Disconfirmed Expectations and Group Decision Behavior

by

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ABSTRACT

Group decisions are common across a variety of marketing and management situations. Within marketing, group purchase decisions for organizations and families have received considerable attention. However, past studies have focused primarily on the environmental or situational determinants of decision influence, not on the effects of interpersonal influence on the group decision process. As a result, social influences related to information and group norms are largely ignored, as are the subsequent effects on changes in preference for individual group members. One consequence is that group choice models typically assume static preferences, which cannot fully explain a wide range of potential preference shifts that might arise due to social interaction. In this dissertation I analyze preference revisions due to group discussion, and find that social influences, particularly disconfirmed pre-discussion expectations, significantly impact preferences and the group decision. A conceptual framework and an economic utility model are presented to explain preference revisions for group decisions. Empirical studies of a dyadic organizational purchase decision and a triadic family vacation decision support the implications of the model and the hypothesized relationships between preference revisions and social influence. In particular, disconfirmed expectations play an important role in group decision-making. Implications for group behavior in various marketing contexts are discussed.

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# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>3</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>7</td>
</tr>
<tr>
<td>1. Introduction and Background</td>
<td>9</td>
</tr>
<tr>
<td>1.1 Group Choice Models</td>
<td>13</td>
</tr>
<tr>
<td>1.2 Multi-person Decision Behavior</td>
<td>18</td>
</tr>
<tr>
<td>1.3 Overview of Remaining Chapters</td>
<td>26</td>
</tr>
<tr>
<td>2. Conceptual Framework and Hypotheses</td>
<td>27</td>
</tr>
<tr>
<td>3. Preference Revision Model</td>
<td>39</td>
</tr>
<tr>
<td>3.1 Preference Revision Model for Two-person Groups</td>
<td>46</td>
</tr>
<tr>
<td>3.2 Preference Revision Model for N-person Groups</td>
<td>50</td>
</tr>
<tr>
<td>4. Methodology</td>
<td>53</td>
</tr>
<tr>
<td>5. Analysis of Dyadic Industrial Purchase Decision</td>
<td>59</td>
</tr>
<tr>
<td>5.1 Subjects and Procedure</td>
<td>60</td>
</tr>
<tr>
<td>5.2 Measures</td>
<td>64</td>
</tr>
<tr>
<td>Product Evaluations and Preference</td>
<td>64</td>
</tr>
<tr>
<td>Product Certainty</td>
<td>66</td>
</tr>
<tr>
<td>Influence</td>
<td>66</td>
</tr>
<tr>
<td>Disconfirmation</td>
<td>67</td>
</tr>
<tr>
<td>5.3 Results and Discussion</td>
<td>67</td>
</tr>
<tr>
<td>Information Search</td>
<td>68</td>
</tr>
<tr>
<td>Individual Preference Revisions Due to Discussion</td>
<td>69</td>
</tr>
<tr>
<td>Post-discussion Influence Perceptions</td>
<td>73</td>
</tr>
<tr>
<td>Summary of Individual Analysis</td>
<td>74</td>
</tr>
<tr>
<td>Group Preferences and Decisions</td>
<td>74</td>
</tr>
<tr>
<td>5.4 Summary and Limitations</td>
<td>79</td>
</tr>
</tbody>
</table>
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1. Introduction and Background

Decisions made by groups are generally such that group members exert influence on each other in formulating individual preferences and the group decision. In the context of organizational buyer behavior, various individual, organizational and environmental influences are believed to affect purchase decisions. This has been recognized from the earliest of the organizational buyer behavior models (see Johnston and Spekman 1987; Ward and Webster 1991). Research on organizational decision influence has primarily studied the various antecedents of influence (Kohli 1989; McQuiston 1989; Ronchetto, Hutt and Reingen 1989; Thomas 1982), and the measurement and formation of perceived influence (Corfman 1991; Silk and Kalwani 1982). These studies demonstrate that various situational and environmental characteristics, such as group size, time pressure, and decision risk, impact one’s influence on the buying decision. For example, experts and organizational leaders will tend to have greater influence under tight time constraints since they generally tend to dominate discussion (Kohli 1989). The research ties such moderating influence antecedents to various dimensions of decision power.

Similar studies have been conducted for family decision-making, also focusing on antecedents and measurement of decision influence (Corfman and Lehmann 1987; Davis 1970, 1976; Filiatrault and Ritchie 1980; Foxman, Tansuhaj and Ekstrom 1989). This research has primarily studied the aspects of family structure, status and roles (such as gender, employment, etc.) on family decisions.

Considerably less research has explicitly addressed the actual social process of organizational and family decision-making, as evidenced by calls for
such research in recent overviews of group and organizational decision-making (Corfman and Gupta 1993; Lilien, Kotler and Moorthy 1992, chapter 3; Wilson, Lilien and Wilson 1991). In particular, little is known about the effects of multi-person interaction and the resulting changes in individual preferences that lead to a group decision. Factors that contribute to a group member's susceptibility to interpersonal influence have also received little attention in the marketing literature\(^1\).

As an example, consider an organization that is thinking of adding a new vendor to its list of approved vendors for some purchased component (e.g., semiconductors). If approved, the new vendor would receive some portion of the total component purchases placed by the organization, depending upon the strength of preference for the new vendor relative to all other approved vendors. Individuals from three functional areas - engineering, purchasing, and management - must evaluate the vendor and make an approve/reject decision. Multiple functional areas are used since they represent varying expertise on some set of evaluative criteria. For example, engineering can best evaluate the vendor's technical merits, purchasing can evaluate cost and delivery considerations, and management can ascertain the strategic implications of creating a new vendor relationship. Suppose that based on their individual evaluations, purchasing has a strong preference to approve the vendor, management is moderately inclined to approve the vendor, and engineering would reject the vendor due to perceived technical deficiencies. Now let the three persons meet to discuss the vendor and make a final decision.

\(^1\)Some studies have addressed consumer susceptibility to influence by reference groups (Bearden and Etzel 1982; Bearden, Netemeyer and Teel 1989; Park and Lessig 1977). However, similar research for multi-person decisions is generally lacking.
If we focus solely on the pre-discussion preferences, and assume that the functional areas have relatively equal organizational influence, we would expect that the vendor would be approved. We could predict this result based upon a “majority rules” decision scheme, or upon some weighted average of the three pre-discussion preferences (for descriptions of various group choice models, see Choffray and Lilien 1980; Corfman and Gupta 1993; Lilien, Kotler and Moorthy 1992, chapter 3). We could also predict that the vendor would receive a modest share of component orders, since we expect the organization to have only a moderately strong preference for the vendor. It is far from certain, however, that our predictions of approval and a modest share of orders would actually reflect what the group would decide.

Suppose that the pre-discussion tendency of purchasing and management to approve the vendor was partially based upon their assumption that the vendor would qualify technically. In discussion, engineering would reveal that the vendor does not, in fact, meet the organization’s technical standards. The result would be that both purchasing and management could decrease their preference for the vendor sufficiently to lead to a “reject” decision. This group decision is contrary to what would be predicted by common group choice models which utilize only the pre-discussion preferences of the group members.

An alternative scenario could be that engineering assumed poor technical performance for the vendor because of reported quality control problems. In discussion management might explain that quality control had been dramatically improved after recent capital investments by the vendor. Engineering would then increase its preference, resulting in an endorsement for the vendor. Although this “approve” decision is the same as we would predict with a group choice model, the group’s preference for the vendor would be considerably
stronger than predicted from the pre-discussion preferences. This would result in expected purchase allocations for the vendor being substantially underpredicted, compared to the actual group decision.

This example demonstrates that simple choice models which ignore group interaction are not capable of capturing many group decision outcomes and processes. The fundamental shortcoming lies in a failure to consider preference shifts due to the social influences of discussion. A better understanding of the social influence process is therefore needed to determine how individual preferences change, how these preference revisions affect the group choice, and to what extent individuals are susceptible to influence during the group decision process.

Since a group decision is determined by the individual group members according to their preferences and influences, an improved understanding of preference revisions would also allow a better description and modeling of group decision outcomes. For example, Wilson, Lilien and Wilson (1991) recently performed an empirical test of group decision models in organizational buying situations. Despite some success in predicting group choice, the models are limited in that preference revisions due to group interaction are ignored. The authors suggest that further research ascertain “perceptions of relative influence both before and after group decision tasks,” recognizing that the “group decision is a dynamic process” whereby preferences of group members are changed due to group interaction (Wilson, Lilien and Wilson 1991, p. 464). Fundamentally, the application of and susceptibility to social influence impact preferences and shape the group’s decision.
This dissertation's principal focus is to study the group decision process, characterized by how social influences through group discussion cause individuals to revise their preferences. The objective is to develop a fundamental theoretical framework that explains preference revisions, and thereby determine the important components of social influence susceptibility that result in preference shifts. This in turn aids the ability to analyze and predict group decisions. Although general to many types of multi-person decisions, the theoretical framework will be utilized primarily to explore organizational and family purchase behavior.

As further introduction, I first briefly review research on group choice models and decision-making. The purpose of this review is to discuss how such research tends to take a "static" approach, whereby the social process of the group decision is not explicitly considered. Various limitations to the "static" view are also discussed. Drawing on social psychology research, I then describe the multi-person decision process and examine preference revisions - for individual group members and the subsequent group preference - due to discussion. Implications of the social influence process on group decisions are presented, setting the foundation for the research approach taken in this dissertation.

1.1 Group Choice Models

A thorough review of group choice models can be found in Corfman and Gupta (1993), and a more focused review applied to organizational buying appears in Lilien, Kotler and Moorthy (1992, chapter 3). Group choice is obviously relevant in numerous marketing and managerial applications, such as family or industrial purchase decisions, cross-functional teams making product
development decisions within an organization, establishing strategic objectives for the firm, etc. In marketing most of the research has focused on organizational purchasing, likely due to its prevalent role in the marketplace (the industrial goods market is larger than for consumer goods; e.g., see Kotler 1991, p. 197). Even in the area of consumer purchasing, many purchase decisions are influenced by multiple family members (Corfman and Gupta 1993, p. 110).

Despite its vast importance, however, considerably more attention has been paid to modeling individual (consumer) choice than group (family or organizational) choice. Perhaps one reason is the greater difficulty (both analytically and empirically) in studying multi-person decisions. The result is that there is no clear understanding of the circumstances under which certain group choice models will, say, predict the purchase decision better than other models. This is an important consideration in areas such as forecasting sales of a new industrial product. Better prediction of the purchase decision (made by a group of individuals within the customer's firm) would result in a better sales forecast, and hence better managerial decisions regarding the new product's development.

A recent study of group choice models by Wilson, Lilien, and Wilson (1991) hypothesized that the particular group choice models used for an organizational purchase decision would vary by the perceived risk of the purchase, and by whether the purchase is a modified rebuy or a new task.\(^2\) Vendor preference data were collected for 24 three-person and 8 two-person organizational buying groups for a range of industrial products (e.g., copiers, copiers,

\(^2\)Modified rebuy and new task purchases describe the situation according to the buyclass framework (Anderson, Chu and Weitz 1987; Røvinson, Faris and Wind 1967). A modified rebuy involves some familiarity by the organization's buying group with the situation, although certain aspects of the supplier or product are new. New task purchases are those where members of the buying group have little or no previous experience with the product or service.
telephone systems, warehouse vehicles, etc.). Each buying group evaluated nine vendors for several products, both as individual group members before discussion and as a group. Although their contingency paradigm performed better than any single model in predicting the group choice, it did so in only about half of the decisions. One key limitation they mention is that the choice models utilized assume static preferences, such that any revisions in individual preferences due to group interaction are not considered.

Indeed, the static preference assumption is problematic for most group choice research in marketing. Lilien, Kotler and Moorthy (1992, p. 150) note that “few published studies have examined how buying centers - those individuals involved in the buying process - resolve preference differences to reach group choice.” Ignoring the group decision process, and hence the potential revisions in preference for individual group members, especially strains the ability of any model to accurately portray group decision outcomes in general terms.

The more popular group choice models involve some type of weighted average of the individual preferences, where the weights correspond to the decision influence of the group members. Examples include weighted linear utility models (e.g., Eliashberg, et al. 1986) and weighted probability models (e.g., Wilson, Lilien and Wilson 1991). However, as will be shown in the empirical studies of chapters 4 and 5, the group decision does not always represent some weighted average of the pre-discussion individual preferences. An illustrative example was presented earlier in this chapter for a vendor selection decision, when negative information revealed by engineering resulted in a reject decision. This was contrary to what one would expect from applying a choice model using a weighted average of the pre-discussion preferences. Weighted average models based upon pre-discussion preferences obviously cannot model decisions that
result from something other than an "averaging" process by the group. Group
decisions and preferences can, at times, be opposite than expected (in
dichotomous choice), or more generally be outside the range of the individuals' 
pre-discussion preferences. As illustrated with the vendor example, this could 
especially be the case when the pre-discussion preferences are based upon 
correct expectations that are discovered during group discussion.

A solution is to remove the static preference assumption; that is, to 
explicitly model the group "dynamic" (or process) which occurs. One recent 
attempt is Rao and Steckel (1991), who modified a static utility model to analyze 
and predict group choice. Their model incorporates the concept of polarization, 
which occurs when the group preference is more extreme after discussion than 
before discussion (e.g., a buying group with members favorable towards a 
vendor will be even more favorable after discussion). The polarization model 
they formulate is a linear utility model with an intercept term which represents 
the difference between the average pre-discussion preference of the individuals 
and the group norm. A group norm is some socially desirable position for 
individuals in the group (this is explained in more detail in Section 1.2). In their 
two reported empirical studies, the Rao and Steckel (1991) polarization model 
slightly outperformed the weighted utility model in predicting group choice. 
However, their model still does not explicitly model the preference revisions of 
individual group members, and is formulated for a particular type of 
polarization which may not generalize to all (or even most) situations.

Such shortcomings with studies on group choice models have prompted 
calls for research which "generalizes from one context to another due to 
understanding of the factors or dimensions that are driving the ability of models 
to predict" (Corfman and Gupta 1993, p. 129). One promising approach would
be to characterize the group process such that individual preference revisions can be modeled. Fundamentally, group decision-making involves a social influence process whereby information and acceptable group norms are revealed, which can result in preference revisions for individual group members. Understanding the preference revision process should improve a model’s capability to analyze and predict group choice. Furthermore, incorporating preference revisions that can vary in magnitude and direction would allow a model to generally apply to a wide range of group decision situations. For example, such a model would be distinguished from a polarization model in that individual preferences need not polarize, and from an averaging model in that preferences need not fall within a particular range bounded by the pre-discussion preferences.

To model preference revisions which can occur in group decision-making, the social influences that prompt changes in preference must be understood. Most research on the social influence process of multi-person decision-making has occurred in social psychology. Group choice models in social psychology are mostly based upon social decision schemes (SDS, see Davis 1973). SDS models characterize how the pre-discussion preferences will be combined to eventually reach a group decision. The models formulate a stochastic matrix to define the probabilities of certain preference patterns occurring, based on the initial distribution of pre-discussion preferences. The transition probabilities represent the various influence tendencies and features of the decision task, such as the decision rule (majority, unanimity, etc.), interpersonal influences, etc. The SDS analysis is dynamic in that transitions of member preferences and uncertainties are modeled, and sometimes the flow and exchange of information in discussion is modeled as well (Stasser 1988; Stasser and Davis 1981).
However, social decision scheme models rely upon the pre-discussion preferences and state of the group to suggest the potential revisions in preferences that might occur. Essentially, such models are more elaborate versions of the static group choice models described above, since both types of models formulate how the pre-discussion preferences will be combined to reach the group decision. SDS models do so based upon the transition probabilities, weighted average models do so based upon the influence weights of each group member, etc. For such models to accurately portray group choice and preference revisions, the social influence process must be adequately captured. The following section briefly reviews the important components of social influence, in preparation of formulating a conceptual framework and analytical model which incorporate these fundamental aspects of group decision behavior.

1.2 Multi-person Decision Behavior

Research on group decision behavior and the social influence process is most prevalent in social psychology. A review of this literature shows that social influences present in multi-person decision processes are generally classified as either normative or informational (this distinction was first presented in Deutsch and Gerard 1955). Normative influence is “based on the desire to conform to the expectations of others,” while informational influence is “based on the acceptance of information from others as evidence about reality” (Kaplan and Miller 1987, p. 306). A result of informational and normative influences is that group discussion generally shifts individual preferences for the decision alternatives. The earlier vendor example illustrated informational influence, where group members revised their preferences due to the information revealed in discussion. An example of a group norm would be the accepted risk attitudes
of the group. If group members are expected to be cautious in approving vendors, normative influence would result in individuals being risk-averse to not appear too deviant.

Preference revisions in social psychology are generally expressed in two ways. One is “group polarization,” which denotes a difference between the average pre- and post-discussion individual preferences. The other is “choice shift,” which represents a difference between the average pre-discussion and group preferences. Use of the term “polarization” arose because most experimental studies focused on explaining why the average preference of individuals in the group polarizes (becomes more extreme in the same direction) due to group discussion. A similar focus occurs for studies on group choice shift, where the group preference is more extreme than the average pre-discussion preference. This is why choice shift is sometimes referred to as a “risky shift” or a “cautious shift” (Myers and Lamm 1976), since the post-discussion risk attitude of the group is often observed to be more risky (cautious) if the individual group members are on average risk seeking (cautious) before discussion. Especially in the earlier literature, polarization is sometimes used as a general label for post-discussion preferences being more extreme in the same direction as pre-discussion preferences, whether for the group or individuals. Although certainly related, preference shifts for the individual group members and the group as a whole need not be of equal magnitude. Therefore, for polarizing preference revisions I will use “polarization” to refer to individual preference shifts, and “choice shift” to refer to the group preference shift (Zuber, Crott and Werner 1992).

Since the risky shift phenomenon was first observed (Stoner 1961), considerable research has appeared on the topic of polarizing preferences in the
social psychology literature. There are generally two schools of thought that explain polarization or choice shift, expressed in terms of informational or normative influences. The two viewpoints will be only summarized below, as excellent reviews are provided in Isenberg (1986), Laughlin and Earley (1982), Myers and Lamm (1976), and Zuber, Crott and Werner (1992).

