This is to certify that the

dissertation entitled

AN INVESTIGATION OF THE PRODUCT VALUE
CONTRIBUTIONS OF EMOTIVE-SENSORY ATTRIBUTES
IN AN INTERMEDIATE PRODUCT MARKET

presented by

James Frederick Wolter

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Marketing

Frank R. Bacon
Major professor

Date July 30, 1986

# AN INVESTIGATION OF THE PRODUCT VALUE CONTRIBUTIONS OF EMOTIVE-SENSORY ATTRIBUTES IN AN INTERMEDIATE PRODUCT MARKET

By

James Frederick Wolter

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Marketing and Transportation

August 1986

ABSTRACT

AN INVESTIGATION OF THE PRODUCT VALUE
CONTRIBUTIONS OF EMOTIVE-SENSORY ATTRIBUTES
IN AN INTERMEDIATE PRODUCT MARKET

By

James Frederick Wolter

This dissertation identifies and measures emotive bases of product value as perceived by intermediaries within marketing channels. Marketing research in industrial markets has all but ignored emotion as a basis for decision making in product innovation tasks because the construct emotion has been difficult to operationalize, and measurement attempts have been unsatisfactory. This study is a pioneering effort which considers the interaction of a special class of emotive variables, defined herein as emotive-sensory, with expert judges in a focused attention and goal specific decision environment.

Four hypotheses were developed from the problem to guide the research. Paraphrasing, they hypothesized that emotive-sensory responses would be; 1) nonlinear, 2) non-interactive, 3) differentiated by the role expectations of the test subjects, and 4) sensitive to differences in construction for products having similar economic (functional) dimensions but differing in emotive content.

A series of field experiments, using 51 buyers and designers from within the apparel industry, were conducted to test these hypotheses. Direct magnitude estimation procedures were used to scale and measure perceptual responses to samples of fabric labels differing in size, color, material type, and construction type. Test results indicate support for all four hypotheses.

Several response function plots are included in this report which demonstrate the flexibility and relevance of the methodology used. Four value related constructs are measured: perceived value, perceived quality, personal preference, and professional preference.

This research validates both the construct emotive-sensory and the magnitude estimation methods when extended to value related measures. Several advantages are anticipated from using this direct measurement approach. The response functions developed are continuous and have ratio like properties suggesting more accurate prediction of response elasticities for optimum value, quality, or preference determination. These techniques are cost effective and were well received by the professional participants of the study.

Several related areas of research are suggested which will advance the understanding of the role of emotion in products.

I dedicate this work to Kandy, my best friend and wife, and our children, Chris, Missy, and Jon, all of whom gave up a share of husband and father to see it through. Also, in loving memory of my father, E. Frederick Wolter, the first scholar I have known. His untimely passing prevented our sharing this moment but he would have liked it.

## ACKNOWLEDGEMENTS

One of the great lessons relearned during a dissertation is how absolutely dependent one is on the contributions of others, without whose generosity this work would not have been possible. Dr. Frank R. Bacon, Jr. deserves special recognition as committee chairman, friend, and forbearer of countless iterations of thought. It was his work in planned innovation methods that inspired my topic. Dr. R. Dale Wilson and Dr. Dale F. Duhan shared the balance of committee responsibilities offering helpful suggestions in research design, analysis and editorial comments. Together, these three men have set a new standard for cooperation, contribution, and encouragement in dissertation research support.

Special acknowledgement for help received is due Rōspatch Corporation. Mr. Joseph A. Parini, President and CEO, provided financial support and access to his Identification Products Decision personnel, products, and markets for the gathering of experimental data. Also within Rōspatch Corporate Headquarters, Glenn Templeton, Technical Director, helped determine the physical properties which became the variable of this research. Bert Remijn, General Manager Label Division, offered the required product sample support. Renato Livas screen-printed and mounted literally hundreds of experimental samples while exercising careful control over the variables of interest.

Several others, outside of Michigan State University and Rōspatch Corporation, have made significant contributions to this work. Dean Marvin DeVries, Grand Valley State College, has consistantly encouraged this effort and provided me a teaching schedule which was compatible with my graduate studies. Dr. George Sturm helped with computer analyses and Joni Joiner created the Computervision data plots presented in the findings chapter.

Credit is due to Marilyn Miller, Wizard of Words, for fast and accurate manuscript preparation. While not directly involved with dissertation research, my friendship with Dr. Jay U. Sterling through coursework and preliminary exams has been a constant source of inspiration and encouragement.

TABLE OF CONTENTS

Page

Page

## TABLE OF TABLES

## TABLE OF FIGURES

# CHAPTER I

## Introduction and Statement of Purpose

Traditional approaches to product evaluation and adoption decision making have discounted or completely ignored the role of human emotion in product information processing (Bettman 1979) and organizational procurement decision making (Sheth 1977). Recent advances in theories of human emotion point to a need to reconceptualize the role of emotion in product related information processing and decision making. This need is especially evident in industrial procurement modeling where prevailing thought has been dominated by rational-based paradigms which admit emotional influence as a covariate only at the level of mood or other personal and subjective goal functions of the decision makers (Webster and Wind 1972).

The purpose of this dissertation is centered in both theoretical and methodological objectives. First, the objective of borrowing current behavioral research in human emotion to explain reactions to product configurations is an important contribution to theory building in marketing. Second, the testing and extension of direct magnitude estimation techniques of sensory response measurement to include new families of salient decision variables in intermediate product markets is a potentially useful methodological contribution. The promise of these techniques is improved quantification of response at reduced research cost.

## The Nature of the Problem

Bacon and Butler (1981) suggest that value is created by a product's capacity to satisfy economic and emotive needs. The economic needs are determined by physical, functional, and financial requirements and are typically measured in cost savings. In the intermediate product markets, needs for such cost savings are often communicated in the form of functional product specifications which include objective measures of conformance and testing methods for the variables of interest. The measurement of the value contributions in the economic domain is possible with deductive analysis. For example, return on investment models (ROI) may be used to assess economic value contributions using payback, discounted cash flow, value, or internal rate of return as criterion variables. Comparison of (new) economic value with existing methods is performed in a linear, compensatory modeling framework to isolate the value contributions for the new approach.

Emotive needs assessment on the other hand requires "a series of interactions with the consumer" (p. 125). Such testing is often expensive, involving thousands of man-hours and several hundreds of thousands of dollars for new consumer products (p. 189) and many years of interactive development for industrial components (Corey 1982). While considerable market research effort has been devoted to the study of emotive needs in consumer markets, little research can be found which traces the communication and measurement of these needs down through the marketing channels.

The following explanations are offered as possible factors contributing to the paucity of information on emotive bases of need in the intermediate markets.

1) There is little agreement among researchers regarding the definition and operationalization of the construct emotion (Izard 1977).

2) Economic bases of value are considered to be the predominate value constructs in the intermediate markets. This has reduced emotive issues to secondary consideration (Hutt and Speh 1985).

3) It is likely that much of the empirical work which has revealed the nature of emotive needs has been product specific and company proprietary and therefore not published.

Recent advances in demystifying and reconceptualizing the construct emotion give promise of isolating and measuring emotive values in intermediate market products. As will be shown, emotive reactions to specific product characteristics constitutes a relevant and salient class of decision criteria in intermediate market procurement situations. Responses to these characteristics by members of the industrial buying center (Bonoma and Zaltman 1978) are phenomenea which are empirically separable from the so-called idiosyncratic intrapersonal emotional variables, e.g. mood and personal goal functions. The isolation of emotive responses to intrinsic product characteristics as the focus of this research enrichens the product marketer's understanding of the adoption process without diminishing the importance of a parallel and simultaneous understanding of the personal needs of decision makers.

## Emotive Sensory Focus

The class of emotive variables of interest in this research are those intrinsic product characteristics which arouse sensory perception and information processing. The five bodily senses, employed individually or in combination produce subjective evaluations which are matched to the functional requirements for the product in the adoption decision process. While some researchers identify as many as eleven unique sensory processes (Pliner *et al*. 1979) quantitative work relevant to the manipulation of product characteristics has focused on human responses to the five primary senses measured as psychological intensity (Stevens 1975) and preference (Moskowitz 1983).

## The Need for Research

Two general intermediate market situations are of interest. First, many competitive products are often undifferentiable on the bases of economic and functional needs. Decisions on adoption in these instances are therefore frequently made on the bases of sensory responses to emotive characteristics. Second, the relationship between certain innate characteristics of components and materials to perceptions of conformance to final product design requirements is frequently related to emotive-sensory evaluations.

To illustrate, the global characteristic "comfortable ride" in an automobile is measured through a multisensory evaluation involving dynamic sensory response to collections of functional stimulae operating in concert. Ergonomic design of seating, tactile qualities of upholstery, spatial orientation and operation of controls and levels and kind of sound and vibration are all perceived, processed emotively, and integrated as comfort. To the suppliers of suspension components, fabrics, padding, acoustic materials, and controls; the emotive value contributions of their products are typically not conveyed in the precise functional specifications which control the purchasing negotiations. In other words, the historically convenient cost-plus pricing paradigm which predominates in the components and materials industries has not considered the emotive value content of products because its analytical focus is on cost, not value.

The present research is therefore directed toward investigating the usefulness of newly emerging direct-sensory methods of measuring perceptual response functions to emotive product characteristics. Of immediate interest to intermediate marketers are value response elasticity functions obtained by manipulation of product characteristics. Similarly useful is an improved understanding of the relationship between emotive-sensory magnitude and other important dependent measures such as perceived quality and personal and professional preference levels.

## Plan of the Dissertation

The remainder of Chapter I is devoted to a brief introduction to sensory measuring methods. Chapter II reviews the literature related to emotion and develops a logical model to guide empirical investigations of emotive responses. Hypotheses guiding this research are developed and explained in Chapter II. Chapter III introduces the methodologies used, the design and conduct of the research and the analyses of data. Chapter IV contains the findings from the analyses and Chapter V draws conclusions from these findings and discusses contributions, limitations, and directions for future research.

## Sensory Measurement Methods

Indirect Methods of Sensory Measurement. Efforts to measure emotive processing has been the foremost methodological issue faced by marketing researchers (Holbrook and O'Shaughnessy 1984). Under the belief that direct measurement of emotive response is not possible, most research has concentrated on psychophysiological measures as indicators of the strength and direction of arousal, activation, and effort (Kroeber-Riel 1979) in information processing. Such measures include electrodermal activity (EDA), the electrocardiogram (EKG), the electromyogram (EMG), the electrogastrogram (EGG), the electrooculogram (EOG), and the electroencephalogram (EEG), (Holbrook and O'Shaughnessy 1984, p. 57).

A substantial literature exists on postural changes, especially the study of facial reflections of interior emotional states (Izard 1977). Within this tradition are included studies of eye pupil dilation and eye-camera tracking of eye movement. Reviews of indirect methods by advertising researchers suggest that such psychophysiological measures are unreliable indicators of either intensity, direction, or kind of emotive response (Holbrook and O'Shaughnessy 1984).

Towards Direct Sensory Measurement. The concepts of differential threshold (also referred to as just noticeable difference) and psychological intensity are well developed in the psychophysical literature. The history of direct sensory measurement is rooted in a two century conflict over the proper representation of sensory response functions. The two contending laws are the logarithmic law and the power law.

In the year 1728 Cramer proposed that the subjective value of money, what economists now call utility, grows less rapidly than the numerical amount of money. In particular he supposed that the subjective or psychological value grows only as the square root of the number of dollars. A square root function would mean, for example, that in order for satisfaction to double, one would need four times as much money.

Cramer's conjecture was footnoted by the noted mathematician Daniel Bernoulli in a famous paper of 1738 in which he proposed that the subjective value of money becomes less as the amount of money increases. Bernoulli however chose a logarithmic function to represent the decreasing marginal utility of money whereas Cramer had chosen a power function with an exponent of one-half. Both functions are concave downward in a manner consistent with the principle that has appeared so obvious to nearly everyone, namely, that the value of one added dollar seems less when you have a thousand than it does when you only have two or three. The differences in the two functional representations, however, have far reaching consequences in the science of sensory measurement.

Bernoulli's logarithmic function was arrived at from the simple assumption that the added utility grows smaller as the number of dollars grows larger - a simple inverse relation. Cramer's power function derives from an alternative assumption which holds that the added utility grows smaller as the total utility grows larger. Again a simple inverse relation, but this time it is between the added utility and the total utility, not between the added utility and the total number of dollars.

Stevens (1975, p. 6) cites this development as the origin of the conflict between logarithmic and power law representations of sensory perception. Because of the prevailing opinion that direct sensory measurement was not possible, nineteenth century psychophysicists concentrated on indirect measurement of sensation. In 1834, E.H. Weber had noted that in order for a change in a stimulus to become just noticeable, a fixed percentage must be added. Thus Weber's law says that the just noticeable difference (JND) grows larger in direct proportion to the size of the stimulus.

Fechner (1860) added a new feature to Weber's law. He proposed that each time a JND is added to the stimulus the sensation increased by a jump of constant size. There, in equal sensation increments, he thought he had found the equal units needed to measure sensation. The combination of Weber's law and Fechner's assumption led directly to a logarithmic law for the growth of sensation (Stevens 1975, p. 9). Thus it was that Fechner proposed to measure sensation by way of indirect experiments by conducting scores of discrimination tests in which he measured the JND. That key concept, the JND, appears innocent enough if all we want to know is a person's ability to tell one stimulus from another. But the JND becomes loaded with potential deception when it is regarded as something more than a measure of sensitivity. This occurs because when undertaking measurement of a JND, we are in fact measuring the confusions of the subject as he tries to cope with small stimulus differences. The JND is a poikilitic measure, a name given it because it is a measure of variability or "noise" that sets limits on our sensory resolving power.

According to Stevens (p. 10) Fechner thought he could measure total subjective magnitudes using confusion and variability in the judgment of small differences as units of measure. L. L. Thurstone based his well-known measurement of attitudes on what he termed Fechner's "logic." Thurstone improved the mathematical machinery but left intact the assumption that out of variability and confusion we can forge the units of measurement.

By basing scales on judgments of subdivisions or apparent differences instead of judgments of ratios, logarithmic laws give a partition scale instead of a magnitude scale. A true magnitude scale is necessary to answer questions about ratios. In summary then Fechner's approach and its modern descendants use the discriminal capacity of the subject upon which to base a measurement formula, whereas those working in the spirit of direct measures utilize the presumed familiarity of the subject with the number system to obtain direct estimates of subjective magnitude.

## The Direct Methods

The history of methods involving judgments of assigned intervals is traced to Plateau, who in 1872 published the results of some experiments he had conducted in which eight artists were required to paint a gray midway between a given black and a given white. Because the perceived brightness relationships among the three resulting surfaces did not change with changes in illumination, Plateau concluded that the psychological ratio was a constant physical ratio and thus the relationship between the two was to be represented as a power function. Unfortunately this method did not seem to work out very well since results from laboratory to laboratory were not reproducible (Jones 1974). Jones (1974) discusses several other historical methodologies for direct measurement leading to ratio scales. Thorndike's scale of penmanship, Torgerson's fractionation methods and constant sum or ratio partition methods are given as examples.

Direct Magnitude Estimation

In the method of magnitude estimation, the subject is asked to assign appropriate numbers to a series of stimulae, presumably in accordance with the subjective impressions they illicit. The origins of this method are usually attributed to Richardson (1929). The credit for development of this method in its modern form must go to Stevens (1956, 1957). Magnitude estimation is a technique belonging to a family of techniques referred to as direct estimation and includes category scaling, rating of similarity, and direct magnitude estimation. In all of these techniques a subject's response is a number that represents some property of a stimulus presentation under observation. In magnitude estimation most of the variance is accounted for by a power-function relationship between stimulus magnitude and assigned numerals. Since this outcome is in obvious contrast with the logarithmic law proposed by Fechner, herein lie the seeds of conflict. Before addressing this conflict further, a more careful look at what is meant by a sensory continuum, and the two classes into which sensory continua divide is in order.

Stevens (1975, p. 12) introduces the distinction between the concepts of quantity and quality, or magnitude and kind, or size and sort of sensory information. No pair of common words quite fits the distinction, but what it means concretely is that sweet is different from sour, although both may vary from strong to weak. The terms metathetic and prothetic are introduced by Stevens to represent these respective characteristics of sensory information.

Psychophysics, the science of sensation, has little to say as yet about qualitative variations among sensations. The qualities of the sensory world are discontinuous within and between sensory modalities and as of yet there is no theoretical explanation as to the underlying mechanisms of preference. The various colors, tastes, smells, and tactile variations seem not to lie on a continuum, but to exist in a more-or-less complete independence of one another (Stevens 1975, p. 12). Sometimes a crude ordering among them seems possible, but for the most part the sensory qualities have not been explained beyond classification.

There exists however many sensations that appear to lie on a continuum of some sort. There sensations may be ordered on a scale from faint to intense, from weak to strong or from short to long, and consequently for numerous continua a measurement form that is stronger than mere ordering can be devised (Stevens, op cit.).

Perception of sound is often used as an example of the two kinds of perceptual continua. Apart from spatial sensation, sound is perceived by loudness and pitch. Loudness is a prothetic measure best described as degrees of magnitude or quantity. Pitch, a metathetic dimension, varies from high to low in a substitutive continuum but does not have quantitative measures of magnitude at a given tone. Sensory discrimination is therefore mediated by one or both of the two processes: the one additive, the other substitutive. Additional excitation may be added to an excitation already present or new excitation may be substituted for excitation that is already present or has been removed. An observer can tell for example if sound intensity is changing or if the pitch or complexity of the sound information is changing as long as these changes are above his JND thresholds. All in all, the metathetic continua seem to comprise a smaller and less orderly class of perceptual variables than the prothetic continua.

Holbrook (1981) has stressed the importance of developing new methods to research emotional response. Noting the inadequacies of the independent use of either composition or decompositional approaches, Holbrook (1981) suggests an integrative lash-up linking linear compensatory attitude modeling with conjoint analyses. The resulting preference descriptions are plagued with the combined shortcomings of both techniques. First there is strong evidence to suggest that emotive responses are nonlinear in the range of interest casting suspicion on the usefulness of existing compositional approaches. Then, measures of perception based on distances from factorially complex ideal points are value-laden in contrast to the relatively simple spontaneous cognitive-perceptual variables of interest. Finally conjoint's preference ranking gives discontinuous, difficult to scale information for predicting the continuous response functions of interest.

Greater explanative and predictive power would be offered by methods measuring perceptual responses with ratio-like scale properties on factorially simple constructs. The direct magnitude estimation methods discussed in this chapter are a significant departure from the currently used indirect, inferential methods. Both in offering ratio-like data and continuous response prediction, direct methods offer promising advances in product research. The necessary theoretical justificaton for adopting direct methods is offered in the following review of the literature on emotion and the accompanying model adaptation.

# CHAPTER II

## REVIEW OF RELATED LITERATURE AND STATEMENT OF HYPOTHESES

### Conceptualization of Emotion: A Historical Perspective

Historically there has been a tendency to treat emotions as biologically primitive, instinctive response patterns. It is against this backdrop that the concept of emotions as social constructions must be viewed (Averill 1980). To further complicate matters, the study of emotive issues in commercial products has been rooted in a dichotomy in which emotive information processing has been set in opposition to normal discursive reasoning. Research efforts in marketing have largely focused on one end of this dichotomy or the other, rather than exploring the interrelationships which exist between emotive and rational decision processes (Kreshel 1984).

Leventhal (1979) traces contemporary theories of emotion to four historical research perspectives: (1) attitude or expressive motor theory which is basically Darwinian; (2) body (or autonomic) reaction theory, which is basically Jamesian; (3) central neural theory, which is the tradition of Walter Cannon; and (4) cognition-arousal theory, which is currently center stage because of the work of Stanley

Schachter and his students. A brief review of the structure of each perspective is borrowed from Leventhal (1979), Izard (1977), and Moss (1973) as follows below.

<u>Attitude or Expressive Motor Theory</u>

Attitude or expressive motor theories form the core of the traditional views of emotion. While theories belonging to this class are exceptionally varied, most are linked by some common assumptions. Among these are process assumptions with the usual sequence being: (1) a stimulus setting is perceived and produces activity in a neural structure which is specific to a particular emotion; the connections between stimulation and particular neural structures may be innate, conditioned, or learned; (2) activity in the underlying neural center gives rise to feelings and expressive motor behavior (postural and facial changes); (3) the pattern of expressive motor behavior, including postural and facial alterations, is specific for each of the emotional states; (4) there is some kind of feedback connection between expressive action and subjective feelings. Expressive motor theories trace to Darwin and tend to take emotion for granted, i.e. the experience and expression are seen to be manifestations of an innate mechanism (Figure 1).

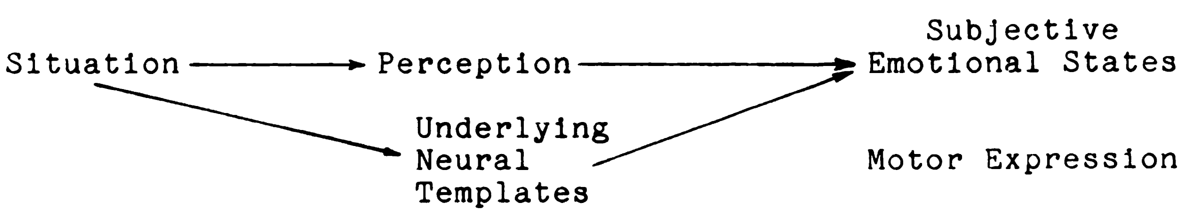



Figure 1. The Darwinian, on Attitude Model of Emotion. Source: Leventhal (1979).

Body (Autonomic) Reaction Theory

Until the nineteenth century most of the medical world believed that emotions circulated in the vascular system (Pribram 1967). Many contemporary scientists have taken the position that emotions are primarily a matter of visceral functions, activities of organ's innervated by the autonomic nervous system (Wenger 1950). William James reversed the view that situations provoke activity in an emotion center which produces subjective emotion and expressive reaction by arguing that situations produce autonomic, expressive, postural, and adoptive behavior which is the source of emotional experience (Figure 2).

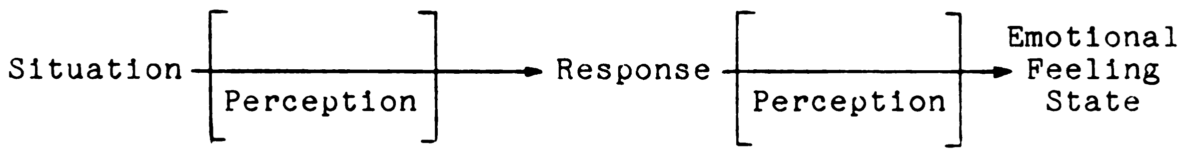



Figure 2. The Body-Reaction or Jamesian Model of Emotion. Source: Leventhal (1979).

James believed the nervous system consisted of sensory, association and motor areas, and lacked any special areas for creating feeling qualities. This belief along with his introspective experience convinced James that feedback from motor reactions was the critical factor in adding feeling to experience. In searching for organismic responses linking perception to emotion, James settled on visceral reactions as the feedback source because they were involuntary, complex and diversely patterned. He rejected the hypothesis that feedback from expressive reactions is the source of feelings because he believed these reactions to be voluntary and therefore they could not produce feelings.

A significant portion of James' theory was lost because of the relationship that developed between James' ideas and those of Lange (1885). Lange took the position that emotion consisted of vasomotor disturbances in the visceral and glandular organs and that secretory, motor, cognitive, and experiential phenomena are secondary effects. The marriage of James' and Lange's ideas obscured from most emotion researchers the fact that James thought that striate (voluntary) muscle feedback also played a role in emotion.

The James-Lange theory grew rapidly in popularity. With James, serious experimental study into the source and nature of affect began (Bindra 1970). The James-Lange theory, which has been and still is one of the most infuential theories of emotion, proposed that bodily changes follow the perception of an exciting situation. The visceral and somatic changes are, in turn, perceived, and these perceptions of physical changes as they occur are emotional feeling. Emotions are seen as the result and not the cause of visceral and somatic responses (Moss 1973).

Central Neural Theory

Walter Cannon (1927, 1931) strongly objected to the Jamesian position. He could only show two broad visceral patterns of response, the sympathetic and the parasympathetic dimensions of the autonomic response. He argued that; (1) the visceral responses are not sufficiently differentiated to account for the wide range of emotional qualities in experience, (2) visceral reactions are too slow to give rise to subjective feelings, (3) the viscera are relatively insensitive, (4) viscera can be separated from the central nervous system without disrupting expressive motor behavior, and (5) after artificial induction (by epinephrine injection) visceral changes create the autonomic responses of emotion but do not lead to subjective emotional states (Leventhal 1979, p. 5).

Cannon felt that emotions were determined in the thalamus when the thalamus was released from cerebral cortical inhibition. Unless this release occurred, the thalamus relayed to the cortex only simple impulses. However, when released from cortical inhibition it added to perception the peculiar qualities that distinguish various emotions (Gellhorn and Loofbourrow 1963). Consequently, visceral and somatic emotional responses were seen as the result of emotional thalamic responses rather than as being the cause of emotional feeling as in the James-Lange theory. Subjective feelings, Cannon argued, were generated by interactions between thalamic and cortical centers (Figure 3).

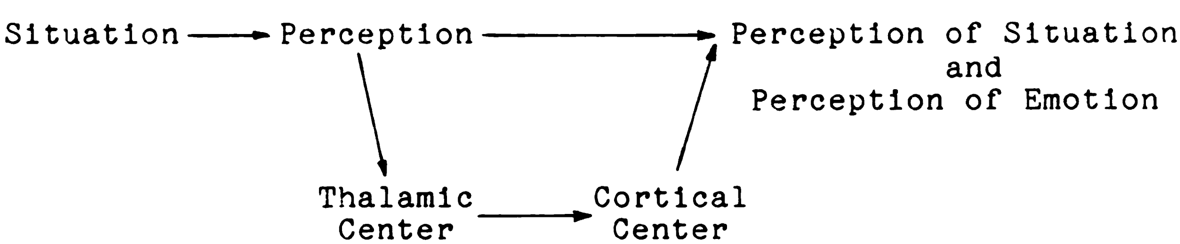



Figure 3. The Central Neural Model of Emotion--Early Cannon version. Source: Leventhal (1979).

Cannon's concept of homeostasis and that of a thalamic-cortical pathway for generating emotion had a positive contribution in physiological and neurological studies but little contribution in emotional research because no new heuristics for creating or varying emotional response were offered by his theories (Leventhal 1979).

Cognition-Arousal Theory

The thesis of cognition-arousal theory is that the integration of cognitions of the eliciting circumstances with autonomic arousal is emotion; with the quality of the emotional experience given by the content of the cognitive experience. Much of the current work on the physiology of emotions is loosely conceptualized and is oriented toward measuring correlations between various neurological and physiological conditions (Moss 1973). Such work is generally concerned with the degree of arousal or activation and can be divided into those studies based on peripheral measurements, such as galvanic skin response, and more direct studies of interval processes, utilizing measures such as hormone levels in the blood (Pribram 1967). These studies have indicated a number of autonomic and physiological similarities between the processes we call stress, emotion, motivation, and arousal and tend to question such conceptual distinctions as they relate to psychophysiological processes (Pribram 1967).

Pribram (1967) suggests that activation is not an increase in neuronal excitation but the spontaneous materialization of different states of neural organization. He minimizes the contribution of visceral and somatic processes to emotion and emphasizes perceptual processes. He also rejects the concept of emotions as particular physiological configuration or as resulting from drives. In his model emotions are the experiencing of an appraisal of incongruity between the input and one's memories and expectations or neural programs and plans. Two processing mechanisms are postulated which modify and regulate the perceptual incongruity. One mechanism, called preparatory, is equivalent to selective perception and shuts out information that may cause an unwanted incongruity. The other mechanism, called participation, involves paying attention to the information input and reorganizing neural representations to mesh with the input. Thus Pribram asserts that emotion and its expression should be separated where as the James-Lange and Cannon theories confuse the two. The Pribram model does not include visceral responses, physical actions or motivations as identical concepts to emotion. His model portrays emotion in terms of reflective aspects of information processing rather than as behavior.

