FORMATION OF RISK PERCEPTIONS IN INDUSTRIAL PURCHASING DECISIONS: AN INFORMATION INTEGRATION ANALYSIS USING SIMULATED BUYING SITUATIONS

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PREFACE

Information integration models used by industrial buyers in forming their risk perceptions in single, policy, and mixed decision situations were investigated to test the validity of expectancy theory as a descriptive model of buyer behavior in decisions under uncertainty. Single decisions were defined as those in which the decision is applied just once. Policy decisions were defined as those in which the decision, once made, is applied repeatedly a large number of times to identical situations. All other decisions which do not fall in the first two categories were defined as mixed decisions. Two experiments with simulated gambling and industrial buying situations were conducted in a laboratory setting using 75 graduate students as the subjects.

The study showed that in policy decision situations, the subjects tended to use the multiplicative expectancy model in forming their risk perceptions. In single decision situations the subjects tended not to use the multiplicative model. In mixed decision situations the subjects tended to use a multiplicative model of information integration, but to a lesser extent as compared to the policy decisions. The study also investigated the relative levels of perceived risk in the three types of decision situations. The findings showed that the subjects perceived the highest risk in single decisions, moderate risk in policy decisions, and the lowest risk in mixed decisions. The results also indicated that the process of information integration is primarily dependent on the type of decision and is not affected, in a significant way, by the type

of experimental setting used. However, the actual level of perceived risk is significantly affected by the experimental setting. The findings have several implications for researchers and managers in the marketing field.

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CHAPTER I

INTRODUCTION

Importance of Perceived Risk in Marketing

Marketing aims at understanding, explaining, predicting, and influencing the process of exchange in human society (Bagozzi 1975; Hunt 1983; Kotler 1972). All exchanges are based on the expectations of the parties concerned about the outcomes of the exchange (Adams 1963; Fisk 1982; Walster, Walster, and Bersheid 1978). Because the outcomes temporally succeed the process of exchange itself, an inherent uncertainty exists about how well the actual outcomes will match the expectations. Risk originates from the uncertainty about the actual outcomes of the purchase decisions faced by the customers. Therefore, all exchange decisions in general and all customer purchase decisions (which are a subset of the former) in particular are choice situations involving risk.

Even though necessary, the presence of risk is not a sufficient condition by itself to influence purchase behavior. If an individual is unaware of the risk, the risk is nonexistent as far as that choice situation is concerned, and it will have no effect on that person's behavior. Thus, in addition to the existence of risk, it is important that the customers have a prior knowledge of and concern for the risk. In other words, the customer must perceive the risk and be concerned about it. Thus, "perceived risk" originates from the concern felt by

customers about the uncertainty of the actual outcomes of their purchase decisions. Moreover, it is not the risk itself but the perceived risk which has a major influence on the decision process and the final choice of the customers. As such, perceived risk is a fundamental construct present in all marketing situations.

Literature on Perceived Risk

Even though mathematicians and psychologists realized the importance of perceived risk in human behavior much earlier, Bauer (1960) was the first marketer to formally propose the conceptualization of consumer behavior as risk taking. Subsequent research has investigated the formation of perceived risk and its effect on various aspects of buyer behavior. The literature on perceived risk can be organized in three areas: how risk perceptions are formed, how various factors influence the perception of risk, and how perceived risk, in turn, affects buyer behavior. Given below are the highlights of the research in each of these areas.

The Formation of Risk Perceptions

Several researchers have proposed different algebraic models which describe how buyers process the information on the two basic components of risk--the uncertainty and the values of the outcomes--to form their perceptions of the risk involved in choosing an alternative. These models can be grouped into two broad categories: the multiplicative expectancy models and the other nonmultiplicative decision heuristics models. The expectancy models (Coombs, Bezembinder, and Goode 1967; Kahneman and Tversky 1979; Von Neumann and Morgenstern 1947) propose

that the people evaluate risky alternatives by computing the expected value of all possible outcomes of the alternative. The decision heuristics models (Anderson 1974a, 1974b, 1974c; Coombs 1975; Loomes and Sugden 1982; Slovic and Lichtenstein 1968a, 1968b) suggest that the uncertainty and the outcomes act as independent dimensions contributing separately to the total risk perceived in an alternative. Empirical research shows that both categories of models have met with mixed success in explaining buyer risk perceptions and behavior in real life situations.

The Effect of Personality, Environmental, and Situational Factors on Perceived Risk

The second important area of research concerns the effect of various factors on perceived risk in different choice situations. These factors can be classified into three groups: personality factors, environmental factors, and situational factors.

Brody and Cunningham (1967), Howard and Sheth (1969), Schaninger (1976), and Zikmund and Scott (1973b) found that perceived risk is positively related to anxiety, and negatively related to confidence, self-esteem, and risk taking. Bruner, Goodnow, and Austin (1956), Bruner and Tajfel (1961), Pettigrew (1958), Popielarz (1967), and Schiffman (1972) found that individuals exhibit consistency in their preference for certain types of outcomes and in their tolerance for certain levels of uncertainty.

Lichtenstein et al. (1978) and Slovic and Lichtenstein (1980) showed that environmental factors such as the frequency of occurrence of the risk, the availability or the familiarity of the decision maker with

the risk through experience, and the judged seriousness of the consequences, simultaneously affect large segments of the population and have a positive effect on the level of risk perceived.

Fischhoff, Slovic, and Lichtenstein (1979) and Starr (1969) found that voluntary risks are more acceptable than involuntary risks. Spence, Engel, and Blackwell (1970) found that people perceived higher risk in mail order shopping as compared to retail store shopping.

The Effect of Perceived Risk on Prepurchase Activities and Purchase Behavior

The third area of research on perceived risk investigates the effect of perceived risk on various prepurchase activities and the actual purchase decisions.

Brown and Gentry (1975), Cooper (1969), Lutz and Reilly (1973), Roselius (1971), and Sheth and Venkatesan (1968) studied a variety of risk reduction strategies used by consumers across a range of choice situations. Berlyne (1960), Copeley and Collom (1971), Hawkins and Lanzetta (1965), and Lanzetta and Driscoll (1968) studied the effect of risk components on information search, which is a common factor of several risk reduction strategies. Reingen (1974) and Woodside (1972, 1974) found that group interactions cause a shift in the acceptable levels of risk toward its mean value.

Perceived risk has an inhibiting effect on the consumer purchase behavior. As such, consumers tend to choose the alternative which has minimum perceived risk. This has been confirmed in numerous empirical studies conducted in different settings covering a wide variety of purchase situations (Barach 1969; Bearden and Shimp 1982; Cox and Rich

1964; Schiffman 1972; Woodside and DeLozier 1976).

This dissertation focuses on the first stage of the formation of risk perceptions by customers in purchase decisions involving uncertainty and, hence, risk.

Purpose of the Study

The basic purpose of this study was to develop and test hypotheses about the circumstances under which industrial buyers will use or not use multiplicative expectancy model to form their risk perceptions. In other words, the study tested the applicability of expectancy theory as a descriptive model of buyer risk perceptions across different types of purchase decisions.

One of the important questions in understanding the role of perceived risk in buyer behavior relates to how risk perceptions are formed in the first place. Risk originates from two basic components: the values of various possible outcomes (V) and the uncertainty of their occurrence (P). Customers comprehend and perceive these components and through some process combine them to form an overall evaluation of the undesirable aspects of an alternative--which is the perceived risk.

Several information integration models have been proposed by researchers to explain how people combine these inputs to form risk perceptions. Among these, an important group of models based on various expectancy theories (Coombs, Bezembinder, and Goode 1967; Edwards 1955; Kahneman and Tversky 1979; Von Neumann and Morgenstern 1947) has traditionally dominated the research. The expectancy approach suggests that individuals will evaluate an alternative with uncertain outcomes, by computing its expectancy--a generic term used to refer to such

constructs as expected value (EV), expected utility (EU), subjective expected value (SEV), subjective expected utility (SEU), and the value of a prospect. Expectancy is computed by multiplying the outcomes by their respective uncertainties and adding the product over all possible outcomes. Thus, expectancy theories use multiplicative models based on the two basic risk components--uncertainty and the values of the outcomes.

Using the expectancy concept as the basis, some researchers (Bettman 1975; Hansen 1972; Jacoby and Kaplan 1972) have defined perceived risk in the following way:

Perceived Risk = Expected Utility of the Undesirable Outcomes

$$= -\sum_y (\text{UNCERTAINTY}_y * \text{CONSEQUENCE}_y)$$

Where y refers to one of the several dimensions of risk identified by the researchers (Jacoby and Kaplan 1972; Peter and Ryan 1976; Zikmund and Scott 1973a).

The above discussion indicates that perceived risk can be related to subjective expected utility by the following equality:

Perceived Risk Involved in an Alternative

= - Subjective Expected Utility of the Alternative

However, in practice, expectancy theories have met with a mixed success (Kahneman and Tversky 1979). Certain types of consumer behaviors, like the purchase of new products or brands, the choice of stores, and such other decisions which are applied repeatedly, have been explained and predicted by expectancy approach (Anderson and Shanteau 1970; Bettman, Capon, and Lutz 1975; Jacoby and Kaplan 1972). However, other types of decisions, such as the purchase of life or property insurance, lottery tickets, assets like house and car involve very high

values of positive or negative outcomes resulting from one single decision. In such decisions the expectancy theories often fail to explain the risk perceptions and behavior (Lanzetta and Driscoll 1968). Some of the reasons identified in the literature for such failure of the expectancy theories are: individual preferences for different ranges of outcomes (Bruner, Goodnow, and Austin 1956; Bruner and Tajfel 1961; Pettigrew 1958; Popielarz 1967; Schiffman 1972), and individual tolerances for different levels of uncertainty (Slovic and Lichtenstein 1968b; Svenson 1979; Weinstein 1979).

With a view to overcoming the inadequacies of the expectancy models, several other theories have been proposed as alternatives. Portfolio theory, as proposed by Coombs (1975), suggests that the choices are made as a compromise between expected value and optimization of risk in accordance with its preferred levels. Loomes and Sugden (1982) proposed regret theory which suggests that customer choices will aim at maximization of utility and minimization of regret as the twin objectives. Slovic and Lichtenstein (1968a) suggested that individuals weight the risk components--uncertainty and outcomes--as independent dimensions and then combine the information to form an overall evaluation of the alternatives. Thus, in a specific situation an alternative may be chosen primarily because one or more of its possible outcomes are attractive irrespective of their extremely low probability of occurrence or vice versa. Anderson (1974a, 1974b, 1974c) proposed information integration theory to describe the way individuals use the information about the probabilities and the outcomes in making decisions.

The research on alternative models of risk perceptions and behavior brings out two important points. First, it shows that expectancy

theories cannot explain risk perceptions and behavior in several real life situations. Second, it identifies ways to overcome the inadequacies of expectancy theories. These include modifying the model algebra from multiplicative to additive models and modifying the objective function from maximization of SEU to optimization of risk, minimization of regret, etcetra.

Despite the observed inadequacies of expectancy theories, no research to date has investigated the question of when and why expectancy models are satisfactory in explaining buyer risk perceptions and under what circumstances the expectancy models fail. This question of the suitability of the expectancy approach in explaining buyer risk perceptions across a variety of real life situations forms the core of the dissertation.

Development of the Hypotheses

In order to understand the mixed success of expectancy theories in explaining choice behavior in real life situations, it is necessary to go to the basic logic and justification behind the use of the expectancy theory as an evaluative criterion by buyers. The intuitive justification for using expectancy as the choice criterion is the law of large numbers (Borch 1972). In a large number of trials, the probabilities of the various possible outcomes represent the relative frequency with which the outcomes will actually occur. Thus, if a gamble is played a large number of times, the actual average outcome in the long run will equal the expected value. Therefore, a rational decision maker will base his choice on what will be the actual outcome in the long run, i.e. the expected value. In effect, the expected value

reduces a decision under uncertainty involving several repeated applications of the chosen alternative to a decision with a sure outcome (Borch 1972). The other expectancy theories i.e. expected utility (EU), subjective expected value (SEV), subjective expected utility (SEU), and prospect theory, are also based on the same basic principles. They differ from the EV theory by taking into account the nonlinear perceptions of the decision makers of the two risk components--uncertainty and outcomes. Thus, the extent of acceptance and use of the expectancy theories by buyers will depend upon whether or not the chosen alternative is to be applied repeatedly a large number of times to identical situations.

The preceding discussion indicates that real world decisions under uncertainty can be differentiated on the dimension of "repeated applications of a decision", that is, the number of times the decision is applied repeatedly to identical situations. Single decisions are defined as those in which the decision is applied just once. Policy decisions are defined as those in which the decision is made once and is applied repeatedly a large number of times to identical situations.

However, many real life decisions do not fall in either of these two categories and can be called "mixed decisions". One important segment of mixed decisions includes the repeat purchase decisions for items such as raw materials, supplies, and services by industries and households, which are implemented over time. These are decisions in which the buyer has an option to either treat each repeat purchase situation separately as a single decision or to give up this freedom to choose everytime in favor of a policy decision.

Several important hypotheses about the formation and the level of

perceived risk can be developed on the basis of such classification of the decision situations. These are presented as Hypotheses A1 to A4 below.

Much of the experimental research done on expectancy theories as descriptive models of human choice behavior has used simulated gambling alternatives as the setting. Unfortunately, as discussed later in the Literature Review chapter, the choice among gambles has little resemblance to the purchase decisions faced by buyers. Bettman and Kakkar (1977), Dawes (1975), and Hershey, Kunreuther, and Schoemaker (1982) have shown that the information integration is significantly influenced by the nature of tasks involved. As such, it can be expected that the perceived risk in otherwise identical decisions will be different in the two settings.

Among several risk dimensions identified by the researchers (Jacoby and Kaplan 1972; Zikmund and Scott 1973a), financial and social risks often play dominant role[5] in influencing buyer behavior. Of these, financial risk often plays a more important role, especially in industrial purchasing behavior. Moreover, of the two, only the financial risk can be quantified. Such quantification was essential in order to test the hypotheses concerning the use of expectancy theories by buyers. Therefore, the dissertation focused only on one dimension of perceived risk--the financial risk.

This study tested the above ideas in the form of five hypotheses, which are presented below:

HYPOTHESIS A1 : In purchase situations involving policy decisions (Situation 2 and Situation 4 of Table I), consumers will tend to use a multiplicative expectancy model in forming their risk perceptions.

HYPOTHESIS A2 : In purchase situations involving mixed decisions (Situation 5 of Table I), consumers will tend to use a multiplicative expectancy model to a lesser extent as compared to the policy decisions, in forming their risk perceptions.

HYPOTHESIS A3 : In purchase situations involving single decisions (Situation 1 and Situation 3 of Table I), consumers will tend not to use a multiplicative expectancy model in forming their risk perceptions and instead will tend to use other nonmultiplicative decision heuristics and choice criteria.

HYPOTHESIS A4 : Consumers will perceive the highest risk in single decisions, moderate risk in policy decisions, and the lowest risk in mixed decisions with equal expected values as shown by the following enequality:

Perceived Risk (Single Decisions) > Perceived Risk (Policy Decisions) > Perceived Risk (Mixed Decisions)

HYPOTHESIS A5 : In respect to decisions under uncertainty which are identical in all other respects, consumers will perceive a different amount of risk in the gambling setting as compared to the risk perceived in the industrial purchasing setting.

Research Methodology

The dissertation tested theory based hypotheses about the causal relationship between the construct of repeated applications of a decision under uncertainty (single decision versus policy decision versus mixed decision) and the risk perceived by the decision maker. Therefore, an experimental study was performed in a laboratory setting, using homogeneous subjects and strong manipulations of the independent variables (Calder, Phillips, and Tybout 1981). The research had two

objectives. One was to make the findings of the study comparable with earlier research using gambling settings. This was accomplished by operationalizing the variables in a gambling setting. The second objective was to partially overcome the inadequate generalizability of the gambling settings to draw inferences about buyer behavior. This was accomplished by also operationalizing the variables in an industrial purchasing setting. Thus, the study involved two experiments in two settings. As explained in the section on the development of hypotheses, the study concentrated only on one dimension of risk--the financial risk. Table I presents the details of the experimental designs.

Each experiment was designed as a "Repeated Applications of a decision by Probability (P) by Value (V)" full factorial experiment. The repeated applications construct was manipulated at two levels in the gambling experiment: single decision and policy decision and at three levels in the industrial purchasing experiment: single decision, policy decision, and mixed decision. The mixed decision was not operationalized in the case of the gambling setting because, given the freedom available in the mixed decisions, the respondents would tend to stop playing the gamble which had one negative and one null outcome and no positive outcomes. The two levels of the repeated applications construct in the gambling experiment, and its three levels in the industrial purchasing experiment formed five unique situations as shown in Table I.

Each subject was randomly assigned to one of the five situations. It was planned to use 15 subjects in each of the five situations, thus making a total sample size of 75 respondents. The probabilities and the values of the outcomes each had four different levels. Thus, within an

TABLE I

DESIGN OF THE TWO EXPERIMENTS OF THE STUDY

	REPEATED APPLICATIONS OF THE DECISION		
	Single Decision	Policy Decision	Mixed Decision
EXPERIMENTS			
1. Gambling Experiment			
	SITUATION 1	SITUATION 2	
Probabilities (P_i)	4 Levels	4 Levels	
Values (V_j)	4 Levels	4 Levels	
Number of Decisions	16 Nos.	16 Nos.	
2. Industrial Purchasing Experimant			
	SITUATION 3	SITUATION 4	SITUATION 5
Probabilities (P_i)	4 Levels	4 Levels	4 Levels
Values (V_j)	4 Levels	4 Levels	4 Levels
Number of Decisions	16 Nos.	16 Nos.	16 Nos.

assigned situation, each respondent was presented with sixteen decisions as stimuli, formed by the combination of four levels of P and V.

The experimental tasks involved reading the narration of a decision situation, reading the characteristics of each of the sixteen decision stimuli, and then rating the perceived risk in each case on two risk scales. The narration of the decision situations was carefully designed to exercise effective control of personality, environmental, and situational factors which can affect the risk perceptions in the two experiments. The experiments required the respondents to simulate the role of the decision maker described in the situations and to record the responses. In view of the experimental tasks and the theoretical nature of the research, graduate students were used as the subjects. A nonprobability convenience sample of subjects was used for the practical reason of feasibility. The subjects were selected on volunteer basis and were compensated to obtain greater commitment. The instruments and the experimental procedures were pilot tested on a small sample drawn from the same population to ensure that no unforeseen problems existed.

The functional measurement theory approach (Anderson 1981) ideally suited the objectives of the study. As such, the design of the study was chosen with a view to use this approach for data analysis and hypothesis testing. The computer program package FM#1 developed by Shanteau (1984a, 1984b) was used for analyzing the data.

Contributions of the Study

A number of factors give the dissertation theoretical and practical value. In the past, expectancy theory has dominated the research in the area of perceived risk as the descriptive model of human behavior.

However, in practice, the expectancy approach has met with a mixed success in predicting consumer risk perceptions and behavior. Consumer purchase decisions can be differentiated on the construct of repeated applications of a decision as single decisions, policy decisions, and mixed decisions. The failure of expectancy approach to make correct predictions of risk perceptions and behavior in certain types of situations indicates the possibility that repeated application of a decision may be an important determinant of when expectancy models are used by buyers. The literature review revealed no evidence of empirical research investigating the dimension of repeated application of a decision. Therefore, the dissertation makes an important contribution by testing the hypotheses concerning the applicability of expectancy theory in purchase decisions differing on the construct of repeated application of the decision.

Any purchase decision can be described as either a single, a policy, or a mixed decision depending on the number of applications of the decision involved. Therefore, repeated applications of a decision is a meaningful construct relevant to any purchase decision. As such, the study investigated an important determinant of customer risk perceptions and its effects on purchase behavior.

Much of the experimental research done on expectancy theories as descriptive models of human choice has used simulated gambling situations as the experimental setting. Unfortunately, choice among gambles has little resemblance to purchase decisions faced by customers. This study conducted two experiments: one in the gambling setting and the other in an industrial buying setting. The use of two settings facilitates comparison of the findings with past research. In addition,

the use of two settings allows the investigation of the generalizability of the results of the gambling setting to a marketing setting.

The study investigated the financial risk, which is an important dimension of perceived risk in a large number of industrial and consumer buying decisions, and as such, is of crucial importance to the marketers.

CHAPTER II

LITERATURE REVIEW

Overview

This chapter seeks to review the literature found in various disciplines on the construct of perceived risk. Since marketers identified perceived risk as an important construct for study, researchers have used various conceptualizations to describe and model its multiple facets (Bauer 1960; Bettman 1973; Cunningham 1966; Jacoby and Kaplan 1972; Taylor 1974). However, despite the general consensus about the nature of the construct, no universally accepted definition of perceived risk exists in the marketing field. Moreover, the construct has not been given its due role and importance in the comprehensive theories of consumer behavior (Bettman 1979; Engel and Blackwell 1982; Howard 1977; Howard and Sheth 1969; Nicosia 1966; Sheth 1974).

Among the various factors affecting the perception of risk by individuals in decisions under uncertainty, personality factors constitute an important group (Brody and Cunningham 1967; Schaninger 1976). Various personality factors include constructs such as confidence (Howard and Sheth 1969; Zikmund and Scott 1973b) and motivation (Atkinson 1957; Brown, Gentry, and O'Brien 1977). In addition, various internal factors have been found to influence risk perceptions, such as experience (Hynes and Vanmarcke 1976) and expertise (Lichtenstein et al. 1978; Christensen-Szalanski et al. 1983). Personality factors are

extremely important in understanding behavior under uncertainty and risk at the individual level. However, these factors are not easily measurable at the aggregate market level. Therefore, only factors such as experience and expertise which can be related to measurable demographic variables can be used as predictors of market behavior. The rest of the personality factors, which remain individual specific random variables, contribute little to the understanding of the market behavior.

Environmental and situational factors also have an important effect on the risk perceptions of individuals (Lichtenstein et al. 1978; Slovic and Lichtenstein 1980; Tversky and Kahneman 1973, 1974). At the individual level these factors give valuable insight into a person's choice behavior under risk. More importantly, these factors simultaneously affect large segments of the population. Therefore, they can be used as predictors of group and mass behavior. For example, a person who has experienced an earthquake will be more willing to buy home insurance against such a calamity than a person who has never experienced it. Further, such calamities normally affect the whole population in a geogrephical area. Thus, all people from an earthquake prone area are likely to have a more positive attitude toward earthquake insurance than people from areas where earthquakes are rare.

Perceived risk affects consumers throughout the decision process. At the prepurchase stage, perceived risk causes the consumers to engage in several risk handling strategies such as: (a) reducing the perceived risk (Copley and Collom 1971; Hawkins and Lanzetta 1965; Sheth and Venkatesan 1968) and (b) increasing or decreasing the acceptable level of risk (Popielarz 1967; Reingen 1974; Woodside 1972, 1974). At the

purchase decision stage, consumers choose that alternative which has minimal perceived risk (Barach 1969; Bearden and Shimp 1982; Schiffman 1972).

Perceived risk is a dynamic construct. The levels of perceived risk and acceptable risk change constantly during the decision process. Consequently, they exert varying amounts of influence on the behavior. However, most studies measure the risk perceptions only at one point in time and then investigate its relationship with the behavior. Therefore, these studies do not reveal the total dynamic role played by perceived risk in consumer behavior.

One basic question relates to how risk perceptions are formed in the first place. In the first step, people comprehend and perceive the basic components of risk--the uncertainty and the values of the outcomes. These inputs are then processed and combined into perceived risk as the overall evaluation of the undesirable aspects of an alternative. Several information integration models have been proposed by researchers to explain how people combine these inputs to form risk perceptions. These can be grouped into two categories: models based on expectancy theories (Coombs, Bezembinder, and Goode 1967; Edwards 1955; Kahneman and Tversky 1979; Von Neumann and Morgenstern 1947) and those based on other choice heuristics (Anderson 1974a, 1974b, 1974c; Bruner and Tajfel 1961; Coombs 1975; Edwards 1953, 1954a, 1954b; Popielarz 1967; Schiffman 1972; Slovic 1967; Slovic and Lichtenstein 1968a, 1968b).

The expectancy approach evaluates an alternative with uncertain outcomes by computing its expectancy--a generic term used to refer to such constructs as expected value, expected utility, subjective expected

value, subjective expected utility, and the value of a prospect. Expectancy is computed by multiplying the outcomes by their respective uncertainties and adding over all possible outcomes. Thus, all expectancy theories use multiplicative models based on the two basic risk components. The choice heuristics models use adding, averaging and other algebraic models to explain the integration of basic risk components into perceived risk. The existence of multiple models shows the inadequacy of using either approach by itself to explain actual choice behavior.

Despite the existence of the two distinct approaches of expectancy theories and other choice heuristics, no research so far has investigated the question of when and why the expectancy models should be satisfactory in describing consumer risk perceptions and under what circumstances they would fail. This question of the suitability of the expectancy approach in explaining consumer risk perceptions in a variety of real life situations forms the core of the dissertation.

The chapter is organized into several sections. The first section discusses the discovery of perceived risk in marketing, its various conceptualizations, and the manner in which the construct has been integrated into the comprehensive models of consumer behavior. The section concludes by presenting a definition of perceived risk which will be used consistently in this dissertation. The second section discusses the the various factors which affect the level of risk perceived by people in different choice situations. These factors include personality, environmental, and situational factors.

The third section discusses the dynamics of perceived risk and its effect on prepurchase and purchase behavior. The fourth section covers

the more basic question of how risk perceptions are formed in the first place. Several theoretical models are discussed and grouped into those based on the expectancy principles and those based on other conceptualizations. Further, the basic assumptions implicit in the expectancy logic are discussed with a view to identify situations in which the expectancy logic can be hypothesized to succeed and those in which it should fail to describe behavior.

Using the first four sections as its foundation, the fifth and last section develops specific hypotheses which will be tested in this dissertation.

Discovery and Conceptualization of Perceived Risk in Marketing

This section reviews the literature on the discovery and conceptualization of perceived risk in the marketing field. The first subsection discusses how perceived risk has been conceptualized by various researchers in marketing. The second subsection presents how the construct of perceived risk was incorporated into the major consumer behavior theories. The third subsection presents literature that discovered another important construct of "willingness to take risk". The fourth subsection identifies the various definitions of the construct and the research from which these definitions emerged. The subsection then discusses several problems that have led to the absence of a universally understood and accepted definition of perceived risk in marketing. The section concludes by presenting a definition of the construct of perceived risk which will be used consistently in this dissertation.

Conceptualization of Perceived Risk in Marketing

Even though mathematicians and psychologists had realized the importance of perceived risk in human behavior much earlier, Bauer (1960) was the first marketer to formally propose the conceptualization of consumer behavior as risk taking. Bauer also recognized the multi-dimensional nature of this construct, by identifying the two dimensions of risk: performance risk and psychological risk. Cunningham (1967) identified the two basic components of risk: the uncertainty of product performance and the seriousness of consequences, as the cause and the primary determinants of perceived risk.

Jacoby and Kaplan (1972) took these developments a step further and identified five independent dimensions of perceived risk: financial, performance, physical, psychological or self-related, and social risk. They suggested that the risk perceived on these dimensions combines to form an overall perceived risk. Further, they measured each of these dimensions in terms of the two basic components: uncertainty and consequences. They replicated this study and validated its findings (Kaplan, Szybillo, and Jacoby 1974). Subsequently, Peter and Ryan (1976) added a sixth dimension of time risk to this conceptualization.

Zikmund and Scott (1973a) provided empirical evidence of the multidimensional nature of perceived risk through the factor analysis of risk related variables. They identified performance risk, social risk, financial risk, and opportunity loss as the important factors affecting overall perception of risk by consumers. They also found that the relative importance of the factors changes for different types of products. The above literature collectively defines the construct of

perceived risk as it is understood in marketing today.

Perceived Risk and the Theories of Consumer Behavior

Realizing the importance of perceived risk in consumer behavior, a few researchers have suggested perceived risk as the central theory of consumer behavior (Bettman 1973; Taylor 1974; Woodside and Delozier 1976). The comprehensive models conceptualizing consumer behavior as risk taking represent the dynamic effect of perceived risk as the major force directing and influencing the consumer decision process.