The informational viewpoint is referred to as persuasive arguments theory (PAT, see Burnstein and Vinokur 1975, 1977; Vinokur and Burnstein 1974, 1978a). According to PAT, preferences will tend to shift according to the persuasiveness and number of arguments exchanged during discussion. Assuming there is a greater number of persuasive arguments in favor of the predominant prediscussion preference, polarization and choice shift will result as these arguments are shared in discussion. An argument’s persuasiveness depends upon its perceived validity and novelty (Isenberg 1986; Vinokur and Burnstein 1978b). Validity refers to the argument’s truthfulness and congruence with established viewpoints, and novelty reflects the ability of an argument to generate additional thoughts and facilitate retrieval of information from memory.

At times the individual group members may not always present persuasive arguments which tend to favor a single position. Vinokur and Burnstein (1978a) demonstrated that when the group consists of two subgroups of relatively equal size, each subgroup favoring a different alternative, polarization will generally be fairly weak or not occur. This is because the group as a whole does not clearly favor either of the two alternatives, and therefore persuasive arguments are presented for both options. According to PAT, the subgroups should tend to “depolarize,” i.e., the preferences of the two subgroups
will become more similar to each other after discussion\textsuperscript{3}. Thus, the valence of the arguments presented (favorable or unfavorable for the decision alternatives) impacts the direction of the preference revisions, with the magnitude affected by the persuasiveness of the arguments (informational influence).

The normative explanation for polarization and choice shift is often referred to as social comparison theory (SCT, see Blascovich, Ginsburg and Veach 1975; Goethals and Zanna 1979; Pruitt 1971; Sanders and Baron 1977). Social comparison is based upon group members being motivated to be viewed favorably with respect to some group norm. Before group discussion, individuals are generally ignorant of their position relative to the norm. When member preferences are revealed in discussion, this signals the group norm and individuals shift their preferences so that they meet or exceed the group norm. Unlike persuasive arguments theory, the social comparison approach hinges only on the preferences of group members becoming known, not the specific arguments revealed in discussion, to explain group polarization and choice shift (Blascovich, Ginsburg and Veach 1975).

Social comparison thus involves two basic assumptions (Sanders and Baron 1977). First, individuals in social situations desire to be perceived at least as favorably as the average tendency of the group. If the perceived desirable social norm of the group is risk seeking, a person would tend to behave in discussion to appear at least as risk seeking as the average group member. Second, group members before discussion will tend to underestimate the group

\textsuperscript{3}Note that depolarization involves comparison of the preferences of subgroups before and after discussion. Depolarization occurs when the difference in preference between subgroups is smaller after discussion than before. Even if depolarization occurs, the group as a whole can still polarize if the average preference for the entire group is more extreme after discussion than before. Unfortunately, this confusing terminology has not been totally resolved in the social psychology literature.
norm since they fear being too extreme. For the example of risk seeking being the group norm, individuals will learn in discussion that the group is more risk seeking than expected, and therefore revise preferences accordingly for a risky shift.

What is not clear from social comparison theory is how the group norm is determined, nor to what extent individuals are motivated to comply. For example, group members may sometimes desire to appear very different than other group members, while at other times being too extreme is undesirable behavior (Isenberg 1986). Even when a group norm is included in a group choice model, as in Rao and Steckel (1991), the norm is purely implicit and not defined. Most often the group norm is assumed to be implicit or explicit in the preferences expressed by group members, independent of any specific information revealed about the decision alternatives (Kaplan and Miller 1987). The term “mere exposure” is often utilized in conjunction with normative influence, since the simple revelation of the preferred choice of group members is sufficient to induce choice shifts.

Although considerable research has attempted to contrast PAT and SCT, the general consensus is that both informational and normative influences occur in group decision-making, with informational influence producing stronger and more frequent preference shifts (Isenberg 1986; Kaplan and Miller 1987; Myers and Lamm 1976). From a decision theoretic viewpoint this is not necessarily surprising. If preference for a decision alternative is formulated based upon information about that alternative (e.g., a multiattribute utility function), the revealed preference might be a noisy signal about the underlying information. This would generally result in revealed preferences causing smaller shifts than if the information itself is revealed.
The more recent reviews of polarization and choice shift emphasize that informational and normative influences are more complementary than competitive, and that future research should be more integrative (Isenberg 1986; Kaplan 1987; Laughlin and Early 1982). Such an approach appearing in the marketing literature is Whitney and Smith (1983), which studied group decisions in a strategic planning context. Their experimental results show that greater (less) cohesiveness within subgroups, described as a tendency of the subgroup to be cooperative and mutually supportive, will tend to relatively strengthen normative (informational) influences. Thus, both types of social influence can occur, but to varying degrees depending upon the circumstances of the group decision (Kaplan 1987; Kaplan and Miller 1987).

While few studies have attempted to understand when and to what extent informational and normative influences are stronger or weaker, even fewer studies have examined when and how these influences differentially impact polarization (preference revision at the individual level) and choice shift (preference revision at the group level). In more general terms one can distinguish between public compliance and private acceptance (Levine and Russo 1987). Public compliance occurs when the publicly stated preference of a group member conforms to the preferences of others in the group. Private acceptance occurs when the post-discussion private preference of a group member conforms more closely to the preferences of others in the group. Research suggests that normative influences will produce public compliance but not private acceptance, while informational influence will produce both compliance and acceptance (Levine and Russo 1987). Although rather intuitive, this relationship has not been clearly demonstrated. However, this does point to
normative and informational influences affecting group and individual preference revisions differently.

Furthermore, just as group choice models tend to emphasize various types of preference averaging, social psychology research has concentrated almost exclusively on preference revisions which polarize. This ignores group decisions which could result from other types of preference shifts, such as whenever a minority subgroup convinces the majority of their position. In summary, the challenge remains to identify the relationship between informational and normative influences, to understand the respective effects on preference revision at the individual and the group levels, and to consider preference revisions other than those which polarize.

One approach to meet these challenges, and the research approach advocated here, is to emphasize a fundamental basis of social influence. Despite the different mechanisms of informational and normative influences, there is a common, central requirement if these social influences are to have an effect. Preference shifts - both at the individual and group levels - due to the social influences in discussion are dependent upon pre-discussion expectations being disconfirmed\(^4\). Normative influences will be largely absent if group members correctly anticipate the group norm, while informational influences will be mostly absent if group members previously know and consider all the information presented in discussion (Laughlin and Earley 1982). However, being

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\(^4\) One can distinguish between positive disconfirmation, where the revised preference for a decision alternative would become more favorable, and negative disconfirmation, where the revised preference would become more unfavorable. Note carefully that disconfirmation refers only to the actual or posterior value being different than the prior expectation. Thus, for example, positive disconfirmation does not in general imply some type of reinforcement of or consistency with a prior expectation. Rather, positive and negative disconfirmation indicate whether what is revealed is more favorable or less favorable than what was expected. This is consistent with how disconfirmation is often described in the marketing literature, especially in consumer satisfaction (e.g., see Anderson and Sullivan 1993; Oliver 1980; Oliver and Winer 1987; Tse and Wilton 1988).
unable to correctly foresee norms or information about alternatives leaves an individual susceptible to influence exerted by other group members, causing preference shifts. Disconfirmation can occur with respect to expectations about information or expectations about the group norm, and be positive or negative depending upon whether the revealed information or norm is more favorable or unfavorable than the expectation.

Given that expectation disconfirmation can be positive or negative, it is easy to see how preference shifts need not polarize, as illustrated in the earlier vendor example. Therefore, the direction of a preference shift is determined by disconfirmed expectations about information and/or the preferences of other group members. The magnitude of the preference shift depends upon the size of the disconfirmation, augmented by one’s susceptibility to informational or normative influences. For example, consider two individuals with identical expectations about the group’s risk norm. Suppose one individual is highly susceptible to normative influence, but the other has relatively low susceptibility. In discussion they both experience the same disconfirmation, but the preference revision is larger for the individual with greater influence susceptibility. Thus, disconfirmed expectations lead to preference revisions which differ in magnitude according to one’s influence susceptibility.

As a result, this dissertation research establishes the disconfirmation of pre-discussion expectations as the fundamental component of social influence which leads to preference revisions in group decision-making. Conceptually, expectation disconfirmation provides an integrative approach to normative and informational social influence, and generalizes beyond polarizing shifts. In addition, since disconfirmed expectations are experienced and perceived by the individual group members, a unifying link is maintained between individual
decision-making and group decision behavior. Analytically, incorporating expectation disconfirmation into a model of preference revision will move past the “static” preference assumption of weighted average formulations by including an important element of the social influence process. Such an approach is also distinct from social decision scheme models, which include various types of social influence but ignore disconfirmation. This dissertation will demonstrate conceptually, analytically and empirically the role of disconfirmed expectations in group decision-making. The goal is to thereby establish a general approach to studying a wide range of group decision behavior evident in marketing research and managerial decision-making.

1.3 Overview of Remaining Chapters

In Chapter 2 a conceptual framework of group decision-making, based upon the susceptibility of group members to social influence, is formulated. Hypotheses are presented which relate preference revisions to several components of susceptibility to social influence. In Chapter 3, these social influence components are examined analytically through a utility model for two- and N-person groups. The hypotheses and implications of the model are tested with two empirical studies. Chapter 4 begins the empirical portion of the dissertation by discussing the empirical methodology. Chapter 5 presents the first study, involving a dyadic industrial purchase decision for a new medical product. Chapter 6 describes the second study, which is a family vacation decision for family triads (teenager, mother and father). The objective is to improve the analysis and modeling of the group decision process and the resulting preference revisions that occur. Chapter 7 discusses the results and their implications, and provides direction for future research.
2. Conceptual Framework and Hypotheses

The social psychology research reviewed in the last chapter suggests three components of susceptibility to social influence which lead to preference revisions. First, as already emphasized, disconfirmed expectations represent the central component of social influence, since informational and normative influences will generally not be present if group discussion reveals only information and norms already considered before discussion (Laughlin and Earley 1982). An individual will revise preferences consistent with experiencing positive or negative disconfirmation. For example, an individual who learns in discussion that a new product is more reliable than expected (as in the earlier vendor example) experiences positive disconfirmation, such that preference for the new product becomes more favorable. Larger disconfirmation will result in greater preference revision.

Despite its theoretical importance, expectation disconfirmation has received little attention in marketing or social psychology studies of multi-person decision behavior. A possible exception is Rao and Steckel's (1991) polarization model, which could be interpreted as implicitly including disconfirmed expectations. Their group utility expression contains a term that is the difference between the average individual pre-discussion utility and an implicit group norm. If the group members' average utility equaled the group norm (as would be the case if the norm was perfectly known), this term would be zero. The approach in this dissertation is to explicitly model disconfirmed expectations in order to understand the multi-person decision process and explain preference revisions due to social influences, whether normative or informational.
The effects of customer expectations have received study in areas other than group decision-making. This research includes expectations for price and promotion (e.g., Kalwani and Yim 1992; Narasimhan 1989), changes in product technology (e.g., Bridges, Yim and Briesch 1995; Dhebar 1994), and the expected benefits of information search (e.g., Hagerty and Aaker 1984; Wilton and Myers 1986). The role of expectations and disconfirmation has by far received greatest attention for customer satisfaction research (Anderson and Sullivan 1993; Johnson, Anderson and Fornell 1995; Oliver 1980), although the relative importance of expectations and disconfirmation is still being debated. However, there is little debate that expectations are important players in individual decision-making. For a review of the various behavioral, economic and decision theories offered to explain the formation of expectations, see Oliver and Winer (1987).

The central hypothesis is that positive (negative) disconfirmation of expectations will cause an upward (downward) revision of preferences, and that the greater the disconfirmation, the greater the preference shift. The social psychology research suggests that the preference revisions at the individual and group levels can differ. However, there is no clear generalization as to whether disconfirmation will affect individual preference shifts more strongly or weakly than preference shifts at the group level. This likely depends upon not only how one defines and measures disconfirmation for the group (e.g., is it a simple average of disconfirmation for the individuals), but also the magnitude and direction of the preference revisions for the group members. For example, if most or all group members experience disconfirmation in the same direction, then the magnitude of the group preference shift will be rather large. However, if some individuals experience positive disconfirmation and others negative, the
group preference shift might tend to be small. Therefore, no hypothesis is made regarding different effects of expectation disconfirmation on the individual and group preference revisions, although this issue will be examined with the empirical results presented later.

H1a: The greater the expectation disconfirmation from group discussion, the greater the amount of preference revision that occurs.

H1b: Upward (downward) preference revision will occur under positive (negative) disconfirmation of expectations.

One potential effect related to disconfirmed expectations is that negative and positive disconfirmation will impact the magnitude of the preference revision differently. Reference point theories, which posit that consumers make evaluations based on values relative to some reference, incorporate loss aversion where losses tend to loom larger than gains (Kahneman and Tversky 1979; Thaler 1985; Tversky and Kahneman 1991). Framing effects are also observed such that individuals will be tend to be risk seeking for losses but risk averse for gains (Tversky and Kahneman 1981, 1986). Given the general support for loss aversion in a variety of contexts, it is plausible that negative disconfirmation will lead to a larger (in magnitude) preference revision than positive disconfirmation.

H2: Negative disconfirmation will have a larger effect than positive disconfirmation on preference revisions due to group discussion.

Although framing effects have been demonstrated for group negotiation and decision-making under risk (Kameda and Davis 1990; Paese, Bieser and Tubbs 1993; Qualls and Puto 1989; Schurr 1987; Tindale, Sheffey and Scott 1993), the potential differential impact of negative and positive disconfirmation on the magnitude of preference revisions has not been studied. However, a hypothesis
similar to H2 was supported in a recent customer satisfaction study of Anderson and Sullivan (1993).

A second component of social influence which can augment the magnitude of preference revisions is uncertainty. While the formation of expectations is not thoroughly understood, it is straightforward that the very concept of expectations includes uncertainty (Oliver and Winer 1987). This clarifies an important limitation of most group choice models reviewed earlier. With little or no uncertainty the preferences of group members will change little if at all, since no new information will be revealed and the group norm will be known\textsuperscript{5}. In this case, static group choice models based only upon pre-discussion preferences could do reasonably well in predicting the group decision. However, under uncertainty the potential for preference revisions is relatively higher, since pre-discussion preferences will be based upon expectations which could be disconfirmed in group discussion.

The implication is that greater uncertainty before discussion will result in a greater susceptibility to both informational and normative social influence (Deutsch and Gerard 1955; Sniezek and Henry 1990). This in turn leads to greater preference revisions. For example, uncertainty about the ability of competing vendors to deliver products on time could mean accepting information from someone else perceived to be knowledgeable about the vendors (informational), or could result in simply agreeing with other group members about their preferred vendor so as not to appear ignorant (normative).

\textsuperscript{5}In discussing uncertainty I will primarily focus on unknown information about the decision alternative(s). In doing so I will tend to de-emphasize effects related to risk attitudes, which are generally a basis for normative influence and not informational, since most of the social psychology literature has focused on risky shifts. For an excellent discussion of uncertainty, risk and ambiguity, see Einhorn and Hogarth (1985).
All else equal, then, greater uncertainty before discussion should result in greater preference revisions by group members. Note that ultimately the preference revision will depend upon one’s uncertainty and the uncertainty of others in the group. A person’s preference shift when uncertainty is relatively equal among group members will be larger (smaller) than when the person has low (high) uncertainty compared to other group members. This is because one has greater susceptibility to influence under high uncertainty, but will be influenced less by highly uncertain information revealed by others in the group. For the group-level preference revision, this implies that a larger shift will occur the larger the differences in uncertainty among the group members.

One study by Thomas (1982) found that persons with greater certainty about product characteristics were less influenced by information from another member of the organization. The study also indicated that uncertainty related to specific product characteristics had a larger impact on influence than one’s general confidence in making decisions (general confidence was insignificant). Particularly when recalling that informational influence tends to be larger than normative influence, this suggests that uncertainty about information specific to the decision alternatives (e.g., product attributes) is a key factor. The uncertainty hypotheses therefore involves only the informational aspects of the group decision.

H3a: The greater a group member’s pre-discussion uncertainty about the decision alternative, the greater the amount of preference revision that occurs.

H3b: The greater the differences in pre-discussion uncertainty among group members, the greater the group-level preference revision due to discussion.
The direction of the individual’s preference revision would be consistent with the disconfirmation due to information revealed by others in discussion. The earlier example of engineering, purchasing, and management approving a new vendor illustrated how uncertainty about attributes led to preference shifts according to the favorability and disconfirmation of the information revealed.

It should be noted that preference revisions related to uncertainty could occur in a manner not classically associated with the informational or normative social influence concepts. Risk averse preferences imply that utility will increase with more certainty in the attributes of decision alternatives (e.g., Roberts and Urban 1988). If group discussion serves to reduce uncertainty, preference becomes more favorable even if disconfirmation of expectations did not occur. Although not an informational social influence in the usual sense, changes in uncertainty are a potential cause of preference revisions. No hypothesis is formulated, however, since this effect is specific to the particular risk attitudes of individual group members, which can vary across decisions and circumstances.

Another aspect of uncertainty is that it will not only affect preference revisions, but also the influence perceptions among group members. Studies have shown that greater certainty results in greater participation during group discussion, and hence a generally greater perception of influence as rated by other group members (Hastie 1986; Sniezek 1992). A similar effect should occur for a person’s own self-rated influence. All else equal, a person with, say, low uncertainty will participate relatively more in discussion, and upon observing this tend to rate his or her own influence more highly. This link between

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6Uncertainty should therefore be an important consideration in examining how influence perceptions change due to group discussion.
uncertainty, discussion participation, and post-discussion influence perceptions suggests two related hypotheses:

H4a: The greater a group member's pre-discussion uncertainty, the less the post-discussion self-rated influence in the group decision.

H4b: The greater a group member's pre-discussion uncertainty, the less the influence in the group decision as rated by the other group members after discussion.

Thus, greater uncertainty implies less influence as rated by oneself and others after group discussion has occurred.

The third component of social influence susceptibility relates directly to perceptions of informational and normative influence within the group. Similar to uncertainty, influence perceptions will augment the magnitude of preference revisions due to group discussion. While social psychology research has concentrated on informational and normative influences, marketing has primarily studied 1) the various antecedents of influence in organizational and family purchase decisions (Anderson and Chambers 1985; Corfman and Lehmann 1987; Kohli 1989; McQuiston 1989; Ronchetto, Hutt and Reingen 1989; Thomas 1982), and 2) the measurement and formation of perceived influence (Corfman 1991; Silk and Kalwani 1982).