Moss (1973) is inclined to agree with Pribram that incongruities between the expected and the experienced are very central to changes in subjective feelings and appraisals. However, Pribram does not adequately account for the autonomic and other physiological aspects of emotion (p. 20).

Of the models of emotion in current use, Moss (1973) believes that Schachter's theory (1964) most successfully combines both the subjective and physiological elements. Schachter modifies the James theory to answer Cannon's objections while retaining the condition of physiological arousal. In contrast to Pribram, Schachter contends that both physiological arousal and appropriate cognitive elements are necessary for emotions to occur. For a given state of physiological arousal for which an individual has no immediate explanation is labeled and described by him in terms of the cognitions available, especially in terms of the situation in which he finds himself. The same physiological state might be labeled joy, fury, or any number of emotions (Schachter 1964, p. 141). In a situation where a person has an appropriate explanation for an experienced arousal state, then no evaluative needs will arise and the individual is unlikely to label his feelings in terms of the alternative cognitions available (p. 142). A concept of potential importance to marketers is Schachter's "cold emotion." In a situation where there is no physiological arousal but which formerly had been emotion-inducing, a feeling of "as if" or "cold emotion" is experienced. One goes through the behavioral motions for that emotion which one has learned is appropriate in the situation, but one "feels" nothing (p. 142).

Schachter's (1964) model argued that: (1) stimulus situations can be contrived to give rise to arousal (e.g. by injection of epinephrine); (2) arousal is attended to and noticed; (3) arousal does not define a clear state of emotion; (4) because the meaning of arousal is unclear, a state of arousal creates a "need to know" or need to explain the arousal sensations; (5) the individual searches his environment for a definition or causal antecedent of his arousal; and when the antecedent cause is identified or labeled, the perception of the cause is itself felt as a particular emotional quality.

These assumptions are clearly Jamesian. First, it is assumed that arousal is both necessary and consciously noticed for emotional experience. The cognitive event itself, independent of defining expressive reactions, is sufficient to the experience of emotional quality. Perhaps the most important aspect of Schachter's theory for marketers is the emphasis upon cognitive development as precedent to emotional development. The hierarchial learning models of product adaption which emerged near the time of Schachter's work (Lavidge and Steiner 1961) subsume emotional development within their cognitive development framework.

Cognitive-arousal theory assumes that the emotive processing sequence proceeds from cognition to arousal to emotion, the reverse of the usual order of arousal and environmental conditioning. The Schachter theory clarifies a variety of questions concerning the way visceral arousal is integrated with cognition in generating emotion while leaving open to question the mechanics of integration (Figure 4).

Situation → Cognition → [ All Levels Interactive ] → Arousal → Emotion

I n t e r a c t i o n

Figure 4. The Cognition-Arousal Model of Emotion, with Questions About the Nature of the Integration Process as Stated by Schachter. Source: Leventhal (1979).

## Critique of Emotion Models: The Marketing Perspective

Basic to differentiating the models is the question of whether or not they view emotive processing as a distinct phenomenon: (1) Is emotion a unique phenomenological experience; (2) Is the process which creates emotion unique to emotional experience; and, (3) Is there a special neurological mechanism underlying the emotional process.

In general, the body-arousal and cognition-arousal models treat emotion with nonemotional mechanisms: e.g. emotion _is_ the perception of bodily or autonomic feedback or emotion _is_ the integration of autonomic feedback with cognitive events (i.e., event perceptions, labels, or concepts). The expressive and central neural models, on the other hand, allow for special psychological and neurological mechanisms for emotional experience (Leventhal 1979). Before proceeding to issues relating to emotional responses to commercial products, several questions remain unasked. Some of these are structural and some definitional issues, e.g.; (1) Is arousal necessary for emotion; (2) Is cognition able to account for the quality of emotional experience; (3) What role does perception play; and, (4) Are there common theoretical threads useful to commercial practice in the diverse body of emotion theorizing?

Is autonomic arousal a necessary condition for emotion? Body-arousal and cognition-arousal theories would both answer a qualified yes. If the question is directed to identifying the relationship between autonomic and central neural arousal as a central condition for the occurrence of any behavior, then most theorists would agree that a physiological state change is associated with behavior (e.g. Lacey 1967). However, if the question regards whether arousal is essential for emotion per se, i.e. for the feeling of particular qualitative states such as pleasure, anger, or fear, then the answer is no (Leventhal 1979). This answer is derived from studies on animals and paraplegics and suggests that sensory memory has its own independent processing loop, a result of considerable use to marketing's promotion theorists. The issue of the role of arousal in emotional experience is of considerably more interest to new product researchers. Arousal has been assigned a formidable central role most likely because of its noticeability during or after emotional experience.

Cognition-arousal theory argues that cognition is an essential contributor to emotion. Two roles are assigned to cognition: first; as an initiator of emotional experience, and second; as the process of evaluating the quality of emotional experience. All four theories of emotion agree that perception and interpretation of the environment and interval imaging intiate emotional experience. Within emotional processing, three functions are assigned cognition; (1) the perceptual processes related to appraisal of the eliciting situation, (2) the perception, measure and classification of arousal, and (3) the perception of emotion itself.

A substantial portion of behavioral research in marketing has focused on the cognitive components of emotive process. The prominent consumer behavior models for example, (Nicosia 1966; Howard and Sheth 1969; Engle, Kollat and Blackwell 1968) are all rationally-based models largely derived from John Dewey's theory of the problem solving process (Kreshell 1984). In advertising research, hierarchial learning models (e.g., Lavidge and Steiner 1961) predict behavior from sequentially ordered levels of cognitive involvement. In the studies of attitude; linear, additive models (e.g., Ajzen and Fishbein 1980) present a cognitive learning paradigm which emphasizes the rationality of man. The so-called Fishbein models all assume that human beings are quite rational, making systematic use of information available to them in decision making. Consumer information processing theories (e.g. Bettman 1979) focus on the cognitive elements of decision making almost exclusively without reference to emotional issues. In psychology, debates over cognition and emotion (Zajonc 1980) are indications of continuing interest in the study of emotional response. Such interest has sparked new theorizing offering complex "grand theories" of emotion (Mandler 1980; Izard and Buechler 1980).

Across the competing theories of emotion, researchers tend to agree on at least four traditional components of emotion: (1) subjective experience, measured in terms of affect; (2) cognitive processes such as appraisal, labeling of the affective component, and choice; (3) physiological adjustments, arousal and autonomic responses; and, (4) conative or action impulses operationalized as approach-avoidance by Mehrabian and Russell (1974). Virtually all theories of emotion recognize a cognitive component somewhere in their framework. As a result, cognition and emotion are not viewed as separate faculties, but as interrelated processes (Kreshel 1984, p. 13).

At least one author (Averill 1980) considers emotions to be social constructions, that is, emotions are responses that have been institutionalized by society as a means of resolving conflicts which exist within a social (economic) system. Averill (1980) conceptualized emotions as cognitive (information processing) systems or rules of behavior. Using a linguistics analogy, it may be said that emotions have a "grammatical logic," and like the grammatical structures used by linguists, emotional systems cannot be identified with any specific set of behaviors. Just as there are an indefinite number of ways in which a person may express his anger or joy, just as there are an indefinite number of ways in which a particular preposition may be expressed in language. The primary questions addressed by Averill are related to the relationship of emotional systems to broader rule-systems defined at the sociocultural, biological, and psychological levels of analysis (p. 40).

Important to the present discussion, Averill (1980, p. 41) presents emotive responses as essentially a cognitive process within the universal structure of thought. To visualize the interdependence of emotive and cognitive processes Averill depicts different types of cognitive activity along a curve (Figure 5). The vertical axis of the curve represents increasing degrees of structuralization while the horizontal swing represents the degree to which behavior is experienced as deliberate and self-determined.

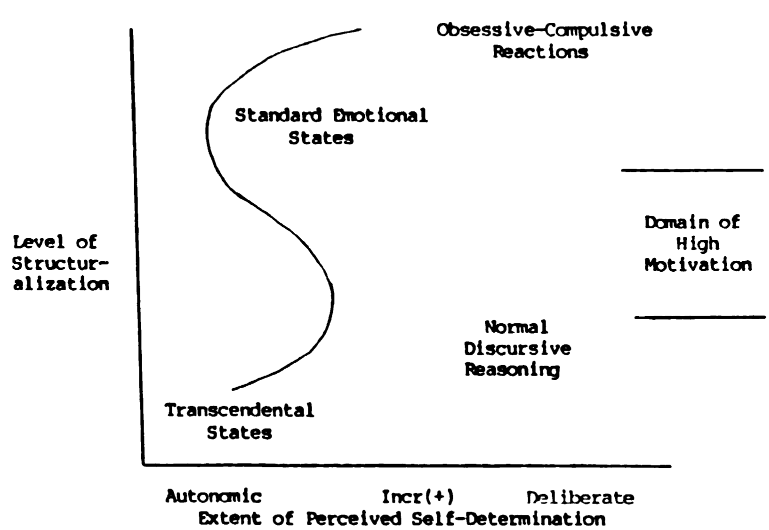



Figure 5. Cognitive Activity. Source: Averill (1980, p. 41).

At the very lowest level of structuralization of thought are the transcendental emotional states (e.g. anxiety, mystical experience). These shade into systems of thought which frequently are considered emotional but which also bear some resemblance to ordinary patterns of thought. Progressing up the curve, one comes to everyday discursive thought (inductive and deductive reasoning). This level is characteristic of learned problem solving and coping responses, ranging from simple to extended-complex attempts at mastery.

As efforts at problem-solving become more focused and directed the spiral enters states of high motivation which Averill equates to the increasing levels of structure of thought and not with energizing situational factors. Moving to higher levels of structure and reduced levels of self-determination one enters the domain of standard emotional reactions. The higher degrees of structuralization are so rigid and stereotyped as to involve a rather severe dissociation of consciousness. Note that while these compulsive reactions are unusual and idiosyncratic, they involve high degrees of both structure and willful self-determination. Often it is difficult to distinguish an obsessive-compulsive response from normal problem solving activity, except that it is rigid and reality distorting rather than flexible and reality oriented (consider for example the delusional system of a paranoid), (Averill 1980, p. 43).

While Averill's (1980) representation of the structure of thought is difficult to operationalize on its descriptive variables, it may be broadly interpreted such that it has relevance to marketing information processing studies. Several issues emerge: (1) The nature in which product characteristics decompose on the structure and perceived self-determination dimensions; (2) The temporal stability of locations on the spiral; and, (3) The experience (learning) related effects which are responsible for migration of points on the spiral.

Avoiding the extremes of transcendental emotion on one end and paranoid behavior on the other, and focusing on the range from normal discursive reasoning to standard emotional response creates a relevant inquiry range for marketing. A further analytical simplification is possible by following Averill's development of the systems approach to the study of emotion. Four levels of analysis are defined to organize this approach (Table 1).

Table 1
Levels of Analysis in Emotional Systems
(Adapted from Averill (1980) p. 48)

| Level of Analysis | Units of Analysis | Dependent Measures | Independent Measures |
|---|---|---|---|
| Cultural | Corporate culture, National cultures, Subcultures | Cultural identity, Homogeneity | Global affect, Core value systems |
| Social | Formal, informal groups | Norms, attitudes | Beliefs, weights |
| Individual | Relevant Decision makers | Preference, Attitude | Product characteristics, Cognitive information |
| Biological | Intraindividual, Animal studies | Psychophysical response | Neurophysio-logical, Arousal, Activation, Effort, Central competancy |

Averill (1980, p. 49) cites Parson's conceptual scheme for the analysis of behavior. To be an "action," a behavior must be analyzable in terms of: (1) its goal orientation or the anticipated state of affairs to which it is directed; (2) the situation in which it occurs; (3) its normative regulation; for example, whether it is expressed in a reasonable or acceptable manner; and (4) the expenditure of energy or effort required for its occurrance. Actions in this context are not isolated bits of behavior but occur in organized constellations or systems, specifically the four listed in Table 1; cultural, social, personal, and biological.

Emotion does not "belong" to any one of these various systems but has elements which may enter into each. In one special sense, learning or experience may be viewed as increasing the level of emotive processing within and between the levels specific above. Leventhal's model (1979, p. 26) stresses the schematic, emotional memory mechanism as a pivotal processing mechanism. Emotive memory schemata are concrete and episodic in nature, i.e. representations of particular experiences that are most readily retrieved by procedures involving image instructions. Emotive schemata form abstract or prototypic representations of classes of emotional experience. The degree to which these structures include instrumental autonomic and expressive components will vary with the <u>learning history of the individual</u> (emphasis by this author).

Well defined functions are assigned to emotive schemata (Leventhal 1979, p. 28):

1) They provide a repository of autonomic reactions for affectively significant situations (economy of mental effort and reaction time efficiency).

2) Emotional schemata direct attention to specific features of the perceptual field, like other categories, they act as selective devices (Broadbent 1977). But unlike some selective devices, such as novelty, emotionally induced attention is longer lasting and sustains interest in particular environmental events for a relatively long period of time.

3) Emotional schemata focus attention by influencing coding, or the elaboration of a trace of the current situation.

4) Inputs are amplified or strengthened by schemata giving them priority in focal awareness.

5) An important function of emotional schemata is their role in the sophistication or development of the emotional life. Emotional experience becomes more differentiated over time and the basic emotions are blended to form subtler feeling states (Ekman et al. 1972). Thus schematization involves both the attachment of existent emotion to new situations and the alteration of emotion by generating new blends of stimulus traces and motor patterns of expressive behaviors along with autonomic and instrumental responses. The result is the emergence of emotional experiences such as empathic distress, intimacy, and pride.

6) The sixth schematic function involves retrieval or access to past events via emotional memory. Episodes can be recalled in detail by self-instructions which stimulate concrete perceptual schemata that recruit emotion and emotion laden imagery.

These six functions are Leventhal's definition of roles of emotional schemata in creating or structuring emotional experience. Emotional schemata are seen as being instrumental in creating a form of tacit or intuitive knowledge that goes beyond situational perception, expressive reaction, or autonomic response. Leventhal (1979, p. 29) adds a seventh function of affect, that of permitting additivity of otherwise unrelated events. Thus, dissimilar events such as expressive motor discharges and perceptual cues are integrated by schemata in a basically collective way. This combination is contrasted to more typical integration by weighted averaging where each individual element is separately coded, judged on a metric, and the judgments average in a linear fashion. In affective integration the elements are first coded in a common schemata or set (i.e. they are first pooled and the judgment is made of the pooled set).

Averill's (1980) model suggests important interactions between cognitive and emotive processing schemata by placing them at either end of the same function (structured thought). From the variables presented, the cognitive processes of inductive and deductive reasoning are characterized as being action-oriented in terms of the goals, normative regulation and willful direction of the process while emotive processes are much more structured and less flexible in terms of the schemata used but relatively spontaneous in terms of their presentation to the judgment process.

The spontaneity issue in emotions resolves conceptual distinctions between emotions and drives, and between emotive process and cognitive process. Izard (1977) makes these distinctions within a framework he calls freedom of emotions.

1) Freedom of time, there is no essential rhythm or cycle as with the drives.

2) Emotion has freedom of intensity; whereas drives characteristically increase in intensity until they are satisfied, the intensity curve or profile of an emotion may vary markedly in time.

3) Emotion has considerable freedom in the density with which it is invested. Density of emotion is the product of intensity and duration. On the density dimension emotions may either be much more casual than any drive or much more monopolistic.

4) The freedom of the emotion system is such that emotion can be invested in "possibility." Thus emotion underwrites anticipation, the central process of learning.

5) The emotion system has freedom of object. Although emotions which are activated by drives and by special releasers have a limited range of objects, the linkage of emotions to objects through cognition enormously extends the range of the objects of positive and negative emotions.

6) Emotion may be invested in a monopolistic way in a particular mode of experience. Emotion may be monopolistically in thinking, feeling (sensing), action, achievement or decision making.

7) Emotions are free to combine with, modulate, and suppress other emotions.

8) There is considerable freedom the way emotion may be instigated and reduced. As a general rule people strive to maximize positive emotions and minimize negative emotions, but even different aspects of the same activity may instigate or reduce negative and positive emotions.

9) Emotions enjoy considerable freedom in the substitutability of objects of attachment. It is the transformability of the emotions, not of the drive, that accounts for the Freudian concept of sublimination.

10) Emotions have great freedom in terms of good orientation or response-sequence alternatives, whereas drives as motives are quite specific in this regard.

Typology of Emotive Constructs

In order to distinguish emotion from other motivational and affective constructs, Holbrook and O'Shaughnessy (1984) present the following position. Because of the interdependency of mental constructs, there has been much controversy surrounding the definitional isolation of emotion. Emotions of interest in product related information processing may be considered to be externally triggered whereas motivations are internally triggered. Motivational desires differ from emotional responses in their degree of activity and reactivity. The former are directed toward action, while the latter reflect the organism's reaction to surrounding situations.

The distinction between emotion and affect is murkier (Holbrook and O'Shaughnessy 1984, p. 48). Some treat the two as synonymous whereas others note that--in addition to affective sign (positive/negative), intensity (strong/weak), and duration (long/short)--emotions entail some further qualitative content. Zajonc (1980) sees affective reactions as being heavier on energy (in contrast to reasoning which is heavy on information). In addition emotive reactions are; 1) primary, 2) inescapable, 3) implicate the self, 4) difficult to verbalize, 5) may be independent of cognition, and 6) may be separable from content (pp. 154-160).

For the purposes of this research, the Holbrook and O'Shaughnessy (1984) typology will be adopted because it supports the view that spontaneous sensory responses to product characteristics may be classified as emotional responses. Furthermore, this position distinguishes emotion as only one among many types of motivational constructs. The differentiation of constructs is made on the basis of three contrasts; 3) active vs. reactive, 2) acute vs. chronic on a temporal base, and 3) specific vs. general on a causal base (Table 2).

Table 2
A Typology of Motivational/Affective Constructs

| | Causal Basis | Acute | Chronic |
|---|---|---|---|
| Active | specific | desire | attitude |
| | general | drive | want |
| Reactive | specific | emotion | sentiment |
| | general | mood | personality |

Source: Holbrook and O'Shaughnessy 1984, p. 49.

This typology regards the active constructs as goal-directed. Both desire and drive are seen as acute (e.g., satisfied in the short run time perspective). In contrast, attitude and want are chronic (e.g., more temporaly stable).

The reactive constructs tend to involve a response to the environment. Both emotion and mood are acute (i.e., short-lived). Emotion is a reaction to some specific object--whether an event, person, or product evaluation, while mood is a general predisposition to respond in some structured way to the world at large. In contrast, sentiments and personality are considered temporaly stable, lasting longer than emotions or moods.

The Holbrook and O'Shaughnessy (1984) typology distinguishes emotion (reactive, acute, specific) from closely related phenomena that differ in only one dimension (moods, sentiments, desires) and from more distantly related constructs that differ in two dimensions (personality, attitudes, drives) or in all three dimensions (wants).

As a capstone for this review of research in emotion, Izard (1977) lists causes of emotion. Three are person-environmental interactions and five are intrapersonal in nature.

I. Person-environment interactions that can cause emotion:

1. Obtained perception-perception following stimulation derived from selective activity of a receptor or sense organ.

2. Demanded perception-environmental or social event demands attention. The orienting reflex may be the first response to such a stimulus.

3. Spontaneous perception-indigenous activity of a perceptual system.

II. Intraindividual processes which can cause emotions:

1. Memory
   a. Obtained (active, sought).
   b. Demanded (something reminds).
   c. Spontaneous (autochthonous or indigenous cognition).

2. Imaging

3. Imaginative and anticipatory thinking.

4. Proprioceptive impulses from postural, facial, or other motor activity - the neuromuscular activity of posture and locomotion may help initiate, amplify, and sustain emotion.

5. Endocrine and other automatically initiated activity affecting neural or muscular mechanisms of emotion.

Considering the importance given to human perception in emotion research, the next portion of this literature review is directed toward investigating the role of perception, especially emotive-sensory information processing.

Sensation, Meaning and Emotion

Izard (1977) takes the position that while sensation is a separable phenomenon, consciousness has a strong tendency to transform sensory data into affect, perception and cognition. Sensory data are transformed first into affect, which in turn organizes ongoing sensory messages into perception and cognition. The type of affect elicited by the sensory message would be a function of the gradient of stimulation and of the selective sensitivty and organizing functions of the receptions.

Differential emotions theory considers emotion by its very nature a phenomenon of consciousness (Izard 1977, p. 42). In differential emotions theory, subjective experiencing of emotions is the principle organizing factor in consciousness and the basis of the selectivity and directiveness that characterizes the human mind. The relatively greater specificity of cues or information from emotions makes them of greater value for adoption and effective behavior than is the case for undifferentiated arousal states. The emotion of interest provides much of the selectivity and focusing of attention that characterize ordinary states of consciousness.

Izard (1977, p. 23) cites Schachter's classification of affects as embeddedness-affects and activity-affects. Schachter also distinguishes between subject-centered, or auto-centric perception and object-centered or allocentric perception (p. 23). The affective reactions of buyers to perceptual variables in products will be allocentric, activity affects by this definition. In the allocentric mode, the perceiver actively examines the object through sensory perception. Schachter's conception of the allocentric attitude as one of profound interest that leads to focal attention and active involvement in the environment.

Emotion and Sensory Perception

Classical studies of perception (e.g., Ittelson and Kilpatrick 1951) show that the perceptual process as we know it in adulthood is almost never a simple transformation of sensory input. The observer tends to add something to the sensation resulting from the stimulus pattern. The something added has typically been explained as a function of the observers past experience. Ittelson and Kilpatrick conclude: "Perception is shaped by our wants, desires, and purposes and our wants, desires and purposes are our emotions or functions of them" (p. 55).

We perceive and attend to the stimulus patterns surrounding us in a highly selective fashion. Numerous researchers see this selectivity as best explained as a function of affect (Izard 1977, p. 143). Others (Singer 1974; Pope and Singer 1976) have focused on separate aspects of consciousness in less structured patterns such as daydreaming, imagery, and fantasy.

The construct attention is often discussed with perceptual processes. Attention variables are classified by Pribram and McGuinness (1975) as arousal, activation and effort. Effort in the professional procurement setting may be conceptualized as less variable than in the consumer markets where perceptual defenses eliminate from deep processing vast amounts of marketing information (Bettman 1979). In Pribram and McGuinness' terminology the combination of tasks in procurement is variable but computable. These tasks are referred to as reasoning problems and are distinguished from response induced combinations of input events, or involuntary attention situations because of the voluntary dimension of the task (p. 133).

Reasoning demands the uncoupling of attention from immediate input variables--the attention involved is voluntary, therefore in the sense that it is initiated by the organism rather than by some stochostic event. Thus, task definition along the lines of categorizing or reasoning shapes physiological response (p. 139). In reasoning tasks, activation preceeds arousal, a structure consistent with the findings of Kroeber-Riel (1979). In this context, increased activation does not necessarily imply more effective manipulation (of the consumer), but that whatever the outcome, perception will be quicker, or more accurate. Activation is seen then as having a primary effect on the level of performance, not its content (p. 244).

## Experimental Model of Emotive-Sensory Processing

The work of psychologists and marketing scholars reviewed in this research has converged on a view of emotion as an interaction between cognition and physiology which is reactive, acute, and specific in nature (Holbrook and O'Shaughnessy 1984). In the environment of new product development, the fruitful research questions regard emotive responses to product characteristics which are perceived through sensory processes and processed within a product adaption decision context.

Mehrabian and Russell (1974) present three factors as primary emotional responses; 1) pleasure, 2) arousal, and 3) dominance (Figure 6).

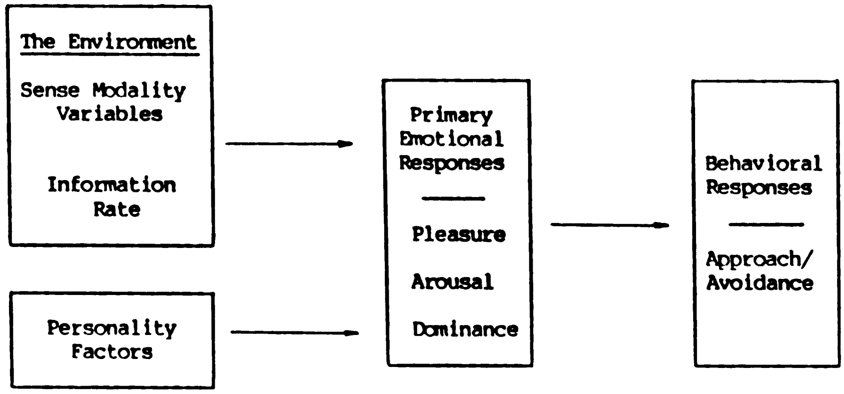



Figure 6. Conceptual Model. Source: Mehrabian and Russell (1974).

The PAD (pleasure, arousal, dominance) framework of the Mehrabian and Russell model has parallels in Osgood, Suci, and Tannenbaum's (1957) studies on the semantic differential (evaluation, activity, potency). The operationalization of this model requires defining a relevant variable set for physical product characteristics which have sensory measures and interpreting the models PAD dependant variable set for the product decision context.

## Independent Variables

Information Rate. The information rate variable is borrowed from information theory and relates to the temporal and spatial distribution of sensory events. Both temporal and spatial events are treated as sequences while allowing for the various alternatives of a processing sequence to be stochastic. Mehrabian and Russell's use of the term information rate takes some license with the precise meaning of the term in information theory. In the context of these experiments where the information related dimensions of a product are essentially passive, the term information content is introduced to represent the interaction between latent information imbedded in product characteristics and the searching and processing actions of product evaluators. When the alternatives of an outcome are not equally probable, the content of information is greater than when the alternatives are equally probable. In the case of a spatial configuration, the information content is less when the various parts are not equally distributed. For example, a painting that has eight equally distributed colors has a higher content of information than another one with the same eight colors, but where one color covers 90% of the surface area. A second important implication of the information measure is that rare or novel events contain more information (Mehrabian and Russell 1974, p. 78).

If there is any patterning (regularity, redundancy, dependencies or lawfulness) within the sequence of events, such patterning reduces the uncertainty of the next event in the sequence and therefore lowers the content of information. Familiarity can also be due to past exposure to similar stimuli. Thus, a professional buyer with experience in a certain commodity class will process information on a similar but new commodity more meaningfully as a function of experience (p. 80).

While Mehrabian and Russell make no attempts to measure the information rate on complex environmental stimuli

(p. 80), the concept is a useful theoretical construct to classify differences in the content of sensory information and the expected results of experience or learning effects in sensory processing. Within the present framework, the information content from an environment is linked to the response variables by the following hypothesis: the arousal level elicited by an environment is a direct correlate of its information content (Mehrabian and Russell 1974, p. 84).

A number of familiar distinctions may be made regarding comparative environmental information content. In characterizing everyday environments, the second term in each of the following pairs refers to an environment of higher information content: simple-complex, patterned-random, harmonious-jarring, homogeneous-heterogeneous, redundant-varied, similar-contrasting, consonant-dissonant, continuous-intermittent (Berlyne 1967). Additionally, meaningfulness, symmetry, closure, and good form reduce information content.

Information content is imbedded in the configuration and presentation of product characteristics. Because it is a global and multidimensional construct it does not represent an ideal variable for investigating the contributions of univariate sensory manipulations. In the experiments proposed for this research, information content is both controlled and minimized within the proposed environmental context.