Bettman (1973) defined the two separate constructs of inherent risk and handled risk to describe and investigate how consumer actions reduce the risk involved in a decision. Taylor (1974) made one of the early efforts to develop a comprehensive theory of consumer behavior under risk. He conceptualized risk at three levels. The "uncertainty/ perceived risk" represented the risk involved in a choice task independent of the person concerned. "Anxiety" represented the risk as perceived by an individual depending upon the person's general and specific self-esteem. Anxiety motivated the person to adopt several risk reduction strategies to bring it down to the "handled level of risk," when the final choice is made.

Woodside and DeLozier (1976) proposed another comprehensive model depicting the role of perceived risk in word-of-mouth advertising. The model suggested that perceived risk acts as a major motivating force behind several risk reduction strategies adopted by consumers in the prepurchase stage. Further, it suggested that the consumer will not make a purchase decision as long as the decision is perceived as a risky

one. Though limited to just one aspect of consumer choice behavior, this model represents an important theoretical contribution to the field by recognizing the crucial role of perceived risk in influencing buyer behavior.

Despite the realization that perceived risk has an important influence on consumer behavior, the construct has not been incorporated explicitly into the comprehensive models of consumer behavior. Some models have treated perceived risk as just one of the several determinants of behavior. For example, Sheth (1974) used perceived risk as a determinant of joint versus autonomous decision making in his theory of family decision process. In their models of consumer behavior, Howard and Sheth (1969) and Howard (1977) did not use perceived risk as an explicit construct. However, they used the construct of stimulus or information ambiguity, which can be viewed as covering one of the many sources of perceived risk. Other models of consumer behavior (Bettman 1979; Engel and Blackwell 1982; Nicosia 1966) have not employed any construct representing perceived risk.

The Construct of Acceptable Risk

While the above efforts led to the understanding and incorporation of the perceived risk construct in consumer behavior, other researchers identified another important and closely related construct--the acceptable risk. Popielarz (1967) investigated the relationship between perceived risk and acceptable risk at the individual level, and concluded that a major part of the acceptable risk is determined by the personality of the individual. Reingen (1974), Robertson (1968), and Woodside (1972, 1974) studied the effects of group interactions on

people's acceptable level of risk in purchase decisions. They concluded that group interactions can cause a shift in the acceptable risk.

The preceding discussion suggests that people engage in activities aimed at perceived risk reduction and acceptable risk enhancement as the means of handling the risk involved in purchase decisions. Since consumer behavior may well be directed by the difference between the perceived and the acceptable risk levels, changes in the levels of both these constructs are important in understanding the consumer decision process over time. However, much remains to be done in exploring the interrelationships between these two types of prepurchase activities.

Definitions of Perceived Risk in Marketing

While a general consensus exists among marketers that risk influences buyer behavior, the term perceived risk is still not a clearly defined and universally understood construct. Some researchers have equated perceived risk with uncertainty (Peter and Ryan 1976, p.185), while others have equated it with uncertainties and the consequences (Cunningham 1967). Taylor (1974) used two different definitions of risk in the same article. At one point he stated, "Since the outcome of a choice can only be known in the future, the consumer is forced to deal with uncertainty or risk" (p.54) "...risk and uncertainty will be used as equivalent concepts" (p.56). However, at another point he stated, "The specific mechanism ....is the ability to perceive the possibility of loss or the risk in a choice situation" (p.59).

Commenting on this state of affairs, Kaplan, Szybillo, and Jacoby (1974) stated that, despite its use by many researchers, the construct of perceived risk has not been given a standard definition. Similarly,

Bettman (1975, p.354) commented, "At present perceived risk is an ill-defined concept with ad hoc underlying component conceptualizations and assumptions. Future consumer research using risk seems fruitless unless some of the major conceptual problems raised are dealt with."

Proposed Definition of Perceived Risk

In a typical purchase situation, the consumer faces several alternatives from which to choose. Each alternative, if chosen, may result in several possible outcomes. The consumer may feel that the actual outcome will not be as good as expected, or feel that it will be bad in an absolute sense. In either case the concern is that the outcome may be less than desirable. Perceived risk is proposed as originating from the consumer's concern for the uncertainty about the outcomes of his or her purchase decisions. The consumer makes an assessment of how undesirable each possible outcome is and what is the likelihood of its occurrence. Then the consumer combines this information to form an overall judgment about the risk involved in choosing that alternative. A definition which incorporates these ideas is: perceived risk is the overall concern felt by the consumer about the undesirable aspects of all possible outcomes that may result from choosing a specific alternative in a purchase situation.

Effect of Personality, Environmental, and Situational Factors on Perceived Risk

Effect of Personality Factors on Perceived Risk

Personality is an important determinant of the extent of risk perceived by an individual in a decision situation. This section reviews

the literature investigating the relationship between the different personality variables and perceived risk.

Among the early efforts, Brody and Cunningham (1967) defined four classes of variables which influence risk perceptions: personal system, social system, exogenous and risk reducing variables. Using consumer panel data, they found that the relative importance of these variables depends upon perceived performance risk, social risk, and specific self-confidence. They further showed that the personality variable of self-confidence is useful in explaining brand choice in situations involving high performance risk and high self-confidence.

In another comprehensive effort, Schaninger (1976) investigated the relationship of state anxiety, trait anxiety, manifest anxiety, self-esteem, rigidity, and risk taking as personality variables, with confidence, danger, and perceived risk as the risk measures. The research indicated that perceived risk is positively related to anxiety and negatively related to confidence, self-esteem, and risk taking.

Several research studies have investigated the relationship of confidence with perceived risk. Many of these studies use confidence as an inverse construct of (and a substitute variable for) the uncertainty component of perceived risk. Howard and Sheth (1969) suggested that confidence plays a central role in buyer behavior. They proposed that confidence is negatively related to arousal and overt search for information, and positively related to behavioral intention. Zikmund and Scott (1973b) found a negative relationship between confidence and perceived risk.

Bennett and Harrell (1975) and Pras and Summers (1978) compared Fishbein and Ajzen's (1975) behavioral intention model with the concept

of perceived risk. They argued that the belief component of the model corresponds to the outcome or consequences component of perceived risk. However, the model includes nothing corresponding to the uncertainty component of risk. By introducing confidence as a multiplier of the belief, they showed that the construct of perceived risk can be fully integrated with the behavioral intention model. They also showed that such integration enhances the predictive power of the model. Day (1970) suggested that confidence is a function of the ambiguity regarding the attitude object and the certainty of judgment.

Among other studies exploring the relationship between perceived risk and individual specific characteristics, Atkinson (1957) studied motivation as a determinant of risk taking behavior and showed that willingness to take risk increases with motivation. Brown, Gentry, and O'Brien (1977) showed that achievement need and perceived risk are unrelated with each other; however, both affect the choice of risk handling strategies. Christensen-Szalanski et al. (1983) compared the judgments of students and physicians as to the risk associated with different diseases. They found that they both used the same thought process and both were equally influenced by external information sources. However, the expertise of the physicians resulted in more accurate judgments of risk. These findings were consistent with those by Lichtenstein et al. (1978) in their research on the judgments of the frequency of lethal events. Fischhoff (1977), Fischhoff, Slovic, and Lichtenstein (1978) and Hynes and Vanmarcke (1976) showed that experience increases the person's familiarity with certain types of risk and makes it possible for the person to understand and imagine the undesirable effects of such risk. This results in higher levels of

perceived risk as compared to a person who has no understanding of a certain type of risk.

The preceding discussion shows that several personality variables and individual specific characteristics play an important role in the formation of risk perceptions at the individual level. However, personality variables are individual specific, and hence difficult to measure and predict for groups of individuals, i.e., at the aggregate market level. This difficulty can be overcome if a specific personality variable can be related to other demographic variables which are easy to measure and on which information is available at the aggregate level. Of the several personality variables discussed above, experience and expertise can be easily related to age, profession, education and such demographic variables. Therefore, these variables can be used to predict market behavior. On the other hand, individual specific characteristics like motivation and confidence can not be related to demographic variables. Therefore, these variables can not be used easily to predict behavior at the aggregate market level.

Environmental and Situational Determinants of Perceived Risk

Environmental and situational determinants of risk have attracted considerable attention due to their immediate relevance to the macro level market behavior. Environmental factors are those which influence the risk perceptions of large segments of population exposed to it in a similar manner. Therefore, these factors have a similar influence on all risky decisions of a certain type. Situational factors are those which vary from situation to situation and affect the perception of risk

differently in each case. This section reviews the literature related to the environmental and situational factors affecting the risk perceptions.

Slovic and Lichtenstein (1980) studied various environmental and situational determinants of the perceived risk in undesirable events affecting large sections of the population. These events included several natural calamities such as disease, floods, and earthquakes. They identified five classes of variables as playing a major role in determining the overall perception of risk: (a) frequency of occurrence, (b) perceived frequency, (c) potential for disaster, (d) judged seriousness of consequences, and (e) several qualitative characteristics. In the last category, they studied 18 qualitative characteristics and grouped them into three factors. The factor "dread" includes variables such as lack of control, involuntariness, severity of consequences, etc. The factor "familiarity" includes variables affecting availability or imaginability of risk. The third factor consisted of a single variable: the number of people exposed to the risk. These findings were supported by the research by Tversky and Kahneman (1973, 1974) and Lichtenstein et al. (1978) on the "availability" of undesirable events.

Among studies relating various situational variables to perceived risk, Fischhoff, Slovic, and Lichtenstein (1979) and Starr (1969) found that voluntary risks are more acceptable to people than involuntary risks. Spence, Engel and Blackwell (1970) studied the effect of the method of purchase on perceived risk. They found that higher risk is perceived in mail order shopping as compared to retail store shopping. Most other empirical studies have used specific situational settings as

a control variable. Their findings therefore can be generalized only to similar situations.

The uniqueness of the environmental and the situational factors lies in the fact that they affect large segments of population in a similar manner. Therefore, they are of special interest to marketers as predictors of aggregate level market behavior.

Effect of Perceived Risk on Prepurchase Activities and Purchase Behavior

Effect of Perceived Risk on Prepurchase Activities

When faced with a decision involving uncertainty and risk, individuals engage in several activities directed at reducing the perceived risk or increasing the acceptable level of risk. This section reviews research done on the effect of perceived risk on such prepurchase activities.

One common reaction of individuals to the undesirable aspects of risk is to try to reduce the perceived risk. Brown and Gentry (1975), Cooper (1969), Lutz and Reilly (1973), Roselius (1971), and Sheth and Venkatesan (1968) studied a variety of risk reduction strategies used by consumers across a range of choice situations. Roselius (1971) ranked risk reduction strategies by their importance in handling risks due to time loss, physical hazard, ego loss, and money loss. He found consumers use (a) brand loyalty, (b) reliance on a major brand, (c) store image, (d) shopping, and (e) free samples as the most preferred risk reduction strategies across all types of risky situations. Deering and Jacoby (1972) argued that consumers use both risk reduction and risk

enhancement as strategies for handling perceived risk.

It can be seen that each of these risk reduction strategies are closely related to the acquisition of additional information as its first step. Several researchers have focused their attention on the relationship between perceived risk and information search. Allport and Postman (1947) found that people's receptivity to rumors as external source of information increases with ambiguity and with the importance of the issue. This phenomenon is consistent with the idea that risk causes an increased desire for acquiring additional information. Berlyne (1960) and Lanzetta and Driscoll (1968) found that the information search was primarily a function of uncertainty and to a lesser extent a function of the outcomes. Hawkins and Lanzetta (1965), Miller, Galander, and Pribram (1960), and Newcomb, Turner and Converse (1965), on the other hand, found that the information search is a function of both the uncertainty and the consequences. This was supported by Copley and Collom's (1971) study of industrial purchase behavior. These studies thus provide important empirical evidence about the role of information search as a major prepurchase activity directed at reducing perceived risk. At the same time, the studies show that the findings about the causal relationship between the risk components and information search as a risk reduction activity are conflicting and hence, inconclusive.

Another important prepurchase process in handling risk involves attempts to influence the acceptable level of risk. Only a few studies have recognized the "acceptable risk level " as an independent construct. As mentioned earlier, Popielarz (1967) investigated the relationship between perceived and acceptable levels of risk. Reingen

(1974) and Woodside (1972, 1974) studied the effect of group interactions in changing the willingness to take risk. They found that the level of risk has a negative effect on the willingness to take risk, whereas the group interactions have a positive effect on the willingness to take risk. Thus, in high risk situations, the willingness to take risk decreases after group interactions resulting in a conservative shift. On the other hand, in low risk situations, the willingness to take risk increases after the group interactions resulting in a risky shift. These findings may indicate the direction in which perceived risk would change with time at the aggregate market level as more information is transmitted and discussed among potential consumers.

The preceding discussion shows that the constructs of perceived risk and acceptable risk have been investigated in independent studies. However, no study has explored their interrelationship. It can be argued that if the perceived risk is higher than the acceptable risk, a consumer will engage in various strategies to narrow the gap between the two. Such strategies could be directed at reducing the perceived risk level or increasing the acceptable risk level. Such efforts will continue until the perceived risk is lower than or equal to the acceptable risk level. Once this is achieved there will be no further motivation to engage in risk handling strategies, and the consumer will proceed to make the final choice. Thus, it can be argued that consumer behavior is influenced more by the difference between the perceived and acceptable levels of risk, than by perceived risk alone.

Effect of Perceived Risk on Purchase Behavior

Perceived risk reflects the consumers' concern about the

undesirable outcomes of their purchase decisions. As a consequence, consumers tend to choose the alternative which has minimal perceived risk. This outcome has been found by numerous researchers (Barach 1969; Bearden and Shimp 1982; Cox and Rich 1964; Hisrich, Dornoff, and Kernan 1972; Perry and Hamm 1969; Perry and Perry 1976; Prasad 1975; Schiffman 1972; Spence, Engel, and Blackwell 1970; Woodside and DeLozier 1976). These studies have used settings covering a wide variety of consumer purchase situations. Their findings confirm the fact that consumers consistently choose products which have minimal perceived risk.

As discussed earlier, most of the theoretical models of perceived risk (Sheth 1974; Taylor 1974; Woodside and DeLozier 1976) reflect the realization that perceived risk is a dynamic construct that changes in its intensity and influence throughout the decision process. Despite this, almost all empirical research on the effect of perceived risk on purchase decisions cited above takes a snap-shot view of perceived risk and treats it as a static construct. Among the exceptions is the experimental research by Sheth and Venkatesan (1968). However, this study concentrated primarily on the dynamics of prepurchase activities in risky decisions. Therefore, it did not take any dynamic measurements of perceived risk during the experiment. The study concluded that the existence of perceived risk is a necessary condition for brand loyalty.

The preceding discussion shows that substantial empirical evidence is available to conclude that perceived risk acts as a major determinant of the choice in consumer decisions. However, it is also clear that the dynamic nature of perceived risk throughout the decision process has still not been thoroughly investigated. Further, research is also lacking on the combined effect of perceived and acceptable levels of

risk in consumer choice behavior.

Formation of Risk Perceptions

Introduction

Most of the discussion to this point has concerned the various factors which affect and change the level of risk perceived by a specific individual in a specific situation. Such risk perceptions in turn influence a consumer's prepurchase and purchase activities. However, a more basic question still to be addressed concerns how the risk perceptions are formed in the first place. This section will review the concepts developed and the research done by marketers on the formation of risk perceptions.

This section is organized in several subsections. The first subsection reviews expectancy approach and shows that its various applications are all based on the same basic concept of "expectancy". The second subsection reviews several alternative theories and models proposed, which reveal the inadequacies of the expectancy models and suggest ways to overcome them. The third subsection shows the close relationship between utility and perceived risk, either of which can be conceptualized as a mediator between uncertainty and consumer behavior. The fourth subsection discusses the intuitive justification behind the use of expectancy approach as the evaluative criterion by buyers and presents a possible explanation of when and why the expectancy theories can be hypothesized to fail to predict buyer behavior. The fifth subsection defines the construct of repeated applications of a decision which can be used to identify situations where the expectancy logic will

apply and those where it will fail to describe buyer behavior. The sixth and last subsection states the specific hypotheses which will be tested in this dissertation.

Development of Expectancy Theories

In the area of perceived risk, expectancy theories have provided the basic foundation for most of the normative and positive models of behavior. One of the earliest conceptualizations of human choice behavior under uncertainty and risk was the classical normative theory of expected value (EV), based primarily on probability theory (Edwards 1955). In a decision situation involving several alternatives to choose from, the expected value of an alternative is defined by the following equation:

$$EV = \sum_x (P_x * V_x)$$

Where P_x is the probability of the x'th outcome, V_x is the dollar value of the x'th outcome, and $\sum_x P_x$ equals 1.

Because a decision maker would on average experience a resultant effect equal to the expected value, the normative theory asserted that an individual should choose the alternative with the highest EV (Borch 1972). Despite its strength as a normative theory, maximizing the expected value was never taken seriously as a descriptive theory of decision making under risk (Coombs, Bezembinder, and Goode 1967).

Bernoulli (1738) was probably the first theoretician to question both the normative and the descriptive correctness of EV theory. He introduced the concept of nonlinear utility for money through his discussion of the St. Petersberg paradox (Bernoulli 1738; Chernoff and Moses 1959) and suggested that people have diminishing marginal utility

for money. As such, he suggested that individuals should choose the alternative with the highest expected utility (EU) rather than the highest expected value (EV). The expected utility was defined by the following equation:

$$EU = \Sigma_x (P_x * U_x)$$

Where U_x is the utility or subjective worth of the value V_x of the x'th outcome.

Thus, this theory substituted the subjective worth or utility for the objective value of the outcome. However, it was only after its reformulation by Von Neumann and Morgenstern (1947) that the theory was used as a descriptive theory about how people actually behave in decision situations involving uncertainty and risk. As a positive theory, EU theory has received substantial attention from researchers. The EU theory is also referred to as the EU hypothesis or the Bernoulli principle (Borch 1972, p.30).

Just as EU theory substituted the objective value of the outcome with subjective utility, Preston and Baratta (1948) replaced the objective probability with its perceived value-- the subjective probability. They defined the subjective expected value (SEV) of an alternative by the following equation:

$$SEV = \Sigma_x (SP_x * V_x)$$

Where SP_x is the subjective probability.

This was the formulation of the SEV theory. SEV theory was able to explain the findings of several experiments conducted by Edwards (1953, 1954a) concerning probability preferences of individuals. Despite this, the SEV theory never really attracted much attention of researchers.

As a logical extension of these developments, Edwards (1955) proposed the subjectively expected utility (SEU) theory. In this comprehensive model he replaced both the objective value and the objective probability terms with their subjective values. Thus, the SEU was defined by the following equation:

$$SEU = \Sigma_X (SP_X * U_X)$$

Where SP_X is subjective value of P_X and U_X is the utility of V_X.

Edwards (1955) proposed SEU as a predictive theory rather than as a normative theory. This model was similar to the one proposed by Coombs and Beardslee (1954). The main difference was that the Coombs and Beardslee model assumed SP and U to be measured on a ratio scale, whereas the Edward's SEU model assumed them to be measured on an interval scale. Since its inception, the SEU theory, which is clearly the most general formulation based on the principle of expectancy, has dominated as the theory describing human choice behavior under uncertainty and risk.

All the above theories of human choice behavior under uncertainty originated as normative theories to prescribe how rational human beings should behave. However, the theories were subsequently proposed as descriptive theories applicable to most individuals in a majority of normal decision situations (Thaler 1980). Peterson and Beach (1967) suggested in their work on intuitive statistics that any normative theory provides a good approximation for the psychological theory of inference. Such an approach was supported more strongly by Barclay, Beach and Braithwaite (1971), who stated that one should begin with a normative model and adjust its form or parameters to develop a descriptive model. Today, expectancy theories really play the dual role

of normative as well as descriptive theories.

The close relationship between all four expectancy theories was shown explicitly by Coombs, Bezembinder, and Goode (1967), who argued that the distinction among the expectancy theories resulted from the difference in the assumption of whether the utility for money is a linear or nonlinear function of objective value, and whether the subjective probability is a linear or nonlinear function of objective probability. Thus, a theory assuming linear utility and linear subjective probability will coincide with the EV theory. Similarly the other three theories can be conceptualized as presented in TABLE II below.

Research on the SEU theory has faced two major problems: the measurement of utility and the measurement of subjective probability (Edwards 1961). Most of the experiments presented the subjects with simulated or real gambles involving outcomes in terms of monetary gains or losses with specified probabilities, and measured their response as preference, indifference, or actual choice. Observation of human behavior in certain situations like the purchase of insurance indicated preference for risk aversion and a concave utility function (Borch 1972). At the same time the unabated sale of lottery tickets indicated preference for risk taking and a convex utility function. The contradictory experimental evidence led Rapoport and Wallsten (1972) to conclude that the SEU theory can be accepted with one set of bets and rejected with another differently constructed set. However, Goodman et al. (1976) asserted that the SEU model gives a good global fit to choice data and particularly for simple gambles.

TABLE II

INTERRELATIONSHIP AMONG THE EXPECTANCY THEORIES

"SP" AS A FUNCTION OF "P"	"U" AS A FUNCTION OF "V" LINEAR	NONLINEAR
LINEAR	EV	EU
NONLINEAR	SEV	SEU

The use of the expectancy logic also can be found in prospect theory (Kahneman and Tversky 1979; Tversky and Kahneman 1981). In proposing this theory they identified two additional findings which violate SEU theory - the certainty effect and the reference effect. The certainty effect reflected people's general preference for a certain outcome over an uncertain one. The reference effect referred to the use of status quo, adaptation level or expectation as the alternative reference points by individuals to assess the actual outcomes of an alternative as either gains or losses. They proposed that in a given decision situation, an individual will select one of these as the reference point, depending upon the way the information is presented to him. Using the reference, he would then perceive various outcomes as either gains (better than the reference point) or losses (worse than the reference point). The worth of an outcome will be judged, not by the utility of the objective value, but by the worth of the difference between the objective value and the chosen reference. For the sake of

convenience, this will be referred to as the relative utility (RU) of the outcome.

They further suggested that the RU curve will be "S" shaped, convex in the loss zone and concave in the gains zone, with the point of inflection being the chosen reference point. The RU as a function of the difference between V and the reference point V_0 is presented in Figure 1 below.

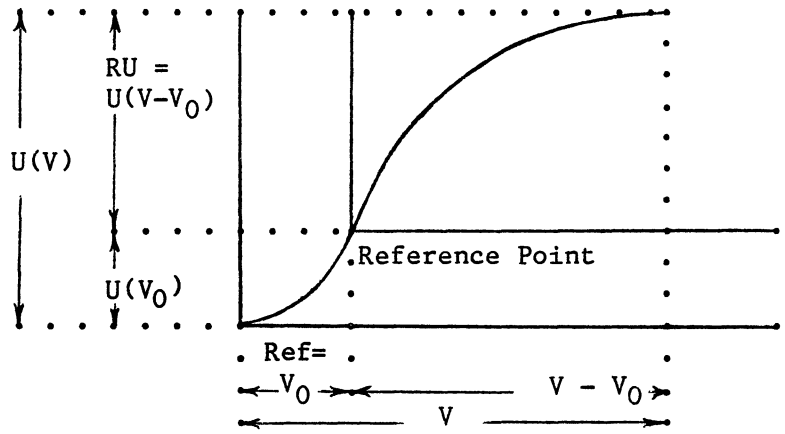


Figure 1. Relative Utility as a Function of Value and the Reference Point

In place of the subjective probability, Kahneman and Tversky (1972, 1979) defined a term Decision Weight (WP), which is a monotonic function of P but is not a probability function. They suggested that very small probabilities will be overweighted (WP > P) and moderate and high probabilities will be underweighted (WP < P). WP as a function of P is presented in Figure 2 below.

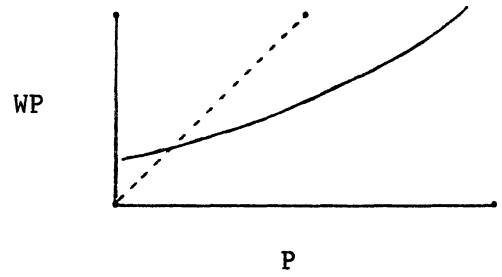


Figure 2. Decision Weight as a Function of Probability

Using the concept of decision weights (WP) in conjunction with the concept of relative utility (RU), Kahneman and Tversky (1979) proposed their Prospect Theory as an alternative to the EU theory. The theory defines the value of the prospect, which will be referred to as subjectively weighted relative utility (SWRU), by the following equation:

$$SWRU = \Sigma_x \ (WP_x * RU_x)$$

Where WP_x is the decision weight and RU_x the relative utility of the $_x$'th outcome.

The major generalizations of the prospect theory are given below.

A. Individuals treat gains differently from losses. They exhibit risk aversion in gain situations and risk preference in loss situations.

B. Individuals exhibit preference for certainty over uncertainty by overweighting the probabilities of losses close to 0 or probabilities of gains close to 1.

C. Whether the outcomes of a decision are perceived as gains or losses depends upon how the problem is presented. Further, such perceptions affect people's choices even though the final asset position is the same.

In summary, expectancy theories which have dominated the study of perceived risk are closely related. They all assume that risk originates from two basic components: P and V. They further assume that individuals form perceptions about these components as defined by SP and U. Expectancy theories suggest that the expectancy--computed by multiplying the uncertainties by the respective outcomes and adding over all possible outcomes--will be used by individuals as the evaluative criterion to choose among alternatives.

Alternative Models of Decision Under Risk

In practice expectancy theories have met with mixed success (Kahneman and Tversky 1979). Certain types of consumer behavior such as the purchase of new products and brands, store-choice decisions and other decisions which are applied repeatedly, have been explained and predicted by expectancy theories (Anderson and Shanteau 1970; Bettman, Capon, and Lutz 1975a; Jacoby and Kaplan 1972). However, decisions such as the purchase of life and property insurance, lottery tickets, assets like house and car involve very high values of positive or negative outcomes. In these cases, the expectancy theories often fail to explain the risk perceptions and the behavior (Lanzetta and Driscoll 1968).

Several alternative reasons have been suggested to explain why the expectancy concept fails to capture all aspects of the consumer decision process. Empirical research has shown that individuals exhibit distinct preferences for certain types of outcomes and uncertainties over others. The following paragraphs will review these research findings.

Individual Preferences for Broad versus Narrow Range of Outcomes

Bruner, Goodnow, and Austin (1956) were among the early researchers to discover that individuals consistently prefer either a broad or narrow range of outcomes on uncertain decision situations. The broad categorizers choose alternatives with a broad range of outcomes in the hope of maximizing desirable or positive consequences. In doing so, they risk the increased probability of negative outcomes. The narrow categorizers, on the other hand, choose alternatives with a narrow range of outcomes with the objective of minimizing the undesirable or negative consequences. In doing so, they risk the possibility of missing some excellent opportunities. Pettigrew (1958) developed a scale to classify individuals on the basis of their preference for broad versus narrow cognitive categories. Subsequently, several researchers have shown that the cognitive category width in fact reflects the choices of individuals in the real world (Bruner and Tajfel 1961; Popielarz 1967; Schiffman 1972).

Individual Preferences and Tolerances for Different Levels and Distributions of Uncertainty

Edwards (1953, 1954a, 1954b) was one of the early researchers to show that individuals exhibit consistency in their preference/tolerance for high versus low levels of uncertainty or probability. Allais (1953), Edwards (1954c), Fisher (1906), and Slovic and Lichtenstein (1968b) showed that individuals exhibit consistency in their preference/ tolerance for low versus high variance of the possible outcomes of an

alternative. They further showed that perceived risk increases with the variance of the outcomes.

Several researchers used desire for certainty as an inverse construct of the tolerance for uncertainty. Brim and Hoff (1957) showed that the desire for certainty was inversely related to the level of satisfaction. Kates (1962), Svenson (1979), and Weinstein (1979) found that individuals reflected their desire for certainty by being unrealistically optimistic and by denying the very existence of risk in decisions under uncertainty.