The link between influence concepts in marketing and social psychology arises from the particular informational and normative components implied in influence antecedents examined in marketing. In organizational situations, for example, Kohli (1989) finds that organizational influence is strongly related to expert power (knowledge about decision alternatives) and reinforcement power (an ability to reward or punish others). Expertise would be a type of informational influence, in that expert information from another group member
would be likely seen as persuasive. Reinforcement power held by another group member would relate to normative influence, in that incentives are provided to conform to the expectations or wishes of others. Anderson and Chambers (1985), Corfman and Lehmann (1987) and Thomas (1982) also distinguish sources of purchase decision influence which can be interpreted as informational or normative social influences. Certain types of influence could have both informational and normative components. For example, expertise could be a source of normative influence if there is a desire to agree with an expert so that a favorable impression is made on others in the group.

Research on influences in family decision-making has focused on the role of different family members in various purchase decisions, as well as antecedents and measurements of decision influence (Corfman and Lehmann 1987; Davis 1970, 1976; Filiatrault and Ritchie 1980; Foxman, Tansuhaj and Ekstrom 1989). As with organizations, various types of family influence can be interpreted as normative or informational, although such relationships have generally not been made explicit in the literature. An exception is related research on consumer susceptibility to reference group influence (Bearden and Etzel 1982; Bearden, Netemeyer and Teel 1989; Burnkrant and Cousineau 1975; Ford and Ellis 1980; Park and Lessig 1977). Examples of reference group effects are purchases of fashions and luxury items. A consumer will often refer to or compare against some reference group to determine if the fashion or luxury is socially acceptable. The reference group can be real or hypothetical, and the decision-making occurs for the individual consumer who purchases, not the group. Thus, although reference group influence is defined and measured in terms of informational and normative influences, it is not directly applicable to cases of multi-person decision-making.
The focus of the previous research has had the result that antecedents to organizational and family influences have seen numerous studies, but there still exists a general lack of research that relates particular informational and normative influences to group decisions and preference revisions. The influence hypotheses presented here will therefore appear somewhat general, since the focus is on preference shifts due to the social influence process and not on the influence antecedents and constructs. The distinctions between informational and normative influences are therefore characterized according to their basic definitions. As discussed in Section 1.2, susceptibility to informational influence corresponds to acceptance of information about the decision alternative(s) from other group members. Susceptibility to normative influence relates the impact of other group members' preferences or choice on one's own preference.

Regardless, then, of the precise nature of the social influence, greater susceptibility to informational and normative influence will result in larger preference revisions for that group member. The direction of the preference revision is consistent with disconfirmed expectations of the preferences and information revealed by others in the group.

H5: The greater a group member’s pre-discussion susceptibility to informational and normative influences, the greater the amount of preference revision that occurs.

For example, a lower-level employee with high susceptibility to normative influence may be impacted by the risk attitudes of upper-level managers in the group. If the employee learns in discussion that management is highly risk averse, the employee’s preference for the “safe” option will increase relative to other more risky alternatives.
The resulting conceptual framework of social influence and preference revisions in group decision-making is shown in Figure 1. Group discussion reveals information and the preferences of other group members, and preference revisions will occur to the extent that the pre-discussion expectations are disconfirmed. The magnitudes of the preference revisions are augmented by uncertainty about the decision alternative(s) and the susceptibility to the informational and normative influences within the group.

![Diagram showing the social influence framework](image)

**Figure 1: Social Influence Framework of Group Decision-Making**

As an example, consider again the vendor approval decision from Chapter 1. Let the engineer have a poor evaluation of the new vendor due to perceived
quality control problems, which management knows has been recently remedied. Suppose that the group norm relates to the risk-averse attitude embedded in the corporate culture of the organization. Let purchasing be relatively new to the company such that the risk-averse culture is not known to it, but as a new employee purchasing would like to favorably impress the other group members. Purchasing otherwise views the new vendor as potentially acceptable since it has a slightly lower cost for the purchased component. As information and norms are revealed in discussion, engineering will experience positive disconfirmation when learning that vendor quality is actually high, and revise preference upward. The magnitude of this shift, however, depends upon how certain management is about its information compared to engineering. If management has just heard a rumor, then engineering would not be particularly influenced by the information and have a small preference revision. Similarly, purchasing will experience negative disconfirmation of the group norm, revising preference downward due to the group’s risk aversion. Since purchasing is a new employee with high normative influence susceptibility, the downward preference revision will be relatively large. Overall, the group decision would likely be reject, since purchasing’s downward preference shift is large (due to high susceptibility to normative influence) and engineering’s upward revision is small (management heard only a rumor).

To demonstrate analytically how the social influence components result in preference revisions for group members, a utility model for two-person and N-person group decisions is next presented. Implications of the model are related to the conceptual framework and hypotheses.
3. Preference Revision Model

To demonstrate analytically disconfirmed expectations and the outlined components of social influence, a specific example is first presented, followed by somewhat more general formulations for two- and N-person groups. Consider a dyadic version of the earlier vendor example from Chapter 1. One person is from engineering and one is from management, and they must decide whether to approve a new vendor to supply a certain component, or retain a current vendor on its approved list. Assume for simplicity that the utility for vendors is based upon two attributes: an engineering attribute (e.g., the technical performance of the vendor’s component in terms of reliability, technical specification, etc.) and a management attribute (e.g., the cost of the component, implications of creating a new vendor relationship, etc.).

The engineer’s utility $U^E$ and the manager’s utility $U^M$ for the new vendor are expressed as

$$U^E = e_E x_E + e_M x_M - 1$$
$$U^M = m_E x_E + m_M x_M - 1$$

where $e_E$ and $e_M$ are the engineer’s respective importance weights for the engineering and management attributes; $m_E$ and $m_M$ are the manager’s respective importance weights for the engineering and management attributes; and $x_E$ and $x_M$ are the attribute values for the engineering and management attributes, respectively. The utilities are normalized such that the utility for the outside option (the current vendor) is equal to one\(^7\).

---

\(^7\)Throughout this example, subscripts will refer to the engineering or management attribute, while superscripts will refer to either the engineering or management representative to the two-person decision group.
To model informational influence, assume there is some uncertainty about the attribute values. Before discussion the engineer knows the value of the engineering attribute, but is unsure of the management attribute value. Similarly, the manager knows the management attribute value, but is uncertain of the engineering attribute value. During discussion the true values of both attributes are revealed and accepted as valid by both group members. Prior to discussion let the unknown attribute values be uniform random variables distributed as

\[ \bar{x}_M \sim U[0,2\bar{x}_M] \quad ; \quad \bar{x}_E \sim U[0,2\bar{x}_E] \]

A type of normative influence is modeled as follows. Let the group norm relate to the importance weights for the two attributes in this particular situation. Since the two persons are essentially experts about their respective attribute, let them be willing to modify the importance weight of the attribute they know little about. For example, suppose the organization is pressuring for cost containment. The manager knows this very well, so has a high importance for the managerial attribute related to cost. Engineering, however, is not fully aware of this fact, and so has a smaller managerial importance weight. In discussion the manager explains the fiscal crisis, and the engineer subsequently concedes that cost considerations should be given more weight.

In this manner, let discussion reveal the attribute importance weights for engineering and management. Assume the engineer updates the importance weight for only the management attribute according to

\[ e'_M = (1 - \alpha^E)e_M + \alpha^Em_M \quad ; \quad \alpha^E \in [0,1] \]

while the manager updates only the engineering attribute importance weight by
\[ m'_E = (1 - \alpha^M) m_e + \alpha^M e_E ; \alpha^M \in [0,1] \]

The variable \( \alpha^E \) represents the engineer's relative susceptibility to influence from the manager in updating the importance weights, while \( \alpha^M \) represents the manager's susceptibility to influence from the engineer. The result is that after discussion the two persons are in greater agreement as to the "proper" importance of the engineering and manufacturing attributes\(^8\). As a type of normative influence, each individual is influenced by the other's perception of how important the attributes are for this organizational decision, independent of any specific information about the vendor.

Given these assumptions, the engineer's preference revision due to discussion (post-discussion utility \( (U^E)' \)) minus the pre-discussion expected utility \( EU^E \)) can be expressed as

\[
(1) \quad (U^E)' - EU^E = e_M(x_M - \bar{x}_M) + \alpha^E(m_M - e_M)x_M
\]

A similar expression applies for the manager's preference revision. Note that the first term of equation (1) is the informational influence related to learning the true value of the management attribute. This term is zero if the engineer had a correct expectation of the attribute value; otherwise the magnitude of the preference revision is larger the greater the magnitude of the disconfirmed expectation (H1a). Note that, as stated in H1b, the direction of the preference revision due to disconfirmation is consistent with the attribute value being

---

\(^8\)One could argue that it is only the relative importances of the two attributes that matter and that should be updated, not the importance of each attribute separately. However, the utility functions are already scaled such that the utility of the outside option is identical for both persons. An alternative formulation using relative attribute importances would, in any case, not change the fundamental implications of the analysis.
under- or overpredicted. The second term of equation (1) is the normative influence related to updating the management attribute importance. This term is zero if either the engineer is not influenced by the manager, or the engineer and manager both had the same management attribute importance before discussion (no disconfirmation). The preference revision is greater in magnitude as the engineer has greater susceptibility to influence from the manager, as hypothesized in H5, and the greater the disconfirmation.

It is easy to see from the model how preference revisions due to social influence might affect the approval decision for the new vendor. For example, equation (1) shows that the engineer will revise downward the utility for the new vendor if the importance of the management attribute and/or the management attribute value were overestimated. A similar effect would occur for the manager if the engineering attribute value and importance are overpredicted. The result could be that even if both persons preferred the new vendor before discussion, sufficiently large downward preference revisions due to discussion could lead both to decide to retain the current vendor. Capturing this phenomenon is obviously difficult for models that are merely a weighted combination of pre-discussion preferences and that ignore disconfirmed expectations.

The model thus far has illustrated how a greater social influence, through disconfirmed expectations and greater susceptibility to normative influence, results in greater preference revisions after discussion. To explore more closely the role of uncertainty and information, consider now risk-averse preferences and let there be uncertainty in attribute values even after discussion. Specifically, assume for simplicity constant absolute risk aversion such that the utilities for both the engineer and the manager take the form
\[ U^E = -\exp\{-r^E[e^E_{\bar{x}_E} + e^E_{M,M}]\} \quad U^M = -\exp\{-r^M[m^E_{\bar{x}_E} + m^E_{M,M}]\} \]

where \( r^E \) and \( r^M \) are the respective coefficients of risk aversion for engineering and management, and now both individuals are uncertain of the values for both attributes. For ease of exposition assume that the pre-discussion attribute values are normally distributed with means and precisions \( (\mu^i, h^i) \) where \( i, j \in \{E,M\} \) and, as before, the subscript refers to the attribute and the superscript refers to the person. For example, the engineer’s prior value for the management attribute \( \bar{x}_M \) is normally distributed with mean \( \mu^E_M \) and precision \( h^E_M \). Utilizing precisions instead of variances makes the utility updating more tractable. The precision value represents how precisely a person has estimated the attribute value, and is generally the inverse of uncertainty.

Assume that during discussion the two persons reveal their expected attribute values, and that all the precisions are known. This represents a situation where the engineer and manager trade their prior “signals” of the attribute values during discussion. The exponential utility functions, combined with normally distributed variables, make the utility updating straightforward (DeGroot 1970, p. 167). Considering just the engineer, the pre-discussion expected utility \( EU^E \) and post-discussion expected utility \( (EU^E)' \) for the new vendor are

\[ EU^E = -\exp\{-r^E\left[e^E_E \mu^E_E - \frac{r^E e^2_E}{2h^E_E} + e^E_M \mu^E_M - \frac{r^E e^2_M}{2h^E_M}\right]\} \]

\[ (EU^E)' = -\exp\{-r^E\left[e^E_E (\mu^E_E)' - \frac{r^E e^2_E}{2h^E_E} + e^E_M (\mu^E_M)' - \frac{r^E e^2_M}{2h^E_M}\right]\} \]
where the updated means and precisions are given by

\[
\left( \mu^E_E \right)' = \frac{h^E_E \mu^E_E + h^M_E \mu^M_E}{h^E_E} ; \quad \left( \mu^M_M \right)' = \frac{h^M_M \mu^M_M + h^E_M \mu^E_M}{h^M_M} ; \quad h^E_E' = h^E_E + h^M_E ; \quad h^M_M' = h^M_M + h^E_M
\]

The revision due to discussion of the engineer's (log-transformed) preference\(^9\) \((\Delta EU^E)\)' can thus be expressed as

\[
(\Delta EU^E)'/r^E = \frac{r^E e^2_E}{2} \left[ \frac{1}{h^E_E} - \frac{1}{h^E_E'} \right] + \frac{r^E e^2_M}{2} \left[ \frac{1}{h^M_M} - \frac{1}{h^M_M'} \right]
\]

\[
+ e^E_E \left[ \frac{h^E_E}{h^E_E + h^M_E} (\mu^M_E - \mu^E_E) \right] + e^M_M \left[ \frac{h^M_E}{h^E_M + h^M_M} (\mu^M_M - \mu^E_M) \right]
\]

(2)

The first two terms of equation (2) represent the effect of increased certainty due to the information exchanged during discussion. The attribute precisions are higher after discussion, such that, for risk averse preferences, utility increases with more certainty. Note that if the attribute information received from the other person was very imprecise, this certainty effect would be small. The last two terms of equation (2) capture an informational influence related to the certainty (precision) levels for the attributes. Note again how these terms are zero if the pre-discussion expected attribute values are the same for both members of the group, i.e., when the pre-discussion expectations are confirmed. A larger disconfirmation will result in a larger preference revision (H1). Furthermore, as the engineer's attribute certainties (the terms \(h^E_E\) and \(h^M_M\)) become smaller, all else equal, the magnitude of the preference revision due to disconfirmation will increase. This demonstrates a relationship between the size of the preference revision and uncertainty, as hypothesized in H3a.

---

\(^9\)Taking a monotonic transformation of the expected utilities does not impact the conclusions of the analysis. This is a very convenient aspect of the exponential utility function and normally distributed random variables (Varian 1992, p. 189).
Notice also that preference revision due to disconfirmed expectations (the last two terms of the equation) depends upon the relative precisions of the information from the two group members. Chapter 2 mentioned studies in social psychology which have shown that less uncertainty is associated with greater discussion participation, which in turn increases that person’s perceived decision influence (H4a and H4b). Assuming that influence perceptions are on average consistent with reality, a person could observe the preference shifts within the group and perceive the relative influences among the group members. From equation (2) it is easy to see that the greater the precision of information from the other group member, the greater the preference revision, and hence the greater the likely post-discussion rated influence for the other group member. Similarly, a person who possesses less precise information than the other group member will learn this in discussion and likely rate the self-influence as being smaller. These relationships are those hypothesized in H4a and H4b.

Two different expressions for utilities were used in order to more clearly illustrate the hypothesized relationships between social influence and preference revisions. Note that it is rather straightforward to implement different formulations of normative influence. For example, considering again that normative influence is related to the attribute importances, suppose that the group norm is established by the organization. Each person has a rational expectation about the true importances, but has uncertainty. In group discussion these “normative signals” are exchanged, and importance weights are updated. In this case, the preference revision from updating importances will appear quite similar to updates for uncertain information. The normative influence susceptibility will be related to the relative precisions of the normative signals.
Somewhat more general formulations are now presented for two-person and N-person groups. The analysis of two-person groups will model a more general normative influence, and the model for N-person groups will establish the analysis approach for two or more attributes and groups of two or more members.

3.1 Preference Revision Model for Two-person Groups

Recall that a group norm is generally implicit or explicit to the preferences of the individual group members. The earlier model related normative influence to the attribute importances, which is but one possible exposition of group norms\textsuperscript{10}. This section will generalize normative influence to the revelation of preferences during group discussion.

Let there be two attributes, $\tilde{x}_1$ and $\tilde{x}_2$ which are normally distributed random variables, and two persons $\{1,2\}$ with utilities

$$U_1 = -\exp\left(-r_1\left[a_{11}\tilde{x}_1 + a_{12}\tilde{\tilde{x}}_2 + \alpha_{12}\tilde{U}_{12}\right]\right)$$

$$U_2 = -\exp\left(-r_2\left[a_{21}\tilde{x}_1 + a_{22}\tilde{\tilde{x}}_2 + \alpha_{21}\tilde{U}_{21}\right]\right)$$

where $r_1$ and $r_2$ are the coefficients of risk aversion for the two persons; $a_{ij}$ is person $i$'s attribute importance for attribute $j$, with $i \in \{1,2\}$, $j \in \{1,2\}$; $\alpha_{ik}$ is person $i$'s susceptibility to normative influence for the preference of person $k$, $i \neq k$ and $i,k \in \{1,2\}$. The pre-discussion attribute values $\tilde{x}_j$ are normally distributed for person $i$ with means and precisions $(\mu_{ij}, h_{ij})$ where $i,j \in \{1,2\}$.

Finally, person $i$'s preference is affected by the preference of person $k$, which

\textsuperscript{10}Given the extensive use of multiattribute utility models, it is somewhat surprising that changes in attribute importances due to social influence have not been studied in marketing and social psychology. The empirical study of Chapter 6 will explore whether this might be a particular source of normative influence that deserves further research.
before discussion is a random variable \( \tilde{U}_k \) normally distributed with mean and precision \( (\bar{U}_k, \eta_k) \).

First, note that with respect to informational influence associated with the attribute values, the formulation is the same as before with the engineer and manager. In discussion the dyad exchanges signals about the values of the two attributes, and updates means and precisions accordingly. Second, the normative influence is now directly related to the preference of the other group member, with influence \( \alpha_k \). The pre-discussion expectation of the other person’s preference is given a mean and precision independent of information about the attributes. This is because conceptually normative and informational influences are considered to be distinct. Also, in this formulation knowing the other person’s preference will not give information about the attribute values as long as the other person’s attribute importances and susceptibility to normative influence are unknown\(^{11}\). These assumptions make the normative influence consistent with the “mere exposure” of preferences as discussed in Section 1.2.