Personality Factors

In the Mehrabian and Russell (1974) model, a distinction is drawn between a person's characteristic level of arousal (i.e., trait arousal) and the individual's characteristically preferred arousal level (operationalized as optimal stimulation level in the consumer research literature). The further distinction is drawn between trait emotions and state emotions such that the characteristic levels of emotion associated with an individual's personality (his temperament) are described in terms of trait pleasure, trait arousal, and trait dominance. On the other hand, momentary feelings of an individual are described in terms of state pleasure, state arousal, and state dominance (p. 30).

Across characteristic levels, research has shown that approach levels are maximized with increasing pleasantness of the situation and at intermediate levels of arousal. Thus, the pleasure state of an individual prior to his contact with a situation is not as important as his arousal state in determining his approach-avoidance reaction to that situation (p. 29).

In the present research design, the variance in emotive response explained by trait emotions is controlled within the specified experimental setting. The following arguments are offered:

1) The task specificity of procurement constrains the environmental stimuli to a predictable and bounded set. In the experiments conducted, treatments are designed to be low information rate and intermediate in arousal potential.

2) Respondents are requested to separate personal preference from professional judgment and given the opportunity to respond to each in turn.

3) The Holbrook and O'Shaughnessy (1984) typology of emotion as reactive, acute, and specific adapted for these experiments; focuses this research on sensory-emotive responses to differential environmental stimuli.

Within the context of control over characteristic levels of emotion afforded by the above three conditions, the present experiments are designed to measure the acute responses to sense modality variables. The intermediate emotional responses (PAD) are momentary in the time dimension of information processing.

Sense Modality Variables

The sense modality variables are defined in traditional psychophysical terms as product characteristics giving rise to perceptions of smell, taste, touch, hearing and sight. A complete description of the neurophysiological mechanisms of sensory perception is beyond the scope of this work. The reader is referred to Livingstone (1978), or Carterette and Friedman (10 volumes, 1974-1978).

The product characteristics of interest in this research are considered to create utility value through their consumption (Lancaster 1976). These characteristics are considered separable in the tradition of Leontief (1947) both horizontally (i.e. possessing the same essential characteristics within groups but widely differing between groups) and vertically (an a priori assignment of hierarchial clusters of descriptive properties). Ratchford (1976) views characteristics hierarchies from the economist's perspective in which product characteristics are looked at from the goods end rather than the consumer's end and thus consist potentially of all the physical, chemical, biological, and other objective properties of the goods. Behavioral models looking at characteristics from the consumer end generally pre-select the apparently relevant characteristics often ignoring taken-for-granted properties intrinsic to the product.

Empirical work by Geistfeld et al. (1977) has identified a three level hierarchy of product characteristics which has broad generalizability. This hierarchy of product characteristics depends on three fundamental ideas: 1) the ability to unambiguously define an intrinsic product characteristic in objective terms, 2) the existance of a dimensioned range of the properties of interest, and 3) the ability to vertically measure the relevant properties. The resulting definition of product characteristics is limited to any intrinsic feature of the product which influences a buyer's evaluation of the product. The intrinsic aspect of the definition precludes brand, warranties, suppliers' reputation and other external to the product features. These external characteristics may be important elements in the procurement decision process but they do not belong in the product characteristics domain of the purchase decision but rather should be identified as a separate set of extrinsic purchasing criteria (p. 303).

The second concept is that of dimensionality. A characteristic is said to be multidimensional if it is functionally related to other product characteristics, which themselves may be either multidimensional or unidimensional. The third concept, measureability, refers to the existance of standards for which comparison of characteristics levels may be accomplished with known accuracy. Geistfeld et al. (1977) introduce a hierarchy which is divided into three levels "A," "B," and "C" by the dimensionality of the underlying constructs considered. "A" level characteristics are abstract, multidimensional characteristics which are difficult to measure in anything but global and interval scales. The nature of "A" characteristics is that they are dependent upon or composed of combinations of lower level "B" or "C" characteristics. For instance, the safety, dependability or status of a product might all be considered "A" level characteristics since they are all multidimensional constructs having no single unit of measure even though they may be mapped into perceptual continua of safe/unsafe, dependable/undependable or high status/low status, respectively.

"B" and "C" level characteristics provide increasing degrees of empirical measurements. "B" characteristics are often multidimensional but having objective empirical measures. The "B" level of characteristic is defined to capture the essense of the transformation process between univariant, innate "C" level characteristics and global, multidimensional "A" levels of characteristics. As such, "B" characteristics become the arguments in the functional relationships determining "A" level characteristics.

"C" level characteristics are often capable of definition in unidimensional and measurable physical properties. These characteristics are functionally related to "B" level characteristics as the input features related to the composition and construction of the product. Examples of "C" characteristics would be the concentration of sweetner in a soft drink, the color of a product, and the weave and fiber content of an apparel product.

"C" level characteristics relate both to Mehrabian and Russell's (1974) sense modality variables and to Lancaster's (1976) product characteristic definition. Direct sensory measurement of the emotive impacts of manipulating "C" level product characteristics differ sharply both conceptually and methodologically from multiattribute methods directed toward consumer preference (Wilkie and Pessemier 1973). Typically, such research has involved measuring the importance or salience of product characteristics as perceived by a consumer and the consumer's belief that a particular brand would possess some desireable magnitude (high to low) of each characteristic (Fishbein 1967). The present approach also departs from Lancaster in that measurement of emotive-sensory responses to product characteristics is necessarily a subjective magnitude estimation procedure. Lancaster is concerned only with objective product characteristics.

## Choice of Experimental Variables: Methods of Identification

The first problem which must be faced involves the identification of product characteristics appropriate to a given product. Generation of comprehensive lists of product characteristics may be accomplished by several methods: 1) advice from product designers, engineers, or other experts; 2) open-ended interviews with users of products; 3) structured (i.e. focus group) interviews; and, 4) literature reviews or direct interviews with appropriate researchers. These characteristics must then be analytically resolved into their appropriate hierarchial position.

In the intermediate product market, the decision must be made whether to extend the research throughout the marketing channels or to limit to one or more sequential transactional elements. This decision can only be made on a case by case investigation which defines the problem scope situationally. As might be expected, a large listing will be generated for even a relatively simple product. Geistfeld et al. (1977) list 4 "A" characteristics, 31 "B" characteristics and 12 "C" characteristics for one consumer product (blankets). The findings of the Geistfeld et al. study supported the hypothesis that greater consumer sophistication leads to use of lower "C" level characteristics as primary evaluative measures.

Within the context of the present study, the following typology of goods characteristics is offered (Table 3).

Table 3
Product Characteristics Hierarchy
In An Intermediate Market

| Geistfeld et al. level | Intermediate Market Level | Measures |
|---|---|---|
| "A" | Global | multidimensional, spatial ordering. |
| "B" | Functional | objective functional definitions, multidimensional or unidimensional. |
| "C" | Natural | Physical properties - unidimensional ratio scaled. |

The Geistfeld et al. (1977) study focused on consumer information processing with no attempt to investigate the implications of this scheme within and between channel hierarchial structures. Borrowing from the finding that increasing levels of buyer experience tend to shift the focus of salient information content towards and into the "C" characteristics level, it is logical to suspect a similar movement would occur in the intermediate, organizational buying situation. In a broader context, the characteristics hierarchy may be interpreted as relating to informational issues across a three-level channel structure where the information processing issues of primary importance are centered in the "A" global level for consumers, in the "B" functional level for integrative manufacturers, and the "C" natural characteristics levels for components and material supplies. In this perspective, it may be seen that building form utility value in a product requires a systematic integration of all three characteristics levels. A simplified view of this process would consider a sequential flow in the value creation process from "C" to "A" levels. For instance, the selection of the particular "C" or natural product characteristics, either in materials selection, configuration, or finish elements contribute to the creation of "B" or functional characteristics of the product. Often, the product designer has numerous "acceptable" choices of "C" characteristics which will yield approximately equivalent "B" functions.

## Choice of Experimental Variables for This Research

Testing for emotive response to "C" or natural level characteristics within an experimental setting requires careful control of environmental factors. The product chosen must be unambiguously resolvable into the three-level characteristics hierarchy. The intermediate product market must actually respond to procurement tasks in a reactive, specific, and acute decision process.

The validity of the proposed model and measuring methods will be enhanced by the degree to which product configuration decision tasks replicate real business practice in the participating firm. A multidivision midwestern firm which had previously expressed interest in emotive needs research was contacted to determine an appropriate fit between their businesses and the proposed research methodology. After several meetings, it was decided that products from their fabric label division represented the best fit for this research. As an intermediate product, these lables are sold in large quantities to apparel manufacturers and major retailers of apparel products. These labels meet both economic (functional) and emotive needs.

To illustrate, the functional requirements of garment labels are built around the economic needs of presenting fabric content, use and care and country of origin information and meeting durability requirements imposed by frequent chemical exposure and mechanical abrasion of cleaning processes. The emotive needs are centered in the aesthetic properties of the label and the anticipated perceptual responses to the sensory characteristics intrinsic to the label itself. That emotive-sensory responses are very important determinants of "C" characteristics choices is a central issue in this research. In the present example, both legislative requirements and commercial practice dictate the existance of the label and specify minimal information content but emotive needs penetrate to the particular selection of designs, materials, and manufacturing processes from the set of acceptable options.

The combination of "C" and "B" characteristics create "A" level characteristics with admittedly complex interactions. This dissertation isolates the information processing on characteristics at the intermediate market level. In the label example, the designers and buyers at apparel manufacturing firms and private branding retailers are responsible for procurement decisions on labels. The information used and the choice heuristics are isolated within the firm making such firms attractive units of analysis. Acting as surrogate buyers for final consumers who may typically know very little about the "B" or "C" characteristics of labels, intermediaries attempt to create satisfaction by matching both global economic and emotive needs with functional characteristics and natural characteristics of label products.

Generally this concept casts the manufacturing intermediary in the role of acquiring relevant information about economic and emotive needs in final market segments and translating these needs into bundles of functional and natural product characteristics. Thus viewed, the task of selecting characteristics may be seen as analytically separable within the interactive hierarchial context presented. Because this process is sequential and likely iterative, building a research based understanding of the process may begin by investigating the intermediate firm. The following dependent variables are chosen because of their importance in directing product creation, specification and procurement decision processes for fabric labels.

## Dependent Variables

The primary objective of this research is to determine the nature of the emotive responses of relevant decision makers to the manipulation of products' sensory characteristics. The response functions of interest relate to the perceived value of characteristics changes, the integrated affective responses of perceived quality and individual preference, and the suitability of label product characteristics in matching the needs of the test subject's firm. Below is a varable set including measures (Table 4).

## Hypotheses

The following hypotheses are proposed to guide the experimental determination of emotive-sensory responses to product characteristics. The experiments proposed are designed to give quantitative measures to perceptions of level or magnitude of certain product characteristics, and to give quantitative measures to perceptions of value, quality, and preference arising from manipulation of these same "C" level product characteristics. The experimental setting is restricted to investigating the transactions environments between primary components and materials suppliers and integrative assembly or reselling firms having discretion over the configuration of their products. Thus

Table 4

Experimental Variables for
Emotive-Sensory Response Determination

<u>Independent Variables: Fabric Labels</u>

| Symbol | Description | Measure |
|---|---|---|
| R | Tactile roughness | Fabric hand |
| C | Color value | % (percent) base color |
| S | Size | square inches |
| CxS | Color x Size interaction | MANOVA variance output |

<u>Dependent Variables: Test Subject Response</u>

| Symbol | Description | Measure |
|---|---|---|
| M | Magnitude estimate of variable in question | Numerical DME (direct magnitude estimation) |
| V | Value of product sample | DMV (cents each) |
| Q | Quality | DMQ (normalized-metric) |
| PS | Personal Preference (personal taste) | DMPS (normalized-metric) |
| PR | Professional Preference (professional judgment for application in subject's organization) | DMPR (normalized-metric) |

only organizations having both design (and as an output of the design process: specifying) and buying functions are included in the study. Because of the role specializations and different experience (learning) factors contained in the designing and buying functions, these manufacturers or reselling intermediaries are seen as having the final say in determining both the kind (metathetic) and amount (prothetic) of the characteristics of interest.

Research Hypotheses:

$H_1$: Value responses to emotive-sensory variations in label products are non-linear because subjective responses are predicted by non-linear psychophysical power functions.

The implications of Stevens' (1975) work in direct magnitude estimation are that ratio-like measures of subjective phenomena are possible to obtain within an experimental context. Functional description of these perceptual responses are expected to be non-linear over the ranges of interest. To the extent that these response functions are generalizable for given product market situations, they will be valuable guides to product managers for predicting the marginal changes which obtain from changes in product characteristics.

This first hypothesis probes the nature of the perceptual response to natural level product characteristics. The dependent measures in Stevens' work are described as psychological intensity. To be of use to marketers, such responses must be dimensioned in more applied measures of market behavior. Predicting perceived value and perceived quality, especially when combined with preference levels has greater predictive validity within the context of product design. Moskowitz (1983) has broken important ground by using direct magnitude methods for measuring the hedonic responses of liking and preference.

$H_2$: Subjects are capable of executing judgments on isolated label characteristics holding all other physical product parameters constant because this task is consistant with their product specification and evaluation job experience.

The usefulness of direct magnitude estimation as a method of measuring emotive responses is enhanced by the degree to which subjects possess the capacity to make judgments on value, quality and preference based on changes in unidimensional "C" or natural characteristics, independent of interactions with other characteristics. To test this hypothesis, a factorial experiment is conducted which simultaneously exposes subjects to two characteristics. If the variance in the dependent measures explained by the interaction terms is insignificant compared to the primary effects, this hypothesis will be supported.

$H_3$: Comparing the two subject classes; designers and buyers, designers response functions on value will have a greater mean and dispersion than that for buyers, because buyers role specialty brings them into more systematic contact with the market price of products.

This hypothesis supports a primary research objective of this dissertation, namely investigating the nature of emotive responses to sensory product information by contrasting the differences in response that may be attributable to role specialized learning. In comparing buyers to designers it is likely that buyer's information regarding the market price of comparable products will significantly narrow their response curve on value. This result, if supported, has both theoretical and managerial significance in explaining how role specializations are related to emotive-sensory information processing.

$H_4$: Both designers and buyers will give higher magnitude estimates on value and quality of woven labels over printed labels because woven labels have been historically more expensive and used in more expensive lines of garments.

Hypothesis 4 has dual significance in this research. First, the results of this test lead to a direct measure of emotive value inasmuch as the differences between woven and printed labels may be seen as primarily emotive. The same size, color, and logotype were used to hold the economic (functional) issues constant. Differences in the dependent measures may thereby be considered as arising from emotive decision making. Second, this test sequence also has important significance to the firm supporting this research because they manufacture both types of labels. Substantial changes in weaving technologies have narrowed the gap between the production costs of woven and printed labels. While the pricing of woven labels has tended to become quite competitive there remains a persistant image that woven labels are associated with higher value and quality lines.

## Additional Informal Research Contributions

This research explores several relationships which are excluded by the scope of the study from being advanced as formal hypotheses, but for which less formal observations may be made. At the exploratory level, the relationship between sensory perception and sensory learning are investigated to the extent that patterns of value, quality, and preference are measured. Additionally, the interrelationships between value, quality, and preference, and the comparison between personal and professional preference are embodied in the response function plots.

The formal hypotheses of this research and their respective acceptance tests are summarized in Table 5.

Table 5

Summary of Hypotheses and Related Acceptance Tests

| Hypothesis | Related Experiment | Acceptance Test |
|---|---|---|
| $H_1$: Non-linearity of response | Emotive-sensory magnitude responses | 1) Response plotting for visual inspection.<br>2) Comparisons of linear and nonlinear regression fits.<br>3) Residuals analysis for pattern recognition and lack of fit testing. |
| $H_2$: Sensitivity of Independent Treatments | Interactive testing | 1) MANOVA results for main and interactive effects with repeated measures corrections.<br>2) Significance testing within the MANOVA model for interactive effects.<br>3) Durbin-Watson tests for autocorrelation. |
| $H_3$: Role Differences | Mean deviation on value estimates by role | 1) "t" test of significance. |
| $H_4$: Perceived Value Difference by Product Type | Mean value estimates for combined subject populations | 1) "t" test of significance. |

# CHAPTER III

## METHODOLOGY

This chapter describes the experimental methods and data analyses used to test the hypotheses of this research.

### Experimental Design: Introduction

A field experiment conducted in the respondent's place of business was designed to test the hypotheses presented in Chapter II. Direct experimentation is a preferable way of accumulating data when respondents tasks are unfamiliar and control over extraneous variables is required. The objectives of this study require careful prescreening of respondents and the conducting of data gathering in a focused attention environment. Within reason, subject's responses should be spontaneous, specific, and without confusion.

The advantages of a verbal introduction to the objectives and methods of the study, first during a telephone screening process and subsequently during a face-to-face interview are numerous. First, a substantial professional interest may be secured on the promise of helping to clarify emotive processes. Second, subjects may be assured of the relevancy of their responses to testing the research hypotheses. Finally, questions may be answered and confidence built during the introductory teaching sequence so that the actual experiments are run uniformly.

## Experimental Design: Product Market Selection

The product selected for testing was fabric labels, a component used in the manufacture of wearing apparel. The rational for this choice was based on the following environmental considerations.

1) The product need is universal in the apparel industry. Both brand identification and legal requirements for garment content and use and care instructions dictate the need for labels.

2) The product is comparatively simple having well defined and practically bounded characteristics hierarchies.

3) The product is mature giving high degrees of learning in test subjects.

4) Product simplicity and mature learning translate into comparatively low levels of information content. This allows for greater dominance of the sensory modality variables in the univariate measures of interest.

5) Suitable numbers of available users are experimentally accessible.

6) Suitable variation in product is available from a cooperating manufacturer.

## Experimental Design: Test Samples

The natural level characteristics chosen were selected by consultation with the cooperating label manufacturing firm as being typical among the salient characteristics affecting the design and sale of label products. Those chosen were; 1) material substrate composition, 2) size of the label, and 3) color value. Variations in design were ruled out because issues of meaning are complex within the apparel industry and have more global measures than natural characteristics. Control for information content would also be reduced because of the additional processing task of design comparison inferring differential information contents. Table 6 lists the variable treatment sets.

Table 6
Experimental Variables

| Natural Characteristic | Psychophysical Response Level | Predicted "Beta" (Stevens, 1975-exponent) |
|---|---|---|
| Material composition | tactile feel to fingertip | $B_T = 1.5$ |
| Size of label | visual perception of surface area | $B_A = 0.7$ |
| Color | visual perception of value | $B_V$ = unmeasured |

Rationale for Variables

The tactile feel and visual area variables are chosen because they have different psychological response functions predicted by Stevens' (1975) work in perceptual magnitude estimation. One is concave upward with an exponent greater than unity and the other concave downward, its respective exponent significantly less than unity. These two variables represent separable phenomena in the psychological intensity responses predicted by Stevens (1975, p. 15). The variation in other dependent measures will be compared to the general magnitude estimation responses to see what extent they separate on equivalent exponential rates.

Color value (lightness) was selected as the color variable for manipulation. This was done because no experimental exponent was found in the literature and the proposed experiment would contribute such a parameter. In addition, value variations are subject to less interaction than saturation variations and less information rate than hue variations. While Stevens (1975) has determined a power law exponent for color saturation, Guilford and Smith (1959) found significant interactions between hue, value, and saturation at higher levels of saturation. For warm colors, the increase in pleasure has been determined to be a positively accelerated function of value (Mehrabian and Russell 1974).

A medium value of the color hue red was chosen because it is a warm color and because indirect measurement (e.g. EEG desynchronization) of arousal has been shown to be greater for red than for other primary colors. The red chosen was varied by using a clear diluent to control for value and an opaque pigment on white substrate to control for hue.

## Experimental Design: Sampling Procedures

From a marketing channels perspective, two intermediary types buy and use fabric labels. First, major retailers or retail buying organizations having significant private label apparel business frequently source labels independently. Second, apparel manufacturing firms design and buy labels for use in their manufacturing process. A representative sample of twenty-five business units, each agreeing to allow their buyer and designer to sit for the experiment were chosen. To provide consistency of response, only firms and people involved with women's sports and active wear were chosen. This restriction was imposed because some of the variables in question (e.g. size of label) would be constrained within narrower limits in this sample frame. By estimate of the American Apparel Manufacturers Association, approximately 15% of domestic manufacturers of women's sportswear were included in this study (Pumphry, 1986). A sample of this proportion would allow a finite population correction factor of 0.92 (Kinnear and Taylor, 1979, p. 211). Because this factor was not large, and because there was some uncertainty as to the actual population size, it was decided that unadjusted results would be presented. Tests for statistical significance will therefore be stated more conservatively than if they were corrected, thereby strengthening the results presented elsewhere in this report. The firms were chosen to provide representation across the variables firm size, dominance in market share, and style leadership.

## Experimental Design: Attribute Independence

Determining attribute independence is a requirement in multiattribute modeling. For multidimensional constructs

("A" level) which are typically factorially complex, establishing attribute independence is usually accomplished through factor analysis (Johnson, 1974). In the present study, the underlying value (utility) measuring method also assumes that the magnitude estimates are orthonormal. Two approaches are used to establish attribute independence. First, pairwise regressions will be completed within each experimental sequence to calculate Durbin-Watson test statistics for autocorrelation. This was considered appropriate because the sequential testing method will create responses that are serially correlated. Second, a factorial experiment combining previous unidimensional experiments will be used to measure interaction effects under MANOVA testing. An advantage of testing at the natural ("C") level characteristics is that real physical independence can be demonstrated on a level understood by all respondents. For example, various size labels are presented which have negligible color differences and various color labels were presented on identical size and substrate dimensions.

Only in the printed versus woven label comparisons are the differences between the two samples complex. Here variations in visual depth, tactile properties of roughness, softness and stiffness combine to create a multidimensional difference between the two products. The directions in this sequence were for subjects to give global measures of value, quality and preference to the (holistic) products.

Experimental Design:
Testing Sequence

Target firms were contacted by telephone and asked for permission to interview the buyer and designer responsible for label products used in ladies sportswear. Each person was then contacted and asked for about one hour of uninterrupted time at their respective places of business. These subjects were tested independently with no sequence between buyer or designer imposed.

The testing sequence began by introducing the subject to the research and completing a simple demonstration learning exercise in direct magnitude estimation of light intensity scaling (script Appendix A, Light Intensity Measurement Through Direct Magnitude Estimation). This teaching exercise builds confidence in subjects and encourages continuing the experiment.

Test Sequence I: Visual Area

| Task Description | Procedure |
| --- | --- |
| 1. Sorting | 1. The subject arranges samples sequentially from small to large. |
| 2. Size measurement by direct magnitude estimation (SDME) | 2. The subject is asked to pick a scale and calibrate its end-points from his evoked set. Subject then assigns a number estimate representing only the size of the label. |
| 3. Value measurement by direct magnitude estimation (SDMV) | 3. The subject is asked to estimate the price he would be willing to to pay for each label, assuming that each |

| | |
|---|---|
| | label met his requirements. He was to assume that the quantities would be large enough to get the "best price" and that there were no set-up charges. |
| 4. Quality measurement by direct magnitude estimation (SDMQ) | 4. The subject is asked to pick a scale for quality and assign a numerical level of quality for the treatment label compared to similar label products He was to assume that the graphics, process, and materials were specified by his firm's requirements. |
| 5. Personal Preference measured by direct magnitude estimation (SDPS) | 5. The subject is asked to pick a scale with which he could reflect the intensity of his liking or preference for the various sized labels. It was further specified that the label was to be used in a ladies sportscoat. A number representing the strength of preference was assigned to each sample. |
| 6. Professional Preference measured by direct magnitude estimation (SDPR) | 6. The subject is asked to pick a scale which will indicate how closely the treatment sample corresponds to the most likely requirement within his firm. The same reference garment, a ladies sportscoat, was used to focus judgment. A number representing the subject's perception of the firm's preference is assigned to each sample. |

Data are recorded under size on the first page of data forms (Appendix B, p. 116).

Test Sequence II: Color Value

Using the same procedure as developed in Sequence I, but substituting visual response to color value as the independent variable, the following tests are completed.

1. Estimating color value by magnitude estimation (CDME).

2. Assigning value estimates by magnitude estimation (CDMV).

3. Assigning quality estimates by magnitude estimation (CDMQ).

4. Assigning personal preference levels by magnitude estimation (CDPS).

5. Assigning professional preference levels by magnitude estimation (CDPR).

Data are recorded under color on the top of the second page of data forms (Appendix B, p. 117).

Test Sequence III: Roughness-Blind

Using the same procedures as developed in Sequence I but restricting subject's interaction with test samples to tactile measures only with a portable screen blocking visual contacts, the following tests are completed.

1. Sorting from rough to smooth. Each subject lines up the samples by order of roughness.

2. Preserving the order determined in step 1 above, subjects are asked to pick a scale to represent concept roughness and to assign low scale values to rough materials and high scale values to smooth materials (RDME).

3. Assigning value estimates by magnitude estimation (RDMV).

4. Assigning quality estimates by magnitude estimation (RDMQ).

5. Assigning personal preference by magnitude estimation (RDPS).

6. Assigning professional preference by magnitude estimation (RDPR).

Data for roughness measures are recorded under roughness on the bottom of the second page of data forms (Appendix B, p. 117).

Test Sequence IV: Color and Size Interaction Testing

| Task Definition | Procedure |
| --- | --- |
| 1. Sorting | 1. Subject orders size horizontally and color value vertically creating a 3 across by 3 down matrix. |
| 2. Visual area by direct magnitude estimation (Size) | 2. Subjects are told to use the same scale previously used for size determination to assign number estimates representing the size of the three families of colors. There are no observable differences in size within each three color sample sets. |
| 3. Color value by direct magnitude estimation (REFCOL) | 3. Subjects are instructed to use the same color value magnitude scale used in Sequence II above to remeasure color value. Here subjects are encouraged to respond to the small within size group variations as they perceive them. |

| | |
|---|---|
| 4. Value of label by direct magnitude estimation (CSMV) | 4. This task is a combination of the previous pricing tasks where responses are solicited for all 9 samples. |
| 5. Quality by direct magnitude estimation (CSMQ) | 5. This task is andegous to previous quality estimator assignments except all 9 samples are included. |
| 6. Personal preference and<br>7. Professional preference (CSPS and CSPR resp.) | 6. & 7. Subjects are first asked if they can make the distinction between personal and professional preference for this task. For those who cannot, it is agreed that their responses will be entered in both tables identically. For those subjects who perceive a difference, they are requested to respond to both variables in turn. |

Data for Sequence IV are recorded on the third data form (Appendix B, p. 118).

Test Sequence V: Comparison of Woven vs. Printed Labels

A new treatment is introduced for this test sequence, a woven label. The woven label is compared to a printed label which is nearly identical in color, size, and design (size 4, color 6). Subjects are instructed to use magnitude estimation procedures to respond to the following tests.

1. Value for each sample.
2. Quality as a within class estimate.
3. Personal preference.
4. Professional preference.

Data for Sequence V are recorded on the top of the fourth data form (Appendix B, p. 119).

## Data Analysis: Establishing Physical Measures for Independent Variables

The relevant range of variation in the intrinsic product characteristics tested in this study was restricted to that variation which might readily be found in commercially available products. This assures that there is a valid decision format offered to subjects and restricts the responses to a set of patterns which replicate actual product evaluation experience. Such experience plays a vital conditioning role in assuring that subjects' responses will be acute, autonomic, and relatively structured so as to be accepted as measures of emotive-sensory responses.

Details of scale development and measuring apparatus for physical measures of size, color value, and surface roughness are discussed in Appendix C. The limits of variation were established by consultation with the technical staff of the cooperating label firm. The range for each parameter was assured to be within the limits of process control and available materials but beyond the range typically accepted in the marketplace. This range was then partioned into increments that would be above just noticeable difference (JND) thresholds and numerous enough to give continuous response measurement of the phenomenon in question.