With a view to overcome the inadequacies of the expectancy models in handling such preferences of individuals, several other theories have been proposed as substitutes. Coombs (1975), Coombs and Bowen (1971), Coombs and Huang (1970a, 1970b, 1974), and Coombs and Meyer (1969) have proposed portfolio theory, which suggests that the choices are made as a compromise between EV and optimization of risk in accordance with its preferred levels. Loomes and Sugden (1982) modified the concept of utility to incorporate choiceless utility as one part and choice related regret/rejoicing as the other. Their regret theory then proposed that individuals will try to maximize the expected value of the choiceless utility, modified by the rejoicing or the regret that may result by not choosing an optimal alternative.

Slovic (1967) and Slovic and Lichtenstein (1968a, 1968b) argued that gambles or alternatives involving uncertain outcomes are multidimensional stimuli. Individuals weight each of these dimensions and combine the information to form the overall evaluation of an alternative. Thus, in a decision under uncertainty, the probabilities and the outcomes are considered as independent dimensions. Depending

upon the person's own preferences, different importance is given to the probabilities and the outcomes. Some people may choose an alternative because the value of one of the outcomes is attractive to them. Therefore, they may disregard the probabilities by giving them a very low weighting. At the same time, some people may choose the alternative primarily on the basis of probabilities and give low importance to the values of the outcomes.

Taking the same problem of how people weight and combine information as the focus, Anderson (1974a, 1974b, 1974c) proposed information integration theory as a means for studying information processing by individuals. The theory uses simple algebraic models to describe the use of information in judgment, decision making, and various attitudinal and perceptual tasks. Anderson and Shanteau (1970) and Shanteau (1975) applied information integration theory to risky decision making as an alternative to the EU theory.

The research on alternative models of behavior under risk discussed above indicates that the various expectancy theories are inadequate in explaining bahavior in several real life situations. The research also identifies several ways to overcome the inadequacies of the expectancy theories. These include superimposing expectancy models with individual preferences for certain outcomes or uncertainties as well as the use of other algebraic models.

Decision Models Using The Construct of Perceived Risk

Despite the fact that all the theories discussed in the previous section dealt with decisions involving uncertainty and risk, none of the

theories defined the constructs of risk and perceived risk explicitly. It is important to note that the concepts of perceived risk and expected utility are functions of the same two risk components that define an uncertain situation: the probability and the value of the outcomes. Expectancy may be conceptualized as representing the long term desirability of an alternative. Conversely, perceived risk may be conceptualized as representing the long term undesirability of the alternative. Expectancy theories in utility are based on the assumption that a typical individual will try to maximize the utility and, hence, choose the alternative with the highest assessed utility. Consistent with that, the perceived risk concept is based on the assumption that a typical individual will try to minimize the perceived risk and hence choose the alternative with the lowest perceived risk. Several researchers in the area of perceived risk (Barach 1969; Bearden and Shimp 1982; Cox and Rich 1964; Peter and Ryan 1976; Popielarz 1967; Roselius 1971; Schiffman 1972; Sheth and Venkatesan 1968; Spence, Engel, and Blackwell 1970) have explored and established that individuals prefer and choose the alternative with minimum perceived risk. Perhaps because of this interrelationship, most research work has implied that expectancy is an indirect measure of perceived risk. However, few researchers have specifically investigated the construct of perceived risk and its dependence on the probability and the value components. These models presented below clearly show that perceived risk can be conceptualized in a manner similar to expected utility conceptualizations.

Using a formulation consistent with both EU theory and information integration theory, Jacoby and Kaplan (1972) proposed a multiplicative

model of perceived risk as represented below:

Perceived Risk = Subjective Expected Utility of the Undesirable Outcomes

$$= -\Sigma_y \left(\text{UNCERTAINTY}_y * \text{CONSEQUENCE}_y \right)$$

Where y refers to a dimension of risk.

They identified five independent risk dimensions: financial, performance, physical, psychological, and social. Thus, considering just one financial demension of risk, the model of perceived risk can be written as below:

Perceived Financial Risk = Subjective Expected Utility of Negative Financial Outcomes

$$= -\Sigma_x \left(SP_x * U_x \right)$$

Where x refers to the x'th outcome of the chosen alternative.

Berlyne (1960) and Hansen (1972) have explained the theoretical reasons for expecting the risk components to multiply. The uncertainty and the outcomes together constitute the necessary and sufficient conditions for risk to be present and the absence of either one of them will eliminate the risk. Therefore, the multiplicative model correctly describes the relationship between the risk components and perceived risk. Bettman (1975) used a similar model of perceived risk in investigating information integration by consumers under risky situations.

As in the case of multiplicative models of expected utility, the multiplicative models of perceived risk also have had a mixed success in explaining and predicting consumer risk perceptions across all decision situations.

With a view to overcome the inadequacies of the expectancy approach, Pollatsek and Tversky (1970) proposed a theory of risk and

suggested that perceived risk is a linear function of expected value and the variance of the gamble outcomes. Slovic (1967) and Payne (1975), on the other hand, used the earlier multidimensional stimulus approach and concluded that perceived risk is primarily a function of the probability of losing.

The above discussion brings out the close relationship between the constructs of utility and perceived risk. Therefore, it is consistent that the multiplicative expectancy models have had mixed success in predicting either the utility or the risk perceptions of individuals. Several important generalizations can be made from the previous discussion.

A. In decisions under uncertainty, people could be conceptualized as evaluating the alternatives by assessing either the utility or the perceived risk involved in each alternative.

B. Utility and the perceived risk are closely related constructs which express respectively the desirability and the undesirability of an alternative in decisions under uncertainty.

C. People make choices so as to maximize the expected utility or to minimize the perceived risk.

D. Both the utility and perceived risk of an alternative are functions of the various possible outcomes of a decision and their probabilities.

E. The interrelationship between expected utility and perceived risk can be expressed as below:

Perceived Risk Involved in an Alternative

= - Subjective Expected Utility of the Alternative

F. The expectancy logic, which involves multiplying the outcome

values by their probabilities and adding them over all possible outcomes, has been shown to be a very powerful and intuitively appealing concept in both utility and perceived risk areas. Despite several known exceptions, expectancy theories continue to be the most generally accepted normative and descriptive theories of human choice behavior under uncertainty and risk.

G. Several choice situations have been identified in which the multiplicative expectancy models fail to describe the perceptions of utility as well as risk. This has resulted in a search for appropriate alternative models.

F. The research has so far not thoroughly explored when and why the expectancy models fail to describe human choice behavior under uncertainty and risk.

A Possible Explanation of When and Why the Expectancy Models Fail

In order to understand the successful application of expectancy theories in some situations and their failure in the others, it is necessary to go back to the basic logic and justification behind the use of expectancy as a decision criterion by buyers. The intuitive justification for using expectancy (say EV) as the choice criterion is the law of large numbers (Borch 1972, p.14). In a large number of trials, the probabilities of the various possible outcomes represent the relative frequency with which the outcomes will actually occur. Thus, if a gamble is played a large number of times, the actual average outcome in the long run will equal the expected value of the gamble. Therefore, a rational decision maker will base his choice on what will

be the actual outcome in the long run, that is, the expected value. In effect, the concept of expected value makes an almost exact prediction of the actual outcome and, thereby, reduces the decision under uncertainty involving several repeated applications of the chosen alternative, to a decision under certainty (Borch 1972, p.14).

The other expectancy theories: EU, SEV, SEU, and prospect theory are based on the same basic principles and are in fact reincarnations of the expected value theory. The four theories differ from one another in the manner in which they take into account the nonlinear perceptions of the decision makers, of the two risk components--probabilities and values of the outcomes. Thus, the extent of acceptance and use of the expectancy theories by buyers will depend upon whether the chosen alternative is to be applied repeatedly a large number of times or not. It is surprising that the validity of such a critical assumption has not been verified before applying the theories to all types of decisions involving uncertainty and risk.

The preceding discussion suggests that expectancy theories offer a rational basis for predicting consumer behavior in situations in which the chosen alternative would be applied repeatedly a large number of times. Such decisions will be referred to as "policy decisions", in which the chosen alternative is applied as a policy on several subsequent occasions. Therefore, in policy decisions, buyers will tend to use expectancy theories in forming their risk perceptions and subsequent behavior.

In contrast, "single decisions," in which the chosen alternative is applied only once, clearly violate the "large number of repeat applications" assumption implicit in the use of expectancy theories. In

such decisions, the expectancy does not predict what is actually likely to happen. Because the expectancy predicts only an average outcome over a large number of repeated applications of a decision, it has little relevance and practical correspondence in single decisions involving just one application to a decision. Thus, in such single decision cases expectancy theories do not have a unique claim as the most appropriate models to predict human choice behavior.

In fact the very awareness that it is a single decision may cause the decision maker to use alternative decision models, such as minimizing the maximum possible loss, maximizing the minimum likely gain, or satisfying a minimum level of need. In situations where such concern for specific outcomes does not exist, some individuals may still use expectancy logic as a way of evaluating the alternatives. However, in many such applications, the expectancy logic loses its basic meaning as a predictor of the long term outcome and reduces to just one way of summarizing the probabilistic information. Therefore, in single decisions, the buyers will tend not to use expectancy theories in forming their risk perceptions and expectancy theories can be anticipated to fail in making correct predictions of human perceptions and behavior.

The distinction between single and policy decisions can be seen vividly through Bernoulli's (1954) St. Petersberg paradox. The experiment involved giving people two alternatives from which to choose. The first alternative offered one million dollars with certainty. The second alternative involved a gamble in which a coin would be tossed. If a head turned up, the person would receive two dollars. Instead if tail turned up, there would be a second toss. If the head turned up in

the second toss, the person would receive "2 raised to the power of 2", i.e., four dollars. Thus, if the head turned up for the first time in the n'th toss, the person would receive "2 raised to the power of n" dollars. The game would continue till the head turns up for the first time and the person received the payment. It can be shown that the EV of the gamble is infinity. However, despite that, most people chose the alternative of getting one million dollars with certainty.

Bernoulli gave the nonlinear utility for money as the exlanation for this phenomenon. While that is one valid explanation, another plausible explanation is that the second alternative allowed the decision maker to play the gamble only once. Thus, it violated the assumption of a large number of repetitions implicit in the use of expectancy theory. As such, it was wrong to expect people to base their choice on the expected value criterion. Had the people been offered the chance to play the gamble a large number of times and then take the average payoff, they may have realized that the average can be far bigger than one million dollars and therefore, their choice might have been different and consistent with the EV theory.

The Construct of "Repeated Applications of a Decision"

The above discussion indicates that real world decisions under uncertainty can be differentiated on the construct of "repeated applications of a decision", that is, the number of times the decision with uncertain outcomes is applied repeatedly to identical situations.

Single decisions will be those where the decision is applied just once. Policy decisions will be those where the choice is made only once and is applied repeatedly a large number of times to identical

situations.

This classification can be applied to customer purchase situations which are of critical interest to marketers (The word "customer" is used here in the most general sense to include industrial, organizational, institutional, and household consumers.). Below, several examples are presented to clarify the single decision- policy decision distinction.

In the gambling setting, a single decision would be whether to play or not to play a gamble involving just one toss of a coin. If a head turns up, the player gets $ 1,000 and if a tail turns up, the player loses $ 500. Even though the EV of this gamble is a $ 250 gain, a person may or may not agree to play it, depending upon whether he can bear the loss and upon the utility of the positive outcome to him. Thus, the EV criterion is likely to have very little relevance to the actual outcome in this case.

The purchase of a personal computer, a home, a car, and other such large investment items are examples of single decisions in household buying. The purchase of a plant and machinery, costly equipment, etc. are examples of single decisions in industrial buying.

A policy decision in a gambling setting would be the choice to play or not to play a gamble 100 times. Each play would involve a toss of a coin with a gain of $ 10 for head and a loss of $ 5 for tail. Once again, the EV of the decision is a $ 250 gain. However, due to the large number of repeat applications of the decision to toss, one can almost be certain to win about $ 250. Thus, a majority of individuals may use the EV criterion in this situation to make their decision.

The purchase of a large number of units of any item is an example of a policy decision in a marketing setting. Thus, the purchase of

electric bulbs, Venetian blinds, or door handles for a home exemplifies household consumer policy decisions. The purchases of furniture, office equipment, and stationery are examples of industrial policy decisions.

A large number of real life decisions, however, do not fall in either of these two pure categories and can be called "mixed decisions". One important segment of mixed decisions includes those decisions which are applied repeatedly over time. Thus, in the gambling setting, the 100 toss gamble described above, with an option to quit any time during the game, would be an example of a mixed decision. Similarly, practically most repeat purchase decisions by industries and households for items such as raw materials, supplies, and services to be supplied in several lots over a period of time, are examples of mixed decisions in marketing situations. These decisions offer the buyer the added freedom to change the decision during its multiple implementations.

In these mixed decisions, the decision maker has two options: either to make a separate decision for every repeat purchase, or to make one policy decision and apply it repeatedly. Brand loyalty, store loyalty and other such habitual behavioral patterns are examples of consumers voluntarily giving up their freedom to choose independently every time in favor of a policy decision.

Many environmental pressures encourage buyers to reduce mixed decisions to policy decisions. Marketers and their intermediaries prefer to have a long term relationship with their customers. They offer several advantages to brand loyal customers as opposed to one time buyers. Marketers also prefer bulk orders to reap the economies of scale. Other factors such as the limited availability of time and the existence of better alternative ways of spending time also encourage

individuals to reduce their decision making load.

Researchers in the information processing field (Kahneman 1973; Lindsay and Norman 1972; Norman and Bobrow 1975; Simon 1969; Slovic 1972) would ascribe this behavior to the limited information processing capacity and expertise which people possess. These limitations require them to reduce complex tasks to simple ones--like making one policy decision in place of several independent decisions. Thaler (1980) explained this behavior through the concepts of psychological price, precommitment as a means of self control, and opting not to choose in order to minimize regret, guilt, responsibility, and psychic costs.

Situations in which the mixed decisions cannot be reduced to policy decisions, or situations in which consumers choose the first option of making a separate decision every time become the cases of single decisions. Thus, mixed decisions are really policy decisions with the added freedom to revise and change the decision during its implementation period. Therefore, it can be argued that in mixed decisions buyers will still tend to use expectancy logic, but to a lesser extent as compared to the policy decisions, in forming their risk perceptions and final choices.

The above discussion also suggests that when faced with one single decision and one policy decision, both having equal EV, people will perceive different amounts of risk in the two situations. In the policy decision, the EV will accurately measure the actual average outcome of each alternative. Thus, the use of EV will lower the uncertainty felt by the decision maker. On the other hand, the single decision will have at least one, if not more outcomes, which are inferior to the EV of the comparable policy decision. Further, if an undesirable outcome occurs

in a single decision case, the decision maker will not have any possibility of "getting even" through subsequent repetitions as is possible in policy decisions. Such a short term perspective will result in a much greater concern in the mind of the decision maker about the single decision as compared to the policy decision. Since perceived risk measures the undesirability of an alternative, the inferior outcomes will make the single decision alternatives less desirable than the policy decision alternatives.

From another perspective, each application of the policy decision will have the same number of possible outcomes as the comparable single decision. The outcomes of the total policy decision will be generated from the permutations and combinations of the outcomes of each of its repeat applications. Thus, a policy decision will always have a much larger number of possible outcomes forming a distribution. Therefore, the policy decision will have a much smaller variance of the outcomes as compared to the variance of the outcomes in the single decision. Coombs and Pruitt (1960), Edwards (1954c), Lichtenstein (1965), Slovic and Lichtenstein (1968), and Vander Meer (1963) have shown that the perceived risk increases with the variance of the outcomes. Therefore, it can be expected that people will perceive higher risk in a single decision as compared to a policy decision with equal expected value.

In the case of mixed decisions, the freedom to revise the decision will result in the people perceiving lower risk in making the decisions as compared to policy decisions. Thus, the people will perceive the highest risk in single decisions, moderate risk in policy decisions, and the lowest risk in mixed decisions.

Much of the experimental research done on expectancy theories as

descriptive models of human choice has used simulated gambling alternatives as the setting. Unfortunately, choice among gambles has little resemblance to purchase decisions faced by buyers. The gambling settings used in the research do not require the decision maker to make a prior investment or commitment of a valuable resource. Further, the gambling outcomes involve highly tangible gains as well as losses.

Customer purchase decisions differ in both areas. First, the customer has to commit financial and other resources in purchasing a product. Further, in most purchase decisions, the losses are tangible in financial terms, whereas the gains are often in terms of intangible benefits. This is true in both industrial as well as household purchases. For example, in purchasing capital equipment, an industrial buyer faces the risk of technological obsolescence. If the equipment in fact becomes obsolete shortly after purchase, the loss can be assessed in terms of the money invested. However, if it serves its full term and purpose, the gain is real but often left intangible. Theoretically the financial value of the gain can be determined, but usually such assessment is not made. Similarly, when a household customer purchases a car and it turns out to be unsuitable or defective, the loss can be assessed in financial terms. On the other hand, if it runs satisfactorily for ten years, the gain is often assessed only in terms of intangible factors such as satisfaction. Therefore, the generalizability of the findings of the gambling experiments to buyer behavior in marketing situations could be questionable.

Purchasing situations are more like gambles involving some outcomes with tangible losses and and a null or no-profit-no-loss outcome. Even such gambles cannot simulate the intangible benefits that are involved

in purchase decisions. Even if such gambles are accepted as imperfect approximations to purchase situations, researchers (Bettman and Kakkar 1977; Dawes 1975; Hershey, Kunreuther, and Schoemaker 1982) have shown that the information integration is significantly influenced by the nature of tasks involved. As such, it can be expected that the perceived risk in otherwise identical decisions will be different in the gambling setting as compared to the purchasing setting. This view is supported by MacCrimmon and Wehrung (1984) who give such differences as the justification for using marketing settings to improve the generalizability of the findings.

Among several risk dimensions identified by the researchers (Jacoby and Kaplan 1972; Zikmund and Scott 1973a), financial and social risks often play a dominant role in influencing buyer behavior. Of these, the financial risk plays a more important role, especially in industrial buying, which was the setting chosen for the second experiment of this study. Moreover, of the two, only the financial dimension can be quantified. Such quantification was essential to test the hypotheses concerning the expectancy approach. Therefore, the dissertation focused on only one dimension of perceived risk-- the financial risk.

Specific Hypotheses of the Dissertation

The dissertation tested the above ideas in the form of five hypotheses which are presented below:

HYPOTHESIS A1 :

In purchase situations involving policy decisions (Situation 2 and Situation 4 of Table 1), consumers will tend to use a multiplicative expectancy model in forming their risk perceptions. Such a model can be

represented as:

Perceived Risk = - Subjectively Expected Utility

$$= -\Sigma_x (SP_x * U_x)$$

Where SP_x is the subjective probability and U_x is the utility of the value of the x'th outcome of an alternative.

HYPOTHESIS A2 :

In purchase situations involving mixed decisions (Situation 5 of Table I), consumers will tend to use a multiplicative expectancy model to a lesser extent as compared to the policy decisions, in forming their risk perceptions. Such a model can be represented as:

Perceived Risk = - Subjectively Expected Utility

$$= -\Sigma_x (SP_x * U_x)$$

Where x represents the x'th outcome of an alternative.

HYPOTHESIS A3 :

In purchase situations involving single decisions (Situation 1 and Situation 3 of Table I), consumers will tend <u>not</u> to use a multiplicative expectancy model in forming their risk perceptions and instead will tend to use other nonmultiplicative decision heuristics and choice criteria. The multiplicative model can be represented as:

Perceived Risk = - Subjectively Expected Utility

$$= -\Sigma_x (SP_x * U_x)$$

Where x represents the x'th outcome of the chosen alternative.

The hypothesis suggests that the above model will not apply to single decision situations.

HYPOTHESIS A4 :

Consumers will perceive the highest risk in single decisions, moderate risk in policy decisions, and the lowest risk in mixed

decisions with equal expected values as shown by the following inequality:

Perceived Risk (Single Decisions) > Perceived Risk (Policy Decisions) > Perceived Risk (Mixed Decisions)

HYPOTHESIS A5 :

In respect to decisions under uncertainty which are identical in all other respects, consumers will perceive a different amount of risk in the gambling setting as compared to the risk perceived in the industrial purchasing setting.

CHAPTER III

RESEARCH METHODOLOGY

Overview

The dissertation tested theory-based hypotheses about the causal relationship between the construct of repeated application of a decision under uncertainty and its perceived risk. In order to establish such a causal relationship, an experimental study was performed in a laboratory setting, using homogeneous subjects and strong manipulations of the independent variables.

This research was planned to meet two objectives. One objective was to make the findings of this research comparable with earlier research work done using gambling settings. This was accomplished by operationalizing the variables in a gambling setting. The other objective was to partially overcome the external validity inadequacies of the use of gambling settings by operationalizing the variables also in a marketing setting. Thus, the study involved two experiments: one simulated gambling experiment and the other an industrial purchasing experiment.

Industrial purchasing situations are characterized by several important factors which influence the behavior of individuals in an organizational setting. Extensive research done in the area of industrial buyer behavior has identified these factors and their respective role in shaping the purchase behavior. It was necessary to

control these factors effectively in the experiment, so that the observed differences in risk perceptions reflect the effect of the independent variables alone. Similarly, it was essential to control the factors influencing the gambling situations in the first experiment.

The design of the experimental tasks to be performed by the subjects had to meet several requirements. In policy and mixed decision situations, it was important to ensure that the outcomes of the several repeated applications of the decision were independent of each other. In order to make the decisions comparable across situations the EVs of the policy decisions had to equal the EVs of the corresponding mixed and single decisions. Further, the multiple ratings of perceived risk given by each respondent had to be independent of each other. The nature of the hypotheses being tested made it desirable that information integration theory approach and functional measurement technique be used to test them. This techniques can be used most conveniently with a full factorial design of the P * V values as stimuli for each respondent. Therefore, such a design was chosen.

The chapter is organized in several sections. The first section discusses the basic nature of the research and the experimental settings that were most suitable for it. The second section presents an extensive review of the industrial buying literature and identifies several factors that have an important influence on industrial buyer behavior. Further, the section explains how these factors were controlled in the experiment. Similarly, the third section identifies factors influencing behavior in gambling situations and explains how they were controlled in the experiments. The fourth section explains several conditions and constraints that the experimental tasks had to

meet and states how these considerations were taken care of in the planned experiments. On the basis of the preceding discussion, the fifth section specifies the important parameters of the experimental design used in this research. The sixth section explains the reason why the information integration theory approach was chosen for design and analysis of this study. It also explains the basic principles of the functional measurement technique, which is an integral part of the integration theory. The seventh section explains the specific tests used for the various hypotheses of the study. The instruments used for this study are presented in Appendix.

Nature of Research and the Choice of Setting

As discussed in the previous chapter, the dissertation tested theory based hypotheses about the causal relationship between the "repeated applications of a decision" under uncertainty as the independent variable, and the formation and the level of the perceived risk by the decision maker as the dependent variables. Therefore, this research could be classified as theory application as opposed to effects application (Calder, Phillips, and Tybout 1981, 1982). Several aspects of research methodology emerged from this. It was desirable to use an experimental design as opposed to survey or observation, since it enabled drawing causal inferences. A controlled laboratory setting which met the basic requirements of the theory and the hypotheses being tested was preferred since it can effectively control type II error. Further, in theory application research, the hypotheses are to be subjected to a falsification test. Therefore, homogeneous subjects and strong manipulations of independent variables were used to magnify the

effects of the treatments, since such conditions offer the toughest possible test to the theory.

As mentioned earlier, it was planned to conduct two experiments: one gambling experiment and one industrial purchasing experiment. While theoretically both industrial and household purchasing settings would have been equally suitable for this research, some critical constraints made the choice weigh in favor of an industrial purchasing situation. In order to be able to test the hypotheses, it was necessary that the treatments differed only on the construct of repeated application of the decision and were otherwise identical in all other respects. Thus, it was necessary to create decision situations of equal expected value (EV). This was achieved by specifying both the probabilities and the outcomes in quantitative terms. Such quantified decisions are much more realistic in an industrial purchasing setting. Therefore, simulated organizational purchasing situations were used as the setting of the second experiment.

The generalizability and usefulness of the research is to some extent unaffected by the choice of industrial rather than consumer purchasing setting. The major distinction between individual and organizational buying decisions arises due to the existence of a formal organization. Otherwise, even organizations are made up of individuals with all their characteristics that influence their behavior as consumers (Webster and Wind 1972, p.9-10). On the other hand, household purchases are also influenced by several less formal organizations like family and reference groups (Fern and Brown 1984).

Identification and Control of Important Influences in the Industrial Purchasing Experiment

Identification of Important Influences in the Industrial Purchasing Experiment

Organizational buying behavior can be defined as a complex process of decision making by which formal organizations become aware of their need for products and identify, evaluate, and choose among alternative brands and suppliers, in their effort to achieve their own objectives (Webster and Wind 1972, p.2). Several comprehensive models have been proposed by researchers in their effort to capture the essence of organizational buying behavior (Cyert and March 1963; Johnston and Spekman 1982; Robinson, Faris, and Wind 1967; Robinson and Stiden 1967; Sheth 1973; Webster 1965; Webster and Wind 1972).

A number of critical organizational buying influences can be identified using these models and other research work done on more narrow aspects of organizational buying. First, organizational buying is a process that passes through several distinct phases or stages (Clawson 1957; Robinson, Faris, and Wind 1967; Webster 1965; Webster and Wind 1972). One generalized conceptualization of these stages is: need identification, establishment of objectives and specifications, identification of buying alternatives, evaluation, and selection of the supplier (Webster and Wind 1972, p.31).

Further, organizational buying tasks can be classified by their degree of newness to the organization. These include: new task, limited rebuy and straight rebuy (Robinson, Faris, and Wind 1967; Sheth 1973; Webster and Wind 1972; Zaltman and Bonoma 1977). The meticulousness and

the number of buying stages through which an organization goes increase with the newness of the task.

Organizational buying typically involves several individuals who participate in and influence various stages of the buying process to a varying extent. Such a set of individuals is commonly referred to as the decision making unit (DMU) or the buying center. Thus, the buying center varies in its composition as well as in its role as the initiator, influencer, decider, buyer, and user during the progressive stages of the buying process (Sheth 1973; Webster and Wind 1972).

Organizational buying is subject to the following major influences: environmental, organizational, interpersonal, and individual (Webster 1965; Wind 1968). The environmental influence consists of physical, technological, economic, political, legal and cultural factors. These factors often take institutional forms such as suppliers, customers, government, labor force, trade associations, professional organizations, competitors and social institutions (Thomas and Grashof 1982; Webster and Wind 1972).

Organizational influence consists of factors like the locus of buying responsibility or centralization versus decentralization of authority, composition of the buying center, size of the organization, and organizational goals and priorities (Sheth 1973; Webster and Wind 1972; Wind 1966; 1971). Several task oriented models exist such as the minimum price model, the lowest cost model, the rational buyer model (Copeland 1924), the materials management model, the reciprocal buying model, the constrained choice model, and the source loyalty model (Copeland 1924; Cyert and March 1963; Harding 1966; Wind 1970). These models attempt to capture the influence of organizational goals and

constraints on buying behavior (Webster and Wind 1972). Four of the important findings of these studies are given below:

1. Organizational decision makers are busy individuals; they are satisfisers rather than optimizers. As such, whenever possible they evolve satisfactory policies for efficient handling of repetitive decisions. Source loyalty is one expression of such an effort(Cyert and March 1963; Harding 1966; Wind 1970).

2. New suppliers are considered when the buying situation is a new task or when one or more of the new suppliers have been successful in convincing the organization that the problem needs to be re-defined, goals enhanced or new solutions sought(Robinson, Faris, and Wind 1967; Sheth 1973; Webster and Wind 1972; Zaltman and Bonoma 1977).

3. Experience and learning result in adaptation of the goals, the attainment rules, and the search rules (Webster 1965; Wind 1968).

4. Several organizational factors (including goals, centralization, and size) and situational factors (including the newness of the buying task, time pressure, level of risk involved) combine to determine the extent of autonomous or joint decision making that would be involved in the buying process (Sheth 1973; Wind 1966, 1971).

The involvement of two or more individuals brings into the picture the third factor of interpersonal influence (Krapfel 1982; Thomas 1982). Conceptualizations such as exchange theory (Homans 1961), consensus theory (Parsons 1951), the homeostasis model (Newcomb 1953), the behavioral theory of communication (Ackoff 1958), and game theory (Rapoport 1965) have attempted to explain and predict the various patterns of behavior resulting from the interactions of individuals (Webster and Wind 1972, 75-87).