During discussion the two persons trade signals about the attribute values and reveal preferences. Even though the group members do not know the true attribute values even after discussion, they do know their preferences (expected utilities) given the information available. Thus, for the impact of normative influence, there is no longer any uncertainty about the other person’s preference once it is revealed in discussion\(^{12}\). Note that here and throughout this chapter,

\(^{11}\) As mentioned in Chapter 1, one could envision the revealing of preference to be a noisy signal about the attribute values. This is left for future study so that the focus remains on disconfirmed expectations, and not the intricate relationships between informational and normative influences.

\(^{12}\) It is straightforward to consider the case where uncertainty about the group norm exists even after discussion. The equations are formulated as they are in the text to heighten the intuitive distinctions between informational and normative influences.
there is also the implicit assumption that all group members truthfully reveal what they know.

The pre-and post-discussion expected utilities for person $i$ are therefore:

$$EU_i = -\exp \left\{ -r_i \left[ a_{i1}\mu_{i1} - \frac{r_i a_{i1}^2}{2h_{i1}} + a_{i2}\mu_{i2} - \frac{r_i a_{i2}^2}{2h_{i2}} + \alpha_{ik} \overline{U}_k - \frac{r_i a_{ik}^2}{2h_{ik}} \right] \right\}$$

$$\left( EU_i \right)' = -\exp \left\{ -r_i \left[ a_{i1}(\mu_{i1})' - \frac{r_i a_{i1}^2}{2h_{i1}'} + a_{i2}(\mu_{i2})' - \frac{r_i a_{i2}^2}{2h_{i2}'} + \alpha_{ik} EU_k \right] \right\}$$

where the updated means and precisions are given by

$$\left( \mu_{ij} \right)' = \frac{h_i \mu_{ij} + h_{ij} \mu_{ij}}{h_i'} ; h_i' = h_i + h_{ij}; i \neq k$$

The revision due to discussion of the (log-transformed) preference for person $i$ $(\Delta EU_i)'$ can thus be expressed as

$$\left( \Delta EU_i \right)' / r_i = \frac{r_i a_{i1}^2}{2} \left[ \frac{1}{h_{i1}} - \frac{1}{h_{i1}'} \right] + \frac{r_i a_{i2}^2}{2} \left[ \frac{1}{h_{i2}} - \frac{1}{h_{i2}'} \right] + \frac{r_i a_{ik}^2}{2} \left[ \frac{1}{h_{ik}} \right]$$

$$+ a_{i1} \left[ \frac{h_{k1}}{h_{i1} + h_{k1}} (\mu_{k1} - \mu_{i1}) \right] + a_{i2} \left[ \frac{h_{k2}}{h_{i2} + h_{k2}} (\mu_{k2} - \mu_{i2}) \right]$$

$$+ \alpha_{ik} [ EU_k - \overline{U}_k ]$$

The first line of equation (3) shows three terms related to the effect of increased certainty due to the information exchanged during discussion about the two attributes and due to learning the other group member’s preference, respectively. The second line of equation (3) captures the informational influence related to the attribute certainties and the disconfirmation of the two attribute values. Note again how these terms are consistent with the preference revision relationships hypothesized in H1a, H1b and H3a, as well as suggest the
hypothesized relationship between post-discussion rated influence and uncertainty (H4a and H4b). The last line of equation (3) shows the normative influence effect (H5), which is zero if the pre-discussion expectation of the other group member’s preference was correct, or if the person is not susceptible to such normative influence.

Knowing now the preference revisions for the two group members, the group-level preference revision can now be examined. Consider a measure consistent with the literature on group polarization; namely, the difference between the average of the individual preferences before and after discussion. For the dyad this group-level preference revision \((\Delta EU_{1,2})'\) would be:

\[
2(\Delta EU_{1,2})' = \frac{r^2_1}{2} \{\text{change in certainty terms for person 1}\} \\
+ \frac{r^2_2}{2} \{\text{change in certainty terms for person 2}\} \\
+ \frac{1}{h_{11} + h_{21}}[(r_1a_{11}h_{11} - r_2a_{21}h_{11})(\mu_{21} - \mu_{11})] \\
+ \frac{1}{h_{12} + h_{22}}[(r_1a_{12}h_{12} - r_2a_{22}h_{12})(\mu_{22} - \mu_{12})] \\
+r_1\alpha_{12}[EU_2 - \bar{U}_2] + r_2\alpha_{21}[EU_1 - \bar{U}_1]
\]

(4)

Note that the group-level preference revision depends upon a weighted difference between precisions of both group members for each attribute, as hypothesized in H3b. In general, disconfirmation may be of different signs and magnitudes for the two group members, such that the group-level preference revision may be small even if the individual preference revisions are large, but not vice versa. This points to how disconfirmed expectations are essentially necessary, but not sufficient, to observe preference shifts for the group (controlling for a change in preference due to a change in certainty under risk aversion).
3.2 Preference Revision Model for N-person Groups

It is now fairly straightforward to generalize the model for groups of three or more persons, and when information about three or more attribute values are being revealed in discussion. Suppose there are $n$ attributes, and the group contains $N$ individuals. Similar to above, let each person $i$ have utility of the form:

$$U_i = -\exp\left\{ -r_i \left[ \sum_{j=1}^{n} (a_{ij} \bar{x}_j) + \sum_{k \neq i}^{N} (\alpha_{ik} \bar{U}_k) \right] \right\}$$

Pre-discussion attribute values $\bar{x}_j$ are normally distributed for person $i$ with means and precisions $(\mu_{ij}, h_{ij})$, and person $i$'s preference is affected by the preference of person $k$, which before discussion is perceived as a random variable $\bar{U}_k$ normally distributed with mean and precision $(\bar{U}_k, h_{uk})$.

After discussion the expected utilities are based upon the updated means and precisions, which for person $i$ and attribute $j$ are given by

$$\left( \mu_{ij} \right)' = \frac{\sum_{k=1}^{N} h_{kj} \mu_{kj}}{h_{ij}'} ; h_{ij}' = \sum_{k=1}^{N} h_{kj}$$

The preference revision due to discussion for person $i$, $(\Delta EU_i)'$, can thus be expressed as

$$\frac{(\Delta EU_i)'}{r_i} = \frac{r_i}{2} \sum_{j=1}^{n} \left[ a_{ij}^2 \left( \frac{1}{h_{ij}} - \frac{1}{h_{ij}'} \right) \right] + \frac{r_i}{2} \sum_{k \neq i}^{N} \left[ \alpha_{ik} \left( \frac{1}{h_{uk}} \right) \right]$$

$$+ \sum_{j=1}^{n} \left[ a_{ij} \left( \sum_{k \neq i}^{N} h_{kj} (\mu_{kj} - \mu_{ij}) \right) / \sum_{k=1}^{N} h_{kj} \right] + \sum_{k \neq i}^{N} \left[ \alpha_{ik} (EU_k - \bar{U}_k) \right]$$

(5)
The first two terms of equation (5) represent the effect of increased certainty under risk aversion, and the last two terms capture the disconfirmation of attribute expectations and the normative influence.

The group-level preference revision ($\Delta EU_N$), considering the average individual preferences before and after discussion, resembles that of equation (4):

$$N(\Delta EU_N) = \sum_{i=1}^{N} \left[ \frac{r_i^2}{2} \text{ (change in certainty terms)} \right]$$

$$+ \sum_{j=1}^{N-1} \sum_{k=i+1}^{N} \left[ (r_i a_k h_{kj} - r_k a_k h_{ij})(\mu_{kj} - \mu_{ij}) \right]/\sum_{i=1}^{N} h_{ij}$$

$$+ \sum_{i=1}^{N} \sum_{k=i}^{N} r_i \alpha_{ii} [EU_k - \bar{U}_k]$$

Of course, another measure of preference revision for the group is like that used for choice shift, which is the group preference after discussion minus the average individual preference before discussion. If one assumes that the group preference will be some type of weighted average of the individual post-discussion preferences, the group-level preference shift will be similar to equation (6), which uses a simple average of the post-discussion individual preferences.

Actual multi-person decision processes can certainly be more complex than indicated by the simplifying assumptions of the model. For example, it was assumed that known information would be perfectly revealed in discussion. This will not always be so, and the impact of informational influence depends upon the perceived validity of the information shared (see Kaplan and Miller 1987). The model relies upon the precision of the information to measure its validity, but sometimes a group member might simply perceive as imprecise a signal that is actually very precise. Such a perceptual bias could, however, be
readily introduced into the model through a parameter of susceptibility to informational influence (much like the $\alpha$ parameter for normative influence). This would in effect modify the precision of the signals received from other group members according to one’s perceptions of informational influence.

The model demonstrates the primary effects of susceptibility to social influence in multi-person decision-making, consistent with the hypotheses. Disconfirmed expectations, uncertainty about information, and normative influence have been shown to impact preference revisions due to discussion for group members. The next three chapters now turn to the empirical question of whether such effects really do help explain preference revisions for group decision-making. Chapter 4 presents an overview of the survey methodology for the two empirical studies. Chapter 5 describes a field study of a dyadic organizational purchase decision to provide a first test of the hypothesized relationships. Chapter 6 then presents a study of a triadic family (teenager, mother, and father) vacation decision which focuses on the effects of disconfirmed expectations.
4. Methodology

In examining the multi-person decision process, the goal is to confirm the hypothesized roles of disconfirmed expectations and susceptibility to social influence on preference revisions. The empirical approach taken is to place relatively little structure on the decision-making task. Although this sacrifices some experimental control, an unstructured approach allows for a more realistic decision problem (Brucks 1985; Ward and Reingen 1990). The primary advantages are that participants in the study can formulate their own preferences and freely exchange information during discussion to reach a group decision. Findings related to preference revisions due to group discussion should therefore have greater external validity. External validity is particularly important in trying to assess the severity of the static preference assumption associated with group choice models.

Generally speaking, the “unstructured” approach applied to group decisions would allow group members to first become familiar with the decision alternative(s). This could be accomplished by having group members search information about the alternatives individually, so that pre-discussion preferences can be formed and measured before social interaction occurs. The group members would then meet for discussion and decide which option to choose. The group preferences for the various alternatives would be measured. After discussion, individual group members would indicate their post-discussion preferences. With this type of process, individual preferences can be measured before and after discussion so that preference revisions can be examined. Individual information search permits individuals to formulate preferences and enter discussion with some knowledge about the decision alternative(s).
Unstructured discussion permits the social influence process to occur as naturally and realistically as possible in a survey setting.

Realism can be further enhanced by allowing relatively thorough information search by the individuals. Freely accessing from a set of realistic information enables individuals to formulate preferences based upon information they choose to review and assimilate. One survey methodology which allows realistic information search is Information Acceleration (the reader is referred to Urban, Weinberg and Hauser 1996 for a review of the I/A process). Information Acceleration (I/A) uses multimedia computer technology to allow participants to search relevant product information (advertising, word-of-mouth, salesperson, etc.) about the focus product. The multimedia approach gives survey participants a great deal of control over the information they choose to search, and a great variety of information formats (graphics, audio, video) that represent sources of information as they really appear in the marketplace.

I/A is typically utilized for the pre-market forecasting of new products. Use in a variety of applications (automobiles, medical products, cameras, etc.) has established I/A as a valid methodology (see Urban et al. 1996; Urban, Qualls, and Bohlmann 1994; Urban, Weinberg and Hauser 1996). The general process is shown in Figure 2. Respondents are trained to use the computer, and then given relevant information about the decision scenario. Since the focus product is usually a new product not yet on the market, this involves conditioning to the future environment when the product will be available. Respondents are allowed to freely search product information to make a purchase decision. Product evaluations are measured during and after the information search to examine the impact and importances of different information sources. Since the product is new, demand effect biases could be quite substantial. Thus, a
test/control design is used whereby some respondents search and evaluate an existing product for which actual sales data are available. Sales forecasts for the new product, using a macro-flow model (Urban, Hauser and Roberts 1990), can then be calibrated according to the measured demand effect for the existing product. Specifics of the multimedia survey procedure itself are given in Figure 3 for the cases of surveying individuals and groups.

Figure 2: General Information Acceleration Process
Specific details about the I/A procedure, including examples of the information sources, are discussed in conjunction with the empirical studies in Chapters 5 and 6. Two different decisions are studied so that preference revisions can be examined more generally in different contexts. One study (Chapter 5) is a dyadic industrial purchase decision, where a physician and medical technician from physician practices evaluate a new medical product. The two persons determine individually and together how likely they would be to purchase the product for their office. The second study (Chapter 6) involves
family decision-making instead of an organizational decision. Three family members (teenager, mother and father) evaluate several vacations and decide which they would prefer for a family vacation.

The goals for each study are to explain the nature of preference revisions that occur due to group discussion and provide a test of the hypotheses, based upon the model derived in Chapter 3. Since the model suggests a particular functional form for the preference revisions, the data are analyzed using ordinary least squares. Regression analysis is used because of the specific equations derived from the model, and because the focus is on how preferences change (a continuous variable) and not on the discrete choice made by the groups. The hypotheses are tested based upon the estimated effects found from the regression analysis. In this way, a consistent link is maintained between the hypothesized relationships and the theoretical model of preference revision.
5. Analysis of Dyadic Industrial Purchase Decision

The group decision of the first study is a dyadic industrial purchase decision, where one of the two decision participants has a dominant influence on the decision. In such a situation, the purchase decision will likely reflect the preference of the dominant decision-maker. The specific decision involves independent physician practices contemplating the purchase of a new medical instrument. Medical equipment purchases of this type usually involve a physician as the dominant influencer, with a staff medical technician also influencing the decision through technical information and expertise. The focus product is a hematology analyzer that performs a Complete Blood Cell count (CBC), whereby the various constituents of the blood (white blood cells, platelets, etc.) are measured. The CBC test is quite common, and instruments performing this test have been on the market for over 20 years. The focus product, while not creating a new category, does represent an improved technology for conducting CBC analysis and is targeted to a new market segment. The product is especially suitable for use by small or medium-sized physician practices (fewer than ten physicians in the practice). Some practices own analyzers to conduct CBC testing, while most use outside laboratories to perform CBC tests for their patients.

The Information Acceleration (I/A) multimedia process is used to allow study participants to gather information about the product. Subjects use the computer to individually search product information, after which the two decision participants from the practice (one physician and one medical technician) meet face-to-face to discuss the product and make a purchase decision. This confines the exercise of social influences to the discussion and
group decision, which is the focus of this research\textsuperscript{13}. After the group decision, each person returns to the I/A computer to indicate post-discussion individual preferences. The data collected therefore includes the group purchase decision and preference for the product, as well as the individual preferences before and after discussion. Participants were aware from the beginning that a group decision would be made.

The data collection involved in this study served a dual purpose, such that in addition to the “group” condition described above (where group discussion occurs), other dyads were surveyed in a similar manner except that the group discussion and decision did not occur (“individual” condition; Figure 3 in the previous chapter outlines the process for individuals and group members). Participating dyads were randomly assigned to either the group or individual condition. Since the individual condition does not pertain to this dissertation’s focus of social influence, only the data pertaining to the group discussions and decisions are presented\textsuperscript{14}.

5.1 Subjects and Procedure

Independent physician practices (those that do not require, for example, hospital or HMO approval to make purchases) in the Boston area were recruited for the study. A physician and medical technician from each practice who were

\textsuperscript{13}This does not mean that an individual’s information search behavior is independent of whether the decision task is individual or group. Indeed, one would certainly expect that individuals will search for information differently when confronted with the prospect of subsequently making a group decision. The focus here, however, is on preference revision due to social influences, not information search.

\textsuperscript{14}The purpose of the individual condition was to ascertain the validity of using simulated personal information in the I/A process. Descriptive characteristics of the subjects and physician practice dyads were not significantly different between the group and individual conditions. Validity of the I/A process is analyzed in Urban, et al. (1996) and Urban, Qualls and Bohmman (1994). The latter reference includes further details about the I/A process for the medical dyad study.
typically involved in medical equipment purchase decisions were identified. To participate, practices were required to conduct CBC testing for their patients, either with their own instrument or an outside laboratory. An honorarium payment was made to each of the 21 practices participating in the study. Computer error led to the loss of data for two physicians, leaving 19 dyads (both physician and technician data) of complete data.

Descriptive statistics for the physician practices surveyed show that 38% of the practices were conducting CBC tests in-house with their own equipment. The median response for the number of CBC tests conducted (whether in-house or through an outside lab) was in the range of 6-10 per day. On average, the practices owned three pieces of diagnostic medical equipment, such as EKG instruments, imaging devices (portable X-ray, ultrasound, etc.), hematology analyzers, etc. Each practice had an average of five physicians on staff, and the specialties of the physicians surveyed were mostly internists and general practitioners (52%). Other specialties represented include pediatrics, obstetrics-gynecology, cardiology, and gastroenterology. Overall, the practices surveyed fell within the segment of physician practices targeted by the new product. For 61% of the physician practices, their typical medical equipment purchase decision was such that the physician would make the final decision, but rely on the medical technician to provide information and make a purchase recommendation. Only 10% of the practices indicated that purchase decisions were best characterized as being jointly made between the technician and physician, while the other 29% of the practices made such decisions with only minimal input from non-physician staff. Thus, the medical equipment purchase decision is generally dominated by the physician, although technicians often do play an important informational role.
Subjects were told that the study’s purpose was to collect their evaluations of a new medical product that would be available for sale in the near future. Participants were informed of the general procedure that both the technician and physician would individually learn about the product, and then meet to share product information and make a purchase decision. Subjects were instructed that they would use a multimedia computer to learn about the product as they normally might if the product were already available for sale. An overview of the survey process is shown in Figure 4.

![Diagram](image)

**Figure 4: Overview of Multimedia Survey Process for Medical Equipment Purchasing Study**

A brief training exercise began the interview so that subjects were comfortable interacting with the computer. After training, subjects were left alone to individually proceed with the I/A survey. Subjects first responded to a number of questions about their practice’s medical equipment, including decision influence measures for equipment purchases. Subjects were then introduced to the product by being shown some initial product information,
according to how they usually first learn about new medical products. For example, a magazine ad for the product would be shown if the subject indicated that an ad is usually his/her first exposure to new medical products. After viewing this initial information, subjects would evaluate the product.