Data Analysis: Coding and File Creation

For convenience and consistency, all magnitude estimation scales were normalized to a one to ten (1-10) scale at the time of data entry. The convention used in naming dependent variables was to use the first letter of the independent variable as the variable prefix. Thus the perception magnitude of color (value) becomes CDME (Color-direct magnitude estimate), the perceived value (monetary) as a function of color becomes CDMV, perceived quality as a function of color is designated CDMQ, and so forth. The same convention was used for size (i.e. SDPS is the measure of personal preference for size), roughness (R), printed (P) and woven (W).

Analyses: Presentation

Data analyses were performed on a Honeywell CP-6 mainframe using $SPSS_x$ (1986) software. The presentation of results is organized under two categories. First, the analyses required to test the formal hypotheses of the study are presented followed by a second section reporting other findings. In the interest of clarity, a complete listing of supporting data and appropriate statistical indicators are referenced in Appendix D.

## CHAPTER IV

## FINDINGS

The preceding chapter discussed the design of the experiment, the sample selection, the conduct of the experiment, and the analyses of the data. This chapter presents the findings of the study.

### Tests of Hypothesis $H_1$

Hypothesis $H_1$:

> Value responses to emotive-sensory variations in label products are non-linear because subjective responses are predicted by non-linear psycho-physical power functions.

The first hypothesis examined the nature of the value response functions to changes in emotive-sensory attributes of fabric labels. Three tests were applied to the value responses given by both buyers and designers to verify the nonlinearity of emotive response.

#### Test Series 1: Graphical Presentation of Response Functions

Test 1.1: Value Responses to Size. Value response to size was found to be a curvelinear, monotonically increasing function of the physical size of the label samples. Figure 7 is a plot of SDMV (direct magnitude estimation of monetary value for the various sizes of labels) which has the appearance of a diminishing scale exponential function.

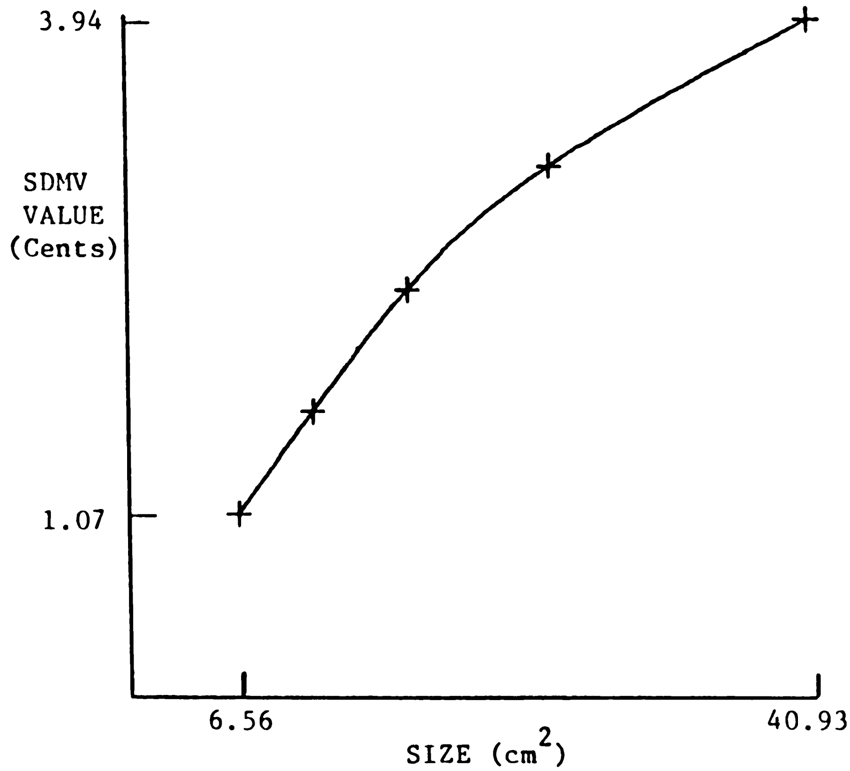



Figure 7. Value as a Function of Physical Size

This plot was created by using the value means as input to the quadratic plotting program named B-spline, included in the Computervision CADDS-IV software. (For reference, these value means are listed in Table D4, Appendix D.) The shape of this experimentally derived value response function is similar to the shape of a curve derived from plotting the function $Y=X^{0.7}$, which represents Stevens' (1975) experimentally determined size magnitude response exponent $\beta=0.7$. For comparison, this curve is shown as Figure 8 below.

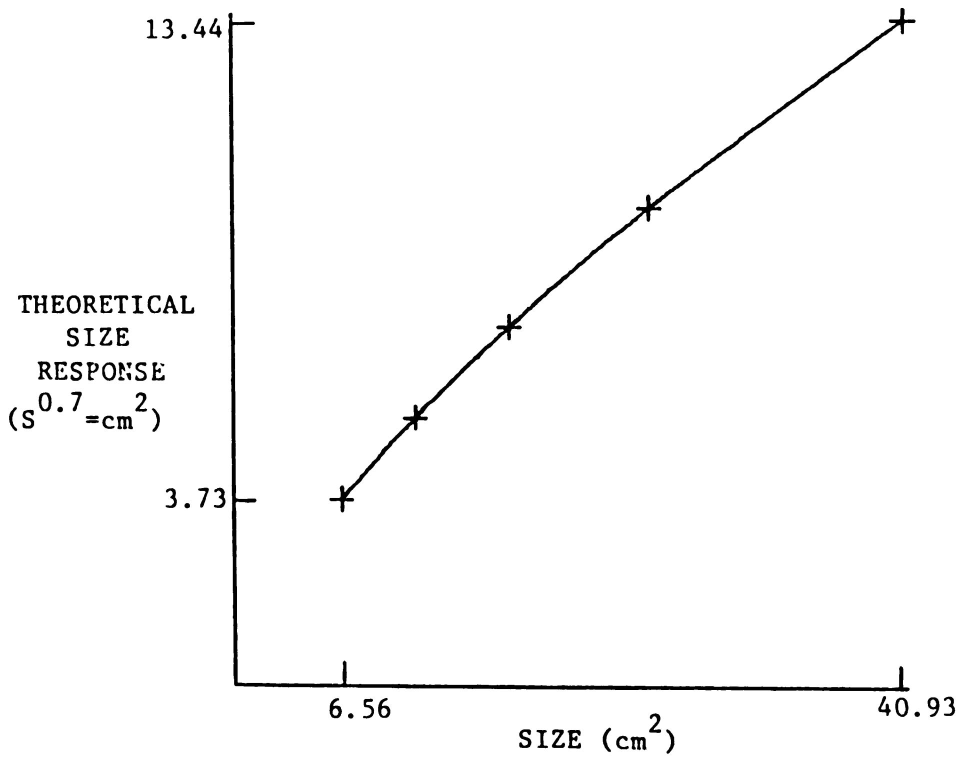



Figure 8. Theoretical Prediction of Size-Perceptual Response (Stevens, 1975).

The test subject's value responses lie slightly higher than the theoretical exponential function, implying that they could be represented by an exponential function having an exponent incrementally less than 0.7 (Figure 9).

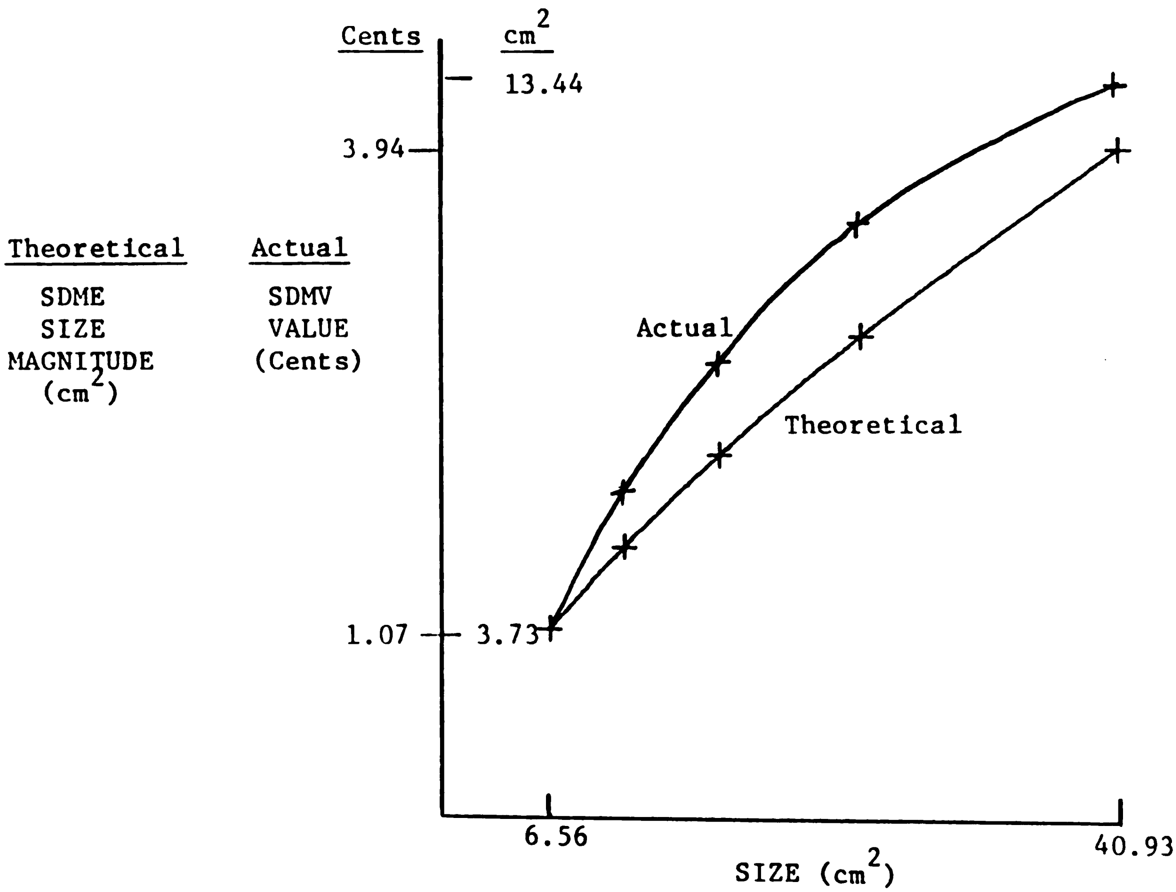



Figure 9. Comparison of Actual Value Measured to Theoretically Predicted Size Magnitude Response.

Another finding in the size experiments is the similarity between subjects' perceptual size magnitude response and value response. Using identical x-value scales, and normalized y-value scales, perceptual size magnitude response and value response are plotted as functions of measured physical size. From inspection, it may be seen that value responses are just below and falling slightly faster than the size magnitude estimates (Figure 10 below).

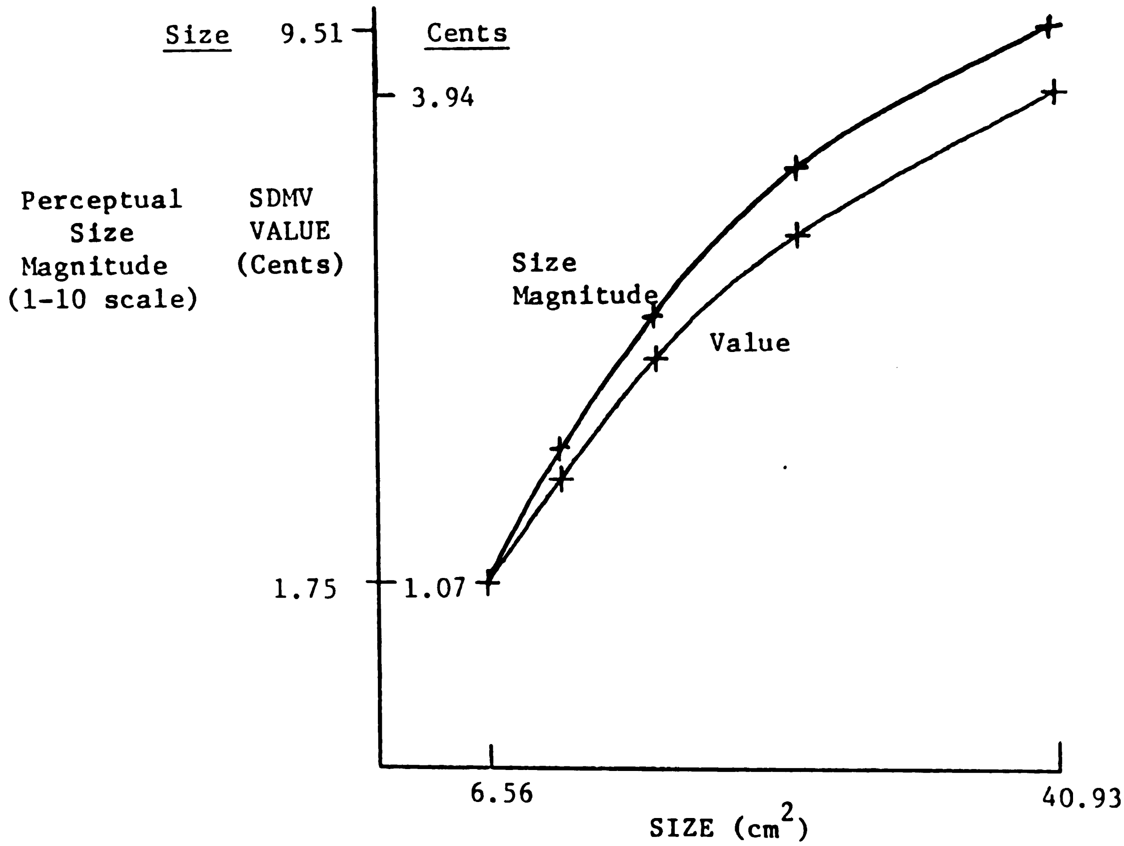



Figure 10. Comparison of Size and Value Measured Response.

Test 1.2: Value Response to Color. A majority of the subjects (43/51) reported no variation in value as a function of color. Most of these subjects reported that they would not expect to pay a different price if they changed color tint. A minority of eight subjects, all designers, reported some variation in value with their responses increasing at a diminishing rate in the direction of darkening tints. This increase is, however, slight and when combined with the value response to color of the other designers, does not create a statistically significant difference in the value responses of all designers as a class. For reference, the monetary value function for these eight designers is shown below as Figure 11.

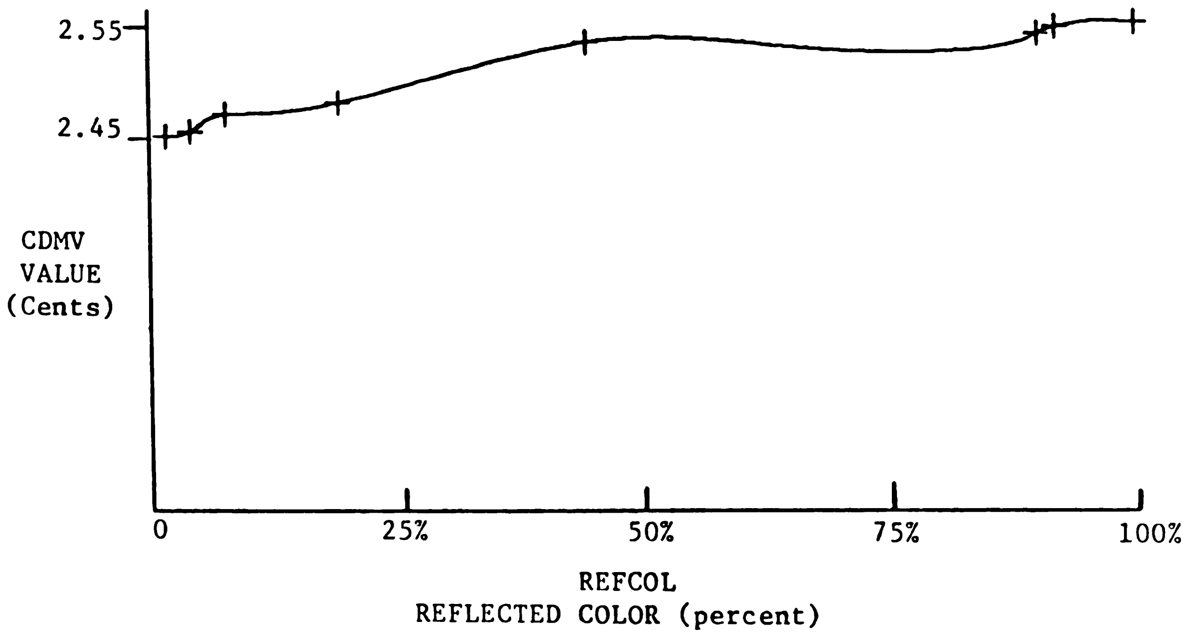



Figure 11. Value as a Function of Reflected Color. (See Appendix C for scale explanation.)

In summary, there is no statistically significant relationship between color and value within each subject class (buyers and designers).

Test 1.3: Value Responses to Roughness. The value responses to the sequence of roughness testing were also found to be nonlinear but apparently poorly related to response functions suggested by Stevens' (1975) roughness perception measures. Stevens' dependent measure called psychological intensity is an exponential function increasing at an increasing rate (or concave upward) as a function of increasing roughness. The value response measures in these experiments increase to an inflection point and then decrease beyond that point (Figure 12).

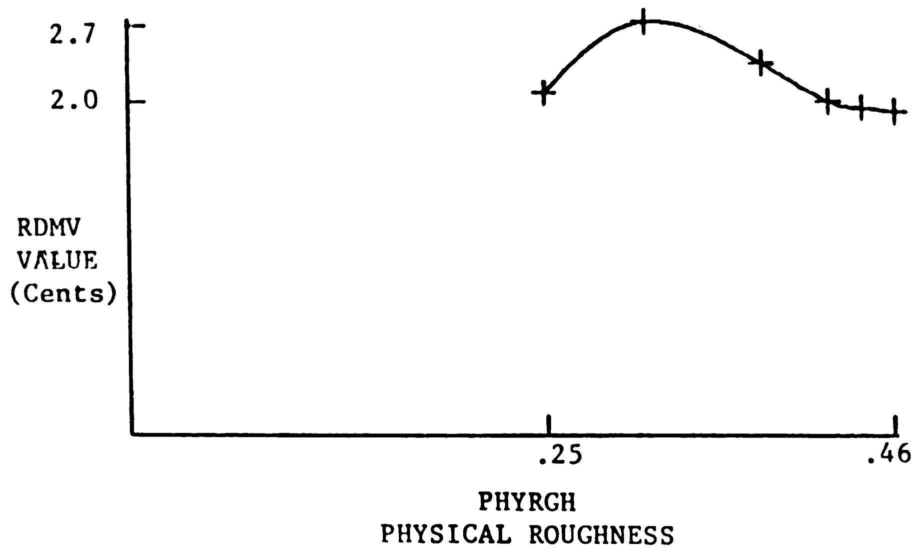



Figure 12. Value as a Function of Physical Roughness. (See Appendix C for scale explanation.)

This behavior is more characteristic of hedonic functions described by Moskowitz (1983) than of the unbounded exponential function offered by Stevens (1975). The correlation between mean value responses and mean preference magnitudes (a hedonic function) to roughness was checked on the linear regression program in a Texas Instruments TI-55 calculator. The resulting correlation coefficient (R=.90) is high enough to suggest a relationship between value and preference. Similarly, quality and value estimates are highly correlated (R=.95). An even closer correlation is found between personal preference and perceived quality (R=.99).

In summary, doing visual inspection of response function plots is a good first indicator of the nature of value response. These results are qualitative and form only a partial basis for accepting the hypothesis that these responses are nonlinear by nature. From these results, support for hypothesis $H_1$ is indicated, with the condition that a situation may exist (as in color) where there is no variation in value estimation. The following tests, linear and nonlinear regressions, provide a quantitative basis for testing hypothesis $H_1$.

## Test Series 2: Comparison of Linear and Nonlinear Regression Results

A second set of tests involving linear and log regressions was performed on the value responses under the assumption that one of three conditions would obtain. First, if both the linear and log regression models were acceptable fits to the data, the log regression would have to explain more variance to assert that the underlying response mechanisms were nonlinear. Second, if the linear regression was a poor fit ($F>.05$) but a log transformation produced an acceptable fit, then the nonlinear assumption could be supported. Finally, if neither linear nor log regressions were acceptable, then the assumption of nonlinearity could be supported.

In the case of the value-size regressions, both the linear and log regression were statistically significant

($\alpha$=0.05) but the log regression explained more variance (Table 7). This result generates support for hypothesis $H_1$.

Table 7

Regression Model Estimates for Value Responses: Linear and Log-transformed Data

| Predictor Variable | Beta | F | Signf F ($\alpha$=.05) | R | $R^2$ |
|---|---|---|---|---|---|
| Physical Size | | | | | |
| SIZE | .54 | 102.6 | <.001 (HSignf)[a] | .54 | .29 |
| LNSIZE | .64 | 175.9 | <.001 (HSignf) | .64 | .41 |
| Color | | | | | |
| REFCOL | .21 | 3.0 | .09 (NS) | .22 | .05 |
| LNREFCOL | .26 | 4.3 | .04 (Signf) | .26 | .07 |
| Roughness | | | | | |
| PHYRGH | -.08 | 1.99 | .16 (NS) | .08 | .006 |
| LNPHYRGH | -.001 | .02 | .88 (NS) | .01 | .0001 |

[a]Significance levels <.001 are designated highly significant (HSignf).

Since the majority of test subjects registered no variation in value the regression of value on color yields the trivial result of a constant value. The mean value responses for those eight subjects who had nonzero variances were regressed on color. The linear regression was statistically not significant (F=.09) but a log transformation produced a statistically significant regression (F=.04) with an $R^2$=.26 (Table 7). These results separate color response into two domains. For a majority of subjects, value is constant and independent of color. For a small minority, a nonlinear relationship is indicated. Both cases suggest a conditional acceptance of the nonlinear hypothesis imposing the condition that the emotive-sensory characteristic under consideration be perceived as affecting value in the test product.

Two conditions prevail which make linear models inappropriate representations of value response to roughness. First, the mean value responses increase to an inflection point and then decline beyond this point. Regression models do not change sign and will not approximate this behavior well. Second, there is greater experimental error introduced by the fact that this experiment was conducted blindfolded, an unnatural task for subjects. There are considerable ranking differences among respondents in the roughness testing which did not exist in the other experiments. Because of the sensory deprivation enforced in the experiment, subjects expressed confusion between dependent measures of roughness, hardness, stiffness, and thickness. Also, because they were deprived of their usual visual cues, subjects had difficulty identifying materials with standards they had in memory, thus increasing experimental error in the judgment process.

The regression results for value with roughness are very poor fits with highly nonsignificant F statistics (Table 7). In this instance, nonlinearity is assumed because of the poor fit of the regression models.

Summarizing the findings of test series 2, there is support for hypothesis $H_1$ from the comparisons of linear and log regressions. The log size regressions are superior to the linear size regressions on value. Color is not a value-related concept for a majority of test subjects under these conditions. For the minority of subjects who related value to color, the log regression is a better fit. Roughness response cannot be represented by a linear regression. Examining the distribution of variances and analyzing the residual sums of squares from the regression models yields an improved understanding of these results. The next section relates such analyses to response function shape and calculates lack-of-fit F test statistics to test for linearity (Neter et al., 1985).

Test Series 3: Analysis of Residuals and Lack-of-Fit F Tests

Standardized probability scatterplots showing the distribution of means-squared residuals were examined to test the assumptions of the regression models. Significant patterning of observed residuals accumulated off of the expected values in the size, color, and roughness linear regressions. This implies that significant nonlinearities exist in these relationships (Neter et al., 1985). The residuals from the regressions run on log-transformed data are more uniformly distributed, which implies that the log regressions are improved fits to the data. This supports the nonlinear hypothesis, $H_1$.

Lack-of-Fit F Testing for Linearity

Using a procedure suggested by Neter et al. (1985), lack-of-fit F statistics were calculated for the size and roughness experiments. Color was excluded from this analysis because of the observed independence between color and value. Pure error variance is partitioned from the regression and MANOVA residuals and used to calculate a lack-of-fit sum of squares. The ratio of mean squared lack-of-fit and pure error variances defines an $F^*$ statistic used to test the linearity of the regression.

Using this method on the value by size regressions, both the linear and log regression are shown as significant. However, this significance must, in the case of the linear regression, be overruled because there is a trapezoidal pattern of variance (i.e., increasing variance with increasing dependent variable) which violates the assumption of equal variance in the linear model. The lack-of-fit statistics were similarly calculated for the value-by-roughness regressions with the result that the condition of linearity was rejected for both the linear and log regressions (see Table D2, Appendix D).

Summary of Findings:
Hypothesis $H_1$: Supported

All three acceptance tests discussed above support hypothesis $H_1$, namely that value responses to emotive-sensory product characteristics are essentially nonlinear in nature. They appear to have different response rates across the physical variables and sensory modalities tested, and the log regressions provide better explanations of variance than equivalent linear models.

Hypothesis $H_2$:

> Subjects are capable of executing judgments on isolated label characteristics holding all other physical product parameters constant because this task is consistent with their product specification and evaluation job experience.

Hypothesis $H_2$ was formulated to test for interaction among emotive-sensory responses in multiple task exposures. If emotive-sensory characteristics are physically and perceptually independent there should be negligible interaction between their measurement processes. In the context of this experiment finding no interaction means that subjects may make valid judgments on size as an independent issue without being affected by color. Two tests were devised within the experiment. First, a factorial design using a simultaneous presentation of a pair of independent variables (color and size) was developed for which all dependent measures were taken. Second, the printed versus woven MANOVA results were examined to determine the significance of the main effect terms (printed and woven). In the case of the printed versus woven experiments, the differences between products are an integrative combination of sensory elements. Each product, however, is well recognized by subjects, so the separation between the products would be expected to be significant within the context of the MANOVA model. This means that there should be a significant separation between the holistic concepts of printed versus woven. In both cases, MANOVA with repeated measures correction was used to test for interaction.

Prior to the actual testing of Hypothesis 2, the distributional properties of the dependent measures were examined with respect to the general symmetry assumptions of MANOVA. No significant departures from the assumptions were detected.

No significant interaction effects were found within the groups of experiments on the Color x Size factorial design. All dependent measures (variable magnitude, value, quality, personal preference and professional preference) were tested without finding significant interaction.

For the printed versus woven design, the product type is found to be highly significant and the subject interaction terms are not significant for all dependent measures. (For reference, MANOVA results are reported in Table D3, Appendix D.)

Durbin-Watson tests confirm that there is autocorrelation among the dependent variables. This condition is expected as a result of the serial nature of the experimental measurement process (Neter et al., 1985, p. 450). In assigning magnitude estimations, most subjects begin at one end of the sample range and sequentially build a measurement model using their first sample as an anchor point. The existence of autocorrelation arising from such sequential testing is embedded in the within-subject serial responses. If between-subject variances were responsible for the autocorrelation, then it might be necessary to perform a transformation on the dependent variables, such as normalizing value responses, or to include an additional covariate, such as years experience, so as to reduce autocorrelation to acceptable levels (Neter et al., 1985, p. 454).

Summary of Findings,
Hypothesis $H_2$: Supported

Hypothesis $H_2$ is supported by the findings that there are no significant interaction effects between color and size. Subjects can differentiate between univariate, natural level characteristics in making emotive-sensory judgments. In the related task of evaluating printed and woven labels, subjects were also able to discriminate between these more complex product types.

Hypothesis $H_3$:

> Comparing the two subject classes, designers and buyers, designers' response functions on value will have a greater mean and dispersion than that for buyers, because buyers' role specialty brings them into more systematic contact with the market price of products.