Individual influences enter into organizational buying through the goals, the motives, and the limitations of the individuals participating in the process. Therefore, factors such as personality, role set, motivation, cognition, learning, preferences, perceived risk, and risk reduction strategies come into play and influence the behavior of each individual, just as in the case of any consumer behavior situation (Webster and Wind 1972).

More importantly, the organizational and the individual influences interact to create unique patterns of behavior. Several non-task models such as the self-aggrandizement model, ego-enhancement model, perceived risk model (Bauer 1960; Cox 1967; Levitt 1965), dyadic interaction model (Evans 1963; Tosi 1966), lateral relationship model, buying influence model (Weigand 1968), and diffusion process model (Webster 1969), have been proposed to explain the individual behavior in an organizational buying process. The only generalizable finding of this research is that in different situations, different factors assume a more prominent role in deciding the behavior.

The interaction of organizational and individual factors also causes different individuals to wield varying degrees of influence in the decision making process (Silk and Kalwani 1982). The conceptualizations of the linking-pin role (Likert 1961; Wind and Robertson 1982) and the gate-keeper role (Pettigrew 1975) are really efforts to identify the most influential persons in the buying organization.

One result of the involvement of several individuals is organizational conflict. Various methods of conflict resolution employed in these situations can be classified as bargaining, problem

solving, persuasion, and politicking (Cyert and March 1963; Sheth 1973).

Some researchers have attempted to relate organizational characteristics with the supplier selection criteria used by them. Cardozo and Cagley (1971); Crow, Olshavsky, and Summers (1980); Dickson (1966); Gronhaug (1975, 1977); Hakan and Wootz (1975); Scott and Wright (1976); Westing, Fine, and Zenz (1969); Wind (1970); and Wind, Green, and Robinson (1968) have investigated the importance of vendor attributes, bid characteristics and supplier selection strategies used by organizations.

Control of the Influencing Factors in the Industrial Purchasing Experiment

The preceding discussion identifies several critical factors that have an important influence on the organizational buying process. Since the dissertation measured the effect of the construct of repeated applications of a decision alone, all other factors had to be carefully controlled in the industrial purchasing experiment. A simulated organizational buying situation was used in which the respondents were asked to play the role of the decision maker. The following paragraphs explain how various factors were controlled in the industrial purchasing experiment.

The general economic and political environment was specified as positive and conducive to industrial growth. The organization was specified as operating in the competitive high-tech electronics industry where responsible risk taking was essential for survival and growth. Since this was in fact the actual industrial environment at the time of

the study, such specification only reinforced the natural effect the environment had on the subjects. Further, careful selection of homogeneous subjects located in geographical proximity ensured effective control of the environmental influence.

The organizational influences were controlled by specifying a medium size, private company with highly decentralized style of management which encouraged innovation and responsible risk-taking. The managers were specified as busy and hard pressed for time, as is true in any industry.

The restrictive effects of interpersonal influences were controlled by specifying a young, growing and motivated management team in a supportive environment that was free from undesirable politics.

Individual influences were controlled by specifying that the managers were in a profit sharing plan and were eager to grow with the company. Thus, the conflict between individual and organizational goals was minimized.

The decision involved selection of a supplier and a brand for the purchase of certain capital equipment required for the manufacturing department. Each decision had two possible outcomes: a financial loss resulting from the technical failure of the product and a null or no-profit-no-loss outcome resulting from satisfactory performance of the product over its life span. The risk resulted from the uncertainty as to which outcome would occur in the case of a specific purchase. The decision process was specified as being in the final stage where full information about the alternatives had been already obtained. The experimental task was to evaluate the alternatives and assess the risk involved in choosing each alternative. The purchase situation was

specified as a new task situation, thereby controlling the effect of prior experience. The decision making unit (DMU) or buying center was specified as consisting of a single decision maker, the subject. This was consistent with the evaluation and choice phase of the decision in many real organizations.

All the controls on the above mentioned background variables were exercised by a carefully worded narration of a purchase situation in which the subjects were asked to play the role of the purchase manager.

Identification and Control of Important Influences in the Simulated Gambling Experiment

The major factors that influence gambling decisions can also be classified into three categories: the environmental, the situational and the personal factors.

The situational factors were controlled by specifying that the subject was facing a gambling situation. As discussed earlier, consumer purchase situations are characterized by tangible losses and intangible gains as their possible outcomes. With a view to make the gamble as similar to a purchase situation as possible, each gamble involved two outcomes: a financial loss of specified value (V) with probability (P) and a no-profit-no-loss outcome with probability (1-P).

It is recognized that such gambles are not very realistic and people would not enter into such a gamble on their own. On the other hand, such gamble is one of the nearest approximations to actual purchase decisions. Moreover, such situations have been used by researchers in studying individual choice behavior under uncertainty

(Kahneman and Tversky 1979). The experiment specified that the question was not whether to play such a gamble or not. Instead, the experimental task was to assess the amount of risk perceived by the subject if he or she were to play such a gamble.

The selection of homogeneous subjects was the only indirect partial control on the environmental factors. Otherwise, the environment and the personality were treated as background variables so that their residual effects were randomized.

Design of the Experimental Tasks

The basic objective of the research was to investigate the effect of the construct of "repeated applications of a decision" on the formation and the level of risk perceived by the decision maker. Two experiments were conducted: one a gambling experiment and the other a simulated industrial purchasing experiment. Each experiment was be designed as a "Repeated Applications of a Decision by Probability (P) by Value (V)" full factorial experiment. The repeated applications construct was manipulated at two levels in the gambling experiment creating single and policy decision situations, and at three levels in the industrial purchasing experiment creating single, policy, and mixed decision situations. The mixed decision situation was not operationalized in the case of the gambling setting because, given the freedom available in the mixed decisions, the respondents would tend to stop playing the gamble which had one negative and one null outcome and no positive outcomes. The following discussion identifies several important characteristics and constraints that had to be satisfied and explains how the experimental tasks were designed to satisfy these

requirements.

Choice of Decision Outcomes

Some of the important characteristics of purchase situations were discussed in the section on the construct of repeated applications of a decision of the Literature Review chapter. As explained there, most of the purchase situations are characterized by tangible losses and intangible gains. As such, the experimental tasks had to be so designed that they preserved these characteristics to the best extent possible.

This could be easily achieved in the industrial purchasing experiment. Each subject was given several alternative decisions as stimuli. Each stimulus decision had two possible outcomes. One outcome was a financial loss V with a probability of occurrence P. The other outcome was a no-profit-no-loss result (Value V = 0) with probability 1-P. Thus, each stimulus could be completely described by specifying two parameters: the financial loss involved (V) and its probability of occurrence (P).

Similarly, two outcome gambles with probabilities and outcomes identical to those used in the industrial purchasing experiment were used as the stimuli in the gambling experiment. As explained in the previous section, even though such gambles are unrealistic, they have been used by researchers in studying choice behavior under uncertainty.

Levels of Probability (P) and Value (V)

For several reasons which will be elaborated upon later in this chapter, it was desirable to use the functional measurement technique to test the hypotheses of this research. This technique can be used most

conveniently with a full factorial design of P * V stimuli for each subject. It was also necessary to create at least three levels for each of the two factors. Therefore, it was decided to create four levels for each factor in both the experiments. Thus, each respondent was subjected to P*V = 4*4 = 16 different decision stimuli.

Preserving the Independence of the Multiple Risk Evaluations

In order to ensure that the assessment of risk in each of the sixteen stimuli was done independently of the others, it was desirable to present them as different alternatives (gambles or product brands) to satisfy the same basic need or purpose. This could be easily done in the gambling experiment since the outcomes of different gambles are inherently independent of one another. However, the situation was different in the industrial purchasing setting. Since all possible combinations of P and V levels were used in creating the stimuli, their EVs were not of comparable magnitudes as can be seen from Table III and Table IV. Therefore, the sixteen stimuli would have looked unrealistic as representing alternatives for one purchase decision in the industrial purchasing experiment.

If, on the other hand, the stimuli were presented as sixteen independent decisions, it was possible that the experiment would be perceived by the subjects as equivalent to a case of repeated application of a decision. In other words, since the subjects would be making several decisions at the same time, they might believe that a consistent use of expectancy criterion across all decisions would minimize the overall risk involved in the total exercise. Such an

TABLE III

PROBABILITIES (P), VALUES (V) AND EXPECTED VALUES (EV) OF THE SIXTEEN STIMULI USED IN SINGLE DECISIONS

Pi	.1	.4	.6	.9
Vi				
4000	400	1600	2400	3600
6000	600	2400	3600	5400
9000	900	3600	5400	8100
36000	3600	14400	21600	32400

TABLE IV

PROBABILITIES (P), VALUES (V) AND EXPECTED VALUES (EV) OF THE SIXTEEN STIMULI USED IN POLICY AND MIXED DECISIONS INVOLVING N (100) REPEAT APPLICATIONS OF EACH DECISION

Pi	.1	.4	.6	.9
Vi				
40	4	16	24	36
60	6	24	36	54
90	9	36	54	81
360	36	144	216	324

interpretation would clearly defeat the purpose of the experiment.

In order to handle these constraints, it was decided to present the sixteen stimuli of the industrial purchasing setting in three groups of 8, 4, and 4 stimuli respectively, as shown in Table III and Table IV. Each group consisted of stimuli of comparable EVs which were presented as alternatives. The three groups were presented as three sets of alternatives to three different purchase decisions. The grouping of the stimuli made the decision situations more realistic. Limiting the number of groups to three avoided the total task being perceived as an inherent case of repeated application of a decision.

Values of Outcomes for Single, Policy, and Mixed Decisions

As discussed earlier, in the gambling experiment the construct of repeated applications of a decision had two levels: single decisions and policy decisions. In the industrial purchasing experiment the construct of repeated applications had three levels: single decisions, policy decisions, and mixed decisions. In single decision situations there was only one application of the decision which may result in a financial loss with a specified probability. In policy and mixed decision situations there were a large number (N) of applications of the decision. Each of these applications could result in a financial loss with a specified probability. In order to make the single decisions comparable with the policy and the mixed decisions, it was necessary that the three had equal expected values.

In the case of a single decision,

EV = Probability * Value.

In the case of a policy and a mixed decision involving N repeat applications of the decision,

EV = N * Probability * Value of One Application

The two EVs would be equal only if,

V(Single Decision) = N * V(One Application of Policy Decision)

= N * V(One Application of Mixed Decision) or

V(One Application of Policy or Mixed Decision)

= 1/N * V(Single Decision)

Therefore, the financial loss involved in each application of the policy and the mixed decision had to be N times smaller than the loss involved in the corresponding single decision, i.e. V/N. The value of N was chosen as 100, which was considered as a strong enough manipulation of the construct of repeated applications of a decision.

Independence of the Outcomes in Policy and Mixed Decisions

The design of the experiment had to ensure that in policy and mixed decisions the outcomes of the N applications of the decision were independent of each other. In the gambling experiment, the single decision situation involved playing just one game of a gamble which could result in a loss V with probability P. The policy decision situation involved playing N games of gamble, each of which could result into a loss of V/N with probability P. Since gambles are inherently independent of each other, they automatically met the condition of independence of outcomes.

In the industrial purchasing experiment, the single decision involved the purchase of capital equipment, which could result in a

financial loss V with probability P. Because just one item was involved, the loss could be ascribed to any reason such as technical failure. The policy and the mixed decisions in the industrial buying experiment involved the purchase of N units of a piece of equipment-special purpose electric bulbs. Each of these units could result in a financial loss of V/N with probability P. The outcomes of the N purchases had to be independent of each other. This was achieved by ascribing the loss to technical failure of the equipment caused by external and random reasons. Failure of one unit of equipment due to such external reasons is completely independent of the possible failure of other units of same equipment. Therefore, such a setting met the requirement of independence of the outcomes. Once again this was realistic considering the fact that the loss involved in each item was only V/N. In order to avoid confounding, it was necessary to use the same cause of loss in both single and policy decision situations. Therefore, "possible catestrophic failure of the equipment" which rendered it virtually worthless, was uniformly used as the cause of financial loss across all three types of decisions in the industrial purchasing experiment.

Experimental Design

Based on the discussion on the design of the experimental tasks, the following paragraphs give the design details of the two experiments of this dissertation.

Stimulus Design

The independent variables or treatments in each of the two

experiments consisted of three factors: the repeated application of the decision (single versus policy versus mixed decision), the probabilities of occurrence for each outcome, and the values of the outcomes. These treatments were arranged in "repeated applications by P by V" full factorial design. The two levels of the repeated application construct in the gambling experiment, and the three levels of the construct in the industrial purchasing experiment formed five unique situations as shown in Table I in the first chapter. Table V presents details of the treatments used in the study.

Dependent Variables

Perceived risk was the main dependent variable in the experiment. It was measured directly as the overt response of the subjects to the treatments. Two measures of perceived risk were used. Researchers have used semantic differential scales of 5-points (Roselius 1971), 7-points (Peter and Ryan 1976), 9-points (Brooker 1983; Jacoby and Kaplan 1972), 11-points (Schaninger 1976), 16-points (Cunningham 1967), and a continuous scale divided into 100-points after the rating (Troutman and Shantau 1976), to measure the risk involved in or the preference for an alternative in a decision under uncertainty. It was decided to use 100-point continuous semantic differential scales with symmetric labels to measure "perceived financial risk" involved in each decision. These 100-point scales were chosen with the expectation that they would provide sufficient accuracy in the measurement of risk. Continuous scales were used to ensure that the scales were simple in appearance and in use, but still required some thinking on the part of the respondent before rating the risk perceived in each decision. One scale used

TABLE V

TREATMENTS USED IN THE STUDY

Experiments	Gambling	Industrial Purchasing
Factors in Each Experiment		
Repeated Applications of a Decision :		
Level 1	Single Decision	Single Decision
Level 2	Policy Decision	Policy Decision
Level 3	-	Mixed Decision
Probabilities of Loss (Pi):		
Level 1	.1	.1
Level 2	.4	.4
Level 3	.6	.6
Level 4	.9	.9
Values of Outcomes i.e. Losses (Vj):		
For Single Decision		
Level 1	$ 4,000	$ 4,000
Level 2	$ 6,000	$ 6,000
Level 3	$ 9,000	$ 9,000
Level 4	$ 36,000	$ 36,000
For Policy and Mixed Decisions		
Level 1	$ 40	$ 40
Level 2	$ 60	$ 60
Level 3	$ 90	$ 90
Level 4	$ 360	$ 360
Number of Repeated Applications of a Decision		
Single Decision	1	1
Policy and Mixed Decision	100	100

labels which were similar to those used by Jacoby and Kaplan (1972), except for the addition of the word "very". The scale is presented below:

Very Low Financial Risk — Very High Financial Risk

!....,....!....,....!....,....!....,....!....,....!
0 100

With a view to increase the accuracy of the ratings, a second scale was used to measure the "perceived importance of avoiding the financial risk" as an alternative measure of perceived risk. The scale is presented below:

Very Unimportant to Avoid the Financial Risk — Very Important to Avoid the Financial Risk

!....,....!....,....!....,....!....,....!....,....!
0 100

Control Variables

As discussed in the section on the nature of research and the choice of settings, in the case of the gambling experiment, the situational influences were controlled by specifying the gamble faced by the subject. The environmental influences were partially controlled through the choice of a homogeneous sample. The residual environmental effects and the personal influences were treated as background variables.

In the case of the organizational purchase situation, the

environmental, organizational, interpersonal, and personal influences were controlled throrgh careful narration of the simulated situation faced by the subject. Residual effects of these influences were treated as background variables.

Subjects

Graduate students were used as the subjects for this experiment. Of the total 75 subjects used, 35 were MBAs, 13 were PhD students in business, 17 were engineers, 8 were science majors, and 2 were from the mathematical sciences. Such a population fitted ideally the experiment involving a simulated industrial purchasing situation. The other experiment involving a gambling situation could use any homogeneous set of subjects. Thus, both experiments could be adequately conducted using graduate students as the subjects. Such a choice of subjects also ensured their homogeneity with respect to several background variables and environmental effects discussed earlier.

A nonprobability convenience sample of the subjects was used for the practical reason of feasibility. Such sampling is considered adequate for theory based research of this kind.

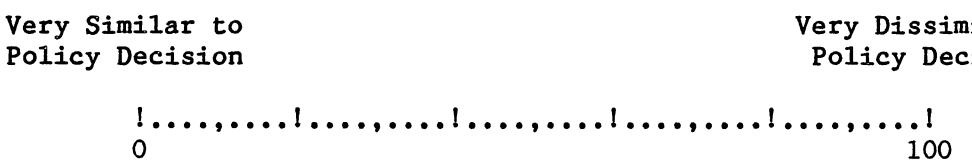
Fifteen subjects were used in each of the five decision situations, thus making a total sample size of 75 respondents. Each subject was randomly assigned to one of the five decision situations. Within each situation, each subject was sequentially presented with the sixteen different stimuli decisions resulting from the combination of four levels of P and V each. Each subject was asked to assess the risk involved in each of the sixteen stimuli decisions. To avoid any ordering effects, the stimuli were presented in a random order. This

was achieved by printing the sixteen stimuli descriptions on sixteen separate sheets of paper and collating them together in a random order. Two alternative measures of perceived risk were taken for each of the sixteen decisions from each respondent.

The instruments and the experimental procedure were pilot tested on a small sample of subjects from the same population to ensure that no unforeseen problems existed.

Manipulation Checks

The mixed decision situation of the study has several similarities to the two extreme cases of the single and the policy decision situations. Therefore, it was decided to use manipulation checks to verify whether the subjects (facing the mixed decision situation) were able to distinguish the mixed decision as a distinct category from single and policy decisions. This manipulation check was used only for those 15 subjects who faced the mixed decision situation in the industrial purchasing experiment. After completing all other tasks, these subjects were presented with narrations of single and policy decision situations. They were then asked to rate their perception of how similar the mixed decision situation was to the single and to the policy decision situation separately. A 100-point semantic differential scales were used for this purpose. The scales are shown below:



Very Similar to Single Decision — Very Dissimilar to Single Decision

!....,....!....,....!....,....!....,....!....,....!
0 100

Scenarios

The experiments required each subject to read the narration of one of the five decision situations in which he or she was placed. Thereafter, the subject read the details of each of the sixteen decisions arranged in a random order. After reading each decision he was asked to rate the level of risk perceived if that alternative was chosen. After completing the "perceived financial risk" ratings for all sixteen decisions, the subject was asked to go over the decisions for the second time to rate the "importance to him of avoiding the financial risk involved" in each decision alternative.

The gambling experiment asked the subjects to assume that they were faced with a gamble of the specified consequences. The single decision situation involved playing each gamble only once, whereas, the policy decision situation involved playing each gamble 100 times. Within each decision situation sixteen different gambles were described by specifying the probability and the value of financial loss in each gamble.

The industrial purchasing experiment described a hypothetical company and the environmental, organizational, interpersonal, and personal factors influencing its operations. Each subject was asked to play the role of the purchase manager of that company. The single decision situation involved the purchase of a single item of a capital equipment. The policy decision situation involved the purchase of 100

special purpose electric bulbs. The mixed decision situation involved entering into a contract to purchase 100 special purpose electric bulbs in 10 lots of 10 each to be supplied over a one year period. The risk in all the three situations resulted from the possibility of a catestrophic technical failure of the product. The sixteen decision alternatives were described by specifying the probability and the value of the financial loss in each case. Detailed instruments used for the study are presented in the Appendix.

Method of Analysis

The Unsuitability of Correlation and Multiple Regression Approaches

The research investigated, as its primary goal, the effect of the construct of the repeated applications of a decision on the models of information integration used by buyers in forming their risk perceptions. More specifically, the research focused on whether or not buyers use multiplicative models of information integration in combining Probability (P) and Value of Outcomes (V) information to form their risk perceptions in decisions differing on the repeated applications construct.

Formal models of judgment have been investigated by researchers in the past mainly through the correlation, and through the multiple regression techniques. Brunswick (1940) was one of the early researchers to suggest the use of the multiple regression model to investigate dependence relationships between variables. The model assumes that the decision maker's final judgment concerning the

criterion or dependent variable is a linear function of the cues or the independent variables upon which the judgment is based. The independent variables themselves either may have objective measures or may be scaled by the decision maker. This model has been used by several researchers in exploring dependence relationships (Dawes and Corrigan 1974; Slovic and Lichtenstein 1971).

The linear regression model has been fairly successful in reproducing the policy of the decision maker. In other words, given values of independent and dependent variables, a linear regression equation can be constructed which will capture the decision maker's cue utilization policy and predict the responses approximately at the actual level. However, the approach does have several inadequacies and problems associated with it. It has been shown that the linear regression model may fit well even if it does not provide an accurate description of the decision maker's cognitive process. This is because the model is very robust and hence insensitive to nonlinearity (Yntema and Torgerson 1961) and to variations in beta weights (Dawes and Corrigan 1974; Wainer 1976). The multiple regression or correlation approach uses r-square as an index of the goodness of fit to judge whether a particular combination rule is an adequate descriptor of the respondent's behavior. However, Anderson (1974d) has pointed out that degree of fit is inappropriate for judgments of model validity. These characteristics make it difficult to falsify a linear regression model. Thus, an apparent good fit of the model does not necessarily mean that it correctly describes the cognitive process.

One important objection to the regression approach concerns the manner in which the constructs are measured. Questioning the respondents

to measure their cognitive variables yields data about their cognitive structure rather than their cognitive processes (Bettman, Capon, and Lutz 1975b). This happens because, in most regression studies, the dependent and the independent variables are measured at the same point in time. Therefore, such studies in fact describe the cognitive structure of the respondent at that point of time. Such studies do not require the respondents to actually integrate information and record the results. Therefore, regression data cannot be used to draw causal inferences about the relationships between independent and dependent variables describing the cognitive processes.

Another problem typical of the linear regression approach is that it is necessary to assume in advance the nature of the scale on which the dependent variables are measured. The problem becomes even more serious in case of multiplicative models (as is the case with the expectancy theories) in which the dependent variables must be assumed to be measured on ratio scales. This condition is not fully met by the commonly-used semantic differential scales. Finally, the correlational approach is ill-suited to the study of the differences among the combination rules used by different individuals. The researcher must devise a model to represent each possible combination rule which might occur and assume that the model with the highest correlation is the most appropriate one (Bettman, Capon, and Lutz 1975b). In that sense, the regression approach requires a strictly deductive approach to understanding the cognitive processes. Birnbaum (1973) has shown that the regression approach is more likely to yield erroneous results when scaling problems are present.

Suitability of the Information Integration Theory Approach

Anderson (1968, 1974b, 1974c) proposed information integration theory as the means of constructing and testing simple algebraic models describing the cognitive algebra used by individuals to combine the information from multiple stimuli in various judgemental and decision making tasks. Since this approach ideally suited the nature of this research, the information integration approach was used in designing the study and in analyzing its findings. The following paragraphs briefly describe the basic principles of the information integration theory as applied to this research. For more detailed information the reader may refer to Anderson (1981, 1982).

The information integration theory conceptualizes the process of information integration in three stages: stimulus valuation, stimulus integration, and overt response formation. The formation of perceived risk through the integration of probabilistic information can be considered as an example of such process (Figure 3).

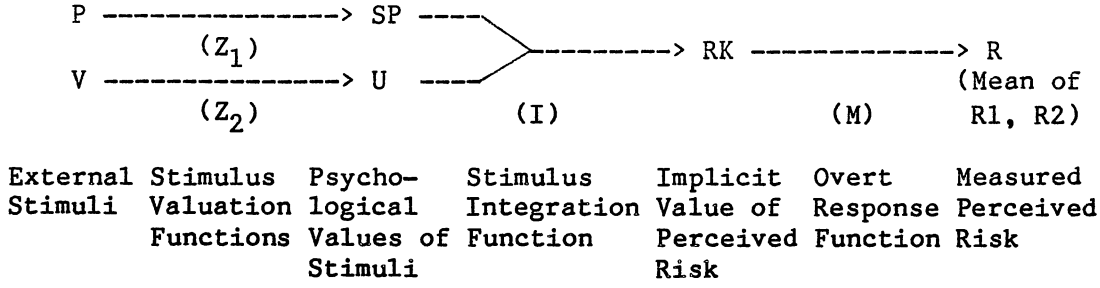


Figure 3. Stages in the Formation of Risk Perceptions through Integration of Probabilistic Information

Thus, in decisions under uncertainty, buyers receive the Probability (P) and the Value of Loss (V) as two external and measurable stimuli. These stimuli are received and processed by the stimulus valuation function (Z) into their psychological values namely, Subjective Probability (SP) and Utility (U) respectively. In the next stage, these psychological stimuli (SP and U) are combined by the stimulus integration function (I) into the Implicit Value of Perceived Risk (RK). This implicit response is then externalized by the overt response function (M) into a Measurable Value of Perceived Risk (R). In this research, the implicit value of perceived risk RK was measured by two overt response measures of perceived risk (R1 and R2) which were combined into their mean value (R). Thus, the primary focus of the research was to investigate the nature of the relationship between SP, U, and RK all of which are unobservable psychological variables. However, such investigation requires the resolution of three interlocked problems, corresponding to the three stages of information integration:

1 Measuring the psychological values of the stimuli

2 Measuring the psychological values of the response

3 Determining the psychological law or the stimulus integration function I

Empirical investigation has shown (Anderson 1981) that stimulus integration often obeys simple algebraic rules such as adding, subtracting, averaging, and multiplying the stimulus information to arrive at a response. Such models assume that the various psychological variables involved can be measured on numerical scales. In the traditional regression or correlation approaches, the testing of these models starts with development of scales for the psychological variables

as the first step. These scales are then used to measure the variables and test the relationships hypothesized by the theory and the models. While such an approach has worked in the physical sciences, it has met with little success in psychological investigations.

In contrast, the knowledge about the cognitive algebra used by individuals allows the functional measurement technique to provide a joint solution to all the three problems. Functional measurement is based on the premise that the stimulus integration function implicitly contains the measurement scales for the psychological stimuli SP and U and the psychological response RK. In other words, the development of the scales for the psychological variables and the investigation of the integration function are intimately and integrally related aspects of one single process. Therefore, if the integration function is confirmed as being valid, then it can be used to scale the psychological variables because it is the function that makes the data on the observable stimulus and response variables fit the functional form. Thus, the term functional measurement is derived from the basic principle of this approach that the measurement of psychological variables can be achieved through the investigation of the form of the integration function.

Application of Information Integration Approach to the Investigation of Multiplicative Models

The focus of the research was on the investigation of the validity of multiplicative as opposed to nonmultiplicative models of information integration in decisions differing on the repeated applications construct. Because the study used two outcome decisions with one negative and one null outcome, the multiplicative integration function

can be represented as:

$$RK_{ij} = SP_i * U_j$$

Where SP_i and U_j are the psychological values of P_i and V_j respectively (Figure 3).

The Linear Fan Theorem proposed by Anderson (1981) states that if the multiplicative model is true, and if the observable response R is a linear function of RK, then (a) the appropriate factorial plot of the data will form a fan of straightlines, (b) the row means of the factorial design will be estimates of the subjective values of the row stimuli on linear scales, and (c) the column means of the factorial design will be estimates of the subjective values of the column stimuli on linear scales.

The theorem can be proved quite easily. The assumption that the observable response R is a linear function of RK means:

$$R_{ij} = C_0 + C_1 * RK_{ij}$$

Using the multiplicative model above, it can be written as:

$$R_{ij} = C_0 + C_1 * SP_i * U_j$$

Thus, for a given value of Uj, the values of R_{ij} (on y axis) for different values of SP_i (on x axis) will plot as straight lines with C_0 as the intercept and $C_1 * U_j$ as the slope. Therefore, different values of U_j would produce different straight lines all with an identical intercept of C_0 but with different slopes, forming a linear fan.

All that is needed for such a plot is the values of SP_i. However, obtaining a linear function of SP_i would also suffice. In the design of this study both i and j took values from 1 to 4. Therefore, taking the mean of Rij values over all j's in each row i it can be written:

$$\text{Mean } R_{i.} = (1/4)\Sigma_j R_{ij}$$

$$= (1/4)\Sigma_j C_0 + C_1 * SP_i * U_j$$

$$= C_0 + C_1 * SP_i * (\text{Mean } U)$$

$$= C_0 + C_2 * SP_i$$

Where, $C_2 = C_1 * (\text{Mean } U)$.