Subjects could then use the I/A to freely search product information sources, including a brochure, magazine ad, medical journal article, salesperson, accountant’s memorandum, and colleague. The information sources were designed based on existing information for similar products and relevant market research for the new product. Appendix A presents sample computer screens available for the information search. Physicians and technicians had the same information sources, except for the colleague information. This was appropriately tailored for the physician and medical technician, although the information content for the colleague was still very similar for both physicians and technicians.

Subjects could query the salesperson and colleague about various product characteristics. For example, if a physician participant selected the colleague (“Comments by Physician”) as an information source, video of another physician would appear on the computer screen. The physician could query this colleague about product attributes by pressing buttons at the bottom of the screen (see Figure A6). If the physician chose, say, “Accuracy,” a short (about 20 seconds) video clip would be played of the colleague speaking about the reported accuracy of the product’s CBC test results. Information sources could be accessed in any order and as often as desired (all subjects viewed at least one information source). Subjects were given a time limit for information search, and the average time to access each source was indicated (based on pre-tests). The time limit was near the average time needed to access all information sources,
and was present to focus subjects on the task and avoid "playing" with the computer. Product evaluations were updated after information search.

Subjects were in different rooms during the I/A computer process, and came together for discussion and group decision after each individual had completed information search. Participants were instructed to discuss the product as they normally would, and were given a form on which to mark their group purchase decision. Discussions typically took less than five minutes, and were audiotaped with their permission (all dyads agreed to be audiotaped). After a group decision was made, each individual returned to the computer to make final, individual product evaluations. Subjects also responded to decision influence and disconfirmation measures based upon their perceptions of the discussion and purchase decision. The total survey time including debriefing was approximately one hour.

5.2 Measures

Product Evaluations and Preference. Subjects evaluated the product with attribute ratings (7-point likert scale ranging from "extremely poor" to "excellent") for eight product attributes. The attributes were chosen based on a separate "voice of the customer" study (Griffin and Hauser 1993; Wong 1991). Definitions of the eight attributes are shown in Table 1. Attribute importances were measured with a 7-point likert scale, ranging from "unimportant" to "extremely important." The subject's probability of purchasing the new medical product was also measured, using a 100-point thermometer scale (see Figure 5). Subjects additionally selected a final overall purchase recommendation of "Purchase," "Not Purchase," or "Undecided."
Table 1: Attributes and Definitions for CBC Analyzer

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throughput and Speed</td>
<td>The ability of the instrument to deliver results in a timely manner, for a single sample and for multiple samples.</td>
</tr>
<tr>
<td>Price</td>
<td>The total price to purchase and operate the instrument, including the costs to conduct each test.</td>
</tr>
<tr>
<td>Safety</td>
<td>The likelihood of accidental exposure to blood when performing the CBC analysis, after the sample has been drawn.</td>
</tr>
<tr>
<td>Ease of Use</td>
<td>The ease and relative simplicity of operating the instrument.</td>
</tr>
<tr>
<td>Ease of Maintenance</td>
<td>The ease and relative simplicity of conducting routine maintenance duties and clean-up for the instrument.</td>
</tr>
<tr>
<td>Analysis Capability</td>
<td>The ability of the instrument to give needed analysis parameters, including differentials.</td>
</tr>
<tr>
<td>Patient Data Management</td>
<td>The ability of the instrument to interface with the office's computers and information system, and to avoid errors in matching patients to samples.</td>
</tr>
<tr>
<td>Ease of Meeting CLIA*</td>
<td>The ease and ability of the instrument, including accompanying manuals, procedures, and customer support services, to meet CLIA regulations.</td>
</tr>
</tbody>
</table>

*CLIA, the Clinical Laboratory Improvement Act, denotes the federal regulations which apply to physician offices and laboratories.

Figure 5: Purchase Probability Scale

The final purchase probabilities are consistent with the indicated purchase recommendation. Individuals recommending "Not Purchase" had a mean purchase probability of 20.4%, compared to a mean purchase probability of 43.9% for "Undecided" and 73.4% for "Purchase." The probabilities are
significantly different for the three purchase recommendations \( (F(2,35)=14.2, p<0.001) \). Purchase probability is thus used as a measure of the overall preference for the product, as a higher probability indicates a greater likelihood of purchase.

An attribute-level measure of an individual’s product evaluation is taken as the average of the eight multiattribute ratings. Reliability analysis gives a Cronbach’s \( \alpha \) of 0.86 for the initial multiattribute ratings, 0.82 for the pre-discussion ratings after information search was completed, and 0.87 for the final ratings after discussion.

*Product Certainty.* In addition to the multiattribute ratings, subjects indicated their certainty in each attribute rating on a 5-point scale anchored from “Extremely Uncertain” to “Extremely Certain.” Certainty about product information is thus measured as the average of these attribute certainty ratings. Reliability analysis of the eight attribute certainty ratings gives a Cronbach’s \( \alpha \) of 0.92 for the initial ratings, 0.82 for the pre-discussion ratings, and 0.83 for the final post-discussion ratings.

*Influence.* Before information search, subjects indicated the relative influence each had in medical equipment purchase decisions, using a 100-point constant-sum scale, where 100 points were allocated between the physician and technician. Subjects were also asked to indicate the general purchase decision process as to whether it involved minimal input from the staff technician, a purchase recommendation from the technician with final decision being made by the physician, or a joint decision between the physician and technician. The perceived relative influence of the physician was significantly different for each of the three general decision processes in the expected direction \( (F(2,35)=7.74, \)
p<0.01). Perceptions of relative influence for the group purchase decision were also measured with the 100-point constant-sum scale after the group discussion.

The constant-sum scale is frequently utilized to measure influence, although agreement among group members is not always strong (see, for example, Corfman 1991). In this study, however, the agreement on relative influence between physicians and technicians is quite high. Before discussion, technicians rated the relative purchase decision influence of the physician as 70.8% on average, while physicians rated their own relative influence at 68.7% (F(1,36)=0.1, n.s.). The relative influence perceptions for the new product purchase decision after group discussion had similarly good agreement between physicians and technicians (F(1,36)=0.3, n.s.).

*Disconfirmation.* Expectation disconfirmation was measured by asking each individual how favorable or unfavorable the other person in the group was towards the product, compared to the expected favorability before discussion. A 7-point likert scale was used, ranging from "Much more unfavorable than expected" to "Much more favorable than expected." The disconfirmation variable is calculated as the disconfirmation rating minus 4 (the "as expected" rating). Negative (positive) values would therefore represent negative (positive) disconfirmation, with larger magnitudes indicating a greater level of disconfirmation.

5.3 Results and Discussion

Debriefing comments from the participating dyads indicate that the decision task was realistic, both in terms of the product information and the group discussion. According to the subjects, the only relevant difference
between the survey and typical medical equipment decisions was that information about competitive products was not available.

*Information Search.* The realism of each information source searched was rated on a 7-point likert scale ranging from “not at all realistic” to “very realistic.” As shown in Table 2, the information sources are on average rated as being realistic. The information source with the overall lowest realism was the product brochure, which happened to be nearly identical in format to a brochure for an existing product.

**Table 2: Realism Ratings for CBC Information Sources**

<table>
<thead>
<tr>
<th>Information Source</th>
<th>Physician Ratings</th>
<th>Technician Ratings</th>
<th>Overall Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salesman</td>
<td>5.41</td>
<td>5.24</td>
<td>5.32</td>
</tr>
<tr>
<td>Product Brochure</td>
<td>4.86</td>
<td>5.43</td>
<td>5.14</td>
</tr>
<tr>
<td>Colleague</td>
<td>5.60</td>
<td>5.27</td>
<td>5.43</td>
</tr>
<tr>
<td>Accountant Memo</td>
<td>5.81</td>
<td>5.70</td>
<td>5.77</td>
</tr>
<tr>
<td>Journal Article</td>
<td>6.14</td>
<td>6.00</td>
<td>6.09</td>
</tr>
<tr>
<td>Magazine Advertisement</td>
<td>4.67</td>
<td>6.00</td>
<td>5.27</td>
</tr>
</tbody>
</table>

Subjects on average spent 9.6 minutes searching 3.5 different information sources. Physicians searched slightly but not significantly more information than the technicians. The salesman information was searched most often (83% of subjects), followed by the colleague (73%), brochure (68%), accountant’s memo (63%), journal article (27%) and magazine advertisement (27%). The information search significantly increased the certainty ratings for all attributes at the p<0.001 significance level. The product attribute ratings also changed significantly due to information search at the p<0.01 level, except for “price” (p<0.05) and “analysis capabilities” (p=0.10). The overall implication is that subjects received realistic
information about the product to make evaluations and form preferences before meeting for group discussion.

*Individual Preference Revisions Due to Discussion.* The attribute ratings and certainties did not change as significantly for discussions as they did for information search. Only the "ease of meeting CLIA" and the "patient data management" attributes were rated significantly different after discussion compared to before discussion (p=0.01 and p=0.07, respectively; both attributes rated less favorably after discussion). However, preferences were affected by the group discussion and decision. The average purchase probability for the technicians was 39.9% after discussion, compared to 52.5% before discussion (t=2.67, p=0.02). The change was mildly significant for the physicians (32.7% after discussion versus 40.3% before discussion, t=1.53, p<0.15). This is consistent with physicians, although having larger influence for this type of decision, still being influenced by their technicians' evaluations. The fact that preferences on average decrease for both physicians and technicians may reflect the significant impact of unfavorable information about the federal CLIA regulations being exchanged in discussion. Overall, these results signify that preferences were revised due to the group discussion. A test of the hypotheses now follows, as well as an examination of the individual and group preference shifts that occurred for this decision.

The model of Chapter 3 expresses in equation form the revision of individual preferences, which can be empirically examined with regression analysis. Given the model and the various measures from this study, a regression equation of the following form is used:

\[
(7) \quad P_i = \beta_0 + \beta_1 P_i^o + \beta_2 A_i^o \left( \frac{1}{C_i^o} - \frac{1}{C_i} \right) + \beta_3 \frac{A_i^o \left( R_i^o - R_i \right)}{C_i^o + C_i} + \beta_4 \left( I_i^o \right) \left( P_i^o - P_i \right) + \beta_5 D_i + \varepsilon_i
\]
where $i, j \in \{D, T\}$, $i \neq j$ signifies the group member (Doctor or Technician); $P_i^o$ and $P_i$ are the individual’s pre-discussion and post-discussion purchase probabilities, respectively, which are the preference measures; $C_i^o$ and $C_i$ are respectively the pre- and post-discussion product certainty measures; $A_i$ is the individual’s attribute importance rating; $R_i^o$ is the individual’s product attribute rating before discussion; $I_j^o$ is $i$’s perception of $j$’s relative influence before discussion; and $D_i$ is the disconfirmation measure for the individual. Note first that the preference measure is the individual’s probability of recommending purchase, and that the dependent measure is the post-discussion preference, with pre-discussion preference being an independent variable to avoid misspecification. Also, the two terms involving the attribute-level measures contain implicit summations over the attributes, consistent with equation (5) derived for the preference revision model\textsuperscript{15}.

The term in equation (7) with coefficient $\beta_2$ is the change in certainty term that would be positive for risk averse preferences (assuming that certainty increases after discussion). The next term ($\beta_3$) is the informational influence associated with product attribute information being exchanged in discussion. H3a predicts that the coefficient $\beta_3$ should be positive, since the person’s own attribute certainty is in the denominator.

\textsuperscript{15}Empirically, ambiguity may exist as to whether one should first formulate the product of importance, certainty and rating and then sum over the attributes (as implied in the model and carried out in the regressions that follow), or whether one should simply consider a single attribute by first summing the importances, certainties and ratings and then forming the product. Also, one might argue that the importances should be subsumed into the estimated coefficients, as is often done in preference regression (e.g., see Urban and Hauser 1993, chapter 10). The results that follow are largely insensitive to these alternative forms of the regression equation. This is perhaps not terribly surprising given the fairly high reliabilities of the attribute ratings and certainties.
For the normative influence term $\beta_4\left(I_i^o\right)(P^o_j - P^o_i)$ and the disconfirmation term $\beta_5D_i$, note that in this study there is no direct measure of one’s expectation about the other person’s preference, and the disconfirmation measure is a single item related to the other person’s preference. Therefore, the normative influence term represents the perceived influence of the other person in the dyad multiplied by the difference in preference between the two persons, and disconfirmation of preferences is a separate term. H5 predicts that less self-perceived influence will result in greater preference revision; hence, $\beta_4$ should be positive. H1 predicts that the disconfirmation coefficient $\beta_5$ will be positive.

To distinguish between positive and negative disconfirmation to test H2, an alternative regression equation is used:

\[(7')\quad P_i = \beta_0 + \beta_1P^o_i + \ldots + \beta_5ND_i + \beta_6PD_i + \epsilon_i\]

where $ND_i$ and $PD_i$ represent negative and positive disconfirmation, respectively, as measured by the 7-point likert scale after discussion. Recall that the disconfirmation value is positive or negative relative to the “as expected” value. If the disconfirmation value is negative (positive), the positive (negative) disconfirmation term is set to zero, while the other disconfirmation term is set to the disconfirmation value. H2 predicts that the negative disconfirmation coefficient will be larger than the positive disconfirmation coefficient. Since negative disconfirmation has a negative sign, the coefficients for both positive and negative disconfirmation should be greater than zero (H1).

The results of the regression analysis of equation (7') are shown in Table 3, noting the significance (p-value) for each coefficient. One outlier was omitted from the analysis due to a residual of greater than three standard deviations,
leaving 18 dyads. Highly significant and positive coefficients exist for the pre-
discussion preference and the influence of the other group member. This gives
strong support for H5 pertaining to normative influence susceptibility. The
product attribute coefficient is positive, as expected, and moderately significant,
giving support to H3a. The regression coefficient for the change in certainty due
to discussion is positive but not significant. This perhaps reflects subjects being
fairly neutral towards risk, given that this was a hypothetical purchase situation.
Also recall that the attribute certainty levels only modestly changed due to
discussion. Both positive and negative disconfirmation are significant (mildly for
negative) in the expected direction. Thus, there is support for expectation
disconfirmation having a significant impact on preference revisions (H1).

Table 3: Results of Individual Preference Revision Analysis for Medical Dyad

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>coefficient value</th>
<th>standard error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-discussion purchase probability</td>
<td>$\beta_1$</td>
<td>1.140</td>
<td>0.112</td>
</tr>
<tr>
<td>Change in certainty from discussion</td>
<td>$\beta_2$</td>
<td>1.265</td>
<td>0.928</td>
</tr>
<tr>
<td>Product attribute information</td>
<td>$\beta_3$</td>
<td>1.580</td>
<td>1.065</td>
</tr>
<tr>
<td>Perceived influence of other person</td>
<td>$\beta_4$</td>
<td>0.004</td>
<td>0.001</td>
</tr>
<tr>
<td>Negative disconfirmation</td>
<td>$\beta_5$</td>
<td>6.507</td>
<td>3.883</td>
</tr>
<tr>
<td>Positive disconfirmation</td>
<td>$\beta_6$</td>
<td>6.081</td>
<td>2.307</td>
</tr>
<tr>
<td>constant</td>
<td>$\beta_0$</td>
<td>-13.869</td>
<td>5.045</td>
</tr>
</tbody>
</table>

Dependent variable: Post-discussion purchase probability. $R^2=0.82$, Adjusted $R^2=0.78$, N=36
Omitting one dyad as outlier with residual greater than three standard deviations.
Refer to equations (7) and (7') for complete definitions of the independent variables.

A test comparing the negative and positive expectation coefficients does
not support negative disconfirmation being larger than positive disconfirmation
($F(1,30)=0.01$, n.s.). H2 is therefore not supported. Since negative and positive
expectation disconfirmation are not significantly different, and noting that the
negative disconfirmation coefficient was only mildly significant, the regression
analysis is repeated using a single disconfirmation term, as in equation (7). These
results are shown in Table 4.

Table 4: Results of Preference Revision Analysis for Medical Dyad, for Single
Disconfirmation Term

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>coefficient value</th>
<th>standard error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-discussion purchase probability</td>
<td>$\beta_1$</td>
<td>1.138</td>
<td>0.107</td>
</tr>
<tr>
<td>Change in certainty from discussion</td>
<td>$\beta_2$</td>
<td>1.286</td>
<td>0.880</td>
</tr>
<tr>
<td>Product attribute information</td>
<td>$\beta_3$</td>
<td>1.563</td>
<td>1.030</td>
</tr>
<tr>
<td>Perceived influence of other person</td>
<td>$\beta_4$</td>
<td>0.004</td>
<td>0.001</td>
</tr>
<tr>
<td>Expectation disconfirmation</td>
<td>$\beta_5$</td>
<td>6.212</td>
<td>1.691</td>
</tr>
<tr>
<td>constant</td>
<td>$\beta_0$</td>
<td>-13.916</td>
<td>5.159</td>
</tr>
</tbody>
</table>

Dependent variable: Post-discussion purchase probability. $R^2=0.82$, Adjusted $R^2=0.79$, $N=36$
Omitting one dyad as outlier with residual greater than three standard deviations.
Refer to equation (7) for complete definitions of the independent variables.

Post-discussion Influence Perceptions. To test the effects of product certainty
on post-discussion influence perceptions (H4a and H4b), regressions were
conducted using the pre-discussion influence ratings and product certainties as
dependent variables. The product certainty is measured as the simple average of
the eight pre-discussion attribute certainty ratings. The results are in Table 5 for
both the self-perceived influence, and how a person’s influence is perceived by
the other group member. Similar to the preference revision results, the certainty
terms are at best mildly significant, but positive as expected. Thus, there is weak
support for H4a (self-perceived influence), but no significant support for H4b.
Table 5: Results of Post-discussion Influence Analysis for Medical Dyad

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Self-perceived influence</th>
<th>Influence perceived by other person</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>coefficient</td>
<td>p-value</td>
</tr>
<tr>
<td>Pre-discussion influence rating</td>
<td>0.483</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Pre-discussion product certainty</td>
<td>5.043</td>
<td>0.133</td>
</tr>
<tr>
<td>constant</td>
<td>9.528</td>
<td>0.467</td>
</tr>
<tr>
<td>adjusted R²</td>
<td>0.464</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Dependent variable: Post-discussion influence rating from constant sum scale. N=38.