This hypothesized relationship between value responses and role differences was tested using Student's t test of significance ($\alpha$=.05). Table 8 lists the mean value responses and the respective variances for the size, color, roughness and printed versus woven experiments. In all cases, designers expressed higher mean values and had greater dispersion in their range of values as measured by variance estimates. The test used is suggested by Chao (1969) and calculates a standardized t value using the normalized variance estimates given by the $SPSS_x$ program. For $\alpha=0.05$, critical t is approximated by $Z_{.05}=1.96$.

Table 8

Comparison of Value and Variance Means

| | Buyers | Designers | t>1.96 α=.05 | P(t/v) | signf t |
|---|---|---|---|---|---|
| Size | 2.12 | 2.74 | 5.75 | <.001 | (HSignf) |
| Color | 1.95 | 3.05 | 2.70 | .01 | (Signf) |
| Rough-ness | 1.83 | 2.79 | 8.57 | <.001 | (HSignf) |
| Printed vs. Woven | 3.91 | 5.85 | 2.62 | .01 | (Signf) |

Summary of Findings,
Hypothesis $H_3$: Supported

The findings that designers tend to place a higher value on emotive-sensory characteristics and use a greater range of value from which to pick their estimates support hypothesis $H_3$.

Hypothesis $H_4$:

> Both designers and buyers will give higher magnitude estimates on value and quality of woven labels over printed labels because woven labels have been historically more expensive and used in more expensive lines of garments.

This hypothesis was tested using t test ($\alpha$=.05) on the mean value and mean quality estimates in turn (Chao, 1969). The appropriate value and quality responses for the entire population and the appropriate test statistics are listed in Table 9.

Summary of Findings,
Hypothesis 4: Supported

There are large, nearly two-to-one differences in the mean value responses for woven labels compared to printed labels having the same functional characteristics. The quality difference is much less pronounced, although significantly higher for the woven labels. Hypothesis 4 is considered supported in the light of these findings.

Other Findings; Related
to the Formal Hypotheses

This research has led to several other findings which were not advanced as formal hypotheses but aid in understanding how emotive-sensory processing is used in product decision making.

I. General Nonlinearity
in Dependent Measures
Other Than Value

Understanding emotive value in products is a central issue in this research. A significant finding discussed above is that the perception and judgment processes used in estimating emotive value are essentially nonlinear in nature. In the series of experiments described here, other dependent measures were included because of their traditional interdependence with value: magnitude estimation,

Table 9

Woven vs. Printed Label Value and Quality Differences

Mean Value Responses

| | | Mean Value | t>1.96 $\alpha$=.05 | P(t/v) | signif t |
|---|---|---|---|---|---|
| Designers | Woven<br>Printed | 7.73<br>3.97 | 2.65 | .01 | Signf |
| Buyers | Woven<br>Printed | 5.44<br>2.38 | 30.22 | <.001 | HSignf |
| Total Population | Woven<br>Printed | 6.6<br>3.2 | 8.8 | .001 | Signf |

Mean Quality Responses

| | | Mean Value | t>1.96 $\alpha$=.05 | P(t/v) | signif t |
|---|---|---|---|---|---|
| Designers | Printed<br>Woven | 7.0<br>6.6 | 2.85 | .01 | Signf |
| Buyers | Printed<br>Woven | 7.5<br>6.3 | 9.6 | <.001 | HSignf |
| Total Population | Printed<br>Woven | 7.2<br>6.4 | 11.42 | <.001 | HSignf |

perceived quality, personal preference and professional preference. The response functions on these variables were also found to be nonlinear.

Magnitude Response in Innate Product Characteristics. Response function plots on size and color correspond in general shape to the direct magnitude estimation predictions of Stevens' (1975) power functions. The response plot of roughness magnitude estimates is much steeper than the Stevens' exponent ($\beta$=1.5) would predict. This is probably due to a range of difference in the roughness scales compared to size and color. To explain, the differences between the smoothest and roughest label fabric were much narrower than the size and color variable ranges. This was a constraint imposed by the availability of specialized narrow fabric tapes which have found commercial acceptance in the label industry. While it was a simple matter to construct a wider range of size and color samples, the only available roughness samples were more within the range of acceptance and thus represented a comparatively narrower prothetic continuum. The tendency for respondents to use their entire scale (usually 1 to 10) to describe the range of perceptual responses coupled with the greater confusion in the visually deprived roughness test make these results less traceable to Stevens' (1975) work.

Preference Mapping: Hedonic Functions. Plots of personal preference have been called "Hedonic Functions" by Moskowitz (1983). The direct magnitude estimates of preference measured in this work have been expanded to include both personal preference and professional preference, a role related construct. Several representative preference plots are included below to demonstrate the results obtained from these methods.

Preference for size follows the classical bell shaped hedonic function. This experiment asked subjects to use magnitude scaling procedures to register their strength of preference for label size intended for use on a women's sports or suit coat. Maximum preference was indicated at or just smaller than the number 4 sample (see Figure 13).

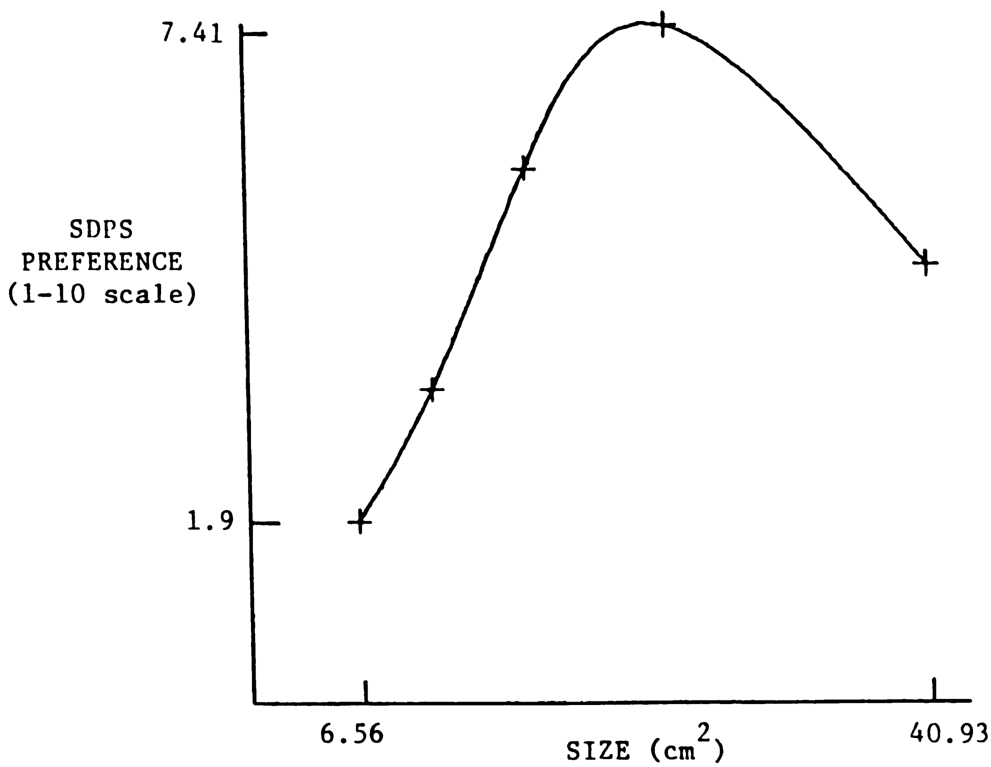



Figure 13. Mean Preference as a Function of Physical Size.

Two preference function graphs are presented for color hedonic response. The first, Figure 14, shows the aggregate preference for all respondents.

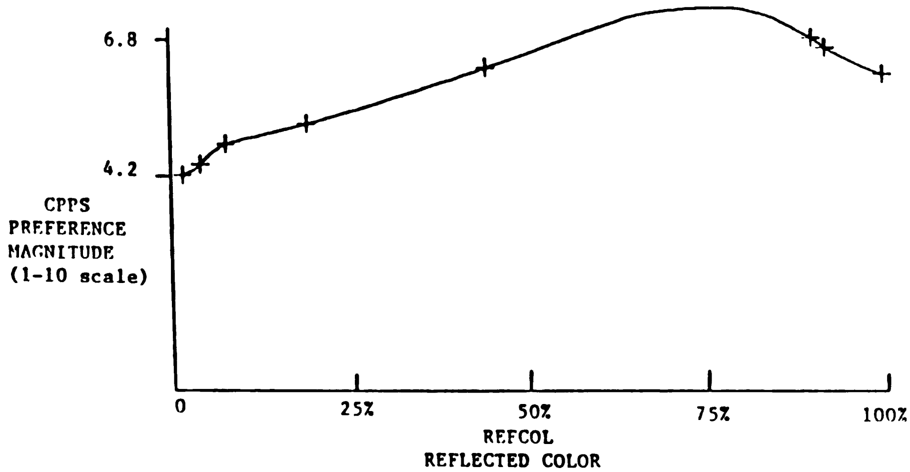



Figure 14. Mean Preference as a Function of Reflected Color. (See Appendix C for scale explanation.)

To aid in understanding the composition of this means plot, Figure 15 shows how diverse individual preferences can be by selecting three very differently centered individual preference functions. Intersubject differences tended to be more pronounced for color than any of the other independent variables (see Table D5, p. 150 for listing of variances).

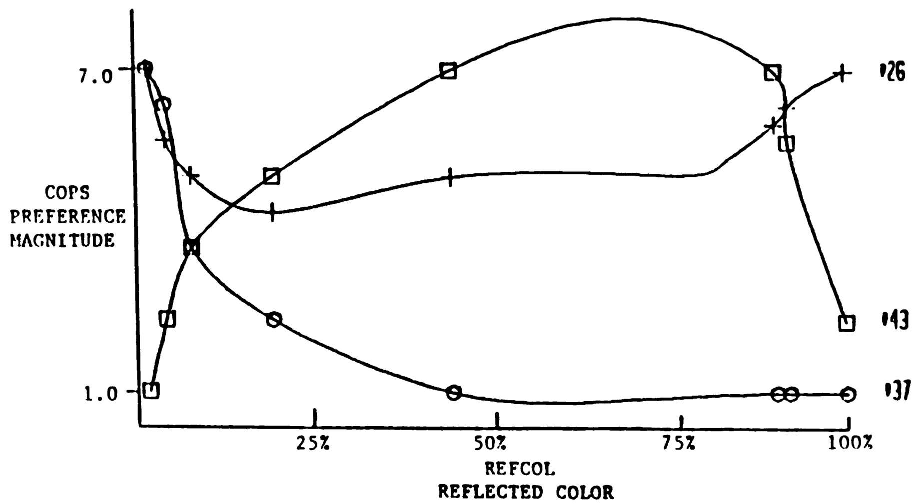



Figure 15. Selected Preference for Test Subjects #26, #43, and #37. (See Appendix C for scale explanation.)

In responding to physical roughness, subjects did not prefer the smoothest sample. Peak preference occurred near the second most smooth sample (see Figure 16). A possible explanation for this ranking is that subjects sensed that the second smoothest sample was of a higher quality substrate (a satin polyester) than the first (a spun bonded olefin). The spun bonded product was perceived as being harder and stiffer (paper like) in addition to being smoother which confused preference measures. This sample (identified in the data as number 8) had correspondingly lower value and quality ratings than adjacent products which explained the discontinuity in the measured responses.

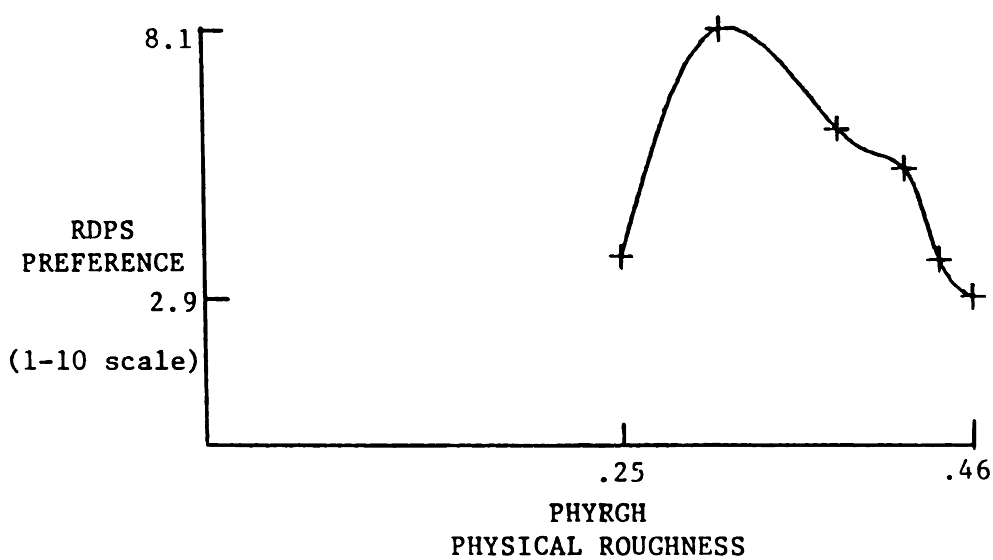



Figure 16. Preference as a Function of Physical Roughness. (See Appendix C for scale explanation.)

Of special interest to marketers is the capacity to combine characteristics into a multidimensional preference map. For illustration, data from personal and professional preference are plotted for the color and size factorial experiment. The result is a three dimensional preference surface which may be used to locate the center and strength of preference for combinations of variables. One such surface is shown below, strength of personal preference for size and color (Figure 17).

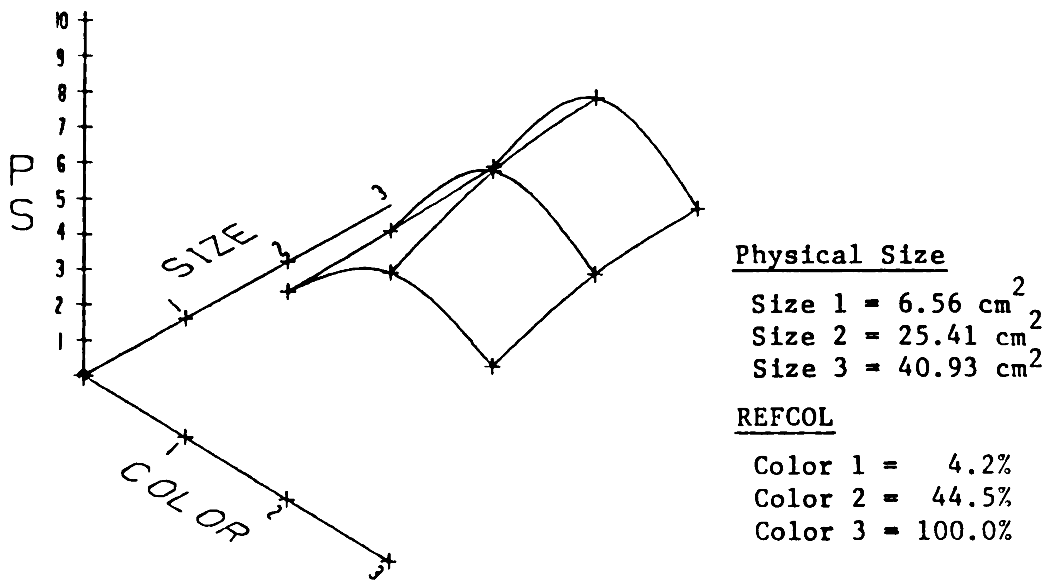



Figure 17. Personal Preference Magnitude by Size and Color.

Again the question generating these responses asked respondents to frame their preference rankings within the context of applying the label samples to a woman's sport or suit coat. This procedure locates the center and strength of preference through the use of a factorially designed experiment which simultaneously exposes subjects to various levels of two variables.

### II. Absence of Other Role Related Differences Between Buyers and Designers

As shown above within the information used to test hypothesis $H_1$, designers gave higher value estimates and had greater variances on value than buyers. Other than value, there were no other role related differences identified by this research.

### III. Comfort and Ease of Response to the Method

Respondents were capable of completing the magnitude estimation procedure after the light-level teaching exercise. An exception to this was found in six designers who disavowed any responsibility or knowledge for market pricing in labels and who thus were reluctant to attempt value estimation. It was decided to coach these subjects to the extent of indicating at the beginning of the size experiment that the small sized label could be considered as being worth one cent (a value nearly equal to the mean response for this sample). These designers were then comfortable with building a value model from this cornerstone. Subjects were universal in their interest in the method and results of the research.

### General Summary: Findings of the Research

Four hypotheses predicting the nature of response to emotive-sensory information were tested in this research and all four are supported by the analysis of experimental data.

The hypothesized nonlinearity of value response functions was supported in this research. The direct relationship between psychophysical response functions, Stevens (1975) power law relationship, and value were only tentatively established, and evident only in the size-value tests. Other response functions representing magnitude estimation responses on physical magnitude, perceived quality, personal preferences and professional preference also appear to be essentially nonlinear.

A second hypothesis supported in this research was that subjects are capable of making independent emotive-sensory judgments on unidimensional product characteristics without significant interaction effects. This finding needs to be qualified as occurring in situations where the characteristics under study are physically and perceptually separable. Moskowitz (1983) reports on the interaction between acidity and sweetness in beverage testing, a case where physical (chemical) separation is possible but perceptual separation is not because of the integrative nature of taste. With this condition of separability, this hypothesis was supported for all dependent measures, using a repeated measures MANOVA design.

The third hypothesis supported in this research stated that as a class, designers would have higher mean value estimates and greater variances than buyers for all of the four experimental sequences (i.e. size, color, roughness, and printed vs. woven). This hypothesis was supported unconditionally after t tests demonstrated significantly higher means for designers.

The fourth hypothesis supported by this research stated that woven labels would receive higher value and quality estimates than functionally comparable printed labels. This hypothesis was also strongly supported by the use of Student's t test of means.

# CHAPTER V

# CONCLUSIONS

This chapter summarizes the research, beginning with a review of the objective, then restating the model and presenting the rationale for the study's hypotheses. The findings presented in Chapter IV are combined in this chapter into the conclusions of the study. The limitations of this research and its contributions to marketing thought and practice are then examined. Finally, future research directions are suggested.

## Restatement of the Objective

The objective of this research was to study emotive-sensory product value in an intermediate product market setting. The Bacon and Butler (1981) economic and emotive value dichotomy was adopted as the framework for this research. An environmental psychology model of emotion (Mehrabian and Russell, 1974) has been used to operationalize the construct emotion and in order to isolate emotive-sensory responses as the predictor variables of this research. Experimental methods in direct magnitude estimation have been borrowed from psychophysics (Stevens, 1975) and extended into more complex decision processes relevant to marketing practice.

The scope of this research has been limited to testing experienced, professional decision makers' emotive-sensory responses in a focused attention experimental setting. This conforms to Holbrook and O'Shaughnessy's (1984) definition of emotive responses, that is, that they be reactive, specific, and acute.

## Rationale for the Hypotheses

The hypotheses guiding this research have been formulated to test the research assumption that direct measurement of emotive-sensory responses to product characteristics gives valid results useful to marketers. These hypotheses reflect the a priori assumptions that the nature of emotive-sensory information processing results in integrative, nonlinear, and noninteractive judgments on perceptually separable product differences. The following conclusions are drawn from this research.

## Conclusions from the Findings

Two major conclusions of this research are cited followed by a discussion on each.

1) Emotive-sensory value is a valid construct which is measurable through direct magnitude estimation methods.

Emotive value in products is a difficult construct to define and measure because it is subjective and interactive with economic, ulilitarian values (Schachter, 1964). This research has defined and measured emotive-sensory value, a component of emotive value, using direct magnitude estimation procedures to scale and measure perceptual responses to changes in physical product characteristics (Stevens, 1975). Limiting the study to a single level in the marketing channel reduces the subjectivity of responses without diluting the predictive power of the results obtained.

These procedures have proven sensitive to role related differences in value judgment and market-knowledge induced shifts in preference. Emotive value differences may be measured in dimensionally simple characteristics (i.e., size, color, and roughness) as well as complex multidimensional constructs (i.e., woven versus printed construction).

The results of this research contribute validity to the Bacon and Butler (1981) economic and emotive value dichotomy and confirm the need for direct, interactive measurement to determine emotive components of value.

2) Emotive-sensory responses are nonlinear and integrative in nature.

In this study, experts responded to sensory differences in products using emotive logic (Leventhal, 1979). The experimental setting induced focused attention and encouraged goal oriented judgments (Pribram and McGuiness, 1975) to evoke reactive, specific, and acute responses (Holbrook and O'Shaughnessy, 1984).

While traces of nonlinear, sensory, power-law effects (Stevens, 1975) and hedonic response patterns (Moskowitz,

1983) were observed in these tests, neither theory comprehensively explains emotive value in products. The findings of this research suggest that a correct representation of emotive value in products will have to be interactive at all levels of thought (Schachter, 1964) and be integrated with environmental responses (Mehrabian and Russell, 1974) on one hand and experience factors (Averill, 1980) on the other hand.

## Limitations of the Study

This study has both situational and sampling conditions which limit the generalizability of results. The emotive responses obtained from professional buyers and designers are unique to label products used in the women's sportswear industry. While several general conditions prevail across the apparel industry, the questions posed to subjects regarding size, color, and roughness of labels were framed in the context of applying the test labels to specific product lines (women's sport or suit coats). This situation was further limited to preferences for colors to be used in the Spring 1987 lines so as to be consistent with a current professional task. Because these restrictions focus subjects' preference rankings to a specific application, they cannot be generalized to larger domains of garment types or fashion seasons. These factors suggest a problem with generalizability of findings but not with generalizability of methods.

The physical separability of product characteristics is an important boundary condition on these methods. If it is not possible to disaggregate products into natural "C" level characteristics, then overall preference measures for products containing these configurations cannot be resolved into knowable constituent levels.

Another important situational constraint was imposed by limiting the scope of this research to only three "C", natural characteristics when others exist. As it was, the experiment consumed approximately one hour of each subject's business time and asking for more time to expand the data was considered inappropriate for reasons of cost and subject fatigue.

## Contributions of This Research

This dissertation offers both practical and theoretical contributions. Relevant to the practice of industrial marketing, this study demonstrates that emotive value is an important and variable component of total value in industrial products. Using these methods to identify and measure emotive-sensory value offers several advantages to industrial product marketers.

Contributions to Industrial Segmentation Research. This study suggests that responses to emotive-sensory product characteristics may be useful segmentation variables in industrial markets. Because of their differentiated value responses, buyers and designers emerged from this study as response-differentiated segments both within and between firms in the apparel industry. The usefulness of these methods lies in their ability to discover how potential segments differ on perceptions of value, quality, and preference for emotive-sensory characteristics.

Contributions to Industrial Product Development. Industrial products are often functionally equivalent implying that their economic value components are also equivalent. This research has demonstrated large value differences in functionally equivalent products (i.e., printed vs. woven construction types) attributable to emotive-sensory characteristics. Finding and including such emotive values during product development is a way to create a differential advantage which is measured by targeted customers as higher levels of value, quality and preference.

Contributions to Industrial Product Marketing. Having a priori knowledge of the need for both emotive and economic components of value will allow pricing to capture total product value. New products which are priced to reflect their total value should be introduced jointly to designers and buyers. The designers can recognize the emotive content of products and support their adoption by creating and defending specifications for higher levels of emotive content.

Theoretical Contributions. This research successfully extends direct sensory measurement methods beyond the traditional domains of psychological intensity (Stevens, 1975) to variables which have important commercial relevance. Moskowitz (1983) has pioneered in this approach by using direct magnitude estimation to measure liking for sensory characteristics of food stuffs. The present research builds a theoretical underpinning to product sensory testing by relating it to emotive decision making and extends the measures to value-related concepts such as perceived value, perceived quality, and professional preference.

Only one level of preference (personal preference) is considered by Moskowitz (1983). In the present research, buyers and designers are seen as acting in the behalf of ultimate customer satisfaction while under the constraints imposed by their companies' resources and objectives. The new variable, professional preference, is a significant contribution of this research. Professional preference captures the complexity of decision making for buyers and designers by measuring their integrated emotive responses.

The methods used in this research contribute a focused, cost-effective procedure for examining emotive issues in products. The simplicity of these methods makes them attractive to both academic and commercial practice.

Another theoretical contribution of this work lies in its exploration of the nature of emotive-sensory response. A relationship between product value and elementary psychophysical response may be tentatively postulated following the value-to-size experiment. Further research must be done to explore these relationships.

Suggestions for Future Research

A Vector Model of Total Value. This study validates the Bacon and Butler (1981) value dichotomy and suggests that emotive value may be determined by decomposing total value into its component parts. Further research could begin by conceptualizing value as the vector sum of two interactive components, economic value and emotive value (Figure 18).

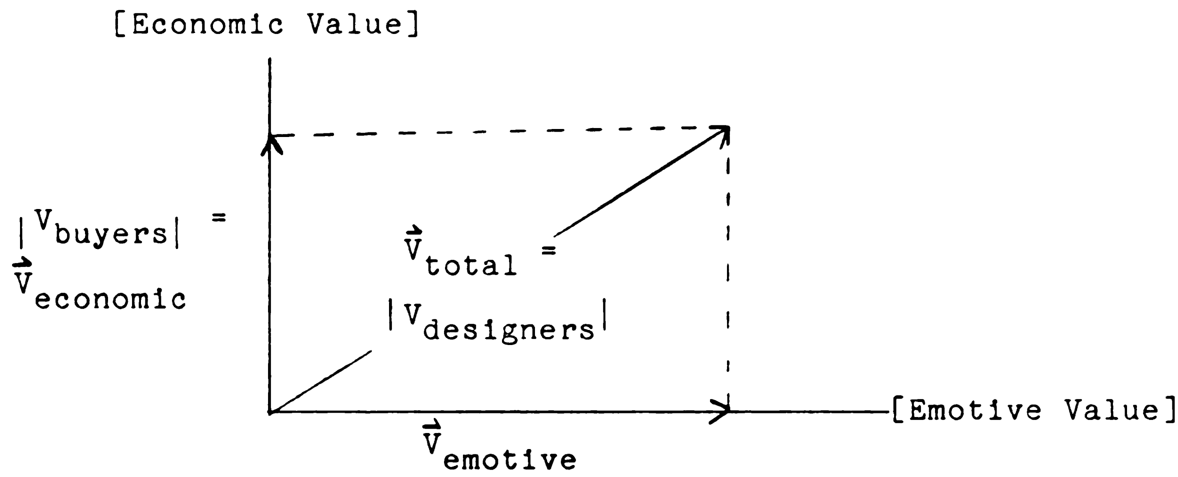



Figure 18. Emotive Value Represented as a Vector Difference Between Economic and Total Value Vectors.

A starting simplification would represent buyers' responses to value as consisting of only the economic components of value $|V_{buyers}|$. The designers' responses could be considered as containing both economic and emotive components and thereby represent total value $|V_{designers}|$. Placing the total value vector in the diagram such that its direction causes it to intersect the vertical height determined by the size of the buyers' value response determines a unique vector solution to the emotive value component ($\vec{V}_{emotive}$).

<u>Expanding the Vector Space to Four Value Quadrants.</u> Admitting positive and negative value components poses another interesting research problem. The vector space suggested in Figure 18 expands to four quadrants if both positive and negative components of economic and emotive value are considered (Figure 19).

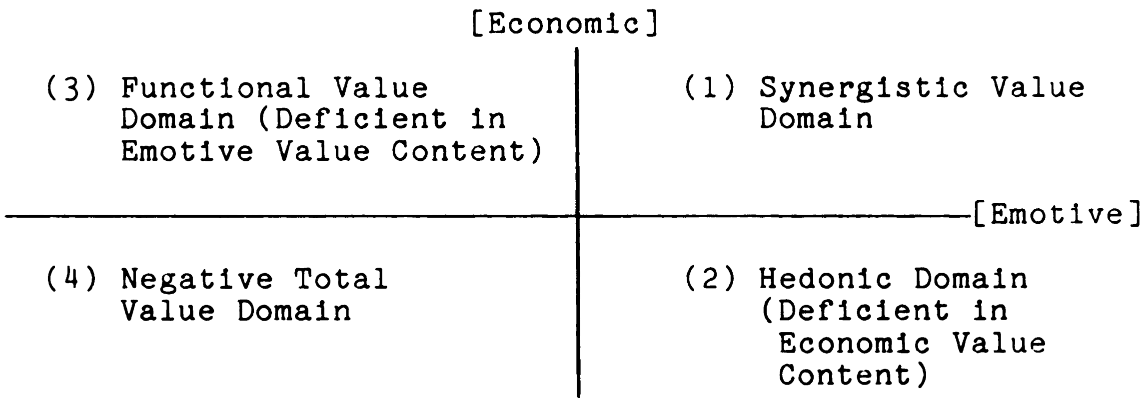



Figure 19. A Four Quadrant Value Research Model.