Thus, row means of R_{ij} (i.e., Mean $R_{i.}$) values are linear functions of the row stimuli. By symmetry, the same holds for the column means.

Thus, using row means of the observed values (Rij) of perceived risk as the estimates of the unobservable SPi values, a plot of Mean Ri. vs Rij for various values of j should produce a linear fan. The linear fan theorem thus provides a simple way to test the validity of multiplicative models. All that is required is to run an experiment and plot the data. An observed linear fan accomplishes three simultaneous goals:

1 It supports the multiplicative model.

2 It supports the linearity of the observed response scale with respect to the unobservable psychological response.

3 It provides linear scales for the stimulus variables.

Even though such a graphical test is simple to administer, it is a very stringent test. Thus, for a data set even if one point deviates from the linear fan pattern, the multiplicative model is rejected. Such test is almost sure to reject the multiplicative model in most practical problems due to the fact that only rarely will a data set exactly conform to a multiplicative model. Further, such a test is not able to verify how closely a data set fits the multiplicative model except by an eyeball inspection. Therefore, the graphical test has to be supplemented by a more precise statistical test using analysis of

variance (ANOVA). This is achieved by constructing an ANOVA table for the observed values of perceived risk Rij with the treatments organized in two factors V and P. The two factor interaction term is split into a Linear * Linear or Bilinear component and the residual. The bilinear component represents the linear fan pattern; the residual represents deviations from the linear fan. Therefore, a complete test in favor of multiplicative model requires a significant bilinear component and a nonsignificant residual.

Shanteau (1984b) has discussed in detail the various conditions that must be met to confirm or reject multiplicative models of information integration. The conditions are summarized for single subject and group level ANOVA results as presented in Table VI. Thus, for single subject data, the multiplicative model is confirmed if the main effects of V and P are significant and the interaction V * P is significant. Further it is necessary that only the bilinear component of the interaction is significant and the residual component is nonsignificant. The multiplicative model is rejected if the interaction V * P is nonsignificant. In such a case the main effects of V and P may or may not be significant. In the case of group data, the conditions are similar. However, there is no single residual term to test for nonlinearity because each term must be tested against its own interaction with the subjects (Anderson 1974a). Among the several residual components the Linear * Quadratic, Quadratic * Linear, and Quadratic * Quadratic components must be necessarily nonsignificant in a multiplicative model. As far as the remaining residual components are concerned, it is desirable, but not necessary, that the remaining residual components are also nonsignificant.

TABLE VI

NECESSARY AND SUFFICIENT CONDITIONS FOR CONFIRMING OR REJECTING MULTIPLICATIVE MODELS OF INFORMATION INTEGRATION

V = main effect of the Value of Loss Vi
P = main effect of the Probability of Loss Pj
L = linear component
Q = quadratic component
C = cubic component
L * L = Bilinear component of the interaction
S = significant
NS = nonsignificant

Source	Single Subject ANOVA for Multiplicative Model's		Group ANOVA for Multiplicative Model's	
	Confirmation	Rejection	Confirmation	Rejection
V	S	S or NS	S	S or NS
P	S	S or NS	S	S or NS
V * P	S	NS	S	NS
Components of V * P				
L * L (Bilinear)	S		S	
Non-Bilinear Residual	NS			
L * Q			NS	
Q * L			NS	
Q * Q			NS	
Remaining Interaction Components Taken Individually			Desirable but not necessary to be NS	

From an experimental perspective, the functional measurement approach involves constructing an experiment in which the independent variables are manipulated to generate stimuli. The subjects are exposed to these stimuli and allowed to form their responses. The overt responses are measured on a numerical scale. These responses are then analyzed to develop a scale for the dependent psychological variables and at the same time to validate the model.

The functional measurement techniques typically use full factorial design, quantitative response measures, and monotone rescaling procedures for the dependent response variables. Neither a quantitative response nor a factorial design are strictly necessary (Friedman, Carterette, and Anderson 1968), but they have strong advantages. Further, they have been used in most of the work to date. The technique also makes use of analysis of variance, although for a somewhat different purpose than the usual test of significance (Anderson 1969a).

The functional measurement approach overcomes many of the shortcomings and inadequacies of the linear regression approach. The technique explores relationships between variables without making any assumptions about the scaling of the dependent variables. Further, it allows direct test of the theoretical model and, more importantly, tests for significant deviations from the model. The functional measurement approach analyzes the different patterns of results in the ANOVA to identify the different combination rules used by respondents. Further, the ANOVA task directly studies the actual integration of cognitive components.

The functional measurement technique has been successfully used in studies involving validation and scaling of cognitive processes

(Anderson and Shanteau 1970; Bettman 1975; Bettman, Capon, and Lutz 1975a, 1975b; Lanzetta and Driscoll 1968; Slovic and Lichtenstein 1968a; Troutman and Shanteau 1976; Tversky 1967a, 1967b).

The preceding discussion shows that the functional measurement technique was ideally suited for this research. It also explains the basic principles and the method of analysis used by this technique. Table VII presents the nomencleature for all the important variables involved in the study designed on the basis of the information integration theory approach.

Tests Used for the Research Hypotheses

Based on the preceding discussion, the tests used for the various research hypotheses of the study are explained below. The study obtained two measures of perceived risk: $R1_{mij}$ and $R2_{mij}$. $R1_{mij}$ measured the "perceived financial risk" and $R2_{mij}$ measured the "importance of avoiding the financial risk". The mean value of the two measures (denoted by R_{mij}) was computed and used as an overall measure of perceived risk. All the research hypotheses were tested using the overall measure of perceived risk so obtained. Thus, the two measures of perceived risk were treated as two replications of the experiment for the purpose of analysis. The internal consistency of the two measures of perceived risk was tested by computing, separately for each decision situation, their correlation and the significance of the replicates interactions with the three treatement factors in the analysis of variance. The section is organized in two subsections: one covering the hypotheses concerning the process of information integration and the other covering the hypotheses concerning the level of perceived risk in

TABLE VII

NOMENCLATURE FOR THE DEPENDENT AND THE INDEPENDENT VARIABLES INVOLVED IN THE STUDY

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i = subscript used to indicate different levels of P (1 to 4)
j = subscript used to indicate different levels of V (1 to 4)
m = subscript used to identify one of the five unique situations defined by the type of experiment and the type of treatment (1 to 5)
P_{mi} = probability
V_{mj} = value of the outcome (financial loss)
N = number of repeat applications of the policy decision
$R1_{mij}$ = externally measured perceived financial risk ..... direct measure
$R2_{mij}$ = externally measured perceived importance of avoiding the financial loss ..... indirect measure
R_{mij} = mean of $R1_{mij}$ and $R2_{mij}$
Y_m = mean of R_{mij} for situation m
SP_{mi} = subjective probability
U_{mj} = utility of the financial loss involved
RK_{mij} = psychological value of perceived risk response

TABLE VII (Continued)

		REPEATED APPLICATION OF THE DECISION		
		Single Decision	Policy Decision	Mixed Decision
EXPERIMENTS				
1. Gambling Experiment		SITUATION 1 (m=1)	SITUATION 2 (m=2)	
External				
Repetitions	N	1	100	
Stimuli	P_{mi}	P_{1i}	P_{2i}	
	V_{mj}	V_{1j}	V_{2j}	
Response	$R1_{mij}$	$R1_{1ij}$	$R1_{2ij}$	
	$R2_{mij}$	$R2_{1ij}$	$R2_{2ij}$	
Computed	R_{mij}	R_{1ij}	R_{2ij}	
	Mean	Y_1	Y_2	
Psychological				
Stimuli	SP_{mi}	SP_{1i}	SP_{2i}	
	U_{mj}	U_{1i}	U_{2j}	
Response	RK_{mij}	RK_{1ij}	RK_{2ij}	
2. Industrial Purchasing Experiment		SITUATION 3 (m=3)	SITUATION 4 (m=4)	SITUATION 5 (m=5)
External				
Repetitions	N	1	100	100
Stimuli	P_{mi}	P_{3i}	P_{4i}	P_{5i}
	V_{mj}	V_{3j}	V_{4j}	V_{5j}
Response	$R1_{mij}$	$R1_{3ij}$	$R1_{4ij}$	$R1_{5ij}$
	$R2_{mij}$	$R2_{3ij}$	$R2_{4ij}$	$R2_{5ij}$
Computed	R_{mij}	R_{3ij}	R_{4ij}	R_{5ij}
	Mean	Y_3	Y_4	Y_5
Psychological				
Stimuli	SP_{mi}	SP_{3i}	SP_{4i}	SP_{5i}
	U_{mj}	U_{3i}	U_{4j}	U_{5j}
Response	RK_{mij}	RK_{3ij}	RK_{4ij}	RK_{5ij}

different decision situations.

Models of Information Integration Used by Buyers in Different Decision Situations-- Hypotheses A1, A2, and A3

Hypotheses A1, A2, and A3 predict the information integration models or the cognitive algebra used by buyers in forming their risk perceptions in different decision situations. The information integration theory approach and the functional measurement technique were used to test these hypotheses using analysis of variance. Specifically, the computer program package FM#1 developed by Shanteau (1984a) was used. The structure of the group and the single subject ANOVA tables to be obtained from the data analysis is indicated in Table VIII. The three hypotheses were tested separately in the gambling and in the industrial purchasing experiments. The following paragraphs describe the method of testing the research hypotheses.

Hypothesis A1 predicts that in the case of policy decisions, buyers will tend to use multiplicative expectancy models in forming their risk perceptions. This hypothesis would be confirmed if the group ANOVA supported a multiplicative model and a majority of the single subject ANOVAs also supported the use of multiplicative models by the subjects.

Hypothesis A2 predicts that in the case of mixed decisions, buyers will tend to use multiplicative models to a lesser extent as compared to the policy decisions. This hypothesis would be confirmed if, at the single subject level, the number of subjects using multiplicative models was still large but was less than that in the policy decision situation. At the group level, such data should support a multiplicative model.

TABLE VIII

STRUCTURE OF THE GROUP AND THE SINGLE SUBJECT ANOVA TABLES

(A) Structure of the group ANOVA for each of the 5 Decision Situations

Source	Degrees of Freedom (DF)
Mean	1
Subjects (S'S)	14
V	3
S'S * V	42
P	3
S'S * P	42
V * P	9
S'S * V * P	126
Replicates (RPLS)	1
S'S * RPLS	14
V * RPLS	3
S'S * V * RPLS	42
P * RPLS	3
S'S * P * RPLS	42
V * P * RPLS	9
S'S * V * P * RPLS	126
Total	480
Components of V * P	
Linear * Linear (L)	1
S'S * L * L	14
L * Quadratic (Q)	1
S'S * L * Q	14
L * Cubic (C)	1
S'S * L * C	14
Q * L	1
S'S * Q * L	14
Q * Q	1
S'S * Q * Q	14
Q * C	1
S'S * Q * C	14
C * L	1
S'S * C * L	14
C * Q	1
S'S * C * Q	14
C * C	1
S'S * C * C	14

TABLE VIII (Continued)

(B) Structure of the Single Subject ANOVA for Each of the 75 Subjects

Source	Degrees of Freedom (DF)
Mean	1
V	3
P	3
V * P	9
Error	16
Total	32
Components of V * P	
Linear * Linear	1
Residual	8

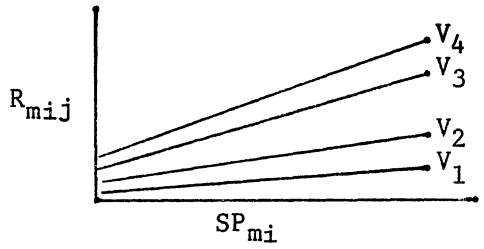

Figure 4. Linear Fan of Subjective Probabilities (SP_{mi} as Estimated by Mean $R_{mi.}$) versus Perceived Risk (R_{mij}) for Various Values of Utility (U_{mj}) in Multiplicative Models

Hypothesis A3 predicts that in the case of single decisions, buyers will tend not to use multiplicative expectancy models in forming their risk perceptions. This hypothesis would be confirmed if the group ANOVA as well as a majority of the single subject ANOVAs rejected the

multiplicative models in favor of nonmultiplicative models.

Graphical analysis was also used at the group level to test for the linear fan in support of the multiplicative model. The, hypotheses A1 and A2 would be confirmed if the group data produced linear fan as indicated in Figure 4. Hypothesis A3 would be confirmed if the group data did not produce a linear fan as indicated in Figure 4.

Level of Risk Perceived by Buyers in Different Decision Situations - Hypotheses A4 and A5

Hypothesis A4 predicts that buyers will perceive the highest risk in single decisions, moderate risk in the policy decisions, and the lowest risk in the mixed decisions with equal expected values. This hypothesis was tested separately in the gambling and in the industrial purchasing experiments, with the single, the policy, and the mixed decision situations being represented as the treatments. The structure of the ANOVA tables for the two experiments is presented in Table IX. The significance of the treatment effects was tested by the F test. Further, the Least Significant Difference (LSD) test was used to test the differences in the mean perceived risk (Y_m) under the different treatments (Steel and Torrie 1980). The hypothesis (A4) would be supported if the tests confirmed the following inequalities as statistically significant.

Perceived Risk Gambling Single Decision (Y_1)	>	Perceived Risk Gambling Policy Decision (Y_2)		
Perceived Risk Industrial Single Decision (Y_3)	>	Perceived Risk Industrial Policy Decision (Y_4)	>	Perceived Risk Industrial Mixed Decision (Y_5)

TABLE IX

STRUCTURE OF THE ANOVAS FOR THE TWO EXPERIMENTS OF THE STUDY

(A) Structure of the Gambling Experiment ANOVA

Source	Degrees of Freedom (DF)	Treatments
Mean	1	1 Single Decision
Subjects	29	2 Policy Decision
Treatments	1	
Error	929	
Total	960	

(B) Structure of the Industrial Purchasing Experiment ANOVA

Source	Degrees of Freedom (DF)	Treatments
Mean	1	1 Single Decision
Subjects	44	2 Policy Decision
Treatments	2	3 Mixed Decision
Error	1393	
Total	1440	

Hypothesis A5 predicts that consumers will perceive a different amount of risk in the gambling setting as compared to the perceived risk in the industrial purchasing setting. This hypothesis was tested by constructing an ANOVA table for the total study with the five decision situations being represented as the treatments. The structure of the ANOVA is presented in Table X. The significance of the treatment effects was tested by the F test. Further, the LSD test was used to test the differences in the mean perceived risk (Y_m) under the different treatments. The hypothesis would be supported if the tests confirm the following inequalities as statistically significant.

Perceived Risk Gambling Single Decision (Y_1)	$\neq$	Perceived Risk Industrial Single Decision (Y_3)
Perceived Risk Gambling Policy Decision (Y_2)	$\neq$	Perceived Risk Industrial Policy Decision (Y_4)

TABLE X

STRUCTURE OF THE ANOVA FOR THE TOTAL STUDY

Source	Degrees of Freedom (DF)	Treatments
		1 Gambling Single Decision
Mean	1	2 Gambling Policy Decision
Subjects	74	3 Industrial Single Decision
Treatments	4	4 Industrial Policy Decision
Error	2321	5 Industrial Mixed Decision
Total	2400	

CHAPTER IV

RESULTS OF THE STUDY

Overview

This chapter presents the results of the study and the tests of the various research hypotheses. The internal consistency of the two measures of perceived risk was tested through correlation and analysis of variance in each of the five decision situations. The strong correlations and the nonsignificance of most of the replicates' interactions indicated that the two measures were internally consistent. The research hypotheses of this study stated and developed in the Introduction and the Literature Review chapters can be grouped into two categories. Hypotheses A1, A2, and A3 form the first category and predict the information integration models or the cognitive algebra used by buyers in forming their risk perceptions in different purchase situations. These hypotheses were tested at the group as well as at the individual subject level. Of these, Hypotheses A1 and A3 were tested in both the experiments: the gambling experiment and the industrial purchasing experiment. Hypothesis A2 could be tested only in the industrial purchasing experiment. The results offer strong evidence in support of all the three hypotheses. In policy decision situations, the subjects tended to use multiplicative expectancy models in forming their risk perceptions. On the other hand, in single decision situations the subjects tended not to use multiplicative models in forming their risk

perceptions. In mixed decisions, the subjects tended to use expectancy models to a lesser extent than in the policy decisions.

Hypotheses A4 and A5 relate to the level of risk perceived by buyers in different purchase situations and form the second category of hypotheses. Both these hypotheses were tested at the group level. Of these, Hypothesis A4 was tested separately in the gambling and in the industrial purchasing experiments. The results offered strong support to the hypothesis. The subjects perceived the highest risk in single decisions, moderate risk in policy decisions and the lowest risk in mixed decisions of equal expected value. Hypothesis A5 was tested by comparing the two single decision situations and the two policy decision situations of the study separately. The results strongly supported the hypothesis. The subjects perceived different amounts of risk in the gambling and in the industrial purchasing situations.

The confirmation of first four hypotheses in both the experiments, considered collectively can lead to the conclusion that the use of either setting does not affect the information integration process or the relative levels of risk both of which primarily depend upon the nature of the decision involved. However, the confirmation of the fifth hypothesis suggests that the actual level of perceived risk does change with the use of different settings. Therefore, when the research objective is to predict the actual level of risk perceived, the gambling settings should not be used as substitutes to the industrial purchasing settings.

This chapter is organized in eight sections. The first section presents the results of the internal consistency tests for the two perceived risk measures. The next five sections discuss the results of

the five hypotheses of the dissertation in sequence. The seventh section discusses the results of the graphical analysis for the first three hypotheses. The eighth section summarizes the results.

Table XI presents the summary of the important F ratios extracted from the ANOVA tables for the group data in each of the five decision situations and the results of the tests of significance conducted on the F ratios.

Table XII presents a summary of important F ratios extracted from the ANOVA tables for the single subject data for each of the five decision situations and the results of the tests of significance conducted of the F ratios.

The discussion in this chapter is primarily based on Table XI and Table XII. All significance tests were conducted by using .05 as the critical value for a Type I error.

Internal Consistency Tests for the Two Perceived Risk Measures

Correlation coefficients were computed separately in each of the five decision situations for the two perceived risk measures, $R1_{mij}$ and $R2_{mij}$. Their values for Situations 1 to 5 were 0.79904, 0.92184, 0.62051, 0.95469, and 0.93462 respectively, providing evidence of the internal consistency of the two measures. The lowest value was observed in the industrial single decision situation which was treated as a random occurrence since there were no specific reasons that could be ascribed to it. Consistent with these results, in the group ANOVAs for the five decision situations only one of the fifteen terms of interaction between the replicates and the treatment factors was

significant (F .05,DF=3,42 = 4.3739). Thus, the statistical tests offered a strong support for the internal consistency of the two measures of perceived risk.

Information Integration Models Used by Buyers in Policy Decisions : Hypothesis A1

Hypothesis A1 states that in purchase situations involving policy decisions, buyers will tend to use multiplicative expectancy model in forming their risk perceptions. Such a model can be represented as:

Perceived Risk (RK_{ij}) = - Subjectively Expected Utility

$$= - SP_i * U_j$$

Using the principles of the information integration theory (Anderson 1962b) and the functional measurement technique (Shanteau 1984b), Table VI in the Methodology chapter presented the necessary and sufficient conditions for confirming or rejecting the multiplicative model for single subject and group ANOVAs. Using those conditions the results of the tests for Hypothesis A1 are discussed below.

Gambling Experiment - Policy Decision Situation

(Situation No. 2 in Tables XI and XII)

In the case of the gambling policy decision situation at the group level (Table XI), the main effects of Value of the Outcomes (V) and Probability (P) were significant, the interaction (V*P) was significant and was concentrated only in the bilinear component. All other components of the interaction were individually nonsignificant. The data thus satisfied all the conditions for confirming a multiplicative model. Thus, in the gambling policy decision, the multiplicative

TABLE XI

RESULTS OF ANOVA FOR FIVE DECISION SITUATIONS AT GROUP LEVEL

V = main effect of the Value of Loss (V_j)
P = main effect of the Probability of Loss (P_i)
L = linear component
Q = quadratic component
C = cubic component
s = significant at .05
E = exponent of 10 (= 10 raised to the power of)

Experiment Situation No.		Gambling		Industrial Purchasing			F .05 Ratios Required for Significance
Source	DF	Single 1	Policy 2	Single 3	Policy 4	Mixed 5	
(A) F Ratios and Significance of Various Treatment Effects							
V	3,42	53.2461 s	102.2981 s	93.5263 s	79.4581 s	73.2318 s	2.84
P	3,42	82.8776 s	70.1957 s	91.8943 s	103.1414 s	68.9453 s	2.84
V*P	1,126	.6097	2.9224 s	1.4295	7.7970 s	15.1071 s	1.88
L*L	1,14	.2257	5.7292 s	.3068	10.9564 s	51.2987 s	4.60
L*Q	1,14	2.5183	.1856	2.8114	1.5561	.1770	4.60
L*C	1,14	.2337	2.8096	.9269	.2489	1.6749	4.60
Q*L	1,14	1.2587	3.5101	4.3571	.6203	3.0693	4.60
Q*Q	1,14	.1112	.0436	.6421	1.5000	.0418	4.60
Q*C	1,14	2.2826	1.4557	1.3696	8.8641 s	3.5306	4.60
C*L	1,14	.0758	1.2317E-3	1.6780	.0620	7.6111E-4	4.60
C*Q	1,14	.1143	2.5187	.3954	.0108	6.0308 s	4.60
C*C	1,14	.0752	1.6781	.8109	3.8025	.3654	4.60
(B) Mean Perceived Risk (Y_m)							
		56.119	46.696	51.167	34.567	21.438	

TABLE XII

RESULTS OF ANOVA FOR FIVE DECISION SITUATIONS AT SINGLE SUBJECT LEVEL

E = exponent of 10 (= 10 raised to the power of)
Models: M = Multiplicative MS = Multiplicative Superimposed by
NM = Nonmultiplicative Non-bilinear Interactions

Source	V	P	V * P	L * L	Residue	Model
DF	3,16	3,16	9,16	1,16	8,16	
F .05	3.24	3.24	2.54	4.49	2.59	
1 Gambling Experiment - Single Decision Situation						
1	6.53 s	35.86 s	1.01	.01	1.14	NM
2	6.03 s	12.79 s	.28	.56	.24	NM
3	.65	2.08	.20	9.87E-4	.23	NM
4	2.86	2.37	.11	.32	.09	NM
5	66.66 s	22.56 s	1.69	2.65	1.55	NM
6	18.29 s	19.95 s	1.03	5.65 s	.45	NM
7	7.26 s	6.71 s	.36	.08	.39	NM
8	13.08 s	12.68 s	.57	2.25	.36	NM
9	16.32 s	33.28 s	2.29	10.55 s	1.26	NM
10	4.73 s	10.54 s	.98	4.64 s	.52	NM
11	1.96	4.53 s	.28	.90	.20	NM
12	9.87 s	86.50 s	.64	.53	.65	NM
13	1.50	38.67 s	.88	.10	.97	NM
14	388.07 s	128.35 s	3.90 s	19.12 s	1.99	M
15	1391.08 s	697.49 s	235.20 s	2058.66 s	7.26 s	MS
2 Gambling Experiment - Policy Decision Situation						
1	13.25 s	84.17 s	2.78 s	11.35 s	1.70	M
2	187.23 s	95.20 s	3.13 s	21.44 s	.84	M
3	420.03 s	131.22 s	3.76 s	17.91 s	1.99	M
4	229.03 s	98.03 s	9.27 s	50.45 s	4.12 s	MS
5	423.72 s	120.56 s	10.51 s	88.30 s	.79	M
6	634.97 s	170.27 s	13.98 s	115.18 s	1.33	M
7	20.10 s	85.97 s	2.72 s	5.72 s	2.34	M
8	53.87 s	41.36 s	2.66 s	5.64 s	2.28	M
9	337.31 s	108.75 s	8.28 s	66.71 s	.97	M
10	515.06 s	140.15 s	10.76 s	87.57 s	1.16	M
11	8.07 s	65.41 s	1.17	3.28	.90	NM
12	21.65 s	134.17 s	1.13	3.47	.83	NM
13	6.43 s	43.81 s	.52	1.54	.39	NM
14	11.91 s	53.48 s	1.02	1.85	.92	NM
15	7.30 s	25.08 s	.88	.75	.90	NM

TABLE XII (Continued)

E = exponent of 10 (= 10 raised to the power of)
Models: M = Multiplicative MS = Multiplicative Superimposed by
NM = Nonmultiplicative Non-bilinear Interactions

Source	V	P	V * P	L * L	Residue	Model
DF	3,16	3,16	9,16	1,16	8,16	
F .05	3.24	3.24	2.54	4.49	2.59	
3 Industrial Purchasing Experiment - Single Decision Situation						
1	12.78 s	42.09 s	.60	.64	.59	NM
2	6.95 s	9.09 s	.15	1.35E-3	.17	NM
3	6.95 s	8.46 s	.83	1.33	.77	NM
4	27.19 s	18.91 s	.58	1.67	.44	NM
5	1.62	2.52	1.26	.79	1.32	NM
6	4.35 s	4.67 s	.10	.50	.05	NM
7	.73	6.61 s	.70	.38	.74	NM
8	10.72 s	1.92	.85	1.24	.81	NM
9	32.77 s	40.53 s	.57	3.25	.23	NM
10	33.25 s	64.34 s	.38	.03	.43	NM
11	13.58 s	53.12 s	.85	.17	.93	NM
12	1.98	1.91	.14	.01	.15	NM
13	5.55 s	8.99 s	.38	.17	.41	NM
14	5.22 s	59.16 s	1.19	1.21	1.19	NM
15	39.40 s	26.18 s	6.38 s	26.13 s	3.91 s	M
4 Industrial Purchasing Experiment - Policy Decision Situation						
1	70.18 s	17.57 s	3.74 s	18.98 s	1.83	M
2	1006.33 s	371.30 s	107.36 s	965.25 s	.12	M
3	71.65 s	50.51 s	6.58 s	48.72 s	1.31	M
4	23443.78 s	8798.44 s	2689.56 s	24186.24 s	2.47	M
5	176.01 s	177.83 s	18.54 s	146.24 s	2.57	M
6	96.51 s	119.73 s	2.78 s	20.81 s	.52	M
7	130.50 s	267.56 s	4.89 s	38.45 s	.70	M
8	71.65 s	50.51 s	6.58 s	48.72 s	1.31	M
9	7821.40 s	3405.58 s	831.06 s	7463.67 s	1.98	M
10	1638.46 s	764.20 s	210.59 s	1890.57 s	.59	M
11	41.87 s	360.39 s	7.21 s	55.56 s	1.17	M
12	112.96 s	280.26 s	5.98 s	49.68 s	.52	M
13	666.07 s	207.13 s	17.63 s	148.13 s	1.31	M
14	7.16 s	21.05 s	1.73	9.62	.74	NM
15	2.25	8.41 s	1.18	2.41	1.03	NM

TABLE XII (Continued)

E = exponent of 10 (= 10 raised to the power of)
Models: M = Multiplicative MS = Multiplicative Superimposed by
NM = Nonmultiplicative Non-bilinear Interactions

Source	V	P	V * P	L * L	Residue	Model
DF	3,16	3,16	9,16	1,16	8,16	
F .05	3.24	3.24	2.54	4.49	2.59	
5 Industrial Purchasing Experiment - Mixed Decision Situation						
1	32.80 s	39.22 s	2.07	15.32	.42	NM
2	71.72 s	66.85 s	5.03 s	38.40 s	.86	M
3	25.90 s	48.53 s	1.01	6.61 s	.31	NM
4	7.55 s	9.15 s	.09	.44	.05	NM
5	10.66 s	28.44 s	1.16	9.82 s	.07	NM
6	49.54 s	101.65 s	3.30 s	22.46 s	.91	M
7	39.12 s	318.18 s	6.84 s	54.55 s	.88	M
8	72.61 s	83.93 s	1.99	2.89	1.88	NM
9	41.72 s	78.90 s	1.92	9.40 s	.99	NM
10	87.71 s	55.85 s	.63	4.71 s	.12	NM
11	5.03 s	29.67 s	.48	2.98	.17	NM
12	65.17 s	64.61 s	2.26	6.39 s	1.75	NM
13	61.78 s	205.81 s	.92	.27	1.00	NM
14	52.47 s	130.68 s	2.83 s	23.49 s	.24	M
15	32.32 s	31.34 s	1.45	11.07 s	.25	NM

expectancy model offered a good fit at the group level.