Summary of Individual Analysis. Overall, the hypotheses are generally supported at the level of the individual, except that a type of loss aversion for expectation disconfirmation is not observed. Also, the hypothesized effects of pre-discussion product uncertainty appear to be relatively weak. One possible explanation is that the purchase decision is hypothetical, and consequently uncertainty may have little impact on preferences. Another explanation is that both persons were able to engage in fairly thorough information search about the product before discussion, such that overall the product attribute evaluations were rather certain. Indeed, only one of eight attribute certainty ratings significantly changed due to discussion (patient data management). Therefore, the impact of uncertainty on individual preference revisions may have been reduced since group members had access before discussion to very similar product information.

Group Preferences and Decisions. The preference revisions at the group level are now examined. Two measures of interest are the group preference decided in discussion, and the average of the individual post-discussion preferences, both relative to the average of the pre-discussion preferences. These measures are consistent with the social psychology literature associated with group choice shift
and polarization. The regression equation, based upon equation (6) of the preference model in Chapter 3, is very similar to that for individual preference revisions.

\[
G = \beta_0 + \beta_1 \bar{P}_0 + \beta_2 \sum_{i=1}^{2} A_i \left( \frac{1}{C_i^o} - \frac{1}{C_i} \right) + \beta_3 \frac{(A_1 C_2^o - A_2 C_1^o)(R_2^o - R_1^o)}{C_1^o + C_2^o} \\
+ \beta_4 (I_{2}^o - I_{1}^o)(P_{2}^o - P_{1}^o) + \beta_5 (D_1 + D_2) + \epsilon
\]

where the dependent measure is the group or post-discussion average preference, \( \bar{P}_0 \) is the average pre-discussion preference; \( P_i^o \) is an individual’s pre-discussion purchase probabilities; \( C_i^o \) and \( C_i \) are respectively the pre- and post-discussion product certainty measures; \( A_i \) is an individual’s attribute importance rating; \( R_i^o \) is an individual’s product attribute rating before discussion; \( I_i^o \) is \( i \)'s perception of \( j \)'s relative influence before discussion; and \( D_i \) is the disconfirmation measure for an individual. In general one might expect the attribute information, normative influence, and disconfirmation terms to be positive and significant (H3b, and the analogies of H5 and H1). Regression results are given in Tables 6 and 7.

The results indicate that disconfirmation and normative influence are still highly significant, but the exchange of attribute information is no longer even mildly significant. H3b is thus not supported. Instead, the change in certainty is now more significant than with the individual preference revisions. Considering that risk attitudes are classically thought of as a potential source of normative influence, and that the group members are at least somewhat risk averse, these results seem consistent with group preference shifts emphasizing normative influence more than the individual shifts (Kaplan 1987).
Table 6: Results of Group Preference Revision Analysis for Medical Dyad: Average of Post-discussion Individual Preferences

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>coefficient value</th>
<th>standard error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-discussion average preference</td>
<td>$\beta_1$</td>
<td>1.233</td>
<td>0.107</td>
</tr>
<tr>
<td>Change in certainty from discussion</td>
<td>$\beta_2$</td>
<td>1.580</td>
<td>0.586</td>
</tr>
<tr>
<td>Product attribute information</td>
<td>$\beta_3$</td>
<td>-1.570</td>
<td>1.898</td>
</tr>
<tr>
<td>Perceived influence</td>
<td>$\beta_4$</td>
<td>0.002</td>
<td>0.001</td>
</tr>
<tr>
<td>Expectation disconfirmation</td>
<td>$\beta_5$</td>
<td>4.265</td>
<td>2.117</td>
</tr>
<tr>
<td>constant</td>
<td>$\beta_0$</td>
<td>-52.546</td>
<td>10.466</td>
</tr>
</tbody>
</table>

Dependent variable: Post-discussion average individual purchase probability.

R²=0.93, Adjusted R²=0.90, N=18
Refer to equation (8) for complete definitions of the independent variables.

Table 7: Results of Group Preference Revision Analysis for Medical Dyad: Post-discussion Group Preference

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>coefficient value</th>
<th>standard error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-discussion average preference</td>
<td>$\beta_1$</td>
<td>1.161</td>
<td>0.202</td>
</tr>
<tr>
<td>Change in certainty from discussion</td>
<td>$\beta_2$</td>
<td>2.195</td>
<td>1.106</td>
</tr>
<tr>
<td>Product attribute information</td>
<td>$\beta_3$</td>
<td>-0.516</td>
<td>3.581</td>
</tr>
<tr>
<td>Perceived influence</td>
<td>$\beta_4$</td>
<td>0.007</td>
<td>0.002</td>
</tr>
<tr>
<td>Expectation disconfirmation</td>
<td>$\beta_5$</td>
<td>7.332</td>
<td>1.997</td>
</tr>
<tr>
<td>constant</td>
<td>$\beta_0$</td>
<td>-70.470</td>
<td>19.744</td>
</tr>
</tbody>
</table>

Dependent variable: Post-discussion group purchase probability.

R²=0.83, Adjusted R²=0.76, N=18
Refer to equation (8) for complete definitions of the independent variables.

To examine more closely the extent and direction of the preference revisions for each dyad, Table 8 presents the pre- and post-discussion individual preferences, the average of the individual preferences, and the group preference. Comparing first the average pre-discussion preference with the post-discussion average preference, twelve of the eighteen dyads analyzed became "polarized," i.e., had a more extreme average post-discussion preference in the same direction.
as the pre-discussion preference. The comparisons are made in relation to preference above or below 50, which indicates equal likelihood of buying (positive intent) or not buying (negative intent). For an example of polarization, Dyad 15 had an average pre-discussion preference of 30.5 and revised to an average of 10.0 post-discussion, which is a shift to a more extreme negative position. This is the type of preference revision pattern suggested by group polarization studies. The other six dyads either showed a less extreme average preference but in the same direction as pre-discussion (Dyads 9 and 16), a less extreme opinion in the opposite direction of the pre-discussion average (Dyads 1 and 12), or a more extreme post-discussion opinion in the opposite direction of pre-discussion (Dyads 7 and 8).

Table 8: Pre- and Post-discussion Preferences for Medical Dyads

<table>
<thead>
<tr>
<th>Dyad</th>
<th>Pre-discussion Preferences</th>
<th>Group Pref.</th>
<th>Post-discussion Preferences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Doctor</td>
<td>Tech</td>
<td>Average</td>
</tr>
<tr>
<td>1</td>
<td>30.0</td>
<td>89.0</td>
<td>59.5</td>
</tr>
<tr>
<td>2</td>
<td>100.0</td>
<td>41.0</td>
<td>70.5</td>
</tr>
<tr>
<td>3</td>
<td>39.0</td>
<td>30.0</td>
<td>34.5</td>
</tr>
<tr>
<td>4</td>
<td>80.0</td>
<td>40.0</td>
<td>60.0</td>
</tr>
<tr>
<td>5</td>
<td>3.0</td>
<td>85.0</td>
<td>44.0</td>
</tr>
<tr>
<td>6</td>
<td>60.0</td>
<td>79.0</td>
<td>69.5</td>
</tr>
<tr>
<td>7</td>
<td>79.0</td>
<td>27.0</td>
<td>53.0</td>
</tr>
<tr>
<td>8</td>
<td>49.0</td>
<td>60.0</td>
<td>54.5</td>
</tr>
<tr>
<td>9</td>
<td>29.0</td>
<td>61.0</td>
<td>45.0</td>
</tr>
<tr>
<td>10</td>
<td>0.0</td>
<td>39.0</td>
<td>19.5</td>
</tr>
<tr>
<td>11</td>
<td>12.0</td>
<td>50.0</td>
<td>31.0</td>
</tr>
<tr>
<td>12</td>
<td>50.0</td>
<td>37.0</td>
<td>43.5</td>
</tr>
<tr>
<td>13</td>
<td>53.0</td>
<td>13.0</td>
<td>33.0</td>
</tr>
<tr>
<td>14</td>
<td>30.0</td>
<td>50.0</td>
<td>40.0</td>
</tr>
<tr>
<td>15</td>
<td>11.0</td>
<td>50.0</td>
<td>30.5</td>
</tr>
<tr>
<td>16</td>
<td>8.0</td>
<td>13.0</td>
<td>10.5</td>
</tr>
<tr>
<td>17</td>
<td>40.0</td>
<td>99.0</td>
<td>69.5</td>
</tr>
<tr>
<td>18</td>
<td>0.0</td>
<td>70.0</td>
<td>35.0</td>
</tr>
</tbody>
</table>

Preference measured with 100-point purchase intent scale.
If the 12 "polarized" and 6 "non-polarized" groups are categorized according to whether the physician and technician agreed more closely on their post-discussion individual preferences than on their pre-discussion preferences, all but one polarized group saw greater post-discussion agreement. For the six non-polarized groups, three had greater post-discussion agreement while three had less agreement. A Pearson chi-square test suggests that whether the dyads were "polarized" or "non-polarized" is correlated with the gap between the two group members' individual purchase probabilities increasing or decreasing due to discussion ($\chi^2=3.84, p<0.05$). This suggests that a classical polarization pattern is less likely to be observed when individuals agree less after discussion. It further appears from the data that whether or not polarized preference shifts are observed does not depend upon whether group members hold similar (both positive or both negative) or opposing (one person positive and the other negative) preferences before discussion ($\chi^2=0.45, \text{n.s.}$).

The post-discussion preferences are also often outside the range spanned by the individual pre-discussion preferences. This occurs for approximately one-third of the groups when considering the group preference, and 42% of the individuals when considering the individual post-discussion preferences. Thus, although a majority of the post-discussion preferences appear to be consistent with a type of weighted preference averaging, this is not the case in a third or more of the dyads.

Focusing on the group preferences and decision, compare now the group preference predicted by the disconfirmation model used here, and a weighted average group choice model based on the pre-discussion individual preferences.
The weights represent the relative influences of the two persons, averaged over the perceptions of the group members. For 5 of the 18 dyads, the static choice model predicts a group decision (based on likelihood of purchase) opposite than that actually indicated by the group preference. For example, Dyad 9 indicated a group purchase probability (preference) of 70% (likely to buy) but the static choice model predicted a purchase probability of 34% (likely to not buy). If the predicted post-discussion individual preferences from the disconfirmation model are combined using the same influence weights as the static choice model, an opposite prediction occurs in only 2 of the dyads. Furthermore, the predicted group choice from the group preference revision model (Table 7) differs from the actual group decision for only one of the dyads. Therefore, the preference revision model is apparently able to capture preference revisions even when the group decisions are opposite that indicated by the pre-discussion preferences.

5.4 Summary and Limitations

Although this study contained a limited number of dyads, a potential implication of the findings is that typical group choice models that consider only pre-discussion preferences are inadequate in explaining group decisions and preference shifts. In contrast, the modeling approach used here, which includes the effects of disconfirmed expectations and susceptibility to social influence, was able to more accurately explain the preference shifts for the individuals and the groups. Regardless of the nature of the preference shifts that occurred (whether polarizing shifts or not), the model framework appears to capture such revisions quite well. This is largely due to the inclusion of disconfirmed expectations. The hypotheses related to disconfirmed expectations (H1) and normative influence susceptibility (H5) were supported. The hypothesized effects of exchanging
attribute information on preference revisions and influence perceptions were either weakly supported (H3a and H4a) or not supported (H3b and H4b).

Several limitations should be noted. First, the disconfirmation measure was related only to preferences, and the expected preference of the other group member was not measured before discussion. This poses an interesting question for group decision behavior. To what extent do the effects of disconfirmed expectations represent a rational updating of preferences (as implied in the model) versus some "non-rational overreaction" to surprising information or preferences? For example, if individuals in the medical dyads expected the other group member to have an identical preference, then the "rational" effect of disconfirmation would be totally captured in the normative influence term. We would then see the "main effect" of disconfirmation in the regression analysis to be insignificant, since the rational updating due to disconfirmation would be included in other regression variables. However, if individuals modify preferences more than they should under purely rational updating, the empirical results would then indicate a main effect for the perceived disconfirmation. Thus, future studies should attempt to directly measure preference expectations.

Also, the influence perceptions were measured with a single constant-sum scale, and hence did not differentiate between informational and normative influence. Although the measure used is consistent with a normative influence, and susceptibility to informational influence due to product uncertainty was included, better measures and constructs would help distinguish between the types of influence. For example, the preference revision model as formulated implicitly assumes that an individual will correctly perceive and consider the product information shared by the other group member. Empirically, however,
this may not be the case, and better social influence measures would help account for such influence perceptions.

For this dyadic purchasing study, the effects related to the exchange of information and uncertainty generally did not significantly impact preference revisions. As mentioned earlier, this may be due to the product information available to each person being very similar. Empirically this could decrease the variance in the independent variable (and hence increase the standard error of the regression coefficient), making it difficult for an effect to be observed. Studies where group members have different information and/or different levels of uncertainty would help ascertain their impacts on preference revisions.

Finally, this study took a simple form of group decision-making: a dyad considering only one alternative. Although the hypothesized effects and the preference revision model are general to the number of group members, most social psychology research considers groups of three or more persons. This is due to the social comparison and persuasive arguments theories focusing on a “majority” of arguments or a clear revelation of a group norm, which tends to trivialize for groups of only two members. Likewise, a single alternative can restrict options for compromise and reduces the group decision to its most basic “yes/no” form. A study with groups of three or more persons considering more than one alternative would permit wider variation in the patterns of preference shifts that might occur.
6. Analysis of Triadic Family Vacation Decision

The theoretical framework and analytical model emphasized the relationship between disconfirmed expectations and preference revision due to discussion. A second study is conducted as further test of the hypotheses and model, emphasizing expectation disconfirmation. This study utilizes three-person groups choosing among three alternatives. Compared to the dyadic decision with a single alternative, this allows for a more general examination of group preference shifts due to the three-way interaction among group members and the greater array of potential choices. Using triads instead of dyads and having more options to choose from increases the number of preferences (and hence preference shifts) measured within and across groups. Although the number of group decisions equals the number of groups, the number of individual preference revisions is nine times the number of groups for triads evaluating three alternatives. Thus, the number of observed preferences shifts pooled across groups is substantially larger than for a single-alternative dyadic decision.

One result of the dyadic medical study was a positive and moderately significant relationship between preference revision and information uncertainty. To explore uncertainty more carefully, this study will introduce greater uncertainty about some of the decision alternatives when the group members meet for discussion. If different group members have different levels of uncertainty about different alternatives, this should facilitate information exchange such that its potential impact on preference revisions can be examined.

This study will also attempt to increase the variance in expectations, and hence in the potential disconfirmation group members might experience in
discussion. To achieve this, the study introduces varied expectations such that
the potential effects of negative and positive disconfirmation can be studied more
closely. Furthermore, the study will utilize different measures of disconfirmed
expectations related to information and preferences, as well as attempt to make
better distinctions between informational and normative influence perceptions.
Improved measurement will allow a more thorough analysis of the observed
preference revisions and their relationships to disconfirmed expectations and
social influence susceptibility.

Families are used instead of organizational decision groups for two main
reasons. First, it provides some contrast with the medical dyads, such that taken
together the empirical findings from both studies should demonstrate rather
general applicability to different types of decisions. Second, from a pragmatic
viewpoint, families are more readily available than, say, organizational buying
groups to schedule and conduct a group survey\textsuperscript{16}.

A vacation decision is used because of its wide familiarity and the
influence structure within the family for this type of decision task. Surveying
family triads necessitates using a child from the family. If the decision influence
of the child is close to zero, this essentially reduces the decision to a dyadic one
between the two parents. Thus, there is incentive to study a family decision
where the child has at least some influence. Previous research has shown that a
family vacation decision typically involves relatively large influence from a child
in the family, and the influence of the husband and wife are fairly equal (Belch,

\textsuperscript{16}Obviously I have not become too pragmatic, since convenient and inexpensive ad hoc groups of
students are not used. A primary motivation for this research is that the general relationship
between disconfirmed expectations and preference revisions is expected to exist across virtually
any type of group decision. The practical importance of such a relationship in decision-making is
largely determined by whether it can be observed for realistic decisions of actual groups. Thus,
ad hoc groups are not used.
Belch and Ceresino 1985; Davis and Rigaux 1974; Filiatrault and Ritchie 1980). Therefore, family vacation decisions do not in general involve a dominant decision maker, and the child’s influence is such that the decision is really triadic in nature. The somewhat even distribution of influence among family members should result in preference revisions being observed for most of the individuals. This obviously facilities the examination of why such preference revisions might occur.

Information about vacation destinations is readily available such that the stimuli can be easily designed and implemented for the survey. The specific decision task studied is for the family to choose from among three possible vacation destinations for a future family vacation. The three vacations are part of the same chain of resorts, but differ in the city/country location. Research shows that among the various subdecisions related to family vacations (length of vacation, how much to spend, where to stay, etc.), the child’s influence is relatively larger for the destination decision (Belch, Belch and Ceresino 1985; Filiatrault and Ritchie 1980). It is also easier to control the information for a destination decision than for a budgeting or length-of-stay decision. This is an important experimental consideration if the information presented to groups is to generate various potential levels of expectation disconfirmation.

The multimedia computer survey process of Information Acceleration is used to collect the data. This enables the efficient presentation of vacation information to the family members, and allows the individuals to freely search product information and formulate preferences prior to discussion. The multimedia technology also permits the creation and design of realistic stimuli to suit the purposes of the study. Details about the subjects, survey methodology and procedure, and the various measures follow.
6.1 Subjects

Families in the Boston area were recruited by telephone for the study. The triad interviewed for each family consisted of the mother, father, and a teenage child (usually the oldest child living at home). Teenagers were used instead of younger children since they would have less difficulty understanding and completing the survey. To qualify, families obviously needed to have at least one teenage child (age 12 to 18) living at home. The families were required to have taken a family vacation lasting at least four days within the past two years, and to be planning on taking a family vacation within the next two years. Furthermore, to be sure the vacations used in the survey would be relevant to the family decision, the family needed to express interest in at least one of the three general destinations as a possible location for a future family vacation. The actual vacation resorts and destinations used in the survey were not divulged while recruiting and screening the families. None of the families surveyed had stayed at any of the three specific resorts used in the survey, but did express interest in taking a vacation in at least one of the city/country locations. If they qualified and agreed to participate, the families were then asked about their household demographics and most recent vacation as part of the recruiting/screening telephone conversation.