More research is needed to test this model. It is not known from the present research to what extent buyer's responses may be considered as purely economic and the vector space suggested may not be orthogonal. It may be seen from the geometry of the model that net positive value is absolutely assured in only one quadrant (1), but possible in three quadrants (1, 2, and 3). Conversely, net negative value (4), always results from a combination of negative economic and negative emotive values. These compositional value models also suggest a new research paradigm to study comparative product positioning amongst competitive offerings. In such cases, repositioning products may be seen as a need to shift either economic or emotive product value constructs to match or exceed competitive offerings.

Further Research in Creating Subjective Value. The general process of value creation in products needs to be studied in an interactive model which includes sensory perception under focused attention, beliefs established by experience, and goal functions established by role-related task perceptions. A suggested modeling framework might integrate the emotive-sensory measurement methods of this study with the emerging literature in expert systems (Hayes-Roth et al., 1984; Feigenbaum, 1979). This would help clarify how experience and role perceptions affect emotive decision making.

Studying the Communication of Emotive Values in a Market. This work has identified some common response patterns on subjective phenomenae across 25 business units which are organizationally and geographically separated but linked by common competitive market structure. Investigations into the communication and acceptance of certain emotive standards might take a diffusion modeling approach (Rogers, 1976) and use the methods of this research to define variables and measure effects.

Extending This Study to the Buying Center as the Unit of Analysis. The scope of these methods should be expanded by a study which focuses on the organizational buying center as the unit of analysis. There is a rich literature (Bonoma and Zaltman, 1978) on role behaviors in such buying centers but no attempt has been made to study the communication of emotive value or emotive-sensory decision making within the center. All of the experiments conducted in this research were on single subjects isolated from their buying-center counterparts. There was no interaction time permitted between test subjects' sittings.

Further Work Within the Characteristics Hierarchy. Important theoretical linkages remain to be made in emotive-sensory decision making between attribute transformations within the "A-B-C" product characteristics hierarchy. One theoretical perspective holds that products are "bundles of attributes" that satisfy needs (Lancaster, 1976). Adopting this position opens the door to study emotive processes with full or partial bundles (i.e., what are the conditions which permit perceptual unbundling of these products). Conventional learning theories are inadequate descriptions of the formation of expert judgment through highly structured emotive processes. One dimension of expertise may for example, be learning the skill to separate characteristics into independently measurable (noninteractive) cells or bundles of unidimensional product characteristics for which emotive-sensory judgment becomes the choice mechanism.

# APPENDICES

# APPENDIX A

## LIGHT INTENSITY MEASUREMENT THROUGH DIRECT MAGNITUDE ESTIMATION

## APPENDIX A

## LIGHT INTENSITY MEASUREMENT THROUGH DIRECT MAGNITUDE ESTIMATION

In order to familiarize subjects with magnitude estimation procedures, a teaching exercise using a variable intensity light source was devised. Since a portable photo flood lamp was carried as a color correcting devise for the main body of the experiment, it was a simple matter to build a variable power supply to control the lamp's intensity. A translucent, back-lighted shield was constructed which, when placed in front of the floor lamp, produced an illuminated spot which parallels Stevens' (1975, p. 25) back-lighted milk glass experimental apparatus.

The power supply and lamp source with screen in place was calibrated for ten equal intensity increments from dim (just perceptable in normal office ambient lighting) to maximum brightness. Scale division was accomplished using a Gossen Pilot photometer positioned one foot from the screen and set at the lowest ASA film speed index. The power supply control was then marked for correspondence to ten exposure value (EV) readings. In this way, ten equal luminance scale divisions were created.

Subjects were told that they would see first the minimum and maximum light values to calibrate their expectations and then a series of randomly selected values from that range. They were asked to pick their own magnitude scale but to peg its endpoints at the dim and bright end of their scale.

Results of this experiment are shown below in Figure A1. The fall off in magnitude estimates near the upper end of the scale are predicted by the Plateau principle (Stevens, 1975, p. 154). The slightly greater low scale readings are probably attributable to the differences in ambient light levels. The lowest intensity (#1) had to be established at a high enough level to be perceptable in the most well lit situations. It was noticed in subdued background environments that it was more likely that respondents assigned the magnitude estimator 2 to the #1 intensity than in well lit workplaces. This tendency elevates the response function for low lighting levels.

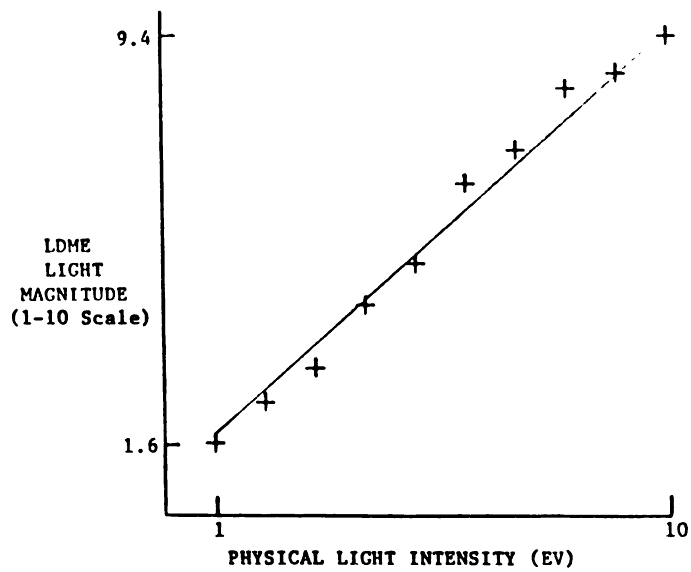



Fig. A1. Light Magnitude Estimation Equal Partitioned Scale, Normalized to 10.

After the results were tabulated on paper one of the data sheets under Light Sequence (see Appendix B. Data Records), the subjects were shown how their magnitude estimation responses correlated with the randomly shown light stimulae. Subjects were generally encouraged by the results of this matching exercise and receptive to extending the procedure to other physical parameters and higher levels of judgment.

# APPENDIX B

# DATA RECORDING FORMS

## APPENDIX B

## DATA RECORDING FORMS

Found in this appendix are the four data recording forms completed for each test subject. The tests were performed in the same sequence for each subject to control for hysterisis effects. In each section, the task was described and the subject was asked to pick a scale that would be comfortable and contain enough resolution and range to describe the sensory continuum presented. Apart from seeing the results of the opening Light Sequence, no other inspection of response records was permitted. Subjects were not advised that they were to be timed, but in the introduction to the procedure they were admonished to issue their judgments with reasonable spontaneity.

The following definitions apply for the respective tests:

Light Sequence, pg. 116

| | |
|---|---|
| Scale Value $dM_e$ | Randomly selected light intensities. Subjective brightness, magnitude estimates. |

Size, p. 116

| | |
|---|---|
| 1. Ordering | Arranging the five samples from small to large. |
| 2. $dM_e$ | Magnitude estimate of size (visual area). |

3. $dM_v$ — Magnitude of what value, measured as willingness to pay, would be assigned to each size sample.

4. $dM_q$ — Magnitude estimate of relative quality, i.e. the presented label with similar printed labels from their experience.

5. $dM_{per}$ — Magnitude estimate of personal preference for label size to be used in a women's blazer or suitcoat.

6. $dM_{pro}$ — Magnitude estimate of professional preference for label size for the same women's blazer as might fit the acceptable standards of practice or recent trends of the subject's current employer.

<u>Color, pg. 117</u>

1. $dM_c$ — Magnitude estimator of the value or the amount of red contained in the test labels.

2. $dM_v$ — Value estimate as a function of color only.

3. $dM_q$ — Quality estimator.

4. $dM_{per}$ — Personal preference estimator.

5. $dM_{pro}$ — Professional preference estimator.

<u>Roughness, pg. 117</u>

1. Ordering — Subjects were asked to order the test labels from rough to smooth.

2. $dM_e$ — Magnitude estimate of roughness with coarse being a low scale value and smooth being a high scale value.

3. $dM_q$ — Magnitude of quality as a function of roughness perception.

4. $dM_{per}$ — Personal Preference (as above).

5. $dM_{pro}$ — Professional Preference (as above).

<u>Color x Size, pg. 118</u>

The same definitions apply in this factorial experiment as in the univariate tests above. Since there were no apparent size differences observed with color variations, subjects were only asked to give one size magnitude estimate ($dM_s$) for each of the three families of color. For the rest of the Color x Size experiment, each treatment consisted of exposure to nine samples (i.e. 3 colors x 3 sizes).

<u>$W_vP$, pg. 119</u>

The comparison of woven and printed labels involved only two samples, closely matched in size, color, and textile substrate, but differing in construction. The printed label was screen printed in a process identical to the technology used to create all of the other test samples. The woven label used colored thread woven through the basic substrate to create the design and lettering.

$dM_v$ — The value of the woven (W) and printed (P) labels.

$dM_q$ — A <u>within group</u> measure for respective quality by magnitude estimation. Subjects were advised to compare their perceptions of quality of the woven label with all other woven labels in their experience and vice versa for printed labels. This was found necessary in pretesting because subjects confused quality of the label itself with their preference for using one or the other in apparel products.

$dM_{per}$ — Personal preference for using one or the other in apparel products.

$dM_{pro}$ — A reflection of the firm's preference for using printed or woven labels.

Experience Ranking

This information was gathered to allow comparison of subjects on experience variables. This information was not necessary to test the hypotheses of this study, but was considered relevant for further intended research.

Date________________ Test Subject________________

Time________________

Light Sequence

Scale Dim [ ] Bright

| Scale Value $dM_e$ | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

Time________________

Size

Scale S [ ] L

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1. Ordering | | | | | |
| 2. $dM_e$ | | | | | |
| 3. $dM_v$ | | | | | |
| 4. $dM_q$ | | | | | |
| 5. $dM_{pers}$ | | | | | |
| 6. $dM_{pro}$ | | | | | |

Comments

Test Subject________________

Time________________

| Color | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1. $dM_c$ | | | | | | | | |
| 2. $dM_v$ | | | | | | | | |
| 3. $dM_q$ | | | | | | | | |
| 4. $dM_{pers}$ | | | | | | | | |
| 5. $dM_{pro}$ | | | | | | | | |

Scale L[ ]D

Scale [ ]

Scale [ ]

Time________________

Roughness

Rough ... Smooth

| Index | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1. Ordering | | | | | | |
| 2. $dM_e$ | | | | | | |
| 3. $dM_v$ | | | | | | |
| 4. $dM_q$ | | | | | | |
| 5. $dM_{per}$ | | | | | | |
| 6. $dM_{pro}$ | | | | | | |

Scale R[ ]S

Scale [ ]

Scale [ ]

Text Subject________________

Time________________

**Color X Size**

| | | (S) | (M) | (L) |
|---|---|---|---|---|
| 1. | $dM_s$ | | | |
| 2. | $dM_c$ | | | |
| | (light) | | | |
| | (mid) | | | |
| | (dark) | | | |
| 3. | $dM_v$ | | | |
| | (light) | | | |
| | (mid) | | | |
| | (dark) | | | |
| 4. | $dM_q$ | | | |
| | (light) | | | |
| | (mid) | | | |
| | (dark) | | | |
| 5. | $dM_{personal}$ | | | |
| | (light) | | | |
| | (mid) | | | |
| | (dark) | | | |
| 6. | $dM_{pro}$ | | | |
| | (light) | | | |
| | (mid) | | | |
| | (dark) | | | |

Scale S [ ] L

Scale L [ ] D

Scale [ ]

Scale L [ ] H

Test Subject______________________

Time______________________

| W, P | W | P |
|---|---|---|
| $dM_v$ | | |
| $dM_q$ | | |
| $dM_{per}$ | | |
| $dM_{pro}$ | | |

Scale [ ]

Scale [ ]

Experience Ranking

Job Classification — Buyer ☐ ☐ Designer

Years experience
- 0 - 1 ☐ ☐
- 1 - 3 ☐ ☐
- 3+ ☐ ☐

Supervisory ☐ ☐

Descriptive Process

Size, color ☐

Process - woven, printed ☐

sing/mult. weave ☐

Substrate - selvedge edge ☐

cut and fold ☐

satin/silk ☐

Cost - fabrication ☐

- application ☐

Specifications, Buying

Objective: Specs ☐

Roles separated ☐

Raw Score ☐

# APPENDIX C

## EXPERIMENTAL VARIABLES: MEASUREMENT AND CONTROL

## APPENDIX C

## EXPERIMENTAL VARIABLES: MEASUREMENT AND CONTROL

This appendix describes the scale development, physical measurement, and control of the independent variables of this research.

### Material Control: Substrate

Identical substrate materials were used for all of the experimental treatments except for the roughness tests. The label tape used is a satin weave, polyester filament. This material is a commonly used material, available in the various sizes required for the size experiments and expected to have both high recognition and ready acceptance among the professional buyers and designers in the study. The following materials were chosen from among commercially available label tapes for the roughness tests because of their different textures. They are listed in order from roughest to smoothest with the mechanical measure of roughness determined by the method described elsewhere in this Appendix (see Appendix C, p.124).

Table C1

Description of Substrate Materials Used

| Label Index Used in the Experiment | Material Description | Roughness Measure |
|---|---|---|
| 8 | Spun bonded olefin | .25 |
| 1 | Uncoated satin polyester-woven | .31 |
| 2 | Uncoated cotton-woven | .38 |
| 3 | Coated polyester/cotton blend-woven | .42 |
| 5 | Coated acetate-woven | .44 |
| 7 | Spun bonded polyester | .46 |

Materials Control: Color

The pigment used for all of the experiments except the colored fiber used in the woven label sample was Harshaw C.P. Cadmium 1560, an opaque medium red pigment mixed in a clear solvent with a viscosity appropriate for screen printing. Spectral decomposition plots from a Milton-Roy Match-Scan II recording spectrophotometer are available from the author by request.

Control for color was achieved by using the same printing process and ink for all of the size, roughness, and the printed label used in the printed vs. woven tests. These samples used at 16% dilution ratio. For the color variation test samples, a series of dilutions on solvent volume were mixed, doubling each solvent ratio to create the following mixtures. The physical color measures are explained below.

Table C2

Comparison of Pigment Dilution to Color-Value Measures

| Sample No. | % Dilution | Physical Color Measures: A. PHYCOL (Log) | Physical Color Measures: B. REFCOL (%) |
|---|---|---|---|
| A (Dark) | 50% | 1.36 | 100.0 |
| B | 32% | 1.36 | 92.04 |
| C | 16% | 1.35 | 90.17 |
| D | 8% | 1.30 | 44.53 |
| E | 4% | 1.14 | 19.26 |
| F | 2% | 0.92 | 7.84 |
| G | 1% | 0.76 | 4.21 |
| H (Light) | 0.5% | 0.56 | 1.65 |

Two different color measuring apparatus were used because the effects of color change in this experiment involve two perceptual continua. Changing color value from a dark, fully pigmented sample to a light, pastel like bleed can be represented as a change in the absorption properties of the printed surface or a change in the reflectance properties of the printed surface. While these are symmetrical physical phenomenae, there are certain anomalies in the instruments which give physical readings that are not mirror images.

PHYCOL: Measurement by Absorption

An X-Rite Corporation 348G Densitometer was used to give color density measures (PHYCOL). This instrument is calibrated against an ANSI Standard Red and makes color density measure by measuring the intensity (by an absorption photometer) of red light passed through a red filter. There was no information available as to the band width of the filter or the spectral sensitivity of the photometer, but the device was relatively insensitive to the higher density samples. There was statistically no separation in color density for samples A, B, and C while on perceptual measures, all respondents were capable of correctly ordering these samples.

REFCOL: Measurement by Reflection

A search for instrumentation that would separate the dark color samples led to a plastics firm which offered the use of their color analyst and their Milton-Roy computerized scanning spectrophotometer (Match Matic 3203). This machine also uses a standard light source, but has the unique advantage of calibrating against one of the test samples to establish a unique spectral composition in memory against which all subsequent samples are compared. In this case, the darkest sample A was used as the calibration standard. As can be seen from the listing above, this machine discriminated between the A, B, and C densities. This machine measures the percentage of red contained in the reflected light (REFCOL).

Comparisons of PHYCOL and REFCOL

Two goodness of fit tests were conducted on the two color measures; PHYCOL and REFCOL. First regressions were run to see how well PHYCOL and REFCOL explained the perceptual color responses CDME. Second PHYCOL and REFCOL were regressed linearly and nonlinearly against value response, CDMV, to see if one improved the regression coefficients over the other. Results are indicated in Table C3.

The value tests were run with the restricted subsample of 8 subjects where a variance in CDMV was recorded. Both PHYCOL and REFCOL have strong correlations on the total subject population (n=51) on measures of CDMC but in the log measures LOG REFCOL is clearly a superior fit ($R^2$=.97 compared to .55).

Table C3

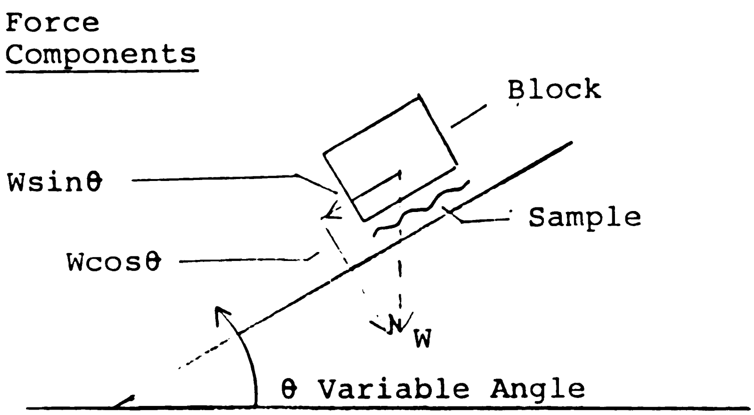
Matching PHYCOL and REFCOL to Experimental Measures

| Regression Test | $R^2$ PHYCOL | $R^2$ REFCOL |
|---|---|---|
| CDMC with ANTILOG PHYCOL | .95 | |
| LOG CDMC with PHYCOL | .55 | |
| CDMV (value) with PHYCOL | .05 | (Not significant F=.0755) |
| LOG CDMV (value) with LOG PHYCOL | .06 | (Significant F=.0470) |
| CDMC with REFCOL | .90 | |
| LOG CDMC with LOG REFCOL | .97 | |
| CDMV (value) with REFCOL | .05 | (Not Significant F=.0861) |
| LOG CDMV (value) with LOG REFCOL | .07 | (Significant F=.0417) |

Roughness Measurement

There is poor agreement within the apparel industry regarding standard measures of the tactile properties of fabric (Dickerson, 1985). The confusion stems from disagreements regarding how to weigh the natural characteristics roughness, hardness, and stiffness in textiles. All three are included in most measurements of "fabric hand," a common term used to describe perceptual responses to tactile involvement with fabric products. Since no standards exist, and since Stevens (1975) had included predictors of response on the variable roughness, it was decided to make this a variable in this research. Also within the label industry, it was acknowledged that "roughness against the skin" had been a consistent perceptual measure of appropriate substrate materials (Dickerson, 1985).

Two roughness testing methods are used in the apparel industry. First, microphotographic comparisons of weave density and fiber size (coarseness) are used but primarily restricted to grading given filament types. Second, a friction device called a dynamic viscometer has been used to provide comparative measures of surface friction properties, a surrogate for roughness. For this work, it was decided that the dynamic friction property more closely matched the physical test performed by subjects. To determine an experimental standard of roughness which would be repeatable, the following apparatus was constructed.




$$\text{Coeff. friction } R = \frac{W\sin\theta}{W\cos\theta} = \tan\theta$$

Figure C1. Incline Plane Apparatus to Measure the Coefficient of Sliding (Dynamic) Friction.

An inclined plane was used to measure the coefficient of dynamic friction in different substrate materials. The angle of inclination was increased until the block sandwiching the substrate sample against the plane slides uniformly with constant downward motion. The plane was lined with a satin polyester label tape to approximate the tactile properties of human fingertips. Each label was trimmed to 1-1/2" x 2-1/4" size and submitted to this test. The angle producing the uniform motion was recorded and the tangent function determined. The results of this experiment are recorded above (Table C1).

Woven Label Control

A sister division of the cooperating firm prepared a woven label using identical design and substrate but having woven construction instead of being screen printed. The color of the weaving filament was dyed to match the 16% dilution color sample used in the printed label for this test sequence. A woven label of such construction differs from the printed label on more than one natural ("C" level) characteristic. Hence, the emotive responses to differences between the printed and woven labels are complex integrations of physical differences including construction type, thickness, softness, and stiffness.

# APPENDIX D

# DATA AND RESULTS TABULATIONS

# APPENDIX D

Appendix D presents the tabulated results of statistical analyses on the experimental data of this research. Computer analyses were performed on a Honeywell CP-6 using $SPSS_x$ software.

The plan of Appendix D is to present data in the same order in which it is referenced in the text of Chapter IV, Results.

## Notes on MANOVA Model: Table D3

Analysis of variance for the Color x Size factorial design used the MANOVA option with repeated measures correction ($SPSS_x$, 1986).

The model assumes that the following terms absorb the variation in the dependent variable

CSDMV = value measure (magnitude) in the Color x Size factorial design

$$\text{CSDMV} = \underset{\text{(Constant)}}{V_{\text{Average}}} + V_{\text{Size}} + V_{\text{Color}} + \underset{\text{(Interaction)}}{V_{\text{Color x Size}}} + \text{Error}$$

The error term is corrected for repeated measures by normalizing each subject's response to a grand mean correction factor.

$$SUBJ_i \text{ effect} = \bar{y}_i - \bar{\bar{y}}$$

$i = 1 \ldots 51$ (9) (grand mean)

The adjusted model then becomes;

$$CSDMV = \underset{\text{(Constant)}}{V_{Average}} + \underset{\text{(Main Effect)}}{V_{Size}} + \underset{\text{(Main Effect)}}{V_{Color}} + V_{Color \times Size} + E_{Subject\ Error} + E_{Random\ Error}$$

Signf of F values less than .05 are significant.

Table D1.1

Linear Regression - Value by Size
Dependent Variable - SDMV
Independent Variable - SIZE

| | | | | | |
|---|---|---|---|---|---|
| Multiple R | .53720 | Analysis of Variance | | | |
| R Square | .28859 | | DF | Sum of Squares | Mean Square |
| Adjusted R Square | .28577 | Regression | 1 | 252.09524 | 252.09524 |
| Standard Error | 1.56728 | Residual | 253 | 621.45884 | 2.45646 |

F = 102.62964 Signif F = .0000

Variables in the Equation

| Variable | B | SE B | BETA | T | SIG T |
|---|---|---|---|---|---|
| SIZE | .08186 | 8.08055E-03 | .53720 | 10.131 | .0000 |
| (Constant) | .78243 | .19019 | | 4.114 | .0001 |

Table D1.2

Log Regression - Value by Size
Dependent Variable - LNSDMV
Independent Variable - LNSIZE

| | | | | | |
|---|---|---|---|---|---|
| Multiple R | .06043 | Analysis of Variance | | | |
| R Square | .41016 | | DF | Sum of Squares | Mean Square |
| Adjusted R Square | .40782 | Regression | 1 | 8.53359 | 8.53359 |
| Standard Error | .22024 | Residual | 253 | 12.27215 | .04851 |

F = 175.92674 Signif F = .0000

Variables in the Equation

| Variable | B | SE B | BETA | T | SIG T |
|---|---|---|---|---|---|
| LNSIZE | .66238 | .04994 | .64043 | 13.264 | .0000 |
| (Constant) | -.52151 | .06251 | | -8.343 | .0000 |

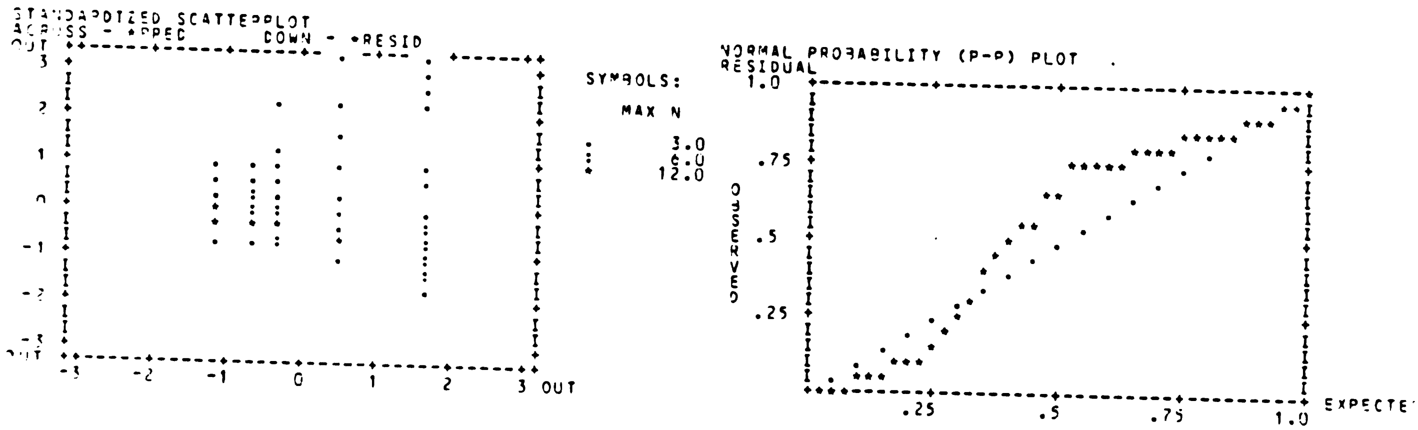



Figure D1. Linear Regression - Value by Size

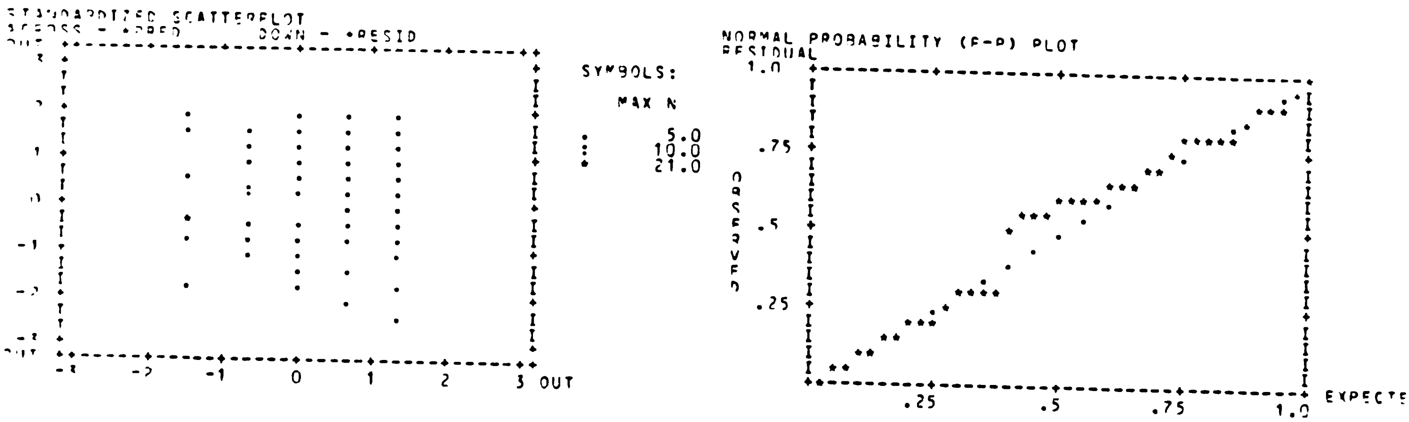



Figure D2. Log Regression - Value by Size

Table D1.3

Linear Regression - Value by Color
Dependent Variable - CDMV
Independent Variable - PHYCOL

| | | | | | |
|---|---|---|---|---|---|
| Multiple R | .22379 | Analysis of Variance | | | |
| R Square | .05008 | | DF | Sum of Squares | Mean Square |
| Adjusted R Square | .03476 | Regression | 1 | 4.74283 | 4.74283 |
| Standard Error | 1.20453 | Residual | 62 | 89.95467 | 1.45088 |