Applying the criteria to the single subject ANOVAs (Table XII), in the case of 10 out of total 15 subjects, the main effects of V and P as well as the interaction V*P were significant. Of these, 9 subjects had the interaction concentrated only in the bilinear component with the residual nonsignificant indicating a good fit of the multiplicative expectancy model. In the case of one subject, both the bilinear as well as the non-bilinear components of the interaction were significant, indicating the superimposition of higher order interactions on the multiplicative model. In the case of the remaining 5 subjects, only the main effects of V and P were significant with the interaction V*P nonsignificant, indicating the use of nonmultiplicative models.

Industrial Purchasing Experiment - Policy Decision Situation (Situation No. 4 in Tables XI and XII)

In the case of industrial policy decision situation at the group level (Table XI), the main effects of V and P were significant. The interaction V*P was also significant. Among the components of the interaction, the bilinear component was significant and the Linear * Quadratic, Quadratic * Linear, and Quadratic * Quadratic components were nonsignificant. Thus, all important conditions necessary for confirming a multiplicative model were satisfied. However, ideally the strongest support for a multiplicative model is provided when all non-bilinear components of the interaction are nonsignificant. This condition was met with one exception. In addition to the bilinear component one more component of the interaction, namely the Quadratic * Cubic component

also was significant. Therefore, it can be concluded that in the case of industrial policy decision the multiplicative expectancy model offered a good fit at the group level. However the model was superimposed by a higher order non-bilinear interaction.

At the single subject level (Table XII), the main effects of V and P as well as the interaction V*P were significant for 13 subjects. In all 13 cases the interaction was concentrated only in the bilinear component and the residue was nonsignificant indicating a good fit of the multiplicative expectancy model. In the case of the remaining 2 subjects, the interaction V*P was nonsignificant indicating the use of nonmultiplicative models. Of these two subjects, one had both the main effects of V and P significant. The other had only the main effect of P significant.

Overall, it can be concluded that Hypothesis A1 was strongly supported in the gambling and the industrial policy decisions at the group level as well as at the individual level, indicating that the subjects tended to use the multiplicative expectancy model in forming their risk perceptions in policy decisions.

Information Integration Models Used by Buyers in Mixed Decisions : Hypothesis A2

Hypothesis A2 states that in purchase situations involving mixed decisions, buyers will tend to use the multiplicative expectancy model, but to a lesser extent as compared to the policy decisions in forming their risk perceptions. Such a model can be represented as:

Perceived Risk (RK_{ij}) = - Subjectively Expected Utility

$$= - SP_i * U_j$$

In other words, the hypothesis predicts that at the group level the multiplicative model will apply. At the single subject level the number of subjects conforming to the multiplicative model should be large but lesser than that in single decision situation. The various tests conducted for Hypothesis A2 are discussed below.

Industrial Purchasing Experiment - Mixed Decision Situation (Situation No. 5 of Tables XI and XII)

In the case of industrial mixed decision situation at the group level (Table XI), the main effects of V and P were significant. The interaction V*P was also significant. Among the components of the interaction, the bilinear component was significant and the Linear * Quadratic, Quadratic * Linear, and Quadratic * Quadratic components were nonsignificant. Thus, all important conditions necessary for confirming a multiplicative model were satisfied. However, ideally the strongest support for a multiplicative model is provided when all non-bilinear components of the interaction are nonsignificant. This condition was met with one exception. In addition to the bilinear component, one more component of the interaction (namely the Cubic * Quadratic component) also was significant. Therefore, it can be concluded that in the case of industrial mixed decision the multiplicative expectancy model offered a good fit at the group level. However, the model was superimposed by a higher order non-bilinear interaction.

At the single subject level, Table XII shows that in the case of four subjects the main effects of V and P as well as the interaction V*P were significant. Further, in all four cases the interaction was concentrated in the bilinear component and the residue was

nonsignificant indicating a good fit of the multiplicative expectancy model. In the case of the remaining 11 subjects, only the main effects of V and P were significant and the interaction V*P was nonsignificant indicating the use of nonmultiplicative models.

Overall, it can be concluded that Hypothesis A2 was supported by the use of multiplicative model at the group level and by the mixed use of expectancy as well as nonmultiplicative models by the respondents at the single subject level. Therefore, it can be inferred that in mixed decision situations the subjects used multiplicative expectancy models to a lesser extent as compared to the policy decisions.

In the case of 15 subjects who faced the mixed decision situation, manipulation checks were used to investigate whether the subjects were able to distinguish the mixed decision as a distinct category from the other two extreme categories of policy and single decisions. The similarity scores of the mixed decisions when compared to the policy and the single decisions on a 100 point scale (0 = Very Similar, 100 = Very Dissimilar) for the 15 subjects, along with with the average ratings of the group, are presented in Table XIII. Their average similarity scores of 68.73 for policy decisions and 42.00 for single decisions show that all subjects did see the mixed decisions as a category distinct from both the policy and the single decisions.

Information Integration Models Used by Buyers in Single Decisions : Hypothesis A3

Hypothesis A3 states that in purchase situations involving single decisions, buyers will tend not to use expectancy models and instead use other nonmultiplicative heuristics. The multiplicative expectancy model

TABLE XIII

PERCEIVED SIMILARITY OF MIXED DECISIONS TO POLICY AND SINGLE DECISIONS

1 Given below are the scores obtained from the 15 subjects who faced the mixed decision situation.
2 These subjects rated the perceived similarity of mixed decision situation with policy and single decison situations separately.
3 The similarity was rated on a 100 point scale with 0 indicating Very Similar and 100 indicating Very Dissimilar.
4 Nonmultiplicative model was confirmed in cases where no model is mentioned.
5 The model of information integration indicated by each subject is given in the last column.
M = Multiplicative model confirmed
NM = Multiplicative model rejected in favor of Nonmultiplicative models.

Subject No.	Similarity of Mixed Decision to Policy Decision	Single Decision	Information Integration Model
1	90	15	NM
2	15	80	M
3	84	10	NM
4	88	20	NM
5	90	15	NM
6	25	90	M
7	30	85	M
8	82	30	NM
9	97	25	NM
10	90	40	NM
11	70	30	NM
12	90	20	NM
13	60	40	NM
14	40	90	M
15	80	40	NM
Group Average	68.73	42.00	M
Average for Subjects Using Model			
M	27.50	86.25	
NM	83.72	25.91	

can be represented as:

Perceived Risk (RK_{ij}) = - Subjectively Expected Utility

$$= - SP_i * U_j$$

The hypothesis suggests that the above model will not apply to single decision situation. The various tests conducted for Hypothesis A3 are discussed below.

Gambling Experiment - Single Decision Situation

(Situation No. 1 of Tables XI and XII)

In the case of gambling single decision situation, at the group level (Table XI), only the main effects of V and P were significant and the interaction V*P was nonsignificant. Thus, the data provided a strong evidence against the applicability of the multiplicative expectancy model in support of nonmultiplicative models.

At the single subject level (Table XII), for 13 subjects the interaction V*P was nonsignificant indicating the use of nonmultiplicative models. Of these, nine subjects had significant effects for both V and P. Two subjects had only a significant main effect for P. The remaining two subjects did not have significant main effects. In the case of two subjects, the main effects of V and P and the interaction V*P were significant. For one of these subjects, the interaction was concentrated only in the bilinear component, thereby indicating the use of multiplicative expectancy model. In the case of the other subject, in addition to the bilinear component the residue was also significant indicating the superimposition of higher order non-bilinear interactions on the multiplicative model.

Industrial Purchasing Experiment - Single Decision Situation (Situation No. 3 of Tables XI and XII)

In the case of industrial single decision situation at the group level (Table XI), only the main effects of V and P were significant and the interaction V*P was nonsignificant. Thus, the data provided a strong evidence against the multiplicative expectancy model in support of nonmultiplicative models.

At the single subject level (Table XII), in the case of 14 out of the total 15 subjects the interaction V*P was nonsignificant indicating strong evidence in support of nonmultiplicative models. Of these, nine subjects had both the main effects of V and P significant. Two subjects had only one main effect significant. The remaining two subjects had nonsignificant main effects. For one subject, the main effects of V and P were significant and the interaction V*P was also significant. However, the interaction was not concentrated only in the bilinear component. Instead, the bilinear component as well as the residueal were significant, indicating the superimposition of higher order non-bilinear interactions on the multiplicative model.

Overall, it can be concluded that the Hypothesis A3 was strongly supported in the gambling and the industrial purchasing decisions at the group level as well as at the single subject level, indicating that the subjects tended not to use multiplicative expectancy model in single decision situations.

The data provides considerable insight into the nature of the actual nonmultiplicative models of information integration used by subjects in single decision situations. The group ANOVA as well as a

majority of the single subject ANOVAs had significant main effects of V and P, and a nonsignificant interaction V*P. Thus, the ANOVAs meet the necessary conditions for confirming either an additive or an averaging model (Shanteau 1984b). In the context of decisions under uncertainty, the two components of Probability (P) and Value of the Outcomes (V) are both necessary to describe risk meaningfully. The presence of loss without an associated probability (or vice versa) is not a conceivable situation. As such, the possibility of an averaging model can be ruled out in this context. Therefore, it can be concluded that in single decisions, a majority of the subjects used an additive model of information integration in forming their risk perceptions. Such a model can be represented as below:

Perceived Risk (RK_{ij}) = $C_0 + C_1 * SP_i + C_2 * U_j$

Where C_0, C_1, and C_2 are constants.

Comparison of Perceived Risk Levels in Single, Policy, and Mixed Decisions : Hypothesis A4

Hypothesis A4 states that buyers will perceive the highest risk in single decisions, moderate risk in policy decisions, and the lowest risk in mixed decision situations with equal expected values as shown by the following inequality:

Perceived Risk (Single Decision) > Perceived Risk (Policy Decision) > Perceived Risk (Mixed Decision)

This hypothisis was tested separately in the two experiments. In the gambling experiment the mean perceived risk levels in the single and the policy decisions were compared. In the industrial purchasing experiment the mean perceived risk levels in the single, the policy and

the mixed decisions were compared in pairs. The results of various tests conducted for Hypothesis A4 are discussed below.

Gambling Experiment

Table XIV presents the ANOVA table for the total gambling experiment with the single and the policy decision situations represented as two treatments. The results of the F test are also presented. The F test showed that the treatment effects were statistically significant indicating that the mean perceived risk in the single decision situation was significantly higher than that in the policy decision situation as represented by the following inequality:

Mean Perceived Risk Gambling Single Decision (Y_1) > Mean Perceived Risk Gambling Policy Decision (Y_2)

Thus, the data offered strong evidence in support of Hypothesis A4.

Industrial Purchasing Experiment

Table XV presents the ANOVA table for the total industrial purchasing experiment with the single, the policy, and the mixed decision situations represented as three treatments. The results of the F test and the LSD tests are also presented. The F test showed that the treatment effects were statistically significant. The LSD tests showed that the mean perceived risk in the single decision situation was significantly higher than that in the policy decision situation. Further, the mean perceived risk in the policy decision situation was significantly higher than that in the mixed decision situation. These results can be represented by the following inequality:

TABLE XIV

ANOVA FOR THE GAMBLING EXPERIMENT

DF = degrees of freedom
SS = sum of squares
MS = mean sum of squares

Treatments	Y_m	Mean Risk Rating
1 Single Decision Situation	Y_1	56.119
2 Policy Decision Situation	Y_2	46.696

Analysis of Variance Table

Source	DF	SS	MS	F
Mean	1	2,537,021.8000	2,537,021.8000	
Subjects	29	171,884.2288	5,927.0424	9.5312
Treatments	1	21,310.3000	21,310.3000	34.2688
Error	929	577,704.6712	621.8564	
Total	960	3,307,921.0000		

F Test: $F_{.05,DF=1,929} = 3.84$

$F_{treatment} = 34.2688 > 3.84$

Therefore, REJECT $H_0 : Y_1 = Y_2$

In favor of : $Y_1 > Y_2$

TABLE XV

ANOVA FOR THE INDUSTRIAL PURCHASING EXPERIMENT

DF = degrees of freedom
SS = sum of squares
MS = mean sum of squares

Treatments	Y_m	Mean Risk Rating
1 Single Decision Situation	Y_3	51.167
2 Policy Decision Situation	Y_4	34.567
3 Mixed Decision Situation	Y_5	21.438

Analysis of Variance Table

Source	DF	SS	MS	F
Mean	1	1,837,734.8000	1,837,734.8000	
Subjects	44	140,732.0000	3,198.4545	7.7343
Treatments	2	213,079.1000	106,539.5500	257.6256
Error	1393	576,066.9000	413.5441	
Total	1440	2,767,612.0000		

F Test: $F_{.05,DF=2,1393} = 3.00$

$F_{treatment} = 257.6256 > 3.00$

Therefore, REJECT $H_0 : Y_3 = Y_4 = Y_5$

LSD Test: $S_{(Yi-Yj)}$ square $= MSE\ (1/n1 + 1/n2)$
$= 413.5441\ (1/480 + 1/480)$
$= 1.7231$

$S_{(Yi-Yj)} = 1.3127$

$(Y_3-Y_4)/S_{(Yi-Yj)} = (51.167-34.567)/1.3127 = 12.65$
$(Y_4-Y_5)/S_{(Yi-Yj)} = (34.567-21.438)/1.3127 = 10.00$

$t_{.025,DF=1423} = 1.960$

$t_{(Y3-Y4)}$ observed $= 12.65 > 1.960$

Therefore, REJECT $H_0 : Y_3 = Y_4$
In favor of : $Y_3 > Y_4$

$t_{(Y4-Y5)}$ observed $= 10.00 > 1.960$

Therefore, REJECT $H_0 : Y_4 = Y_5$
In favor of : $Y_4 > Y_5$

Mean Perceived Risk Industrial Single Decision (Y_3)	>	Mean Perceived Risk Industrial Policy Decision (Y_4)	>	Mean Perceived Risk Industrial Mixed Decision (Y_5)

Thus, the data offered strong evidence in suppory of Hypothesis A4.

Overall, it can be concluded that the Hypothesis A4 was strongly supported in gambling as well as in industrial purchasing experiments, indicating that the subjects perceived the highest risk in single decisions, moderate risk in policy decisions, and the lowest risk in mixed decisions with equal expected values.

Comparison of Perceived Risk in Gambling versus Industrial Purchasing Settings : Hypothesis A5

Hypothesis A5 states that, in decisons under uncertainty which are identical in all other respects, buyers will perceive different amounts of risk in a gambling setting as compared to the perceived risk in the industrial purchasing setting.

This hypothesis was tested by comparing the mean perceived risk in t he gambling setting with that in the industrial purchasing setting. Two separate comparisons were made: one for the single decisions and one for the policy decisions. Table XVI presents the ANOVA table for the total study. In this ANOVA the five decision situations are represented as five treatments: gambling single, gambling policy, industrial single, industrial policy, and industrial mixed. The results of the F test and the LSD tests are also presented.

The F test showed that the treatment effects were statistically significant. The LSD tests showed that the mean perceived risk in the gambling single decision situation was significantly higher than that in the industrial single decision situation. Similarly, the mean perceived

TABLE XVI

ANOVA FOR THE TOTAL STUDY

DF = degrees of freedom
SS = sum of squares
MS = mean sum of squares

Treatments	Y_m	Mean Risk Rating
1 Gambling Single Decision Situation	Y_1	56.119
2 Gambling Policy Decision Situation	Y_2	46.696
3 Industrial Single Decision Situation	Y_3	51.167
4 Industrial Policy Decision Situation	Y_4	34.567
5 Industrial Mixed Decision Situation	Y_5	21.438

Analysis of Variance Table

Source	DF	SS	MS	F
Mean	1	4,233,075.9000	4,233,075.9000	
Subjects	74	312,616.2636	4,224.5441	8.4983
Treatments	4	376,069.3000	94,017.3250	189.1312
Error	2321	1,153,771.5364	497.1010	
Total	2400	6,075,533.0000		

F Test: $F_{.05,DF=4,2321} = 2.37$

$F_{treatment} = 189.1312 > 2.37$

Therefore, REJECT $H_0 : Y_1 = Y_2 = Y_3 = Y_4 = Y_5$

LSD Test: $S_{(Yi-Yj)}square = MSE\ (1/n1 + 1/n2)$
$= 497.1010\ (1/480 + 1/480) = 2.0712$

$S_{(Yi-Yj)} = 1.4393$

Single: $(Y_1-Y_3)/S_{(Yi-Yj)} = (56.119-51.167)/1.4393 = 3.4406$
Policy: $(Y_2-Y_4)/S_{(Yi-Yj)} = (46.696-34.567)/1.4393 = 8.4270$

$t_{.025,DF=2321} = 1.960$

Single: $t_{(Y1-Y3)}$ observed $= 3.4406 > 1.960$

Therefore, REJECT $H_0 : Y_1 = Y_3$
In favor of : $Y_1 > Y_3$

Policy: $t_{(Y2-Y4)}$ observed $= 8.4270 > 1.960$

Therefore, REJECT $H_0 : Y_2 = Y_4$
In favor of : $Y_2 > Y_4$

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risk in the gambling policy decision situation was significantly higher than that in the industrial policy decision situation.

Overall, it can be concluded that in decisions under uncertainty, the subjects perceived different amounts of risk in a gambling setting as compared to the perceived risk in the industrial purchasing setting. Further, it can be also concluded that the subjects perceived higher risk in gambling situations as compared to industrial purchasing situations of equal expected value.

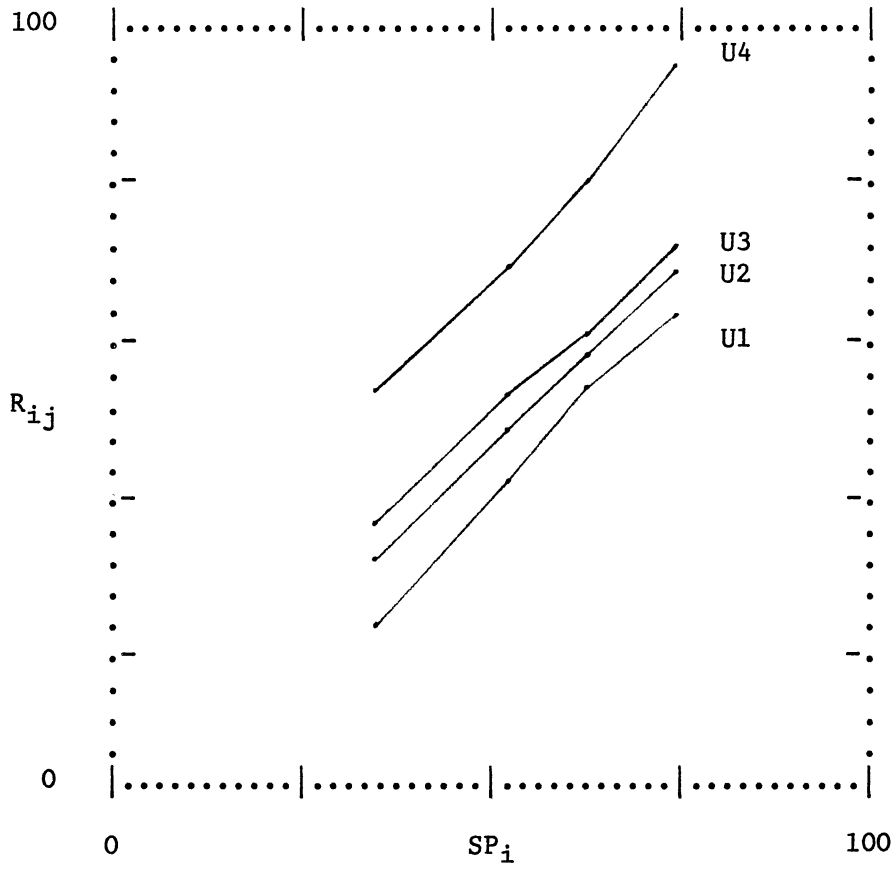
Graphical Analysis for Hypotheses A1, A2, and A3

Table XVII presents the values of Mean $R_{i.}$ (as the estimates of SP_i) and the corresponding observed perceived risk R_{ij} (as the estimates of RK_{ij}) for different values of V_j (representing the levels of U_j) for the five decision situations of the study. Figures 5 to 9 present the plots of Mean $R_{i.}$ on the x-axis and the observed perceived risk R_{ij} for the group data on the y-axis for the each of the five decision situations. In the case of gambling policy decision situation (Figure 6), the plot resembles a linear fan indicating a multiplicative model. In the case of industrial policy decision situation (Figure 8), the plot resembles a linear fan indicating a multiplicative model, with the exception that plots for V levels of 40 and 60 the lines intersect. In the case of industrial mixed decision situation (Figure 9), the plot resembles a linear fan indicating a multiplicative model. In the gambling single decision situation (Figure 5), and in the industrial single decision situation (Figure 7), the plots do not resemble a linear fan indicating the use of nonmultiplicative models.

TABLE XVII

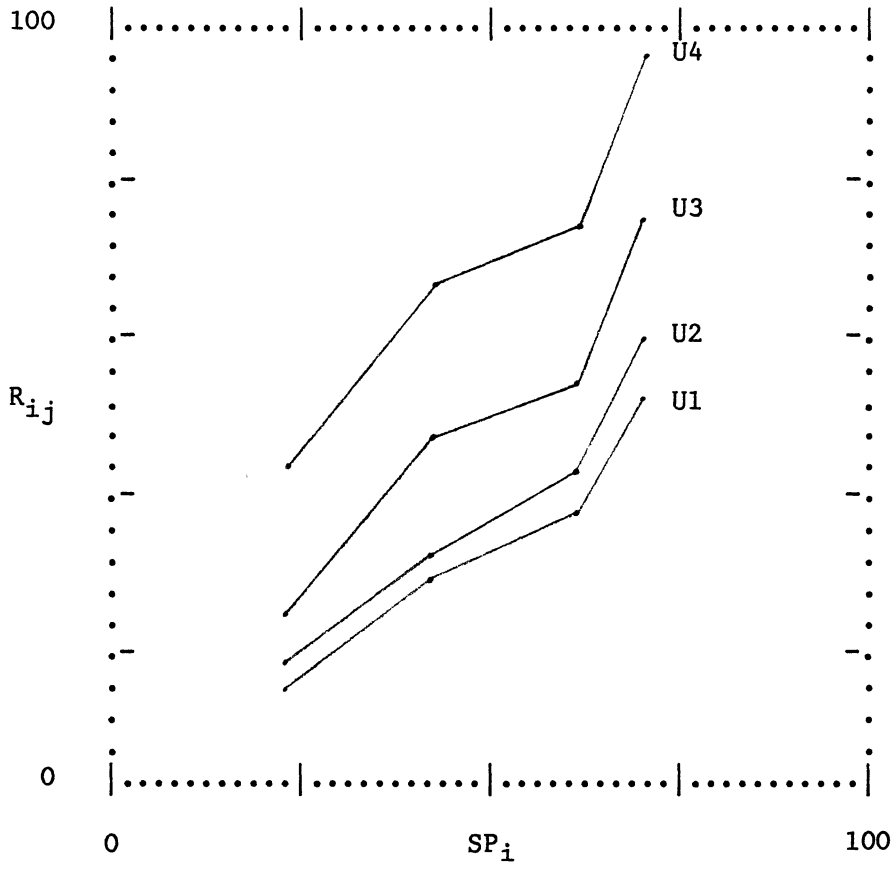
VALUES OF MEAN R_i AND CORRESPONDING OBSERVED PERCEIVED RISK R_{ij} FOR VARIOUS VALUES OF V_j

i	Ri. as Estimate of SPi	j	1	2	3	4
1	Gambling Experiment - Single Decision Situation					
		Vj (in $)	4,000	6,000	9,000	36,000
1	34.483		21.233	24.967	34.533	52.200
2	52.350		40.900	47.167	52.000	69.333
3	62.967		53.167	57.467	60.367	80.867
4	74.675		61.900	68.733	72.000	96.067
2	Gambling Experiment - Policy Decision Situation					
		Vj (in $)	40	60	90	360
1	22.967		11.900	15.633	22.333	42.000
2	42.292		27.133	30.267	45.867	65.900
3	51.583		36,733	41.833	53.533	74.233
4	69.942		50.733	58.633	74.167	96.233
3	IndustrialPurchasing Experiment - Single Decision Situation					
		Vj (in $)	4,000	6,000	9,000	36,000
1	29.517		15.033	23.767	30.500	48.767
2	46.350		37.333	41.367	43.233	63.467
3	57.783		46.467	51.633	56.300	76.733
4	71.017		58.667	66.333	65.567	93.500
4	IndustrialPurchasing Experiment - Policy Decision Situation					
		Vj (in $)	40	60	90	360
1	16.917		8.000	12.167	18.267	29.233
2	28.067		18.433	17.700	26.700	49.433
3	37.725		22.100	28.333	36.533	63.933
4	55.558		37.300	40.633	53.600	90.700
5	IndustrialPurchasing Experiment - Mixed Decision Situation					
		Vj (in $)	40	60	90	360
1	9.417		4.833	7.567	9.700	15.567
2	18.133		10.600	14.867	19.600	27.467
3	25.042		15.400	21.733	27.900	35.133
4	33.158		21.033	29.800	35.767	46.033



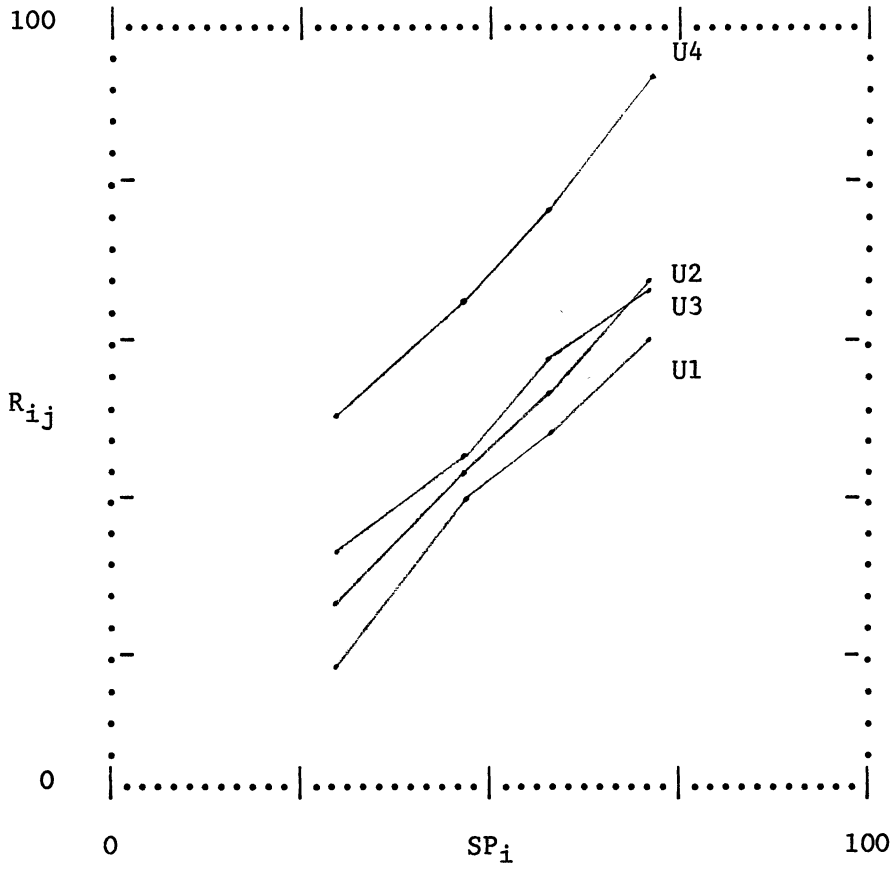
Utility Level	Corresponding to Loss of
U_1	\$ 4,000
U_2	\$ 6,000
U_3	\$ 9,000
U_4	\$ 36,000

