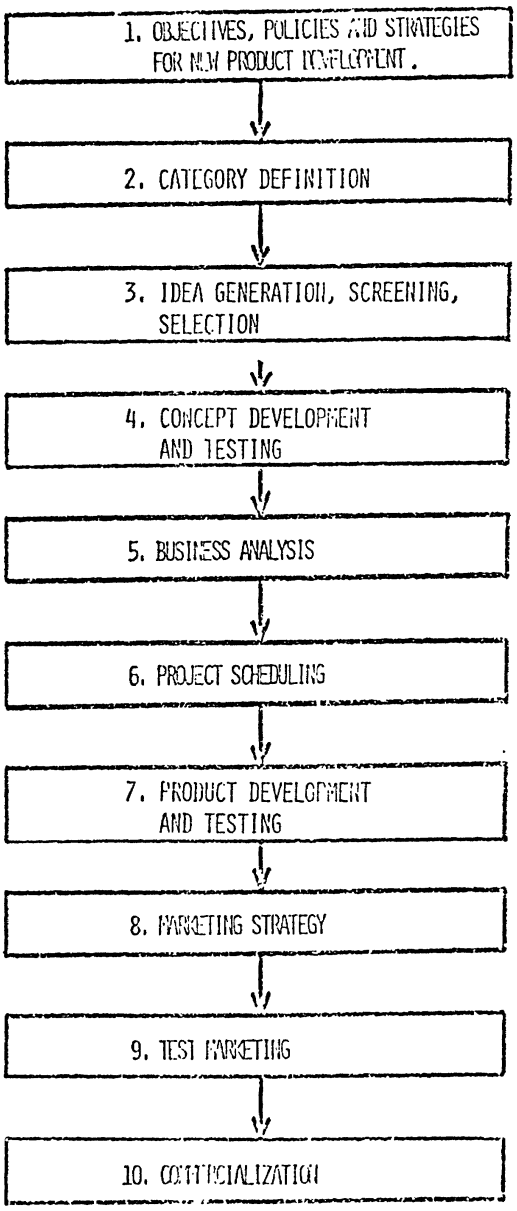
Although the reasoning behind the problem analysis approach has strong intuitive appeal, more work needs to be done at the level of theory. For example, model specification is not fully theoretically explained. Yet the approach is not without theoretical support: conforms well to the fundamental idea behind the comprehensive consumer behavior models by Nicosia (1966), Howard and Sheth (1969), and Howard (1977), that the process of purchase behavior is one of problem solving.

It is also possible that theories of human information processing, in addition to general consumer behavior theory, may lend support to the problem analysis approach. If problems are more likely to enter long-term memory (than are preferences, benefit perceptions, needs, wants), they would also be more likely to generate measures with good validity. In fact, it seems

that the measurement aspect of problem analysis (although not without unresolved issues) offers some distinct advantages. Compared to needs and wants, problems may be easier for consumers to articulate. Relative to information about beliefs on product attributes and stated preference rankings, the problem approach seems to allow more meaningful consumer involvement. The assumption is that problems are closely linked to specifics of actual personal experience. Needs and wants, on the other hand, are nonspecific, and preference or perception models suffer from the risk of being based upon perhaps artificially imputed beliefs about product characteristics.

Figure 1

CURRENT MODEL OF THE NEW PRODUCT DEVELOPMENT PROCESS



Source: Kotler, 1977.

Figure 2

THE OPUS METHOD

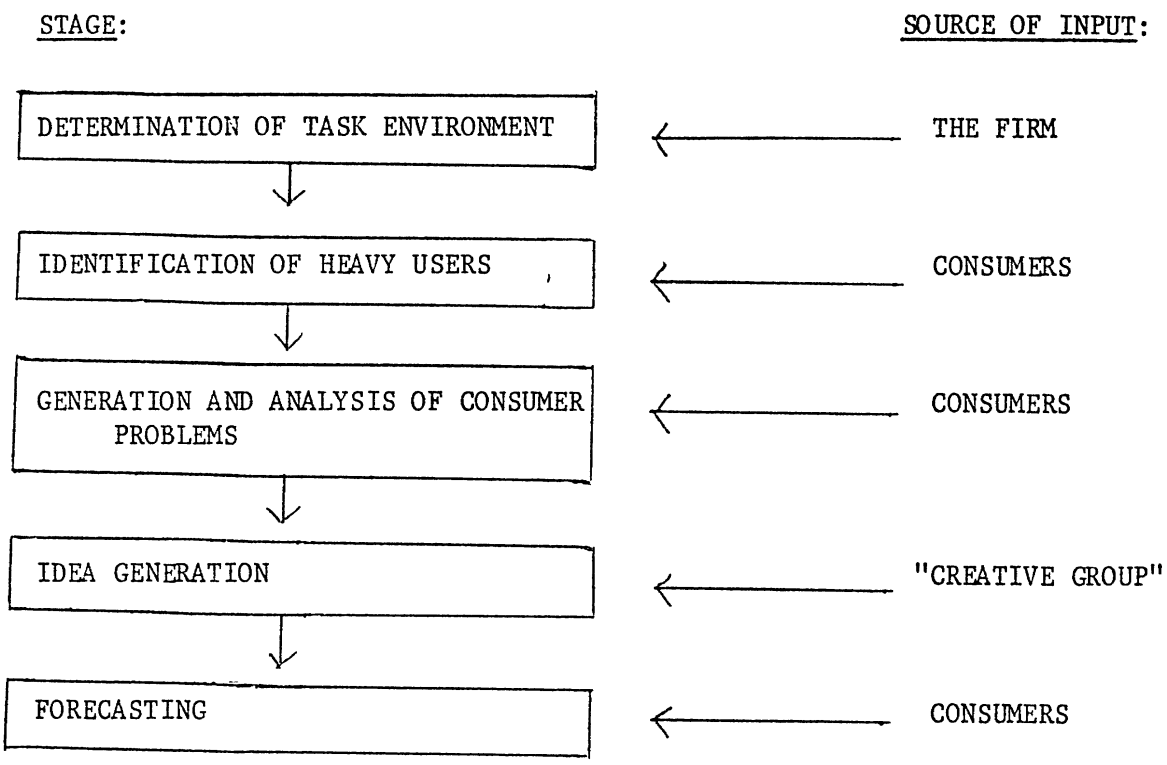


Table 1

CONSUMER PROBLEM ANALYSIS

Problem Statements	EPA[1]	FPO[2]	APS[3]	L_{1_i}	L_{2_i}	L_{3_i}
Difficulty of entering bank communications and transfers	4	3	3	.10	**.60**	.08
Institutionalized sets of rules	3	3	2	**.55**	.17	.10
Teller closing when you are waiting	1	1	2	.02	.10	**.50**
Inadequate information about bank services	3	4	3	.05	**.75**	.07
Waiting behind people with long transactions	2	1	1	.10	.02	**.68**
Inaccessability of people who make decisions	4	4	3	**.65**	.12	.13
Complex paper work required	3	3	3	.15	**.68**	.06
Computers not trustworthy	3	4	3	**.38**	.21	.12

[1]Extent of problem annoyance

[2]Frequency of problem annoyance

[3]Awareness of problem solution

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