F = 3.26893 Signif F = .0755

Variables in the Equation

| Variable | B | SE B | BETA | T | SIG T |
|---|---|---|---|---|---|
| PHYCOL | .03571 | .01975 | .22379 | 1.808 | .0755 |
| (Constant) | 2.02216 | .33156 | | 6.009 | .0000 |

Table D1.4

Log Regression - Value by Color
Dependent Variable - LNCDMV
Independent Variable - PHYCOL

| | | | | | |
|---|---|---|---|---|---|
| Multiple R | .24927 | Analysis of Variance | | | |
| R Square | .06214 | | DF | Sum of Squares | Mean Square |
| Adjusted R Square | .04701 | Regression | 1 | .13709 | .13709 |
| Standard Error | .18268 | Residual | 62 | 2.06917 | .03337 |

F = 4.10779 Signif F = .0470

Variables in the Equation

| Variable | B | SE B | BETA | T | SIG T |
|---|---|---|---|---|---|
| LNPHYCOL | .15891 | .07481 | .24927 | 2.207 | .0470 |
| (Constant) | .19237 | .08875 | | 2.168 | .0340 |

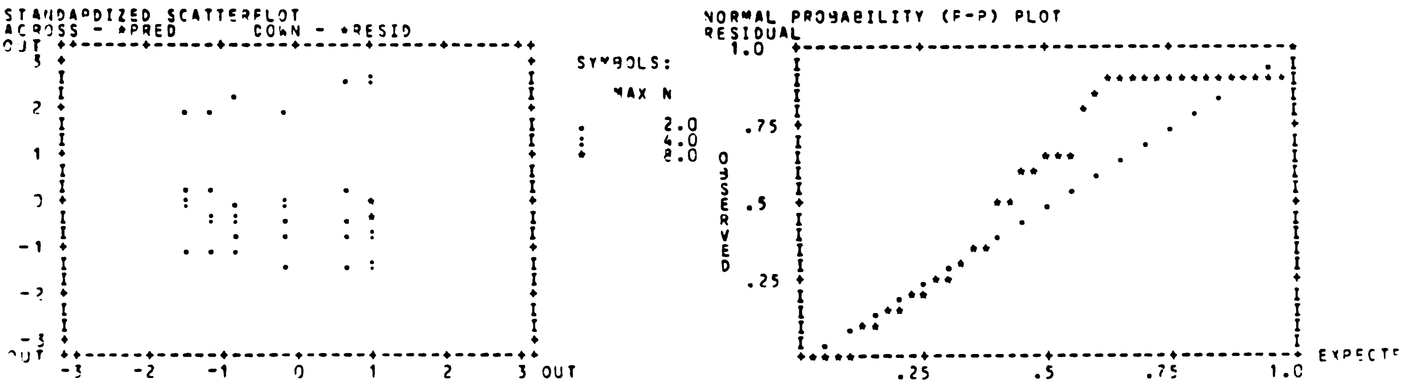



Figure D3. Linear Regression - Value by Color

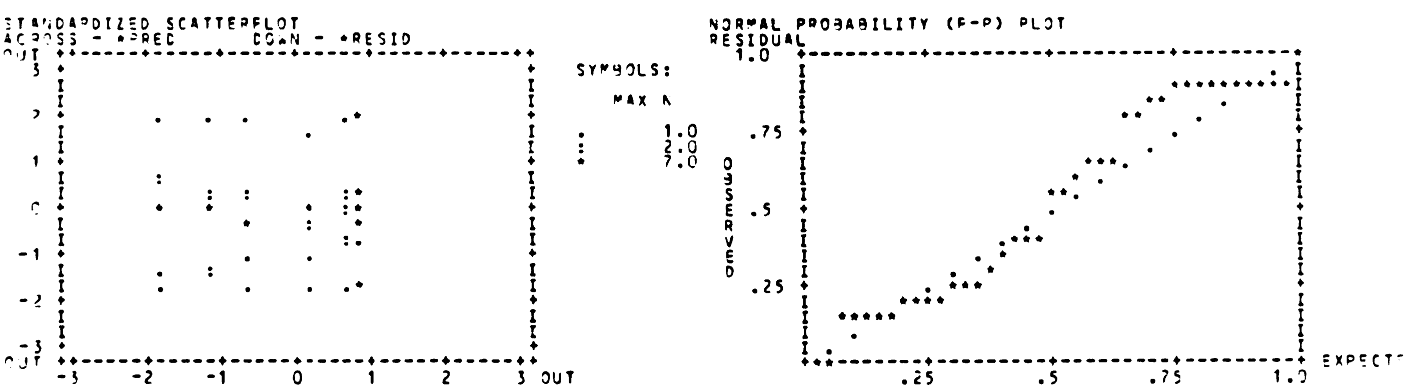



Figure D4. Log Regression - Value by Color

Table D1.5

Linear Regression - Value by Roughness
Dependent Variable - RDMV
Independent Variable - PHYRGH

| | | | | | |
|---|---|---|---|---|---|
| Multiple R | .08067 | Analysis of Variance | | | |
| R Square | .00651 | | DF | Sum of Squares | Mean Square |
| Adjusted R Square | .00324 | Regression | 1 | 4.73779 | 4.73779 |
| Standard Error | 1.54255 | Residual | 304 | 723.35787 | 2.37947 |

F = 1.99111 Signif F = .1592

Variables in the Equation

| Variable | B | SE B | BETA | T | SIG T |
|---|---|---|---|---|---|
| PHYRGH | -1.66941 | 1.18308 | -.08067 | -1.411 | .1592 |
| (Constant) | 2.94793 | .45427 | | 6.489 | .0000 |

Table D1.6

Log Regression - Value by Roughness
Dependent Variable - RDMV
Independent Variable - PHYRGH

| | | | | | |
|---|---|---|---|---|---|
| Multiple R | .00821 | Analysis of Variance | | | |
| R Square | .00007 | | DF | Sum of Squares | Mean Square |
| Adjusted R Square | -.00322 | Regression | 1 | .00194 | .00194 |
| Standard Error | .30770 | Residual | 304 | 28.78204 | .09468 |

F = .02051 Signif F = .8862

Variables in the Equation

| Variable | B | SE B | BETA | T | SIG T |
|---|---|---|---|---|---|
| LNPHYRGH | -.02689 | .18779 | -8.213E-03 | -.143 | .8862 |
| (Constant) | .26110 | .08330 | | 3.135 | .0019 |

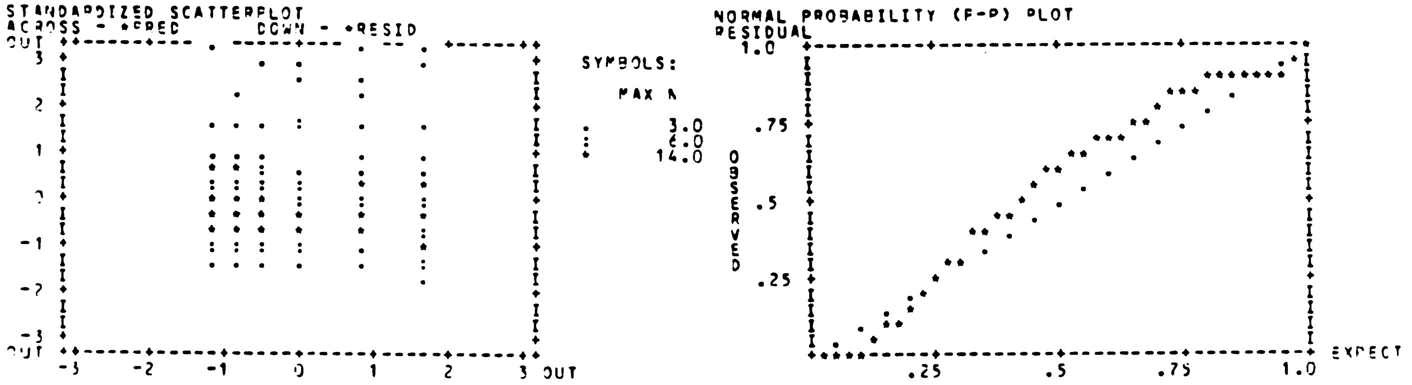



Figure D5. Linear Regression - Value by Roughness

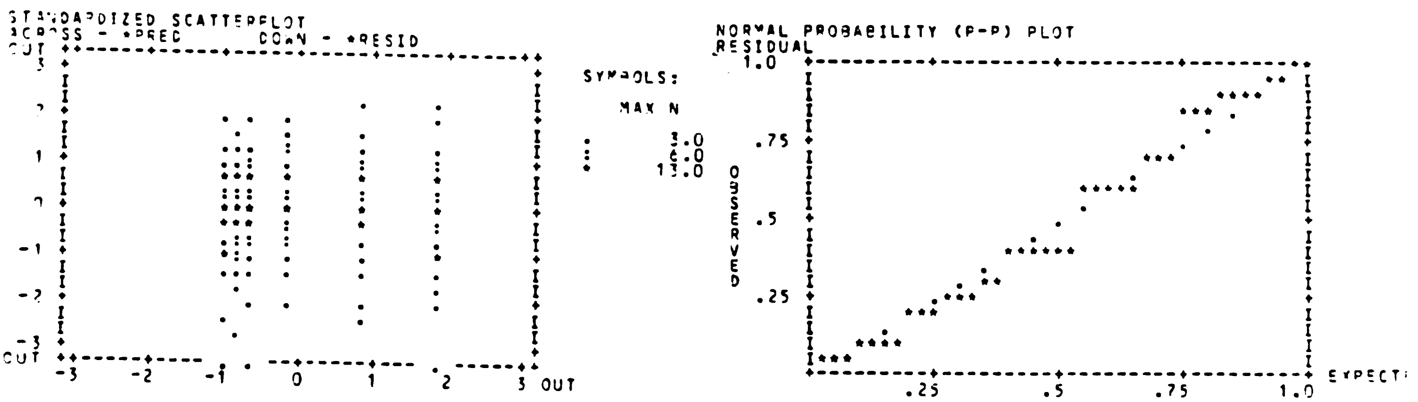



Figure D6. Log Regression - Value by Roughness

Table D2

Lack of Fit F* Tests for Linearity:
Size, Log Size, Roughness and Log Roughness

Size-Lack of Fit Sums of Squares

| | DF | SS | MS | F* | $F_{crit}$ | |
|---|---|---|---|---|---|---|
| SSR | 1 | 89.16 | 89.16 | | 3,120,.05 | |
| SSLF | 3 | 2.48 | .83 | .40 | 3.07 | SIGN |
| SSPE | 120 | 249.47 | 2.08 | | | |
| Total | 124 | | | | | |

Log Size - Lack of Fit Sums of Squares

| | DF | SS | MS | F* | $F_{crit}$ | |
|---|---|---|---|---|---|---|
| SSR | 1 | 4.78 | | | 3,120,.05 | |
| SSLF | 3 | 0.11 | .036 | .83 | 3.07 | SIGN |
| SSPE | 120 | 5.417 | .043 | | | |
| Total | 124 | | | | | |

Roughness - Lack of Fit Sums of Squares

| | DF | SS | MS | F* | $F_{crit}$ | |
|---|---|---|---|---|---|---|
| SSR | 1 | 4.74 | 4.74 | | 4,30,.05 | |
| SSLF | 4 | 11.69 | 2.92 | 1.23 | 2.37 | NONSIGN |
| SSPE | 300 | 711.67 | 2.37 | | | |
| Total | 305 | | | | | |

Log Roughness - Lack of Fit Sums of Squares

| | DF | SS | MS | F* | $F_{crit}$ | |
|---|---|---|---|---|---|---|
| SSR | 1 | 28.78 | 28.78 | | 4,30,.05 | |
| SSLF | 4 | 16.42 | 4.10 | 1.69 | 2.37 | NONSIGN |
| SSPE | 300 | 728.1 | 2.43 | | | |
| Total | 305 | | | | | |

Table D3

MANOVA Results Used for Interaction Testing

Tests of Significance for CSDMS (Size)
Using Sequential Sums of Squares: Buyers

| Source of Variation | Sum of Squares | DF | Mean Square | F | Signf of F [a] |
|---|---|---|---|---|---|
| Residual | 95.36000 | 192 | .49667 | | |
| Constant | 6756.84000 | 1 | 6756.84000 | 13604.37584 | 0.0 |
| Color | 0.0 | 2 | 0.0 | 0.0 | 1.000 |
| Size | 2120.64000 | 2 | 1060.32000 | 2134.87248 | 0.0 |
| Subj | 78.16000 | 24 | 3.25667 | 6.55705 | 0.0 |
| Color by Size | 0.0 | 4 | 0.0 | 0.0 | 1.000 |

Tests of Significance for CSDMS (Size)
Using Sequential Sums of Squares: Designers

| Source of Variation | Sum of Squares | DF | Mean Square | F | Signf of F |
|---|---|---|---|---|---|
| Residual | 103.00000 | 200 | .51500 | | |
| Constant | 7078.50000 | 1 | 7078.50000 | 13744.66019 | 0.0 |
| Color | 0.0 | 2 | 0.0 | 0.0 | 1.000 |
| Size | 2007.00000 | 2 | 1003.50000 | 1948.54369 | 0.0 |
| Subj | 126.50000 | 25 | 5.06000 | 9.82524 | 0.0 |
| Color by Size | 0.0 | 4 | 0.0 | 0.0 | 1.000 |

Tests of Significance for CSDMC (Color Magnitude)
Using Sequential Sums of Squares: Buyers

| Source of Variation | Sum of Squares | DF | Mean Square | F | Signf of F |
|---|---|---|---|---|---|
| Residual | 140.42293 | 192 | .73137 | | |
| Constant | 6807.35004 | 1 | 6807.35004 | 9307.67630 | 0.0 |
| Color | 1679.21129 | 2 | 839.60564 | 1147.99114 | 0.0 |
| Size | 7.00729 | 2 | 3.50364 | 4.79053 | .009 |
| Subj | 150.42107 | 24 | 6.26754 | 8.56960 | 0.0 |
| Color by Size | .98738 | 4 | .24684 | .33751 | .852 |

[a]Use of 0.0 in Table D3 indicates a significance value of less than .001 (<.001).

Table D3 (continued)

Tests of Significance for CSDMC (Color Magnitude)
Using Sequential Sums of Squares: Designers

| Source of Variation | Sum of Squares | DF | Mean Square | F | Signf of F |
|---|---|---|---|---|---|
| Residual | 126.64222 | 200 | .63321 | | |
| Constant | 7561.67538 | 1 | 7561.67538 | 11941.79203 | 0.0 |
| Color | 1709.00333 | 2 | 854.50167 | 1349.47358 | 0.0 |
| Size | 16.52333 | 2 | 8.26167 | 13.04725 | 0.0 |
| Subj | 108.92239 | 25 | 4.35690 | 6.88064 | 0.0 |
| Color by Size | 1.33333 | 4 | .33333 | .52642 | .716 |

Tests of Significance for CSDMV (Value)
Using Sequential Sums of Squares: Buyers

| Source of Variation | Sum of Squares | DF | Mean Square | F | Signf of F |
|---|---|---|---|---|---|
| Residual | 94.64747 | 192 | .49296 | | |
| Constant | 1033.83685 | 1 | 1033.83685 | 2097.22121 | 0.0 |
| Color | .04222 | 2 | .02111 | .04283 | .958 |
| Size | 178.59476 | 2 | 89.29738 | 181.14691 | 0.0 |
| Subj | 225.81093 | 24 | 9.40879 | 19.08649 | 0.0 |
| Color by Size | .01778 | 4 | .00444 | .00902 | 1.000 |

Tests of Significance for CSDMV (Value)
Using Sequential Sums of Squares: Designers

| Source of Variation | Sum of Squares | DF | Mean Square | F | Signf of F |
|---|---|---|---|---|---|
| Residual | 150.55786 | 200 | .75279 | | |
| Constant | 1832.32068 | 1 | 1832.32068 | 2434.04182 | 0.0 |
| Color | .22573 | 2 | .11286 | .14993 | .861 |
| Size | 300.82983 | 2 | 150.41491 | 199.81011 | 0.0 |
| Subj | 428.70598 | 25 | 17.14824 | 22.77960 | 0.0 |
| Color by Size | .07991 | 4 | .01998 | .02654 | .999 |

Table D3 (continued)

Tests of Significance for CSDMQ (Quality)
Using Sequential Sums of Squares: Buyers

| Source of Variation | Sum of Squares | DF | Mean Square | F | Signf of F |
|---|---|---|---|---|---|
| Residual | 188.56889 | 192 | .98213 | | |
| Constant | 9152.11111 | 1 | 9152.11111 | 9318.63863 | 0.0 |
| Color | 3.63556 | 2 | 1.81778 | 1.85085 | .160 |
| Size | 3.44889 | 2 | 1.72444 | 1.75582 | .176 |
| Subj | 623.11111 | 24 | 25.96296 | 26.43537 | 0.0 |
| Color by Size | .12444 | 4 | .03111 | .03168 | .998 |

Tests of Significance for CSDMQ (Quality)
Using Sequential Sums of Squares: Designers

| Source of Variation | Sum of Squares | DF | Mean Square | F | Signf of F |
|---|---|---|---|---|---|
| Residual | 417.59402 | 200 | 2.08797 | | |
| Constant | 10089.02671 | 1 | 10089.02671 | 4831.97857 | 0.0 |
| Color | 12.11111 | 2 | 6.05556 | 2.90021 | .057 |
| Size | 7.62393 | 2 | 3.81197 | 1.82568 | .164 |
| Subj | 483.72329 | 25 | 19.34893 | 9.26686 | 0.0 |
| Color by Size | 3.17094 | 4 | .79274 | .37967 | .823 |

Tests of Significance for CSDPS (Personal Preference)
Using Sequential Sums of Squares: Buyers

| Source of Variation | Sum of Squares | DF | Mean Square | F | Signf of F |
|---|---|---|---|---|---|
| Residual | 887.28000 | 192 | 4.62125 | | |
| Constant | 4190.40444 | 1 | 4190.40444 | 906.76861 | 0.0 |
| Color | 130.68222 | 2 | 65.34111 | 14.13927 | 0.0 |
| Size | 366.13556 | 2 | 183.06778 | 39.61434 | 0.0 |
| Subj | 312.54000 | 24 | 13.02250 | 2.81796 | .000 |
| Color by Size | 18.95778 | 4 | 4.73944 | 1.02558 | .395 |

Table D3 (continued)

Tests of Significance for CSDPS (Personal Preference)
Using Sequential Sums of Squares: Designers

| Source of Variation | Sum of Squares | DF | Mean Square | F | Signf of F |
|---|---|---|---|---|---|
| Residual | 1074.79274 | 200 | 5.37396 | | |
| Constant | 4316.34615 | 1 | 4316.34615 | 803.19600 | 0.0 |
| Color | 11.62179 | 2 | 5.81090 | 1.08131 | .341 |
| Size | 397.61538 | 2 | 194.80769 | 36.99461 | 0.0 |
| Subj | 428.76496 | 25 | 17.15060 | 3.19142 | 0.0 |
| Color by Size | 14.35897 | 4 | 3.58974 | .66799 | .615 |

Tests of Significance for CSDPR (Professional Preference)
Using Sequential Sums of Squares: Buyers

| Source of Variation | Sum of Squares | DF | Mean Square | F | Signf of F |
|---|---|---|---|---|---|
| Residual | 980.62667 | 192 | 5.10743 | | |
| Constant | 3927.11111 | 1 | 3927.11111 | 768.90152 | 0.0 |
| Color | 31.10889 | 2 | 15.55444 | 3.04545 | .050 |
| Size | 420.00222 | 2 | 210.00111 | 41.11678 | 0.0 |
| Subj | 318.83333 | 24 | 13.28472 | 2.60106 | .000 |
| Color by Size | 7.31778 | 4 | 1.82944 | .35819 | .838 |

Tests of Significance for CSDPR (Professional Preference)
Using Sequential Sums of Squares: Designers

| Source of Variation | Sum of Squares | DF | Mean Square | F | Signf of F |
|---|---|---|---|---|---|
| Residual | 980.91667 | 200 | 4.90458 | | |
| Constant | 4385.33761 | 1 | 4385.33761 | 894.13051 | 0.0 |
| Color | 37.72009 | 2 | 18.86004 | 3.84539 | .023 |
| Size | 529.46368 | 2 | 264.73184 | 53.97642 | 0.0 |
| Subj | 358.21795 | 25 | 14.32872 | 2.92150 | .000 |
| Color by Size | 22.34402 | 4 | 5.58600 | 1.13894 | .339 |

Table D4

Value Response Means for Size, Color, Roughness, and Printed Versus Woven Labels

Size - Value Magnitude
Buyer or Designer
Size Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| Buyer | | 2.1160 | 1.6586 | 2.7509 |
| Order | 1 | 1.0120 | .4766 | .2271 |
| Order | 2 | 1.4580 | .6576 | .4324 |
| Order | 3 | 2.0220 | 1.1497 | 1.3219 |
| Order | 4 | 2.6680 | 1.7352 | 3.0108 |
| Order | 5 | 3.4200 | 2.3243 | 5.4023 |
| Designer | | 2.7373 | 1.9841 | 3.9368 |
| Order | 1 | 1.1288 | .5036 | .2536 |
| Order | 2 | 1.8808 | .7747 | .6002 |
| Order | 3 | 2.7231 | 1.3877 | 1.9256 |
| Order | 4 | 3.5154 | 1.9988 | 3.9952 |
| Order | 5 | 4.4385 | 2.5389 | 6.4459 |

Total Cases = 255

Table D4 (continued)

Color - Value Magnitude
Buyer or Designer
Color Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| Buyer | | 1.9520 | 1.1140 | 1.2411 |
| Color | 1 | 1.9320 | 1.1239 | 1.2631 |
| Color | 2 | 1.9320 | 1.1239 | 1.2631 |
| Color | 3 | 1.9320 | 1.239 | 1.2631 |
| Color | 4 | 1.9320 | 1.1239 | 1.2631 |
| Color | 5 | 1.9720 | 1.1440 | 1.3088 |
| Color | 6 | 1.9720 | 1.1440 | 1.3088 |
| Color | 7 | 1.9720 | 1.1440 | 1.3088 |
| Color | 8 | 1.9720 | 1.1440 | 1.3088 |
| Designer | | 3.0481 | 1.4545 | 2.1156 |
| Color | 1 | 2.9577 | 1.4725 | 2.1681 |
| Color | 2 | 2.9654 | 1.4623 | 2.1384 |
| Color | 3 | 2.9962 | 1.4731 | 2.1700 |
| Color | 4 | 3.0192 | 1.4588 | 2.1280 |
| Color | 5 | 3.0923 | 1.5033 | 2.2599 |
| Color | 6 | 3.1077 | 1.4916 | 2.2247 |
| Color | 7 | 3.1192 | 1.4838 | 2.2016 |
| Color | 8 | 3.1269 | 1.4799 | 2.1900 |

Total Cases = 408

Table D4 (continued)

Roughness - Value Magnitude
Buyer or Designer
Roughness Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| Buyer | | 1.8290 | .9151 | .8375 |
| RORD | 1 | 2.0800 | .9359 | .8758 |
| RORD | 2 | 1.9560 | .8840 | .7815 |
| RORD | 3 | 1.7596 | .9130 | .8336 |
| RORD | 5 | 1.7646 | .8207 | .6736 |
| RORD | 7 | 1.7360 | .8963 | .8034 |
| RORD | 8 | 1.6780 | 1.0488 | 1.1000 |
| Designer | | 2.7904 | 1.8537 | 3.4364 |
| RORD | 1 | 3.3444 | 2.4868 | 6.1841 |
| RORD | 2 | 2.9231 | 1.7542 | 3.0770 |
| RORD | 3 | 2.6192 | 1.5572 | 2.4248 |
| RORD | 5 | 2.4923 | 1.3461 | 1.8119 |
| RORD | 7 | 2.5320 | 1.7129 | 2.9339 |
| RORD | 8 | 2.8000 | 2.0504 | 4.2040 |

Total Cases = 306

Woven vs Printed - Value Magnitude
Buyer or Designer
Woven or Printed Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| Buyer | | 3.9100 | 2.9100 | 8.4679 |
| Woven | 1 | 5.4360 | 3.3543 | 11.2516 |
| Printed | 2 | 2.3840 | 1.0888 | 1.1856 |
| Designer | | 5.8500 | 4.5809 | 20.9842 |
| Woven | 1 | 7.7346 | 5.5280 | 30.5592 |
| Printed | 2 | 3.9654 | 2.2048 | 4.8610 |

Total Cases = 102

Table D5

Quality, Personal Preference and Professional Preference for Size, Color, Roughness and Printed vs. Woven Labels

Size Measured by Direct Magnitude Estimation
Buyer or Designer
Size Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 5.5725 | 2.8674 | 8.2221 |
| Buyer | | 5.5040 | 2.9144 | 8.4939 |
| Order | 1 | 1.6000 | .7071 | .5000 |
| Order | 2 | 3.5200 | .6532 | .4267 |
| Order | 3 | 5.4400 | .7118 | .5067 |
| Order | 4 | 7.4400 | .9609 | .9233 |
| Order | 5 | 9.5200 | .9183 | .8433 |
| Designer | | 5.6385 | 2.8312 | 8.0156 |
| Order | 1 | 1.8846 | .8162 | .6662 |
| Order | 2 | 3.7692 | .8152 | .6646 |
| Order | 3 | 5.5385 | .8593 | .7385 |
| Order | 4 | 7.5000 | .9899 | .9800 |
| Order | 5 | 9.5000 | .9487 | .9000 |

Total Cases = 255

Table D5 (continued)

Size-Quality Magnitude
Buyer or Designer
Size Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 6.6922 | 1.8582 | 3.4531 |
| Buyer | | 6.5800 | 1.7943 | 3.2194 |
| Order | 1 | 6.5800 | 1.8239 | 3.3267 |
| Order | 2 | 6.5800 | 1.8239 | 3.3267 |
| Order | 3 | 6.5800 | 1.8239 | 3.3267 |
| Order | 4 | 6.5800 | 1.8239 | 3.3267 |
| Order | 5 | 6.5800 | 1.8239 | 3.3267 |
| Designer | | 6.8000 | 1.9185 | 3.6806 |
| Order | 1 | 7.0769 | 1.9580 | 3.8338 |
| Order | 2 | 7.2692 | 1.7334 | 3.0046 |
| Order | 3 | 6.8846 | 1.6572 | 2.7462 |
| Order | 4 | 6.6154 | 1.8347 | 3.3662 |
| Order | 5 | 6.1538 | 2.2925 | 5.2554 |

Total Cases = 255

Table D5 (continued)