Figure 5. Gambling Single Decision Situation: Plot of Subjective Probability (SP_i) versus Perceived Risk (R_{ij}) for Various Levels of Utility (U_j)



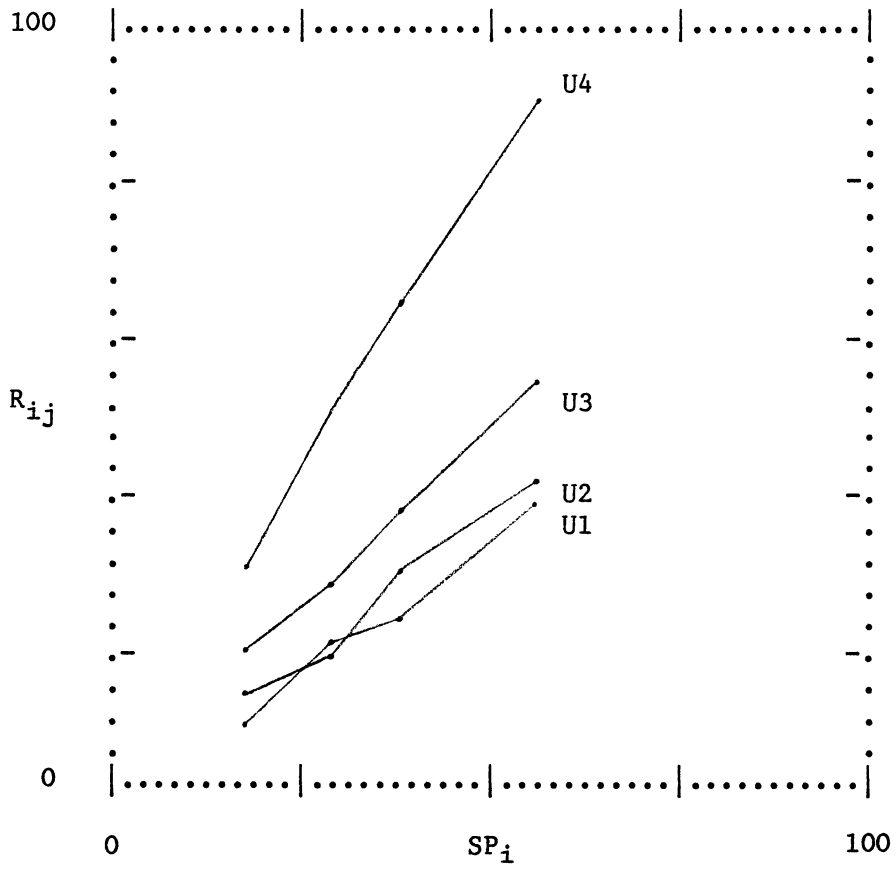
Utility Level	Corresponding to Loss Per Application of
U_1	\$ 40
U_2	\$ 60
U_3	\$ 90
U_4	\$ 360

Figure 6. Gambling Policy Decision Situation: Plot of Subjective Probability (SP_i) versus Perceived Risk (R_{ij}) for Various Levels of Utility (U_j)



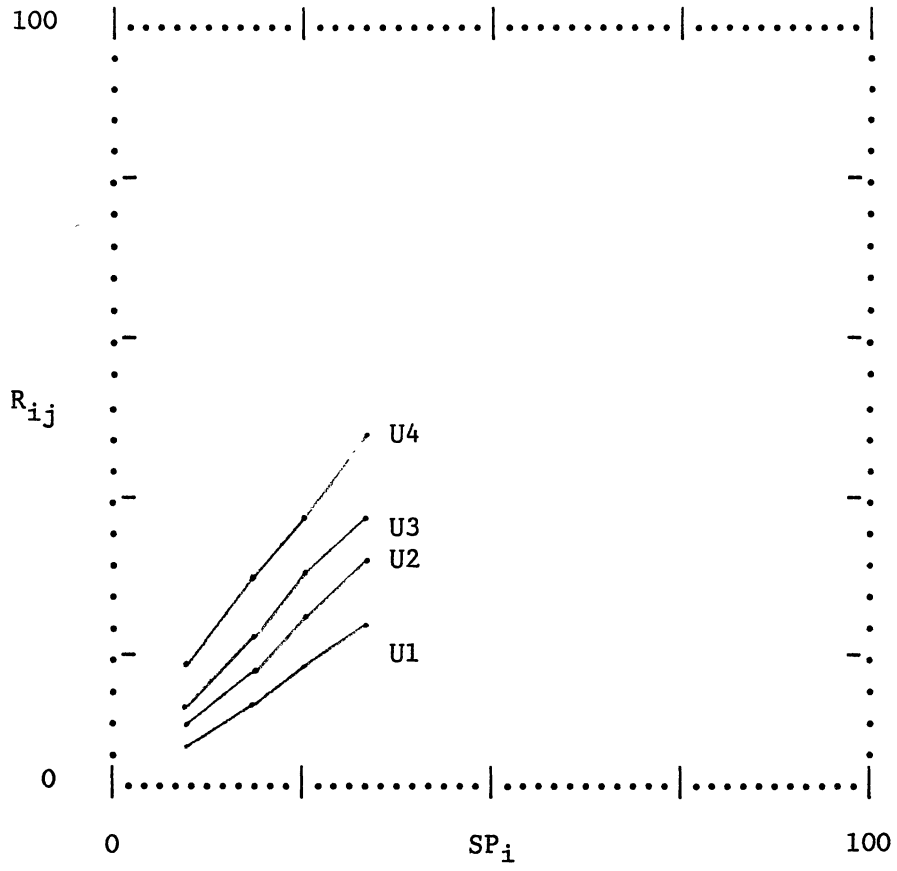
Utility Level	Corresponding to Loss of
U_1	\$ 4,000
U_2	\$ 6,000
U_3	\$ 9,000
U_4	\$ 36,000

Figure 7. Industrial Single Decision Situation: Plot of Subjective Probability (SP_i) versus Perceived Risk (R_{ij}) for Various Levels of Utility (U_j)



Utility Level	Corresponding to Loss Per Application of
U_1	$ 40
U_2	$ 60
U_3	$ 90
U_4	$ 360

Figure 8. Industrial Policy Decision Situation: Plot of Subjective Probability (SP_i) versus Perceived Risk (R_{ij}) for Various Levels of Utility (U_j)



Utility Level	Corresponding to Loss Per Application of
U_1	\$ 40
U_2	\$ 60
U_3	\$ 90
U_4	\$ 360

Figure 9. Industrial Mixed Decision Situation: Plot of Subjective Probability (SP_i) versus Perceived Risk (R_{ij}) for Various Levels of Utility (U_j)

As discussed by Anderson (1981), graphical analysis has limited use in testing the models of information integration because it is practically impossible to obtain a perfect linear fan to confirm the multiplicative models. Such plots are even less revealing for group data, because in such analysis different individuals using different models of information integration are pooled together to predict one common model. The deviations observed in the data plots discussed above must be considered in that perspective.

Summary of the Results

In summary, the results provided evidence which strongly supports all five hypotheses of the dissertation. Thus, in policy decision situations the subjects tended to use the multiplicative expectancy model of information. In single decision situations the subjects tended not to use the multiplicative model. In mixed decisions situations the subjects tended to use the multiplicative model, but to a lesser extent as compared to the policy decision situation. The subjects perceived the highest level of risk in single decisions, moderate risk in policy decisions, and the lowest risk in mixed decisions. Further, the subjects perceived higher risk in the gambling experiment as compared to the industrial purchasing experiment across single as well as policy decision situations. The next chapter will discuss these findings of the study.

CHAPTER V

DISCUSSION OF THE FINDINGS AND CONCLUSIONS

Discussion of the Findings

The basic objective of the dissertation was to test theory-based hypotheses regarding the use of multiplicative expectancy models of information integration by buyers as the decision makers in forming their risk perceptions in decisions under uncertainty. A summary of the results discussed in the previous chapter is presented in Table XVIII.

The results strongly supported the first hypothesis (A1) that in policy decisions which involve several repeated applications of a single decision, the decision makers may tend to use a multiplicative expectancy model in combining Probability (P) and Value of Loss (V) information to form their risk perceptions. The multiplicative model was confirmed at the group level in the case of the gambling policy decision situation. This was further supported by 9 out of total 15 subjects conforming to the multiplicative model at the single subject level. The multiplicative model was also strongly supported at the group level in the case of industrial policy decision situation. However, the data indicated slight superimposition of higher order non-bilinear interactions. At the single subject level, 13 out of total 15 subjects confirmed a multiplicative model which provides further supporting evidence for the hypothesis. On the basis of these results it can be concluded that the study offered strong evidence in support of

TABLE XVIII

SUMMARY OF THE RESULTS OF THE STUDY

Experiment	Gambling		Industrial Purchasing		
Situation No.	Single 1	Policy 2	Single 3	Policy 4	Mixed 5
Hypothesis	A3	A1	A3	A1	A2
Information Integration Models at Group Level					
Nonmultiplicative	YES	-	YES	-	-
Multiplicative	-	YES	-	YES	YES
Information Integration Models at Single Subject Level (No. of Subjects)					
Nonmultiplicative	13	5	14	2	11
Multiplicative	1	9	-	13	4
Multiplicative Superimposed by Non-bilinear Interaction	1	1	1	-	-
Comparison of Perceived Risk Levels					
Mean Perceived Risk	Y_1	Y_2	Y_3	Y_4	Y_5
Hypothesis A4					
Gambling Experiment			$Y_1 > Y_2$		
Industrial Purchasing Experiment			$Y_3 > Y_4 > Y_5$		
Hypothesis A5					
Single Decision Situations			$Y_1 > Y_3$		
Policy Decision Situations			$Y_2 > Y_4$		

the first hypothesis.

In a similar manner, the results supported the third hypothesis (A3) that in single decisions which involve just one application of a decision, the decision makers may tend not to use multiplicative expectancy models in combining Probability (P) and Value of Loss (V) information to form their risk perceptions. In the gambling single decision situation, the multiplicative model was strongly rejected at the group level. Further, in the case of 13 out of total 15 subjects, the multiplicative model was rejected, indicating the use of nonmultiplicative models. In the indulstrial single decision situation, the multiplicative model was strongly rejected at the group level. Moreover, at the single subject level the multiplicative model was rejected in the case of 14 out of total 15 subjects. Therefore, it can be concluded that the study offered strong evidence in support of the third hypothesis.

The second hypothesis (A2) predicts that in the case of mixed decisions, the decision makers will tend to use multiplicative expectancy model of information integration to a lesser extent as compared to the policy decision situation. In the industrial mixed decision situation, the multiplicative model was strongly supported at the group level. However, the model showed some superimposition of higher order non-bilinear interactions. At the single subject level, the multiplicative model was supported in the case of 4 subjects. In the case of the remaining 11 subjects the multiplicative model was rejected indicating the use of nonmultiplicative models. On the basis of these results it can be concluded that the study offered strong supportive evidence for the second hypothesis.

The first three hypotheses discussed above concerned the model or the process of information integration used by buyers in forming their risk perceptions in different decision situations. Therefore, the results which support all the three hypotheses can be considered as confirming the basic logic which was used in the derivation of these hypotheses. Thus, in the case of single decisions, which offer just one chance for the actual outcome to be favorable or unfavorable, the concept of expectancy has little practical meaning. This may be due to the fact that expectancy predicts only the average outcome of a decision under uncertainty, which can turn into a reality only in the long run after a large number of repeated applications of the decision. Therefore, as shown by the study, in single decisions the subjects may have tended to reject the expectancy approach as a meaningful criterion in evaluating an alternative and instead use nonmultiplicative models in forming their risk perceptions.

On the other hand, in the case of policy decisions, which involve several repeat applications of one single decision, the concept of expectancy offers a meaningful tool to predict the actual longterm outcome of a decision with a high degree of accuracy. Therefore, the subjects may have tended to use multiplicative expectancy models in forming their risk perceptions in policy decisions.

Mixed decisions really lie on the continuum between the two extreme cases of single and policy decisions. They are like policy decisions with the added freedom to change the decision during its multiple implementations spread over time. Depending on the perceived ease with which such freedom can be actually exercised, different individuals may be using totally different models of information integration in

evaluating the risk in these decisions. Thus, individuals who used nonmultiplicative models could be those who perceived the decisions as very easy to change. As such, they considered only the first one or few implementations as the relevant span of the decision and handled them in a manner similar to single decisions. On the other hand, individuals who used multiplicative models could be those who perceived the decisions as very difficult to change and handled them in a manner similar to the policy decisions. The data on the perceived similarity of the mixed decisions to single or policy decisions presented in Table XIII indicates the possibility of such an explanation. Of the 15 subjects who faced the mixed decision situation, four used a multiplicative model of information integration. Their average similarity scores were 27.50 for the policy decision and 86.25 for the single decision indicating that they perceived the mixed decisions as being more similar to policy decisions than single decisions. In contrast, the remaining 11 subjects, who used nonmultiplicative models, perceived the mixed decisions as being more similar to single decisions (Similarity Score = 25.91) than policy decisions (Similarity Score = 83.72).

Many real life mixed decisions can be seen as examples of such situations. Thus, a very large company with strong bargaining position is likely to treat a long term repeat order placed on a small supplier as the case of a single decision of value equal to only the first supply quantity, rather than as a policy decision covering the total contracted quantity, due to the belief that the decision can always be easily changed. However, the same company may treat another contract with a large corporation with a severe penalty clause more like a policy

decision than a single decision. Clearly, more conclusive inferences will require further research in the area.

The study offered strong evidence in support of the fourth hypothesis (A4) that the decision makers may perceive the highest risk in single decisions, moderate risk in policy decisions, and the lowest risk in mixed decisions. In the gambling experiment the mean perceived risk was significantly higher in the single decision situation as compared to that in the policy decision situation. In the industrial purchasing experiment the mean perceived risk in the single decision situation was significantly higher than that in the policy decision situation. Similarly the mean perceived risk in the policy decision situation was significantly higher than that in the mixed decision situation. These results support the logic which was used in the derivation of this hypothesis. The subjects may have perceived the highest risk in single decisions because in such decisions the total risk is concentrated in its one single implementation. Therefore, the high value of the negative consequences involved in such decisions resulted in their being perceived as highly risky ones. In contrast, policy decisions involve several implementations of a decision. Each implementation offers one chance for the outcome to be desirable or undesirable. In such a situation, it is possible to predict almost exactly the longterm average outcome of the several implementations of the decision by using expectancy model. Moreover, the estimated mean outcome has much smaller variance in the case of policy decisions as compared to the single decisions. This may have resulted in the policy decisions being perceived as less risky than single decisions. Therefore, the subjects perceived moderate risk in policy decisions.

Mixed decisions are really policy decisions with the further added freedom to change the decision during its multiple implementations. Therefore, the real risk involved in such decisions is limited to only the first one or few implementations of the decision. Consequently, such mixed decisions may have been perceived as the least risky ones.

The study strongly supported the fifth hypothesis (A5) that the decision makers may perceive a different amount of risk in a gambling setting as compared to the industrial purchasing setting. The results clearly showed that the subjects perceived a significantly greater amount of risk in the gambling experiment as compared to the industrial purchasing experiment across both single and policy decision situations. One possible explanation of this finding is that the gambles, which involved one negative and one null outcome, were so undesirable that the subjects perceived them as highly risky ones. On the contrary, in the industrial purchasing setting, probably due to the intangible gains involved in the financially null outcome, similar odds were perceived as perfectly normal and acceptable ones resulting in low perceived risk. It is also possible that the subjects expected gambles to be inherently riskier than purchase situations purely due to the contextual differences between the two settings. In any event the most critical conclusion is that the level of perceived risk is significantly affected by the type of the setting used in the study.

One basic purpose behind introducing the gambling experiment in the study was to test whether the type of setting makes a significant difference in the prediction of the level of perceived risk and of the information integration models used by buyers. Such knowledge is of great importance to researchers because gambling settings are inherently

simpler and hence easier to operationalize. They are also the most commonly used settings in the past research on decisions under uncertainty. Therefore, any understanding about the effect of the setting can facilitate more judicious use of the gambling and the purchasing settings in future marketing research. The confirmation of the first, the third, and the fourth hypotheses in both the gambling and the industrial purchasing settings suggests that the process of information integration and the relative level of perceived risk are more critically dependent upon the nature of the decision (single, policy, or mixed) and are less affected by the setting used. However, some differences were observed between the two settings in respect of the strength with which the multiplicative model was accepted or rejected.

The single subject analysis showed that the multiplicative model was used by more subjects in the industrial policy decision situation (13 subjects) as compared to the gambling policy decision situation (9 subjects). Similarly the multiplicative model was rejected in favor of nonmultiplicative models by more subjects in the industrial single decision situation (14 subjects) as compared to the gambling single decision situation (13 subjects). Though relatively small, the direction of these differences suggests that the marketing settings may be preferable to a gambling settings in research on buyer risk perceptions.

Thus, when the research goal is only to study the process and the models of information integration either setting could be used in the study though marketing settings may be more preferable. However, the confirmation of the fifth hypothesis indicates that when the research

goal is to estimate the actual level of perceived risk, gambling settings may not be used as a substitute for more rigorous industrial or other purchasing settings.

Conclusions

This study used simulated industrial purchasing situations as the setting in one of the two experiments. Therefore, the findings can be considered as indicative of actual industrial buyer behavior. To the extent such generalization can be made, the various specific conclusions that can be drawn on the basis of the findings of this study are stated below:

1. Industrial purchase decision situations can be meaningfully classified into single, policy, and mixed decision situations.

2. When faced with policy decisions, buyers may tend to use multiplicative expectancy models in combining the probability and value information to form their risk perceptions.

3. When faced with single decisions, buyers may tend not to use multiplicative expectancy models and instead tend to use nonmultiplicative models of information in forming their risk perceptions.

4. In mixed decisions, some buyers may use the multiplicative expectancy models while some others may use nonmultiplicative models of information integration.

5. Buyers may perceive the highest risk in the single decisions, moderate risk in the policy decisions, and the lowest risk in the mixed decisions with equal expected values.

6. The type of experimental setting may not critically affect the

information integration process used by buyers in forming their risk perceptions. Thus, gambling settings may be used in place of rigorous industrial purchasing settings without much distortation of the findings when the research objective is only to study the process of information integraion.

7. The actual level of perceived risk may be significantly affected by the experimental setting used. Therefore, gambling settings may not be used as substitutes to more rigorous industrial purchasing settings when the research objective is to estimate the level of risk perceived risk in a decision situation.

Limitations of the Study

Important limitations of the study are explained below:

(1) The basic objective of the study was to investigate the effect of the construct of the repeated applications of a decision on the formation and the level of perceived risk in marketing exchange situations. However, for several reasons explained earlier, the study used an industrial purchasing setting in the second experiment. While such a setting was appropriate to test the basic theory based hypotheses of the research, it does put certain limitations on the extent to which the findings can be generalized. Thus, the findings of the research can be more easily extended to industrial as opposed to consumer purchase behavior. Further research using consumer purchase situations may be required before more specific conclusions can be drawn about consumer purchase behavior.

(2) Another limitation of the study was the use of graduate student subjects. Even though the subjects were suitable for the theoretical

nature of the research, most of them had had only a limited exposure to industrial purchasing tasks and practices. Therefore, further research using actual purchasing agents as the subjects may have to be conducted to draw specific conclusions about the industrial buyer behavior.

(3) The study included only one type of mixed decision. However, the intermediate category of mixed decisions covers a very wide spectrum of decision situations that are very practical in nature. For example, such decisions may include a longterm contract which can be canceled with or without a penalty or a series of similar small value single decision spread over time. As such, the findings of this study about the mixed decisions should considered more as illustrative than conclusive. Only a multi-study program of research can develop sufficient knowledge about risk perceptions in a variety of mixed decisions.

(4) The construct of the repeated application of a decision was operationalized at only two levels: single decisions with just one application and policy decisions with 100 applications. The findings indicated that the construct is an important determinant of the information integration model used and the level of risk perceived in a decision. Further studies using several levels of the construct would be necessary to establish its absolute and relative levels which make a significant difference in people's information integration process and the level of perceived risk.

(5) Several personality, environmental, and situational factors which affect the risk perceptions of buyers were treated as background variables in the study. Only partial control could be exercised on such variables even in a laboratory setting. Their residual effects have

been assumed to be randomozed in the study.

In the author's view, these limitations were unavoidable. However, it is his belief that, to be of any practical use, the constructs and effects studied must be able to overcome such experimental limitations. In other words, any effects which can be easily affected by such unavoidable experimental limitations are unlikely to be of any practical use. The strong support found for all of the hypotheses of this study can be considered as a valuable contribution to the knowledge on perceived risk in that perspective.

Implications of the Study

As discussed earlier, practically every marketing exchange involves decision making under uncertainty and hence risk. In most cases, buyers do have at least some idea about the two components of risk namely, the values of the outcomes and their probabilities of occurrence. Buyers combine the information about the two risk components to form their risk perceptions. Perceived risk acts as a motivator of several prepurchase activities and as an inhibitor of actual purchase decisions. Therefore, it is important for the marketers to know: (a) How buyers integrate the risk-related information to form their risk perceptions and (b) What level of risk the buyers perceive in different types of purchase situations.

The present study indicated that purchase decisions can be meaningfully classified into single, policy, and mixed decision situations from the buyer's view point. Marketers can use this knowledge to find out the category in which their products are classified by the buyers in a specific market segment. It is important

that the classification is done based on the buyers' perceptions and not on the marketer's own logic. Otherwise, wrong interpretations could lead to disastrous marketing strategies. The study further shows that buyers may perceive the highest level of risk in single decisions, moderate risk in policy decisions, and the lowest risk in mixed decisions. Thus, a marketer whose products are perceived as single purchase decisions by the buyers must make special efforts to help his buyers overcome or handle the perceived risk involved in the purchase. Such conscious effort may reduce the time spent by the buyers in the risk handling activities and to that extent affect sales in a positive manner. Such effort could also help reduce consumer dissonance. On the other hand, a marketer of products falling in the policy or the mixed decision categories may not need to spend much effort on risk related promotions.

This study focused on the investigation of when buyers use the multiplicative expectancy model in forming their risk perceptions and when they use nonmultiplicative models. The results show that buyers may tend to use multiplicative models in policy decisions and nonmultiplicative models in single decisions. Thus, a marketer of products falling in the policy decision category would do well so long as the subjectve expected utility of his offering is comparable to that of other competitors' offerings. In other words, a higher value of loss involved in his product can be totally overcome by a proportionately low probability of its occurrence. On the contrary, such compensation of one component of risk by the other might not be possible if the product falls in the single decision category where nonmultiplicative models apply. In such a single decision category product, if it is known that

the buyers give maximum weightage to the value of possible loss and very little importance to its probability of occurrence, a marketer would do well to limit the maximum loss involved in his offering even at the cost of increasing its probability of occurrence. In other words, he should offer a product with a smaller amount of potential losse involved even if the product is less reliable than competing products. The relative importance of the probability and the value of the loss may be totally reversed in another product-market requiring a different marketing strategy. Obviously, such and more specific conclusions can be drawn only after investigating the exact nature of the nonmultiplicative model.

Marketers can also try to change the consumer perceptions about decisions typically considered as single decisions and, hence, more risky ones. Such changed perceptions can be achieved by changes in basic product offerings which convert a single decision into a policy or even a mixed decision. Thus, automobile manufacturers who offer cars to the customers on lease with an option to purchase the vehicle anytime during the lease period are, in fact, converting a large single decision into a mixed decision and thereby reducing the perceived risk substantially. Similar conscious actions are possible in practically every marketing activity which can effectively use the knowledge about consumer risk perceptions to mutual advantage. Knowledge about the buyers' thought process in forming their risk perceptions in purchase decisions is thus an invaluable tool that can be used in many different ways.

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APPENDIX

INSTRUMENTS USED FOR THE STUDY

INTRODUCTION

The present study was developed to investigate how people form their risk perceptions in different types of decisions under uncertainty.

The following pages will describe several gambling situations. You will be asked to record the amount of financial risk you perceive in playing each game.

Please read the situations carefully. Then carry out the various experimental tasks as you would, if you were actually faced with each gambling situation.

THE GAMBLE

In real life we come across situations where the odds are heavily against us and the best we can do is to minimize our losses. Given a choice, we will not enter such situations on our own. However, often we are required to face such situations with no way to avoid them.

Enclosed are descriptions of several such gambles. Each gamble can result in two possible outcomes. One outcome will involve a net financial loss of a given magnitude with a specified probability of its occurrence (P). The other outcome will involve a no-profit-no-loss situation with balance probability (1-P) so that the two probabilities add up to 1. Thus, each situation can be fully described by specifying only the first outcome, i.e. the extent of financial loss and its probability.

Please note that you do not have an option to decide whether to play the gamble or not. You only have to record the amount of financial risk you perceive in playing each gamble, if you were required to play it.

The possible amounts of financial loss for the gambles vary from $ 4,000 to $ 36,000. The probabilities of such loss vary from 0.1 to 0.9.

GAMBLING SINGLE - Page 3

The assessments of all the gambles are enclosed as Set 1. First please read all the instructions given below. Then come back to the instructions sequentially and carry out the specified tasks.

(1) Please read the assessments of the gambles one by one. After reading each assessment, estimate in your mind the total financial risk which you perceive in playing that gamble ONCE.

(2) At the bottom of each assessment, a hundred point continuous scale is given. The two end points of the scale have been marked as 0 indicating very low risk and 100 indicating very high risk.

VERY LOW FINANCIAL RISK — VERY HIGH FINANCIAL RISK

0 — 100

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(3) Now record your perceived risk by putting a slash (/) on the scale line at a point which most accurately represents the amount of financial risk which you perceive in playing that gamble ONCE.

(4) Please keep this sheet in front of your eyes and before rating each supplier please remember the following points:

==========

The financial losses vary from $ 4,000 to $ 36,000.

The probabilities of loss vary from 0.1 to 0.9

The total financial risk is concentrated in only ONE game of the gamble. As such the result of your assessment will totally depend upon the result of that ONE game of the gamble.

==========

(5) Now please proceed to make the risk assessments for all the situations described in SET 1.

Another set of the assessments of the gambles are enclosed as Set 2. Once again, first please read all the instructions given below. Then come back to the instructions sequentially and carry out the specified tasks.

(1) Please read the assessments of the gambles one by one. After reading each assessment, estimate in your mind the importance to you of avoiding the financial risk involved in playing the gamble ONCE.

(2) At the bottom of each assessment, a hundred point continuous scale is given. The two end points of the scale have been marked as 0 indicating very unimportant to avoid the financial risk and 100 indicating very important to avoid the financial risk.

VERY UNIMPORTANT TO AVOID FINANCIAL RISK — VERY IMPORTANT TO AVOID FINANCIAL RISK

0 100

(3) Now record the importance to you of avoiding the financial risk by putting a slash (/) on the scale line at a point which most accurately represents how important it is to you to avoid the financial risk involved in playing that gamble ONCE.

(4) Please keep this sheet in front of your eyes and before rating each supplier please remember the following points:

==========

The financial losses vary from $ 4,000 to $ 36,000.

The probabilities of loss vary from 0.1 to 0.9

The total financial risk is concentrated in only ONE game of the gamble. As such the result of your assessment will totally depend upon the result of that ONE game of the gamble.

==========

(5) Now please proceed to make the risk assessments for all the situations described in SET 2.

Sample Decision and Scale for "Perceived Financial Risk" in Set 1

GSR1

In the case of this gamble, there is

10 PERCENT chance of losing $ 36,000, and

90 PERCENT chance of incurring no financial loss.

Rate the financial risk you perceive in playing this gamble ONCE on the following scale.

VERY LOW FINANCIAL RISK — VERY HIGH FINANCIAL RISK

0 100

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Sample Decision and Scale for "Importance of Avoiding the Risk" in Set 2

GST1

In the case of this gamble, there is

10 PERCENT chance of losing $ 36,000, and

90 PERCENT chance of incurring no financial loss.

Rate the importance to you of avoiding the financial risk involved in playing this gamble ONCE on the following scale.

VERY UNIMPORTANT TO AVOID FINANCIAL RISK — VERY IMPORTANT TO AVOID FINANCIAL RISK

0 100

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INTRODUCTION

The present study was developed to investigate how people form their risk perceptions in different types of decisions under uncertainty.