A total of 56 families were recruited and surveyed. An honorarium payment was made to each participating family. The average age was 42.8 years for the mothers surveyed, 44.9 years for the fathers, and 14.3 years for the teenagers. The age range for the mothers was 33 to 55 years, and for fathers 34 to 58 years. The teenagers’ ages ranged from 12 to 18 years, and 63% of the teenagers surveyed were female. The median education level was high school
plus some college for both mothers and fathers. Median household annual income was between $50,000 and $60,000, with an average of 72.5% of the income earned by the fathers.

Most families indicated that they budget between $2000 and $4000 for a family vacation. Their most recent vacations ranged from 4 to 14 days, and lasted 6.8 days on average. Nearly 79% of the families had taken their most recent vacation within six months of being surveyed (the survey was conducted in the summer of 1995). Only 6% of the families had not taken a family vacation within the previous 12 months. The median response of families was that the mother had the most influence in making the vacation destination decision, followed by the father and then the teenager.

6.2 Methodology and Procedure

The general procedure was similar to that used for the medical dyads. Family members would use the multimedia computer to individually learn about the different vacations, come together face-to-face for family discussion and decision, and then finish the survey by indicating final preferences and influence perceptions individually on the computer. All interviews were conducted on the campus of a major university in the Boston area. Before beginning the survey, subjects were informed that the study’s task was to collect their evaluations of three different destinations which might be of interest to them for their next spring or summer family vacation. Prior to arriving for the computerized vacation survey, each family member completed a short written survey to indicate the influence of each family member in making a vacation decision. These completed surveys were returned by mail.
The experimental design for the information acceleration computer survey included manipulation of the vacation information. The purpose of the manipulation is to vary the expectations and preferences of family members for the three vacations, and to introduce different levels of uncertainty among family members prior to the group discussion. The intended effect is to increase the variation in uncertainty as well as the potential for expectation disconfirmation (both negative and positive) within each family. This is accomplished by letting information search for the vacations be conducted in two stages. First, each family member receives brief information about the three vacations. Second, each family member then freely searches detailed information about only one of the vacations, and each of the three family members searches a different vacation (this is why three vacation options are used - one for each person in the family). Thus, when the family meets for discussion after information search, each person is essentially a "expert" for one of the vacations, although everyone has at least some knowledge about all three vacations. This should tend to vary the levels of uncertainty about the vacations within the family. Since in discussion each person will have only limited knowledge about two of the vacations, the pre-discussion expectations can be modified by showing different versions of the initial vacation information, which would vary in how favorably or unfavorably each vacation is portrayed. So that this manipulation of expectations can carry over to impact the disconfirmation due to discussion, the detailed information about each vacation remains the same. Therefore, even though the initial information is manipulated, the total information available to each family remains unchanged for the three vacations.

The general survey procedure is shown in Figure 6. All steps except the family discussion are done individually with the information acceleration
computer. Each family member is randomly assigned as to which of the three vacation destinations he/she searches in detail.

![Diagram](image)

**Figure 6: Information Acceleration Survey Process for Vacation Study**

The experimental survey conditions relate to the initial vacation information. One of the three vacations is chosen as a "base case," whose initial information will be relatively neutral (neither positive nor negative towards the vacation) and remain constant across all experimental conditions. This neutral vacation provides a standard of comparison for analyzing family members' expectations and preferences. To reduce the total number of experimental
conditions, the initial information for the other two vacations consists of two possibilities which favor one of the vacations over the other. In one scenario the initial information will be positive for one vacation and negative for the other, while the second scenario will switch the vacation which receives the positive information. Thus, for the three vacations A/B/C the valence of the initial information is positive/neutral/negative (+/0/-) in one scenario and the reverse (-/0/+ in the other.

To manipulate the expectations within a family, the three family members are not necessarily shown the identical initial information. Given two scenarios for the initial information, there are a total of eight possible combinations of the two scenarios for the three family members. The eight possible combinations are reduced to five as shown in Table 9. As an example, condition 3 in the table shows that the family members who search vacations A and B in detail will see the initial information which favors the third vacation (C), while the other family member that searches vacation C in detail sees initial information that tends to favor the first vacation (A).

The first four conditions from Table 9 have the person who searches in detail the neutral vacation (vacation B, the base case) always viewing the same initial information which favors vacation C. As a contrast, the other condition has all family members seeing initial information that favors vacation A instead of vacation C. Table 9 also indicates the number of families randomly assigned to each condition. Of the 56 families surveyed, 12 were randomly assigned to each of the first four conditions, and the remaining 8 were assigned to the final condition. Within each family, the family members were randomly assigned to one of the three vacations to search in detail. For the first four conditions, having
12 families each, the six possible combinations of family member (teenager, mother, father) by vacation searched in detail (A, B, C) are repeated twice.

Table 9: Experimental Conditions for Family Vacation Survey

<table>
<thead>
<tr>
<th>Vacation searched in detail</th>
<th>Experimental Condition: Initial information seen by family member conducting detailed information search for the vacation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>/0/+</td>
</tr>
<tr>
<td>B</td>
<td>/0/+</td>
</tr>
<tr>
<td>C</td>
<td>/0/+</td>
</tr>
<tr>
<td>number of families</td>
<td>12</td>
</tr>
</tbody>
</table>

(+/-0/-) indicates that the valence of initial information for vacation A is positive, vacation B is neutral, and vacation C is negative.

(-/0/+ ) indicates that the valence of initial information for vacation A is negative, vacation B is neutral, and vacation C is positive.

Initial information for vacation B is always neutral.

The particular vacations used as stimuli for the survey are three different destinations offered by a single international chain of resorts. The resort chain will be referred to generically as “Resort,” although the actual name was used for the survey. After conferring with several local travel agents to determine popular family vacation spots, three destinations were chosen: Huatulco, Mexico, which is located on the southern Pacific coast of Mexico; southern Florida near the Atlantic coast, within easy driving distance to Orlando; and Eleuthera, Bahamas, a long and narrow island part of Bahamas’ “Out Islands.” The Resort has facilities at each of these three locations, which are especially suited and marketed for family vacations. Since southern Florida is at least somewhat familiar to most families, this destination was utilized as the neutral vacation (B). The other two locations were chosen to reflect potentially desirable vacations that are nonetheless unfamiliar to most families due to their specific
locations. This implies that the subjects will largely rely upon the provided information to learn about the vacations, which assists in the survey’s ability to manipulate expectations with the initial information. All families expressed interest in at least one of the general destinations (Mexico, Florida, or Bahamas) for a family vacation, but never had a vacation at any of the three specific Resort locations used for the survey. Subjects were told that the cost of each vacation for one week, departing from Boston, was virtually the same (which in fact they generally were), and that they were to evaluate the vacations as potential destinations for a future family vacation.

The Florida location serves as vacation B (the neutral or base case), while the Mexico location is vacation A and the Bahamas location is vacation C. Information about the three vacation destinations were gathered from travel agents, Resort brochures, information from the local tourism boards, magazines, and travel bulletin boards available on the internet. This raw information was sorted and categorized for each vacation according to major features, such as climate, activities, room comfort, food, etc. To make discussion and the family decision more interesting, differences in major features among the three vacations were created such that each destination had a different list of favorable and unfavorable features. For example, the food at the Mexican Resort was made to be excellent, with relatively poor food at the Florida Resort and somewhere in between for the Bahamas Resort. Each vacation had some negative aspects, such that no vacation is expected to be clearly dominant in the family decision.

The stimuli used for the initial information consisted of an excerpt from an unnamed major travel magazine about the specific Resort location. Two versions, one positive and one negative, were created and written for the Mexico and Bahamas locations. For each location, the two excerpts were essentially
written as two portions of the same magazine article, where one part tended to stress the positive aspects of the location and the other part focused more on the negative aspects. For the Florida vacation, two excerpts were also created, each of which presented a rather balanced (neutral) description of the vacation. One excerpt was consistently used as the initial information for the Florida vacation, while the other magazine excerpt was used to begin the detailed information for those persons searching the Florida vacation, as explained shortly.

The positive and negative initial information designed for Mexico and the Bahamas are shown in Appendix B, Figures B1 through B4. The initial information used for Florida is shown in Figure B5, seen by all subjects. The magazine excerpts were dated for the spring after the surveys were conducted, consistent with the decision task of evaluating vacations for a future spring or summer family vacation. Depending on the experimental condition, subjects would see either the positive information for Mexico and negative for the Bahamas (+/0/-), or negative for Mexico and positive for the Bahamas (-/0/+). These stimuli were pretested with a convenient sample of 16 adults, who read each excerpt and then rated the vacations overall and for several vacation attributes using a 7-point likert scale. The overall ratings were significantly different for the positive and negative excerpts for both Mexico and the Bahamas. The differences in the attribute ratings were consistent with the particular vacation features chosen to be described as positive or negative for each vacation. The pretest therefore indicated that the initial information stimuli were effective at inducing different evaluations for Mexico and Eleuthera according to the negative or positive information shown.

So that the total set of vacation information searched by each family member remains generally consistent across all conditions, the magazine excerpt
not shown as initial information is shown at the beginning of the detailed information search for that vacation. For example, suppose that the mother will search detailed information about Eleuthera, and the family is randomly assigned to condition 2 (see Table 9). Under this experimental condition, the person searching Eleuthera, Bahamas (vacation C) receives initial information that is negative for Mexico, neutral as always for Florida, and positive for the Bahamas. So that the total information available to the mother about the Bahamas is consistent across conditions, she will receive the second Bahamas magazine excerpt that she did not see initially. Thus, before the mother begins freely searching detailed information about Eleuthera, she would first see the negative Bahamas magazine excerpt. In this way the vacation information available to the family’s “expert” for that vacation remains constant regardless of the specific initial information seen. The expectations of the other two family members for that vacation will depend upon the initial information they see.

The sources of vacation information available for detailed search were determined after several personal interviews with travel agents and several parents and teenagers. The information sources utilized were a magazine article, different than the two excerpts used for initial information and the start of detailed information search; two color brochures, one specific to the Resort and another produced by the local Board of Tourism; information about the pros and cons of the vacation from a travel agent, presented by playing brief, pre-recorded audio clips; television and video promotions, consisting of one video clip describing Resorts in general and one video clip describing the specific Resort (each about two minutes in length), and a one-minute television commercial (for the Bahamas only); plus evaluations by family members (mother, father, teenage girl, teenage boy) who had vacationed at the Resort, presented as written
responses to a customer satisfaction survey indicating their likes and dislikes about the vacation. The information search screen is shown in Figure B7, and examples of the information sources (except for audio and video) are presented in Figures B8 through B12. The information was designed based upon publicly available information about the vacation locations, and made to reflect the desired pros and cons of each vacation.\textsuperscript{17}

Subjects were given a 15-minute limit on the amount of detailed information search. This limit was established based on pretests, and was intended to focus the individuals on the decision task as much as possible. The 15-minute limit was essentially the time needed to view all of the information sources once. Family members were in different rooms during the I/A computer process, and came together for discussion and group decision after each individual had completed the information search. Since family members would likely finish information search at different times, the amount of time each subject waited until all three had finished the information search was recorded. Figure 7 summarizes the overall process of presenting vacation information to each subject.

For the family discussion participants were instructed to discuss the vacations as they normally would, and were given a form on which to mark their family decision and preferences for the three vacations. Discussions took around 10 minutes on average, and were videotaped with their permission (only one family did not agree to be videotaped). After a decision was made, each individual returned to the computer to make final, individual evaluations for the

\textsuperscript{17}To guarantee that subjects experienced no confusion at the end of the survey, the debriefing made clear that most of the information had been created by the experimenter, and therefore did not accurately portray the vacation destinations. However, details about the general location, and most details about the specific locations, were presented as accurately as possible.
vacations. Subjects also responded to decision and disconfirmation measures based upon their perceptions of the discussion and family decision. The total survey time including debriefing was approximately one hour and ten minutes.

![Diagram](image)

**Figure 7: Summary of how Vacation Information is Presented to Subjects**

6.3 Measures

*Product Evaluations and Preference.* Subjects indicated preference for the three vacations by using a three-way 100-point constant sum scale. Constant sum scales are often used to measure preferences among alternatives (e.g., see Urban and Hauser 1993). Each family member also ranked the three vacations in order of preference. Subjects additionally rated their overall favorability for each
vacation by using a 7-point likert scale ranging from “extremely poor” to “excellent.” Preferences and vacation evaluations were measured after the initial information, after detailed information search just before discussion, and after family discussion. To determine whether waiting for other family members to finish the detailed information search affected preferences, the constant sum scale preference measure was taken before and after the waiting period. The family decision and preferences were also recorded at the conclusion of the discussion.

The constant sum scale preference measures are significantly correlated with the overall favorability rating for each vacation as rated by the individuals and the group (all correlations significant at p<0.0001; smallest value is 0.57 for the correlation between the final individual preference and rating of the Florida vacation). Furthermore, the constant sum scale preferences differ significantly with how each vacation is ranked (all F-scores significant at p<0.0001). The constant sum scale preference ratings therefore provide a measure consistent with how favorably subjects view the vacations. The vacation preferences were not significantly different before and after the waiting period.

Individual family members also evaluated the product with attributes ratings (7-point likert scale ranging from “extremely poor” to “excellent”) for five vacation attributes. The attributes were chosen based upon two preliminary studies. As a first step, a list of potentially important family vacation attributes was compiled based upon discussions with travel agents, personal interviews with several parents, and by examining other vacation surveys used by corporations and available in the published literature (Haider and Ewing 1990; Kaciak and Louviere 1990; Lounsbury and Hoopes 1985; Rubenstein 1980; Wahlers and Etzioni 1985). A set of 26 vacation attributes were generated, 15
relating to aspects of the city/country location, and the other 11 related to attributes about the hotel or resort accommodations.

The second step was to determine which of these attributes families find particularly important. The 26 attributes were included as part of a mall intercept survey. Parents (both mothers and fathers) and teenagers (ages 12 to 18) were approached in a large local mall and asked to complete a survey about family vacations (subjects were paid $2). To be surveyed the individual needed to be part of a family with a teenage child, and to have taken a family vacation within the past two years. Subjects were surveyed as individuals, not together as families. A total of 106 persons were surveyed, including 40 teenagers, 34 mothers, and 32 fathers. The teenagers were 70% female and on average 15.6 years old. Average age for the mothers was 39.8 years and for the fathers 43.9 years. The average household contained 2.0 children, and the most recent family vacation lasted on average 9.6 days. In general, the demographics of the respondents are fairly consistent with the 56 families surveyed with the information acceleration computer process. Other questions included in the mall intercept survey were demographics, information about the person’s family vacation experiences, and various influence ratings.

Respondents for the mall survey rated the attribute importances on a 7-point likert scale ranging from “extremely unimportant” to “extremely important.” From the data numerous attributes were found to significantly less important than others, and many attributes were highly correlated with each other. Based upon these rated importances and the relevant characteristics of the specific vacation stimuli used for the study, five highly important attributes were chosen to be used for the computerized family survey. Definitions of these five attributes are shown in Table 10.
Table 10: Attributes and Definitions for Family Vacations

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comfort</td>
<td>The overall comfort of the accommodations.</td>
</tr>
<tr>
<td>Climate</td>
<td>Good weather and climate for the area.</td>
</tr>
<tr>
<td>Food</td>
<td>The quality and variety of restaurants you can enjoy.</td>
</tr>
<tr>
<td>Activities</td>
<td>The variety of activities you can enjoy, such as sports, beaches, shopping, local sights, nightlife, etc.</td>
</tr>
<tr>
<td>Location</td>
<td>The convenient location of the accommodations to sights and activities you would enjoy.</td>
</tr>
</tbody>
</table>

During the computerized survey subjects would give multiattribute ratings for each vacation using a 7-point likert scale ranging from “extremely poor” to “excellent.” All three vacations were rated one at a time after seeing the initial information. At the end of the detailed information search, the multiattribute ratings were taken again only for the specific vacation searched, since no new information is revealed about the other two vacation destinations. All three vacations would be rated for each attribute a final time after family discussion.

The attribute importances were also measured at various points in the survey: near the beginning prior to the initial information, after information search just prior to family discussion, and again after discussion. During the discussion, the family would not only indicate their vacation decision and preferences, but also jointly determine how important each attribute was for making their decision. The attribute importances were measured at several points for the following reason. Recall that the first and simplest model presented in Chapter 3 characterized normative influence as affecting attribute importances. It was noted then that, despite its intuitive appeal, group decision studies have not determined if normative social influence might indeed impact
or be related to how important the attributes are to individual group members. Therefore, this study measures attribute importances before and after family discussion to see if any revisions occur.

**Uncertainty.** In addition to the multiattribute ratings, subjects indicated their uncertainty in each attribute rating on a 5-point scale anchored from “not at all certain” to “extremely certain.” Using the same 5-point scale, uncertainty was also measured for the overall favorability ratings of each vacation, as well as uncertainty in the vacation rankings. This was done for the individual family members as well as for the evaluations given with the family decision. Analysis of the individual pre-discussion and post-discussion attribute certainty ratings gives reliability of 0.83 for the five pre-discussion certainties and 0.89 for the post-discussion certainties.

**Influence.** Influence susceptibility was measured by using three different 100-point constant sum scales (CSS). These constant sum scale questions asked about the relative influence among family members in making vacation decisions, the relative amount of useful information provided by the family members to reach a decision, and the relative consideration the person gives to the preferences of family members in choosing his or her own most-preferred vacation. These CSS questions are worded to be consistent with, respectively, overall influence in the family decision (publicly manifested influence), informational influence, and normative influence related to the private desire to consider the preferences of other family members. Constant sum scales are often used to measure relative influence (see Corfman 1991).

These constant sum scales are used as influence susceptibility measures for the preference revision analysis. So that merely measuring influence does not
impact a person’s behavior during family discussion, families completed and returned by mail a short written survey before arriving for the computerized interview. This survey contained the three CSS scales, and other multi-item influence measures. In completing the survey family members were asked to think of how they make vacation decisions, and answer the questions individually without conferring with other family members. The constant sum scale questions were repeated during the computerized survey after the family discussion.