Size-Personal Preference Magnitude
Buyer or Designer
Size Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 4.6961 | 3.0605 | 9.3669 |
| Buyer | | 4.4320 | 2.9982 | 8.9893 |
| Order | 1 | 1.4000 | 1.0408 | 1.0833 |
| Order | 2 | 2.8000 | 1.8708 | 3.5000 |
| Order | 3 | 5.3200 | 2.4786 | 6.1433 |
| Order | 4 | 7.5200 | 2.0025 | 4.0100 |
| Order | 5 | 5.1200 | 2.8478 | 8.1100 |
| Designer | | 4.9500 | 3.1097 | 9.6700 |
| Order | 1 | 2.5385 | 2.4369 | 5.9385 |
| Order | 2 | 4.0385 | 2.8911 | 8.3585 |
| Order | 3 | 6.3654 | 2.2519 | 5.0712 |
| Order | 4 | 7.2885 | 2.4826 | 6.1635 |
| Order | 5 | 4.5192 | 3.0805 | 9.4896 |

Total Cases = 255

Table D5 (continued)

Size-Professional Preference Magnitude
Buyer or Designer
Size Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 4.7373 | 3.0930 | 9.5665 |
| Buyer | | 4.4640 | 3.0015 | 9.0088 |
| Order | 1 | 1.3600 | .9950 | .990 |
| Order | 2 | 2.7600 | 1.8991 | 3.6067 |
| Order | 3 | 5.3600 | 2.4813 | 6.1567 |
| Order | 4 | 7.5600 | 2.0017 | 4.0067 |
| Order | 5 | 5.2800 | 2.6851 | 7.2100 |
| Designer | | 5.0000 | 3.1678 | 10.0349 |
| Order | 1 | 2.1923 | 2.0595 | 4.2415 |
| Order | 2 | 3.8846 | 2.8330 | 8.0262 |
| Order | 3 | 6.4615 | 2.3363 | 5.4585 |
| Order | 4 | 7.5962 | 2.2362 | 5.0004 |
| Order | 5 | 4.8654 | 3.2111 | 10.3112 |

Total Cases = 255

Table D5 (continued)

Color Measured by Magnitude Estimation
Buyer or Designer
Color Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 5.5998 | 2.7025 | 7.3033 |
| Buyer | | 5.5885 | 2.6984 | 7.2814 |
| Color | 1 | 1.6000 | .7217 | .5208 |
| Color | 2 | 2.8920 | .9331 | .8708 |
| Color | 3 | 3.9720 | .9633 | .9279 |
| Color | 4 | 5.1800 | 1.0396 | 1.0808 |
| Color | 5 | 6.4240 | 1.1468 | 1.3152 |
| Color | 6 | 7.3000 | 1.2162 | 1.4792 |
| Color | 7 | 8.1920 | 1.2701 | 1.6133 |
| Color | 8 | 9.1480 | 1.2204 | 1.4893 |
| Designer | | 5.6106 | 2.7128 | 7.3594 |
| Color | 1 | 1.6885 | .7982 | .6371 |
| Color | 2 | 2.7731 | .8670 | .7516 |
| Color | 3 | 3.9000 | .9972 | .9944 |
| Color | 4 | 5.0808 | 1.0984 | 1.2064 |
| Color | 5 | 6.4115 | 1.2064 | 1.4555 |
| Color | 6 | 7.4885 | .9421 | .8875 |
| Color | 7 | 8.3308 | .9657 | .9326 |
| Color | 8 | 9.2115 | .9210 | .8483 |

Total Cases = 408

Table D5 (continued)

Color-Quality Magnitude
Buyer or Designer
Color Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 6.6956 | 2.1133 | 4.4659 |
| Buyer | | 6.5350 | 1.9789 | 3.9159 |
| Color | 1 | 6.0400 | 2.4406 | 5.9567 |
| Color | 2 | 6.1800 | 2.2026 | 4.8517 |
| Color | 3 | 6.2800 | 2.0518 | 4.2100 |
| Color | 4 | 6.4200 | 1.8579 | 3.4517 |
| Color | 5 | 6.7600 | 1.8321 | 3.3567 |
| Color | 6 | 6.8000 | 1.7559 | 3.0833 |
| Color | 7 | 6.8800 | 1.8102 | 3.2767 |
| Color | 8 | 6.9200 | 1.8466 | 3.4100 |
| Designer | | 6.8500 | 2.2288 | 4.9674 |
| Color | 1 | 5.9231 | 2.8695 | 8.2338 |
| Color | 2 | 6.0115 | 2.3857 | 5.6915 |
| Color | 3 | 6.1154 | 2.3380 | 5.4662 |
| Color | 4 | 6.4808 | 2.0024 | 4.0096 |
| Color | 5 | 7.3654 | 1.7062 | 2.9112 |
| Color | 6 | 7.8077 | 1.6738 | 2.8015 |
| Color | 7 | 7.6346 | 1.8738 | 3.5112 |
| Color | 8 | 7.4615 | 1.9795 | 3.9185 |

Total Cases = 408

Table D5 (continued)

Color-Quality Magnitude
Buyer or Designer
Color Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 6.6956 | 2.1133 | 4.4659 |
| Buyer | | 6.5350 | 1.9789 | 3.9159 |
| Color | 1 | 6.0400 | 2.4406 | 5.9567 |
| Color | 2 | 6.1800 | 2.2026 | 4.8517 |
| Color | 3 | 6.2800 | 2.0518 | 4.2100 |
| Color | 4 | 6.4200 | 1.8579 | 3.4517 |
| Color | 5 | 6.7600 | 1.8321 | 3.3567 |
| Color | 6 | 6.8000 | 1.7559 | 3.0833 |
| Color | 7 | 6.8800 | 1.8102 | 3.2767 |
| Color | 8 | 6.9200 | 1.8466 | 3.4100 |
| Designer | | 6.8500 | 2.2288 | 4.9674 |
| Color | 1 | 5.9231 | 2.8695 | 8.2338 |
| Color | 2 | 6.0115 | 2.3857 | 5.6915 |
| Color | 3 | 6.1154 | 2.3380 | 5.4662 |
| Color | 4 | 6.4808 | 2.0024 | 4.0096 |
| Color | 5 | 7.3654 | 1.7062 | 2.9112 |
| Color | 6 | 7.8077 | 1.6738 | 2.8015 |
| Color | 7 | 7.6346 | 1.8738 | 3.5112 |
| Color | 8 | 7.4615 | 1.9795 | 3.9185 |

Total Cases = 408

Table D5 (continued)

Color-Personal Preference Magnitude
Buyer or Designer
Color Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 5.5833 | 2.9101 | 8.4685 |
| Buyer | | 5.4350 | 2.8441 | 8.0887 |
| Color | 1 | 3.2000 | 2.7839 | 7.7500 |
| Color | 2 | 3.9000 | 2.5900 | 6.7083 |
| Color | 3 | 4.7200 | 2.5087 | 6.2933 |
| Color | 4 | 5.2200 | 1.8713 | 3.5017 |
| Color | 5 | 6.4400 | 2.3862 | 5.6942 |
| Color | 6 | 7.0200 | 2.7022 | 7.3017 |
| Color | 7 | 6.7600 | 2.7467 | 7.5442 |
| Color | 8 | 6.2200 | 2.8102 | 7.8975 |
| Designer | | 5.7260 | 2.9720 | 8.8328 |
| Color | 1 | 5.1923 | 3.5779 | 12.8015 |
| Color | 2 | 4.9231 | 3.4050 | 11.5938 |
| Color | 3 | 4.8846 | 2.8366 | 8.0462 |
| Color | 4 | 5.0769 | 2.0430 | 4.1738 |
| Color | 5 | 6.1538 | 2.3739 | 5.6354 |
| Color | 6 | 6.7885 | 2.8290 | 8.0035 |
| Color | 7 | 6.5769 | 2.8590 | 8.1738 |
| Color | 8 | 6.2115 | 3.1943 | 10.2035 |

Total Cases = 408

Table D5 (continued)

Color-Professional Preference Magnitude
Buyer or Designer
Color Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 5.4828 | 2.9612 | 8.7687 |
| Buyer | | 5.3100 | 2.8278 | 7.9964 |
| Color | 1 | 3.5200 | 2.8449 | 8.0933 |
| Color | 2 | 4.1400 | 2.6360 | 6.9483 |
| Color | 3 | 4.8000 | 2.4324 | 5.9167 |
| Color | 4 | 5.0200 | 1.8956 | 3.5933 |
| Color | 5 | 6.2800 | 2.5293 | 6.3975 |
| Color | 6 | 6.6200 | 2.8110 | 7.9017 |
| Color | 7 | 6.2400 | 2.9795 | 8.8775 |
| Color | 8 | 5.8600 | 3.0772 | 9.4692 |
| Designer | | 5.6490 | 3.0817 | 9.4970 |
| Color | 1 | 4.1154 | 3.3145 | 10.9862 |
| Color | 2 | 4.4615 | 3.2029 | 10.2585 |
| Color | 3 | 4.7308 | 2.9774 | 8.8646 |
| Color | 4 | 5.2308 | 2.5386 | 6.4446 |
| Color | 5 | 6.3846 | 2.7251 | 7.4262 |
| Color | 6 | 7.1154 | 2.6882 | 7.2262 |
| Color | 7 | 6.8462 | 2.7523 | 7.5754 |
| Color | 8 | 6.3077 | 3.1846 | 10.1415 |

Total Cases = 408

Table D5 (continued)

Roughness Measures by Magnitude Estimation
Buyer or Designer
Roughness Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 5.6814 | 2.5044 | 6.2718 |
| Buyer | | 5.6200 | 2.4752 | 6.1264 |
| RORD | 1 | 7.9000 | 1.0704 | 1.1458 |
| RORD | 2 | 5.2000 | 1.5343 | 2.3542 |
| RORD | 3 | 5.0000 | 1.7664 | 3.1200 |
| RORD | 5 | 3.7292 | 1.5107 | 2.2822 |
| RORD | 7 | 3.4000 | 1.6833 | 2.8333 |
| RORD | 8 | 8.4400 | 1.8046 | 3.2567 |
| Designer | | 5.7404 | 2.5387 | 6.4449 |
| RORD | 1 | 7.8296 | 2.0492 | 4.1991 |
| RORD | 2 | 5.6346 | 1.8791 | 3.5312 |
| RORD | 3 | 5.0808 | 2.1018 | 4.4176 |
| RORD | 5 | 4.2885 | 1.3429 | 1.8035 |
| RORD | 7 | 3.3400 | 1.6119 | 2.5983 |
| RORD | 8 | 8.0962 | 2.1072 | 4.4404 |

Total Cases = 306

Table D5 (continued)

Roughness Quality Magnitude
Buyer or Designer
Roughness Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 5.1373 | 2.4928 | 6.2139 |
| Buyer | | 5.0133 | 2.3856 | 5.6911 |
| RORD | 1 | 7.3200 | 1.7493 | 3.0600 |
| RORD | 2 | 5.8400 | 1.7720 | 3.1400 |
| RORD | 3 | 5.1538 | 2.0917 | 4.3754 |
| RORD | 5 | 3.9167 | 1.5581 | 2.4275 |
| RORD | 7 | 3.6000 | 1.9791 | 3.9167 |
| RORD | 8 | 4.2000 | 2.8431 | 8.0833 |
| Designer | | 5.2564 | 2.5937 | 6.7274 |
| RORD | 1 | 7.9074 | 1.9711 | 3.8853 |
| RORD | 2 | 6.2885 | 2.0600 | 4.2435 |
| RORD | 3 | 5.0962 | 1.7206 | 2.9604 |
| RORD | 5 | 3.9615 | 2.0096 | 4.0385 |
| RORD | 7 | 3.5000 | 2.2822 | 5.2083 |
| RORD | 8 | 4.6154 | 2.7288 | 7.4462 |

Total Cases = 306

Table D5 (continued)

Personal Preference Magnitude
Buyer or Designer
Roughness Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 4.9918 | 2.8114 | 7.9040 |
| Buyer | | 4.8233 | 2.7861 | 7.7622 |
| RORD | 1 | 7.8000 | 1.6073 | 2.5833 |
| RORD | 2 | 5.9200 | 2.3791 | 5.6600 |
| RORD | 3 | 5.0962 | 2.5924 | 6.7204 |
| RORD | 5 | 3.3750 | 1.9519 | 3.8098 |
| RORD | 7 | 3.0400 | 2.0510 | 4.2067 |
| RORD | 8 | 3.6400 | 2.7671 | 7.6567 |
| Designer | | 5.1538 | 2.8350 | 8.0375 |
| RORD | 1 | 8.3889 | 2.1319 | 4.5449 |
| RORD | 2 | 6.3846 | 2.2817 | 5.2062 |
| RORD | 3 | 5.6731 | 2.0047 | 4.0188 |
| RORD | 5 | 3.8077 | 1.9395 | 3.7615 |
| RORD | 7 | 2.8000 | 1.7321 | 3.0000 |
| RORD | 8 | 3.6538 | 2.5130 | 6.3154 |

Total Cases = 306

Table D5 (continued)

Professional Preference
Buyer or Designer
Roughness Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 4.9526 | 2.79646 | 7.8100 |
| Buyer | | 4.7167 | 2.7383 | 7.4980 |
| RORD | 1 | 7.6400 | 1.7767 | 3.1567 |
| RORD | 2 | 5.6800 | 2.2494 | 5.0600 |
| RORD | 3 | 5.0192 | 2.5942 | 5.7296 |
| RORD | 5 | 3.3333 | 1.9035 | 3.6232 |
| RORD | 7 | 2.9600 | 1.9681 | 3.8733 |
| RORD | 8 | 3.6000 | 2.7538 | 7.5833 |
| Designer | | 5.1795 | 2.8381 | 8.0547 |
| RORD | 1 | 8.3889 | 2.1319 | 4.5449 |
| RORD | 2 | 6.4231 | 2.3182 | 5.3738 |
| RORD | 3 | 5.6731 | 2.0047 | 4.0188 |
| RORD | 5 | 3.8462 | 1.9327 | 3.7354 |
| RORD | 7 | 2.8800 | 1.8330 | 3.3600 |
| RORD | 8 | 3.6538 | 2.5130 | 6.3154 |

Total Cases = 306

Woven vs. Printed-Quality Magnitude
Buyer or Designer
Woven or Printed Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 6.8341 | 1.7076 | 2.9157 |
| Buyer | | 6.7800 | 1.7905 | 3.2057 |
| Woven | 1 | 6.9600 | 1.6515 | 2.7275 |
| Printed | 2 | 6.6000 | 1.9365 | 3.7500 |
| Designer | | 6.9038 | 1.6391 | 2.6867 |
| Woven | 1 | 7.5000 | 1.1832 | 1.4000 |
| Printed | 2 | 6.3077 | 1.8280 | 3.3415 |

Total Cases = 102

Table D5 (continued)

Woven vs. Printed-Personal Preference Magnitude
Buyer or Designer
Woven or Printed Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 6.2794 | 3.1760 | 10.0870 |
| Buyer | | 6.3000 | 3.2529 | 10.5816 |
| Woven | 1 | 8.9200 | 1.4697 | 2.1600 |
| Printed | 2 | 3.6800 | 2.2679 | 5.1433 |
| Designer | | 6.2596 | 3.1319 | 9.8087 |
| Woven | 1 | 8.8846 | 1.4581 | 2.1262 |
| Printed | 2 | 3.6346 | 1.8845 | 3.5512 |

Total Cases = 102

Woven vs. Printed-Professional Preference Magnitude
Buyer or Designer
Woven or Printed Sample Number

| Variable | Sample | Mean | Std Dev | Variance |
|---|---|---|---|---|
| For Entire Population | | 6.3971 | 3.0969 | 9.5908 |
| Buyer | | 6.6200 | 3.0897 | 9.5465 |
| Woven | 1 | 9.0400 | 1.3064 | 1.7067 |
| Printed | 2 | 4.2000 | 2.3629 | 5.5833 |
| Designer | | 6.1827 | 3.1186 | 9.7258 |
| Woven | 1 | 8.7692 | 1.4016 | 1.9646 |
| Printed | 2 | 3.5962 | 1.9901 | 3.9604 |

Total Cases = 102

## BIBLIOGRAPHY


Ajzen, Izak and Martin Fishbein (1980), Understanding Attitudes and Predicting Social Behavior, Engelwood Cliffs, N.J.: Prentice Hall.

Antrobus, J.S., J.L. Singer and S. Greenberg (1966), "Studies in the Stream of Consciousness: Experimental Enhancement and Suppression of Spontaneous Cognitive Processes," Perceptual and Motor Skills, 23(2), 399-417.

Averill, James R. (1980), "Emotion and Anxiety: Sociocultural, Biological, and Psychological Determinants," in Rorty, A.O. (ed.) Explaining Emotions, Berkeley: University of California Press.

Bacon, Frank R., Jr. and Thomas W. Butler, Jr. (1981), Planned Innovation, Ann Arbor, MI: The University of Michigan Press.

Berlyne, D.E. (1967), "Arousal and Reinforcement," in Nebraska Symposium on Motivation, D. Levine (ed.) Lincoln, Nebraska: University of Nebraska Press. Cited by Mahrabian and Russell (1974), 82.

Bettman, James R. (1979), An Information Processing Theory of Consumer Choice, Reading, Mass.: Addison-Wesley.

Bindra, D. (1970), "Emotion and Behavior: Current Research in Historical Perspective," in Black (Ed.) Physiological Correlates of Emotion, New York: Academic Press.

Bonoma, Thomas V. and Gerald Zaltman (Eds.) (1978), Organizational Buying Behavior, Chicago, American Marketing Association.

Broadbent, D.E. (1958), Perception and Communication, New York: Pergamon Press.

Broadbent, D.E. (1977), "The Hidden Preattentive Processes," American Psychologist, 32, 109-118, cited by Leventhal (1979).

Cannon, W.B. (1927), "The James-Lange Theory of Emotions: A Critical Examination of an Alternative Theory," American Journal of Psychology, 39, 106-124.

Cannon, W.B. (1931), "Again the James-Lange and the Thalamic Theories of Emotion," Psychological Review, 38, 281-295.

Cardozo, Richard N. and James W. Cagley (1971), "An Experimental Study of Industrial Buyer Behavior," Journal of Marketing Research, 8, August, 329-331.

Carterette, Edward C. and Morton P. Friedman (Eds.) (1974-1978), Handbook of Perception Volume I-Volume X., New York: Academic Press.

Cattell, R.B. (1979), Personality and Learning Theory: The Structure of Personality in Its Environment, New York: Springer.

Chao, Lincoln L. (1969), Statistics: Methods and Analyses, New York: McGraw-Hill.

Corey, E. Raymond (1982), Procurement Management, Boston, MA: CBI Publishing.

Dickerson, Kitty (1985), Professor of Human Ecology, University of Missouri, Columbia, Missouri. Telephone and mail communications on the subject of measuring fabric hand.

Ekman, P., W.V. Friesen and P. Ellsworth (1972), Emotions in the Human Face: Guidelines for Research and an Integration of Findings, New York: Pergamon Press, cited by Leventhal (1979, 28).

Engle, James F., Kollat, David T. and Roger D. Blackwell (1968), Consumer Behavior, New York: Rinehart and Winston, 40.

Estes, W.K. (1976), Handbook of Learning and Cognitive Processes (Vol. 4), New York: Wiley.

Eysenck, M.W. and C. Eysenck (1979), "Processing Depth, Elaboration of Encoding, Memory Stores, and Expended Processing Capacity," Journal of Experimental Psychology: Human Learning and Memory, 5, 472-484.

Fechner, Gustav T. (1860), Elements of Psychophysics, Leipzig, Breitkoph and Hartel.

Feigenbaum, Edward A. (1979), Themes and Case Studies of Knowledge Engineering in D. Michie (ed.) Expert Systems in the Microelectronic Age, Edinburgh, UK. University Press.

Fishbein, Martin (1967), "Attitude and the Prediction of Behavior," in Reading in Attitude Theory and Measurement, M. Fishbein (ed.), New York: Wiley and Sons.

Geistfeld, L.V., G.B. Sproles and S.B. Badenhop (1977), "The Concept and Measurement of a Hierarchy of Product Characteristics," Advances in Consumer Research, 4, 302-307.

Gellhorn, E. and G. Loofbourrow (1963), Emotions and Emotional Disorders, New York: Harper and Row, cited by Moss (1973, 18).

Guilford, J.P. and P.C. Smith (1969), "A System of Color Preferences," American Journal of Psychology, 72, 487-502.

Hayes-Roth, Frederick, Donald A. Waterman, and Douglas B. Lenat (1983), Building Expert Systems, Reading, MA.

Holbrook, Morris B. (1981), Interpreting Compositional and Decompositional Analyses to Represent the Intervening Role of Perceptions in Evaluative Judgements," Journal of Marketing Research, Vol. XVIII (February), 13-28.

Holbrook, Morris B. and John O'Shaughnessy (1984), "The Role of Emotion in Advertising," Psychology and Marketing, Vol. 1, No. 2, Summer.

Howard, John A. and Jagdish N. Sheth (1969), The Theory of Buyer Behavior, New York: John Wiley and Sons, 26.

Hunt, E. (1978), "Mechanics of Verbal Ability," Psychological Review, 85, 109-130.

Hutt, Michael and Thomas Speh (1985), Industrial Marketing Management: A Strategic View of Business Markets, Chicago: The Dryden Press.

Ittelson, W. and F. Kilpatrick (1951), "Experiments in Perception," Scientific American, 185, 50-55.

Izard, Carroll E. and S. Buechler (1980), "Aspects of Consciousness and Personality in Terms of Differential Emotions Theory," in Plutchik and Kellerman (Eds.), Emotion: Theory, Research, and Experience Vol. I, New York: Academic Press.

Izard, Carroll E. (1977), Human Emotions, New York: Plenum Press.

Johnson, Richard M. (1974), "Trade-Off Analysis of Consumer Values," Journal of Marketing Research, 11 (May), 163-68.

Jones, F. Nowell (1974), "Overview of Psychophysical Scaling Methods," in Carteretto, E.C. and M.P. Friedman (Eds.) Handbook of Perception, Vol. II, New York: Academic Press, 343-358.

Kreshel, Peggy J. (1984), "Emotion and Advertising: The Grand Idee of the 80's," unpublished working paper No. 17, Department of Advertising, University of Illinois, Urbana.

Kroeber-Riel, Werner (1979), "Activation Research: Psychobiological Approaches in Consumer Research," Journal of Consumer Research, 5, 240-249.

Lacey, J.R. (1967), "Somatic Response Patterning and Stress," cited by Leventhal 1979, 8.

Lancaster, Kelvin (1976), "Hierarchies in Goods--Characteristics Analysis," Advances in Consumer Research, B. Anderson (ed.), 348.

Lange, K. (1885), "The Emotions," in K. Dunlap (ed.), The Emotions, Baltimore: Williams and Wilkins, 1922.

Lavidge, Robert J. and Gary A. Steiner (1961), "A Model for Predictive Measurements of Advertising Effectiveness," Journal of Marketing, 25, October: 59-62.

Leontief, W. (1947), "Introduction to a Theory of the Internal Structure of Fundamental Relationships," Econometrica, 15, 362-373.

Leventhal, Howard (1979), "A Perceptual-Motor Processing Model of Emotion," in Pliner et al. (Eds.), Perception of Emotion in Self and Others Vol. 5, Advances in the Study of Communication and Affect, New York: Plenum Press.

Levitt, Theodore (1967), "Communications and Industrial Selling," Journal of Marketing, Vol. 31, April.

Livingston, Robert B. (1978), Sensory Processing, Perception, and Behavior, New York: Raven Press.

Mandler, George (1980), "The Generation of Emotion: A Psychological Theory," in Plutchik and Kellerman (Eds.), Emotion: Theory, Research, and Experience Vol. I, New York: Academic Press.

Mehrabian, A. and J.A. Russell (1974), An Approach to Environmental Psychology, Cambridge, Mass.: The MIT Press.

Moskowitz, Howard R. (1983), Product Testing and Sensory Evaluation of Foods, Westport, Connecticut: Food and Nutrition Press.

Moss, Gordon Ervin (1973), Illness, Immunity, and Social Interaction, New York: John Wiley and Sons.

Neter, John, William Wasserman and Michael H. Kutner (1985), Applied Linear Statistical Models, Homewood, IL: Richard D. Irwin.

Nicosia, Francesco M. (1966), Consumer Decision Processes, Englewood Cliffs, N.J.: Prentice-Hall, 156-88.

Osgood, C.E., G.J. Suci and P.H. Tannenbaum (1957), The Measurement of Meaning, Urbana: University of Illinois Press.

Piaget, J. (1953), The Origin of Intelligence in the Child, London, Routledge and Kegan, cited by Livingston (1978).

Pliner, Patricia, Kirk R. Blankstein and Irwin M. Spigel (1979), Perception of Emotion in Self and Others, New York: Plenum Press.

Pope, K. and J. Singer (1976), "Regulation of the Stream of Consciousness: Toward a Theory of Ongoing Thought," in Schwartz, G. and D. Shapiro (Eds.) Consciousness and Self-Regulation: Advances in Research, New York: Plenum Press.

Pribram, Karl H. and Diane McGuinness (1975), "Arousal, Activation, and Effort in the Control of Attention," Psychological Review, Vol. 82, No. 2, 116-149.

Pribram, Karl H. (1967), "Emotion: Steps Toward a Neuropsychological Theory," in Glass (Ed.), Neuropsychology and Emotions, New York: Rockefeller.

Pumphry, Candice (1986), Associate Director, American Apparel Manufacturers Association, Washington, DC.

Ratchford, Brian (1976), "The New Economic Theory of Consumer Behavior: An Interpretive Essay," Journal of Consumer Research, 2, 65-75.

Reekie, W. Duncan and Ronald Savitt (1982), "Marketing Behavior and Entrepreneurship: A Synthesis of Alderson and Austrian Economics," European Journal of Marketing.

Richardson, L.F. (1929), "Imagery, Conation, and Cerebral Conductance," Journal of General Psychology, 2, 324-352.

Rogers, Everett M. (1976), "New Product Adoption and Diffusion," Journal of Consumer Research, Vol. 2, March, pp. 290-301.

Schachter, Stanley, (1964), The Interaction of Cognitive and Physiological Determinants of Emotional State, cited in Moss (1973).

Sheth, Jagdish N. (1977), "Recent Developments in Organizational Buying Behavior," in A. Woodside, J. Sheth and P. Bennett (Eds.) Consumer and Industrial Buying Behavior, New York: Elsevier North Holland, IL, 30.

Singer, J.L. (1974), Imagery and Daydream Methods in Psychotherapy and Behavior Modification, New York: Academic Press.

SPSS$^{X}$ Users Guide, 2nd Edition (1986), New York: McGraw-Hill.

Stevens, S.S. (1956), "The Direct Estimation of Sensory Magnitudes--Loudness," American Journal of Psychology, 69, 1-25.

Stevens, S.S. (1957), "On the Psychophysical Law," Psychology Review, 64, 153-181.

Stevens, S.S. (1975), Psychophysics: Introduction to its Perceptual, Neural, and Social Prospects, New York: John Wiley and Sons.

Tyler, S.W., P.T. Hertel, M.C. McCallum and H.C. Ellis (1979), "Cognitive Effort and Memory," Journal of Experimental Psychology: Human Learning and Memory, 5, 607-617.

Webster, Frederick E., Jr. and Yoram Wind (1972), Organizational Buying Behavior, Engelwood Cliffs, N.J.: Prentice-Hall.

Wilkie, William L. and Edgar A. Pessemier (1973), "Issues in Marketing's Use of Multiattribute Models," Journal of Marketing Research, 428-41.

Woelfel, Joseph and Edward L. Fink (1980), The Measurement of Communication Processes: Galileo Theory and Method, New York: Academic Press.

Wenger, M.A. (1950), "Emotion as a Visceral Action: An Extension of Lange's Theory," in M.L. Reymert (Ed.), Feelings and Emotions, New York: McGraw-Hill.

Zajonc, Robert B. (1980), "Feeling and Thinking: Preferences Need No Inferences," American Psychologist, 35(2), February, 151-175.