The following pages will describe several gambling situations. You will be asked to record the amount of financial risk you perceive in playing each game.

Please read the situations carefully. Then carry out the various experimental tasks as you would, if you were actually faced with each gambling situation.

THE GAMBLE

In real life we come across situations where the odds are heavily against us and the best we can do is to minimize our losses. Given a choice, we will not enter such situations on our own. However, often we are required to face such situations with no way to avoid them.

Enclosed are descriptions of several such gambles. Each gamble can result into two possible outcomes. One outcome will involve a net financial loss of a given magnitude with a specified probability of its occurrence (P). The other outcome will involve a no-profit-no-loss situation with balance probability (1-P) so that the two probabilities add up to 1. Thus, each situation can be fully described by specifying only the first outcome i.e. the extent of financial loss and its probability. The rules of the game require that each gamble is played **ONE HUNDRED TIMES**.

Please note that you do not have an option to decide whether to play the gamble or not. You only have to record the amount of financial risk you perceive in playing each gamble **ONE HUNDRED TIMES** if you were required to play it.

The possible amounts of financial loss for the gambles vary from $ 40 to $ 360. The probabilities of such loss vary from 0.1 to 0.9.

The assessments of all the gambles are enclosed as Set 1. First please read all the instructions given below. Then come back to the instructions sequentially and carry out the specified tasks.

(1) Please read the assessments of the gambles one by one. After reading each assessment, estimate in your mind the total financial risk which you perceive in playing that gamble ONE HUNDRED TIMES.

(2) At the bottom of each assessment, a hundred point continuous scale is given. The two end points of the scale have been marked as 0 indicating very low risk and 100 indicating very high risk.

VERY LOW FINANCIAL RISK — VERY HIGH FINANCIAL RISK

0 100

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(3) Now record your perceived risk by putting a slash (/) on the scale line at a point which most accurately represents the amount of financial risk which you perceive in playing that gamble ONE HUNDRED TIMES.

(4) Please keep this sheet in front of your eyes and before rating each supplier please remember the following points:

==========

The financial losses per game vary from $ 40 to $ 360.

The probabilities of loss vary from 0.1 to 0.9

The total financial risk results from playing ONE HUNDRED GAMES OF A GAMBLE. As such the result of your assessment will depend upon how those ONE HUNDRED GAMES OF THE GAMBLE collectively turn out to be.

==========

(5) Now please proceed to make the risk assessments for all the situations described in SET 1.

Another set of the assessments of the gambles are enclosed as Set 2. Once again, first please read all the instructions given below. Then come back to the instructions sequentially and carry out the specified tasks.

(1) Please read the assessments of the gambles one by one. After reading each assessment, estimate in your mind the importance to you of avoiding the financial risk involved in playing that gamble ONE HUNDRED TIMES.

(2) At the bottom of each assessment, a hundred point continuous scale is given. The two end points of the scale have been marked as 0 indicating very unimportant to avoid the financial risk and 100 indicating very important to avoid the financial risk.

VERY UNIMPORTANT TO AVOID FINANCIAL RISK — VERY IMPORTANT TO AVOID FINANCIAL RISK

0 100

(3) Now record the importance to you of avoiding the financial risk by putting a slash (/) on the scale line at a point which most accurately represents how important it is to you to avoid the financial risk involved in playing that gamble ONE HUNDRED TIMES.

(4) Please keep this sheet in front of your eyes and before rating each supplier please remember the following points:

==========

The financial losses per game vary from $ 40 to $ 360.

The probabilities of loss vary from 0.1 to 0.9

The total financial risk results from playing ONE HUNDRED GAMES OF A GAMBLE. As such the result of your assessment will depend upon how those ONE HUNDRED GAMES OF THE GAMBLE collectively turn out to be.

==========

(5) Now please proceed to make the risk assessments for all the situations described in SET 2.

Sample Decision and Scale for "Perceived Financial Risk" in Set 1

GPR1

In the case of this gamble, EVERY TIME there is

10 PERCENT chance of losing $ 360, and

90 PERCENT chance of incurring no financial loss.

Rate the financial risk you perceive in playing this gamble ONE HUNDRED TIMES on the following scale.

VERY LOW FINANCIAL RISK — VERY HIGH FINANCIAL RISK

0 100

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Sample Decision and Scale for "Importance of Avoiding the Risk" in Set 2

GPT1

In the case of this gamble, EVERY TIME there is

10 PERCENT chance of losing $ 360, and

90 PERCENT chance of incurring no financial loss.

Rate the importance to you of avoiding the financial risk involved in playing this gamble ONE HUNDRED TIMES on the following scale.

VERY UNIMPORTANT TO AVOID FINANCIAL RISK — VERY IMPORTANT TO AVOID FINANCIAL RISK

0 100

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INTRODUCTION

The present study was developed to investigate how managers form their risk perceptions in different types of industrial purchase situations.

The following pages will describe an industrial purchase situation. You will be asked to play the role of the purchase manager of a company. Your task is to record the extent of financial risk which you perceive in buying the required products from each alternative supplier.

Please read the situations carefully. Then carry out the various experimental tasks as you would if you, as a manager, were actually faced with each decision situation.

A B C CORPORATION

ABC Corporation is a medium-sized private company in the business of manufacturing high technology electronic components and marketing them to computer manufacturers. In 1984 the company had sales of $ 200 Million and profits of $ 10 Million. The company's manufacturing plant is located in a medium-sized city in New Jersey. Most of its suppliers and customers are also in the Northeastern states. The general economic and political climate in the country is conducive to excellent growth in the industry. However, the electronic component industry faces intense competition among established and new manufacturers.

During the last five years, the new president— the son of the company's founder-- has built a strong and highly decentralized organization of motivated managers, who are encouraged to try new ideas and take full responsibility for the results. As such, even though committees are used to exchange ideas, most decisions are made by the individual managers responsible for the function. This style of management has proved to be very effective, due to the small size of the organization. Management personnel often feel hard pressed for time and somewhat understaffed due to the fast growth of the business.

The company believes that its employees, especially the managers, are its most valuable assets and encourages them to make a career in the company. Most of the managers are in their late thirties and have joined the company with a view to stay for several years. The company offers a profit sharing plan to all its managers, which encourages them to realize that achieving the company's profit objectives also means achieving their own personal objectives. The resultant motivation and sense of belonging, combined with excellent growth prospects, have led to the development of an effective management team that encourages innovation and responsible risk-taking, while being practically free of any undesirable politics.

Assume that you have been the purchasing manager for ABC Corporation for the last three years. You are totally satisfied with the company and are planning to stay there indefinitely.

Recently the engineering department has developed a new electronic component which has excellent demand and profit potential in the market. Therefore, the company has decided to start trial production of the new component in the next few months.

In order to undertake the production of this component, three different new machine tools must be purchased. You have obtained quotations from several suppliers for these machines.

One major risk in buying these machines is the possibility of a machine's "catastrophic failure". Such a catastrophic failure occurs when all safety systems of the machine fail and a surge of electric current burns the electronic circuitry of the machine. The chances of such a failure are especially high in the first three months of a machine's operation. In the unfortunate event of such a catastrophic failure, the machine will have to be scrapped and a large part of the money invested in buying the equipment would be lost. For each supplier's machine, the extent of the financial risk due to such catastrophic failure depends upon the price, the design features and the safety systems used in the machine.

With a view to make comparisons possible, your department has made an assessment of the chances that a machine from a given supplier will have a catastrophic failure after the purchase and the extent of financial loss that will be incurred as a result. Of course, the other possibility is that the machine will prove suitable for its full term and, in that case, there will be no financial loss involved.

These assessments show that the possible amounts of financial loss vary from $ 4,000 to $ 36,000. The probabilities of such loss vary from 0.1 to 0.9.

The assessments of the machines offered by various suppliers are enclosed as Set 1. First please read all the instructions given below. Then come back to the instructions sequentially and carry out the specified tasks.

(1) Please read the supplier assessments one by one. After reading each assessment, estimate in your mind the total financial risk which you perceive in buying the machine from that supplier.

(2) At the bottom of each assessment, a hundred point continuous scale is given. The two end points of the scale have been marked as 0 indicating very low risk and 100 indicating very high risk.

VERY LOW FINANCIAL RISK — VERY HIGH FINANCIAL RISK

0 — 100

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(3) Now record your perceived risk by putting a slash (/) on the scale line at a point which most accurately represents the amount of financial risk which you perceive in buying the machine from that supplier.

(4) Please keep this sheet in front of your eyes and before rating each supplier please remember the following points:

==========

The financial losses vary from $ 4,000 to $ 36,000.

The probabilities of loss vary from 0.1 to 0.9

The total financial risk is concentrated in buying only ONE MACHINE. As such the result of your assessment will depend upon how that ONE chosen MACHINE turns out to be.

==========

(5) Now please proceed to make the risk assessments for all the situations described in SET 1.

Another set of the assessments of the machines offered by various suppliers are enclosed as Set 2. Once again, first please read all the instructions given below. Then come back to the instructions sequentially and carry out the specified tasks.

(1) Please read the supplier assessments one by one. After reading each assessment, estimate in your mind the importance to you of avoiding the financial risk involved in buying the machine from that supplier.

(2) At the bottom of each assessment, a hundred point continuous scale is given. The two end points of the scale have been marked as 0 indicating very unimportant to avoid the financial risk and 100 indicating very important to avoid the financial risk.

VERY UNIMPORTANT TO AVOID FINANCIAL RISK — VERY IMPORTANT TO AVOID FINANCIAL RISK

0 100

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(3) Now record the importance to you of avoiding the financial risk by putting a slash (/) on the scale line at a point which most accurately represents how important it is to you to avoid the financial risk involved in buying the machine from that supplier.

(4) Please keep this sheet in front of your eyes and before rating each supplier please remember the following points:

==========

The financial losses vary from $ 4,000 to $ 36,000.

The probabilities of loss vary from 0.1 to 0.9

The total financial risk is concentrated in buying only ONE MACHINE. As such the result of your assessment will depend upon how that ONE chosen MACHINE turns out to be.

==========

(5) Now please proceed to make the risk assessments for all the situations described in SET 2.

Sample Decision and Scale for "Perceived Financial Risk" in Set 1

ISR1

MACHINE A

In the case of this supplier, there is

10 PERCENT chance of losing $ 36,000, and

90 PERCENT chance of incurring no financial loss.

Rate the financial risk you perceive in buying the machine from this supplier on the following scale.

VERY LOW FINANCIAL RISK — VERY HIGH FINANCIAL RISK

0 100

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Sample Decision and Scale for "Importance of Avoiding the Risk" in Set 2

IST1

MACHINE A

In the case of this supplier, there is

10 PERCENT chance of losing $ 36,000, and

90 PERCENT chance of incurring no financial loss.

Rate the importance to you of avoiding the financial risk involved in buying the machine from this supplier on the following scale.

VERY UNIMPORTANT TO AVOID FINANCIAL RISK — VERY IMPORTANT TO AVOID FINANCIAL RISK

0 100

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INTRODUCTION

The present study was developed to investigate how managers form their risk perceptions in different types of industrial purchase situations.

The following pages will describe an industrial purchase situation. You will be asked to play the role of the purchase manager of a company. Your task is to record the extent of financial risk which you perceive in buying the required products from each alternative supplier.

Please read the situations carefully. Then carry out the various experimental tasks as you would if you, as a manager, were actually faced with each decision situation.

A B C CORPORATION

ABC Corporation is a medium-sized private company in the business of manufacturing high technology electronic components and marketing them to computer manufacturers. In 1984 the company had sales of $ 200 Million and profits of $ 10 Million. The company's manufacturing plant is located in a medium-sized city in New Jersey. Most of its suppliers and customers are also in the Northeastern states. The general economic and political climate in the country is conducive to excellent growth in the industry. However, the electronic component industry faces intense competition among established and new manufacturers.

During the last five years, the new president-- the son of the company's founder-- has built a strong and highly decentralized organization of motivated managers, who are encouraged to try new ideas and take full responsibility for the results. As such, even though committees are used to exchange ideas, most decisions are made by the individual managers responsible for the function. This style of management has proved to be very effective, due to the small size of the organization. Management personnel often feel hard pressed for time and somewhat understaffed due to the fast growth of the business.

The company believes that its employees, especially the managers, are its most valuable assets and encourages them to make a career in the company. Most of the managers are in their late thirties and have joined the company with a view to stay for several years. The company offers a profit sharing plan to all its managers, which encourages them to realize that achieving the company's profit objectives also means achieving their own personal objectives. The resultant motivation and sense of belonging, combined with excellent growth prospects, have led to the development of an effective management team that encourages innovation and responsible risk-taking, while being practically free of any undesirable politics.

Assume that you have been the purchasing manager for ABC Corporation for the last three years. You are totally satisfied with the company and are planning to stay there indefinitely.

Recently the engineering department has developed a new electronic component which has excellent demand and profit potential in the market. Therefore, the company has decided to start trial production of the new component in the next few months.

The quality control department has decided to use high precision testing instruments to carry out quality inspection for these new components. They require three new types of special purpose electric bulbs for use in the testing instruments. ONE HUNDRED ELECTRIC BULBS of each type will be required and all bulbs will have to be purchased at one time. These bulbs are produced with special materials and glass to emit steady light of specified intensity and wavelength. Therefore, they are costly as compared to normal electric bulbs used for domestic or industrial lighting. However, in all other respects, these bulbs are similar to most other electric bulbs. They have an average life expectancy of 3000 hours. The major risk in buying these bulbs is the possibility of a bulb having a "catastrophic failure". Such a catastrophic failure occurs when a bulb burns out prematurely within the first 50 hours of its use. Once burned out, the bulb has to be discarded thereby incurring a financial loss.

You have obtained quotations from several suppliers for these special purpose electric bulbs. After studying the technical specifications and prices, your department has made an assessment of the chances that a bulb from a given supplier will have a catastrophic failure by burning out prematurely and the extent of financial loss that will be incurred by having to scrap it. Of course the other possibility is that the electric bulb will serve its full term and in that case there will be no financial loss involved. Obviously these assessments reflect only the average quality and suitability of each supplier's electric bulbs.

These assessments show that the possible amounts of financial loss for one bulb vary from $ 40 to $ 360. The probabilities of such loss vary from 0.1 to 0.9.

The assessments of the special purpose electric bulbs offered by various suppliers are enclosed as Set 1. First please read all the instructions given below. Then come back to the instructions sequentially and carry out the specified tasks.

(1) Please read the supplier assessments one by one. After reading each assessment, estimate in your mind the total financial risk which you perceive in buying ONE HUNDRED ELECTRIC BULBS in one lot from that supplier.

(2) At the bottom of each assessment, a hundred point continuous scale is given. The two end points of the scale have been marked as 0 indicating very low risk and 100 indicating very high risk.

VERY LOW FINANCIAL RISK — VERY HIGH FINANCIAL RISK

0 100

!....,....!....,....!....,....!....,....!....,....!....,....!

(3) Now record your perceived risk by putting a slash (/) on the scale line at a point which most accurately represents the amount of financial risk which you perceive in buying ONE HUNDRED ELECTRIC BULBS in one lot from that supplier.

(4) Please keep this sheet in front of your eyes and before rating each supplier please remember the following points:

==========

The financial losses per bulb vary from $ 40 to $ 360.

The probabilities of loss vary from 0.1 to 0.9

The total financial risk results from buying ONE HUNDRED ELECTRIC BULBS all in one lot. As such the result of your assessment will depend upon how those ONE HUNDRED ELECTRIC BULBS collectively turn out to be.

==========

(5) Now please proceed to make the risk assessments for all the situations described in SET 1.

Another set of the assessments of the special purpose electric bulbs offered by various suppliers are enclosed as Set 2. Once again, first please read all the instructions given below. Then come back to the instructions sequentially and carry out the specified tasks.

(1) Please read the supplier assessments one by one. After reading each assessment, estimate in your mind the importance to you of avoiding the financial risk involved in buying ONE HUNDRED ELECTRIC BULBS in one lot from that supplier.

(2) At the bottom of each assessment, a hundred point continuous scale is given. The two end points of the scale have been marked as 0 indicating very unimportant to avoid the financial risk and 100 indicating very important to avoid the financial risk.

VERY UNIMPORTANT TO AVOID FINANCIAL RISK — VERY IMPORTANT TO AVOID FINANCIAL RISK

0 100

(3) Now record the importance to you of avoiding the financial risk by putting a slash (/) on the scale line at a point which most accurately represents how important it is to you to avoid the financial risk involved in buying ONE HUNDRED ELECTRIC BULBS in one lot from that supplier.

(4) Please keep this sheet in front of your eyes and before rating each supplier please remember the following points:

==========

The financial losses per bulb vary from $ 40 to $ 360.

The probabilities of loss vary from 0.1 to 0.9

The total financial risk results from buying ONE HUNDRED ELECTRIC BULBS all in one lot. As such the result of your assessment will depend upon how those ONE HUNDRED ELECTRIC BULBS collectively turn out to be.

==========

(5) Now please proceed to make the risk assessments for all the situations described in SET 2.

Sample Decision and Scale for "Perceived Financial Risk" in Set 1

IPR1

BULB TYPE A

In the case of this supplier, FOR EACH BULB there is

10 PERCENT chance of losing $ 360, and

90 PERCENT chance of incurring no financial loss.

Rate the financial risk you perceive in buying ONE HUNDRED ELECTRIC BULBS from this supplier on the following scale.

VERY LOW FINANCIAL RISK — VERY HIGH FINANCIAL RISK

0 — 100

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Sample Decision and Scale for "Importance of Avoiding the Risk" in Set 2

IPT1

BULB TYPE A

In the case of this supplier, FOR EACH BULB there is

10 PERCENT chance of losing $ 360, and

90 PERCENT chance of incurring no financial loss.

Rate the importance to you of avoiding the financial risk involved in buying ONE HUNDRED ELECTRIC BULBS from this supplier on the following scale.

VERY UNIMPORTANT TO AVOID FINANCIAL RISK — VERY IMPORTANT TO AVOID FINANCIAL RISK

0 — 100

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INTRODUCTION

The present study was developed to investigate how managers form their risk perceptions in different types of industrial purchase situations.

The following pages will describe an industrial purchase situation. You will be asked to play the role of the purchase manager of a company. Your task is to record the extent of financial risk which you perceive in buying the required products from each alternative supplier.

Please read the situations carefully. Then carry out the various experimental tasks as you would if you, as a manager, were actually faced with each decision situation.

A B C CORPORATION

ABC Corporation is a medium-sized private company in the business of manufacturing high technology electronic components and marketing them to computer manufacturers. In 1984 the company had sales of $ 200 Million and profits of $ 10 Million. The company's manufacturing plant is located in a medium-sized city in New Jersey. Most of its suppliers and customers are also in the Northeastern states. The general economic and political climate in the country is conducive to excellent growth in the industry. However, the electronic component industry faces intense competition among established and new manufacturers.

During the last five years, the new president— the son of the company's founder-- has built a strong and highly decentralized organization of motivated managers, who are encouraged to try new ideas and take full responsibility for the results. As such, even though committees are used to exchange ideas, most decisions are made by the individual managers responsible for the function. This style of management has proved to be very effective, due to the small size of the organization. Management personnel often feel hard pressed for time and somewhat understaffed due to the fast growth of the business.

The company believes that its employees, especially the managers, are its most valuable assets and encourages them to make a career in the company. Most of the managers are in their late thirties and have joined the company with a view to stay for several years. The company offers a profit sharing plan to all its managers, which encourages them to realize that achieving the company's profit objectives also means achieving their own personal objectives. The resultant motivation and sense of belonging, combined with excellent growth prospects, have led to the development of an effective management team that encourages innovation and responsible risk-taking, while being practically free of any undesirable politics.

Assume that you have been the purchasing manager for ABC Corporation for the last three years. You are totally satisfied with the company and are planning to stay there indefinitely.

Recently the engineering department has developed a new electronic component which has excellent demand and profit potential in the market. Therefore, the company has decided to start trial production of the new component in the next few months.

The quality control department has decided to use high precision testing instruments to carry out quality inspection for these new components. They require three new types of special purpose electric bulbs for use in the testing instruments. These bulbs are produced with special materials and glass to emit steady light of specified intensity and wavelength. Therefore, they are costly as compared to normal electric bulbs used for domestic or industrial lighting. However, in all other respects these bulbs are similar to any other electric bulbs. The average life expectancy of a typical bulb is 3000 hours.

ONE HUNDRED ELECTRIC BULBS of each type will be required over a period of one year. It will be necessary to enter into a contract with the chosen supplier for the supply of one hundred special purpose electric bulbs in 10 lots of 10 bulbs each, spread over one year. Since these are special purpose electric bulbs, the suppliers expect that the company will in fact purchase the total contracted quantity of bulbs. Of course, if you are extreamely unhappy with the product of a supplier, you can terminate a contract any time. But such an action should be used sparingly and only in extreame circumstances.

The major risk in buying these bulbs is the possibility of a bulb having a "catastrophic failure". Such a catastrophic failure occurs when a bulb burns out prematurely within the first 50 hours of its use. Once burned out, the bulb has to be discarded thereby incurring a financial loss.

You have obtained quotations from several suppliers for these special purpose electric bulbs. After studying the technical specifications and prices, your department has made an assessment of the chances that a bulb from a given supplier will have a catastrophic failure by burning out prematurely and the extent of financial loss that will be incurred by having to scrap it. Of cource the other possibility is that the electric bulb will serve its full term and in that case there will be no financial loss involved. Obviously these assessments reflect only the average quality and suitability of each supplier's electric bulbs.

These assessments show that the possible amounts of financial loss for one bulb vary from $ 40 to $ 360. The probabilities of such loss vary from 0.1 to 0.9.

The assessments of the special purpose electric bulbs offered by various suppliers are enclosed as Set 1. First please read all the instructions given below. Then come back to the instructions sequentially and carry out the specified tasks.

(1) Please read the supplier assessments one by one. After reading each assessment, estimate in your mind the total financial risk which you perceive in entering into a contract with the supplier to supply ONE HUNDRED ELECTRIC BULBS in 10 LOTS of 10 BULBS each over a period of one year.

(2) At the bottom of each assessment, a hundred point continuous scale is given. The two end points of the scale have been marked as 0 indicating very low risk and 100 indicating very high risk.

VERY LOW FINANCIAL RISK — VERY HIGH FINANCIAL RISK

0 100

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(3) Now record your perceived risk by putting a slash (/) on the scale line at a point which most accurately represents the amount of financial risk which you perceive in entering into a contract with that supplier to supply ONE HUNDRED ELECTRIC BULBS in 10 LOTS of 10 BULBS each over a period of one year.

(4) Please keep this sheet in front of your eyes and before rating each supplier please remember the following points:

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The financial losses per bulb vary from $ 40 to $ 360.

The probabilities of loss vary from 0.1 to 0.9

The total financial risk results from entering into a contract to buy ONE HUNDRED ELECTRIC BULBS in 10 LOTS of 10 BULBS each over a period of one year. However, technically the contract can be terminated anytime during the year. As such the result of your assessment will depend upon the quality of only the number of bulbs which you actually purchase.

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(5) Now please proceed to make the risk assessments for all the situations described in SET 1.

Another set of the assessments of the special purpose electric bulbs offered by various suppliers are enclosed as Set 2. Once again, first please read all the instructions given below. Then come back to the instructions sequentially and carry out the specified tasks.

(1) Please read the supplier assessments one by one. After reading each assessment, estimate in your mind the importance to you of avoiding the financial risk involved in entering into a contract with the supplier to supply ONE HUNDRED ELECTRIC BULBS in 10 LOTS of 10 BULBS each over a period of one year.

(2) At the bottom of each assessment, a hundred point continuous scale is given. The two end points of the scale have been marked as 0 indicating very unimportant to avoid the financial risk and 100 indicating very important to avoid the financial risk.

VERY UNIMPORTANT TO AVOID FINANCIAL RISK — VERY IMPORTANT TO AVOID FINANCIAL RISK

0 100

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(3) Now record the importance to you of avoiding the financial risk by putting a slash (/) on the scale line at a point which most accurately represents how important it is to you to avoid the financial risk involved in entering into a contract with that supplier to supply ONE HUNDRED ELECTRIC BULBS in 10 LOTS of 10 BULBS each over a period of one year.

(4) Please keep this sheet in front of your eyes and before rating each supplier please remember the following points:

==========

The financial losses per bulb vary from $ 40 to $ 360.

The probabilities of loss vary from 0.1 to 0.9

The total financial risk results from entering into a contract to buy ONE HUNDRED ELECTRIC BULBS in 10 LOTS of 10 BULBS each over a period of one year. However, technically the contract can be terminated anytime during the year. As such the result of your assessment will depend upon the quality of only the number of bulbs which you actually purchase.

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(5) Now please proceed to make the risk assessments for all the situations described in SET 2.

Sample Decision and Scale for "Perceived Financial Risk" in Set 1

IMR1

BULB TYPE A

In the case of this supplier, FOR EACH BULB there is

10 PERCENT chance of losing $ 360, and

90 PERCENT chance of incurring no financial loss.

Rate the financial risk you perceive in entering into a contract with this supplier to supply ONE HUNDRED ELECTRIC BULBS in 10 LOTS of 10 BULBS each on the following scale.

VERY LOW FINANCIAL RISK — VERY HIGH FINANCIAL RISK

0 — 100

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Sample Decision and Scale for "Importance of Avoiding the Risk" in Set 2

IMT1

BULB TYPE A

In the case of this supplier, FOR EACH BULB there is

10 PERCENT chance of losing $ 360, and

90 PERCENT chance of incurring no financial loss.

Rate the importance to you of avoiding the financial risk involved in entering into a contract with this supplier to supply ONE HUNDRED ELECTRIC BULBS in 10 LOTS of 10 BULBS each on the following scale.

VERY UNIMPORTANT TO AVOID FINANCIAL RISK — VERY IMPORTANT TO AVOID FINANCIAL RISK

0 — 100

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Suppose, a decision to buy 100 special purpose electric bulbs, **ALL IN ONE LOT** is called a "**Policy Decision**". Now compare this policy decision with the decision situation you faced in the experiment. To what extent is the decision situation you faced in the experiment similar to the policy decision. Please indicate on the following scale by putting a slash (/) on the scale line at an appropriate place.

VERY **SIMILAR** TO THE POLICY DECISION — VERY **DISSIMILAR** TO THE POLICY DECISION

0 100

Suppose, you were faced with a "**Single Decision**" situation which involves the purchase of just **ONE** special purpose electric bulb equal in price to the 100 electric bulbs you considered in the experiment. Now compare this single decision with the decision situation you faced in the experiment. To what extent is the decision situation you faced in the experiment similar to the single decision? Please indicate on the following scale by putting a slash (/) on the scale line at an appropriate point.

VERY **SIMILAR** TO THE SINGLE DECISION — VERY **DISSIMILAR** TO THE SINGLE DECISION

0 100

VITA 2

Shreekant Gopal Joag

Candidate for the Degree of

Doctor of Philisophy

Thesis: FORMATION OF RISK PERCEPTIONS IN INDUSTRIAL PURCHASING DECISIONS: AN INFORMATION INTEGRATION ANALYSIS USING SIMULATED BUYING SITUATIONS

Major Field: Business Administration

Biographical:

Personal Data: Born in Karad, Maharashtra, India, August 20, 1947, the son of Gopal M. and Vijaya G. Joag. Married to Sera Robson on May 5, 1976.

Education: Graduated from N. M. V. High School, Pune, India, April, 1963; received Bachelor of Technology (Mechanical) degree from Indian Institute of Technology, Bombay, India in April, 1969; received M.B.A. degree from Indian Institute of Management, Ahmedabad, India in April, 1971; completed requirements for the Doctor of Philosophy degree at Oklahoma State University, Stillwater Oklahoma in July, 1985.

Professional Experience: Deputy Sales Manager, IDL Chemicals, Hyderabad, India, June, 1971, to December, 1976; Sales Manager, Industrial Pumps Division, Kirloskar Brothers Limited, Pune, India, January, 1977, to December, 1979; Manager, Marketing Control Division, Jay Engineering Limited, New Delhi, January 1980, to December 1980; Visiting Professor of Marketing Management, Pune University and Bhopal University, January, 1977, to December, 1983; Associate Professor of Marketing Management, Indian Institute of Management, Ahmedabad, January, 1981, to December, 1983.