The influence perceptions among the family members are in generally good agreement when examining the constant sum scale measures. The rated influence of a family member did not significantly vary by who was doing the rating. The only exception from the pre-interview written survey is for the relative consideration given to the mother’s preference. This was rated somewhat lower by the mother (35.6%) than by the teenager (37.3%) or the father (42.7%), which indicates that the mother considers her own preference slightly less than the father or teenager considers her preference (F(2,161)=2.98, p<0.10). Comparing the self-rated influences across the family members, the consideration of one’s own preference did not vary significantly with persons (31.1% for the teenager, 35.6% for the mother, 32.5% for the father, F(2,161)=1.13, n.s.). However, the family members did rate their self-influences differently in terms of the vacation decision influence (F(2,161)=20.03, p<0.001), and the relative amount of useful information shared in making the decision (F(2,161)=32.88, p<0.001). The self-rated influences for family vacation decisions are 20.5% for the teenager, 39.1% for the mother, and 34.0% for the father; the self-rated relative amount of useful information shared is 17.6% for the teenager, 43.8% for the mother, and 34.0% for the father. Overall, although the mother
tends to consider her own preference slightly less than the other family members do, she always is rated as having greater influence from all three constant sum scales, both as rated by herself and by the other family members. This is consistent with the information collected while recruiting the families, which showed that for most families the mother had the greatest influence in making family vacation decisions.

_Influence Attempts._ In addition to measuring influence susceptibility, subjects were asked after discussion to indicate their behavior during discussion. Using a 7-point disagree/agree scale, subjects rated eight statements to reflect their attempts at influencing the family vacation decision. The eight items were similar to those used to measure persuasion in family decision-making (Spiro 1983). Factor analysis indicated two factors for influence attempts, with two of the eight items having low factor loadings which are therefore dropped from the analysis. The two factors for the remaining six items are interpreted as "persuasion" (a four-item scale with reliability 0.72), and "misrepresentation" (a two-item scale with reliability 0.66). Table 11 shows the items.

<table>
<thead>
<tr>
<th>&quot;Persuasion&quot;</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. During discussion I tried to help my family learn about the different vacation places.</td>
<td></td>
</tr>
<tr>
<td>2. During discussion I tried to convince the other family members that the place I preferred to go on vacation was really the best place for a family vacation.</td>
<td></td>
</tr>
<tr>
<td>3. During discussion I demonstrated how pleased or displeased I was with the places the other family members wanted to go on vacation.</td>
<td></td>
</tr>
<tr>
<td>4. I tried to persuade my family during discussion so that they would like my favorite vacation place better.</td>
<td></td>
</tr>
<tr>
<td><strong>&quot;Misrepresentation&quot;</strong></td>
<td></td>
</tr>
<tr>
<td>5. I misrepresented what I knew about the other vacation places so that the family would decide to go where I wanted to go on vacation.</td>
<td></td>
</tr>
<tr>
<td>6. During discussion I tried to demonstrate to my family that I was best able to decide where the family should go on vacation.</td>
<td></td>
</tr>
</tbody>
</table>
Disconfirmation. As in the customer satisfaction literature, expectation disconfirmation can generally be measured in two ways (Oliver 1980). One is an “objective” measure of the difference between the expectation and the actual outcome or revealed information. This is generally consistent with “rational updating” as formulated in the preference revision model. The other method is to have subjects give a “subjective” measure of how they perceived the information or outcome compared to their expectations. In the satisfaction literature this is usually measured with a likert scale ranging from “more unfavorable than expected” to “more favorable than expected” (Anderson and Sullivan 1993; Churchill and Surprenant 1982; Oliver 1980; Oliver, Balakrishnan and Barry 1994; Tse and Wilton 1988). For example, in the customer satisfaction study of Anderson and Sullivan (1993), disconfirmation was measured by asking respondents to indicate how product quality compared to their expectations on a 10-point scale ranging from “much worse than expected” to “much better than expected.” Perceived disconfirmation is generally not measured with multi-item scales, and the subjective measures usually have a stronger impact on satisfaction than the objective measures of disconfirmation (Oliver, Balakrishnan and Barry 1994).

Guided by the social influence theory and model, however, distinctions are made here between expectation disconfirmation for product-specific information (informational disconfirmation) and for the preferences of other group members (normative disconfirmation). Several measures of “subjective” disconfirmation are used, all measured after the family discussion and decision. First, subjects are asked to indicate in general, using a 7-point disagree/agree scale ranging from “strongly disagree” to “strongly agree,” whether they learned new information about the vacations during discussion, and whether the family
decision was different than expected. Using the same disagree/agree scale, subjects also rated whether each individual family member revealed any new information, and whether each person's vacation preference was different than expected. The disagree/agree ratings measure the general extent to which informational and normative disconfirmation occurred.

What affects preference revisions due to discussion for each vacation, however, is the expectation disconfirmation related to each family member and each vacation, not only in magnitude but also the direction (positive or negative disconfirmation). These person- and vacation-specific measures for informational and normative disconfirmation were rated by subjects on a 7-point likert scale ranging from "much more unfavorable than expected" to "much more favorable than expected." For example, for each of the three vacations, the mother indicated how information revealed by the teenager compared to expectations, and how the teenager's preference for the vacation compared to her pre-discussion expectations. The mother also gave similar ratings for the father. Therefore, each family member indicates the normative and informational disconfirmation for each of the other two family members for each of the three vacations. Negative and positive disconfirmation can be measured as the disconfirmation rating minus 4 (the "as expected" rating). Negative (positive) values would represent negative (positive) disconfirmation.

One interesting question unresolved from the medical dyad study was whether, as in customer satisfaction, subjective disconfirmation has a stronger effect than the objective disconfirmation. From the preference revision model, the "objective" informational disconfirmation is the difference between the person's pre-discussion attribute values and the values revealed by other group members. Likewise, normative disconfirmation is the difference between the
other person’s preference and the expected preference. Thus, subjects in this study are asked to indicate what they expect the vacation preferences to be for the other two family members. This is done after the initial information is given, using the 100-point constant sum preference scale. In this way, both “objective” and “subjective” measures of informational and normative disconfirmation are available in the data.

6.4 Results and Discussion

The results in this section will be presented for all 56 families surveyed, unless otherwise indicated. In general no substantial differences in the results occur when comparing analysis of all 56 families with analysis using the 48 families balanced across the first four experimental conditions.

Debriefing comments indicated that families found the computerized survey easy to use and informative about the vacations. Near the end of the survey each family member was given several statements about the survey, and asked to indicate level of agreement for each one on a 7-point scale ranging from “strongly disagree” to “strongly agree.” A higher rating indicates stronger agreement. Mean ratings indicated agreement with statements that asked subjects whether they found the vacation decision to be important (5.5) and personally relevant (5.2), and whether the decision process of the survey was similar to how their family actually makes vacation decisions (4.6). Families neither agreed nor disagreed with a statement that they were likely to actually take a vacation at the specific resort location they preferred in the survey (average of 3.9 on the 7-point scale). On average family members indicated significant agreement to receiving enough vacation information to make one’s own decision (mean of 5.6) and to help the family make a decision (5.4). Subjects
agreed that the vacation information was realistic (5.6). As a whole these results indicate face validity for the survey procedure.

Family demographics (age, gender, number of children in the family, length of previous vacation, and self-rated decision influence) did not differ significantly across the experimental survey conditions. One exception is household income, which is mildly different across the five conditions (p=0.06). Income level did not significantly affect which of the three vacations the individuals and families preferred.

Analysis of the vacation preferences and evaluations now follow. First, the relationship between the manipulated initial information and vacation preferences is checked. Next, the effects of the detailed information search are described, summarizing the pre-discussion preferences of the family members. Analysis of the preference revisions due to discussion are then presented, further testing the hypotheses. This section is concluded by analyzing the group vacation decision, and discussing implications of the results.

**Manipulation Check and Initial Evaluations.** The manipulation of the initial vacation information is intended to vary preferences and expectations about the preferences of other family members. Having only one of the three family members search any given vacation in detail is expected to vary the uncertainty about the vacations within each family. Looking first at the uncertainties, the initial overall uncertainty about each vacation does not significantly vary by the experimental condition, even though uncertainty about some of the individual attributes do vary across condition for Mexico and the Bahamas. This is because the positive and negative information about each vacation vary by portraying some attributes positively and different attributes negatively. Uncertainty about
one’s initial overall rating of each vacation is essentially the same across conditions. Analyzing how the overall uncertainty changes due to information search, the change in uncertainty for the vacations does significantly differ by which vacation was searched, except for the Mexico vacation. For Florida and the Bahamas, subjects became more certain about the vacation they searched, compared to the change in uncertainty for the two vacations they did not search in detail (F(2,165)=4.51, p=0.01, for Florida; F(2,165)=6.64, p<0.01, for the Bahamas; F(2,165)=1.43, n.s., for Mexico). Comparing the post-search certainty rating by the vacation searched, the certainty varied significantly for the Bahamas (p=0.03), mildly for Florida (p=0.13), and not significantly for Mexico. Thus, there was mixed success in varying the levels of uncertainty within families.

The differences in preferences and expectations due to manipulating the initial information was quite substantial. Across the five experimental conditions, the initial preferences measured by the constant sum scale was significantly different for Mexico (F(4,163)=7.06, p<0.01) and the Bahamas (F(4,163)=8.10, p<0.01), but not for Florida since its initial information was constant across conditions (F(4,163)=0.27, n.s.). Table 12 shows how the preferences and the overall favorability ratings for the vacations varied according to whether subjects saw initial information which favored Mexico (+/0/-) or the Bahamas (-/0/+). Again, the differences are significant for Mexico and the Bahamas, but not Florida. The five attribute ratings for Mexico and the Bahamas also showed similar patterns, being rated significantly better whenever positive information was seen. These results indicate that the manipulation of initial information effectively impacted the preference evaluations for Mexico and the Bahamas according to whether positive or negative information was seen.
Preferences for Florida remained essentially constant since Florida’s initial information is always the same neutral magazine excerpt.

Table 12: Differences in Preferences and Favorability Ratings by Initial Vacation Information

<table>
<thead>
<tr>
<th>Preferences</th>
<th>Initial Information (+/0/-)</th>
<th>Initial Information (-/0/+</th>
<th>F(1,166)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>46.9</td>
<td>15.4</td>
<td>110.7</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Florida</td>
<td>29.9</td>
<td>26.6</td>
<td>1.3</td>
<td>n.s.</td>
</tr>
<tr>
<td>Bahamas</td>
<td>23.2</td>
<td>58.0</td>
<td>144.1</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ratings</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>5.79</td>
<td>3.75</td>
<td>75.3</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Florida</td>
<td>5.00</td>
<td>4.72</td>
<td>1.6</td>
<td>n.s.</td>
</tr>
<tr>
<td>Bahamas</td>
<td>4.54</td>
<td>6.20</td>
<td>65.1</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Preferences measured with 100-point constant sum scale.
Ratings measured with 7-point likert scale.
Initial information favors Mexico (+/0/-) or Bahamas (-/0/+)

The expectations about how other family members would prefer each vacation also varied in a similar fashion according to which vacation the initial information favored. Table 13 shows how the expectations in preferences (measured by a 100-point constant sum scale) for the other two family members varied for each vacation. The expectations did not significantly vary according to the family member (teenager, mother, or father), nor did the expectations in preferences differ by whose expected preferences were being rated (i.e., the expectations in the upper and lower halves of Table 13 do not differ significantly). The result is that the disconfirmation of preferences should vary across experimental conditions, since family members do not always see the same initial information. When family members were asked to indicate how strongly they agree that each of the other family members revealed new information about the vacations (informational disconfirmation), and that the
preferences were different than expected for the family members (normative disconfirmation), the ratings differed across experimental conditions (F(4,331)=1.9, p=0.11, for informational; F(4,311)=7.3, p<0.001, for normative).

Table 13: Differences in Preference Expectations by Initial Vacation Information

<table>
<thead>
<tr>
<th>Expected Preference ...</th>
<th>Initial Information (+/0/-)</th>
<th>Initial Information (-/0/+</th>
<th>F(1,166)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>for person 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>40.2</td>
<td>15.3</td>
<td>72.8</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Florida</td>
<td>35.8</td>
<td>32.5</td>
<td>1.2</td>
<td>n.s.</td>
</tr>
<tr>
<td>Bahamas</td>
<td>24.0</td>
<td>52.2</td>
<td>96.6</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>for person 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>40.6</td>
<td>17.5</td>
<td>56.7</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Florida</td>
<td>33.8</td>
<td>33.7</td>
<td>0.0</td>
<td>n.s.</td>
</tr>
<tr>
<td>Bahamas</td>
<td>25.6</td>
<td>48.8</td>
<td>65.9</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Expectations in preferences measured for each of the other two family members with 100-point constant sum scale.
Initial information favors Mexico (+/0/-) or Bahamas (-/0/+)

How subjects initially ranked the vacations also varied by the initial information. When shown the initial information which favored Mexico, family members ranked Mexico as their most preferred vacation 61% of the time, compared to 24% for Florida and 15% for the Bahamas. When shown information that favored the Bahamas, 85% of the subjects preferred the Bahamas, compared to 10% preferring Florida and only 4% preferring Mexico the most. The data seem to indicate that the positive information was more effective for the Bahamas than for Mexico; however, Mexico was generally the least popular of the three destinations cited by families when they were screened to participate in the survey. Overall, the manipulation of the initial information appears effective.
Information Search and Pre-discussion Evaluations. Subjects spent an average of 8.4 minutes freely searching the detailed information about the vacation assigned to them at random. Subjects who saw initial information which favored Mexico searched slightly longer than others (9.1 minutes versus 7.9 minutes, F\((1,166)\)=3.7, p<0.10). Subjects spent the least amount of time searching Florida (7.5 minutes versus 8.3 minutes for Mexico and 9.4 minutes for Bahamas), although the amount of information search was not significantly different for the teenagers, mothers and fathers.

Subjects on average searched 9.5 different pieces of information about the vacation. The magazine article was the least popular source, with only 43% of the subjects searching that information. Most popular were the video information (83% of subjects saw at least one video) and the evaluations of other persons who had been on that vacation (83% of subjects saw at least one such customer evaluation). The travel agent information was accessed by 70% of the subjects, and at least one of the two brochures was seen by 72% of the family members. Information search habits were fairly consistent for the teenagers, mothers and fathers, although the mothers searched the brochures more and the teenagers searched the videos more than other family members.

Overall the preferences for Mexico and the Bahamas changed significantly due to information search (t=2.69, p<0.01 for Mexico; t=3.15, p<0.01 for the Bahamas), but not for Florida (t=0.97, n.s.). For those who searched Mexico in detail, the preference for that vacation increased about twice as much if the negative information about Mexico was initially seen, compared to if the positive information was seen. For those who searched the Bahamas, preference for Bahamas went up if the negative Bahamas information was seen, but down if the positive information was seen. Tables 14a and 14b summarize the initial and pre-
discussion (after detailed information search) preferences for the vacations. Table 14a is for all family members, and Table 14b shows the average preferences for only those persons who searched that particular vacation in detail. Note that the preferences in Table 14a may not always indicate substantial change, since the preferences are averaged over all family members whether they searched detailed information about the particular vacation or not. Also note that in Table 14b the preferences will not add to 100 for each column, since only the preferences of the persons who searched each vacation in detail are used to compute the averages. The pre-discussion preferences differ significantly depending on the initial information seen for Mexico (F(1,166)=81.1, p<0.001) and for the Bahamas (F(1,166)=80.7, p<0.001), but not for Florida (F(1,166)=0.9, n.s.).

**Table 14a: Initial and Pre-discussion Preferences for the Vacations: averages for all family members (N=168)**

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initial</td>
<td>Pre-discuss</td>
<td>Initial</td>
<td>Pre-discuss</td>
<td>Initial</td>
</tr>
<tr>
<td>Mexico</td>
<td>28.9</td>
<td>31.7</td>
<td>46.9</td>
<td>47.9</td>
<td>15.4</td>
</tr>
<tr>
<td>Florida</td>
<td>28.0</td>
<td>29.4</td>
<td>29.9</td>
<td>27.8</td>
<td>26.6</td>
</tr>
<tr>
<td>Bahamas</td>
<td>43.1</td>
<td>38.9</td>
<td>23.2</td>
<td>24.3</td>
<td>58.0</td>
</tr>
</tbody>
</table>

* For cases where the initial information favors Mexico (+/0/-) or Bahamas (-/0/+)

**Table 14b: Initial and Pre-discussion Preferences for the Vacations: averages for family members who searched indicated vacation in detail (N=56)**

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initial</td>
<td>Pre-discuss</td>
<td>Initial</td>
<td>Pre-discuss</td>
<td>Initial</td>
</tr>
<tr>
<td>Mexico</td>
<td>30.5</td>
<td>42.0</td>
<td>42.8</td>
<td>51.2</td>
<td>14.1</td>
</tr>
<tr>
<td>Florida</td>
<td>24.5</td>
<td>30.5</td>
<td>28.5</td>
<td>25.9</td>
<td>23.9</td>
</tr>
<tr>
<td>Bahamas</td>
<td>35.3</td>
<td>35.9</td>
<td>22.8</td>
<td>29.5</td>
<td>52.0</td>
</tr>
</tbody>
</table>

* For cases where the initial information favors Mexico (+/0/-) or Bahamas (-/0/+)

- 111 -
The vacation rankings also changed somewhat due to the information search. Percentage of those ranking Mexico most highly changed from 29% initially to 33% after information search, Florida from 16% to 18%, and the Bahamas from 55% to 49%.

\textit{Hypothesis Testing.} The hypotheses H1, H2, H3 and H5 are tested by regression analysis of the preference data, according to the preference revision model of Chapter 3. Given the measures available for the family vacation study, the regression equation can take a more general form:

\begin{equation}
\Delta P_i = \beta_0 + \beta_1 (\text{change in certainty}) + \beta_2 \frac{A_i C_j (R_i^e - R_j^e) II_{ij}^e}{C_i^e + C_j^e} + \beta_3 (N_{ij}^e) (P_i^e - \overline{P}_{ij}) \\
+ \beta_4 PDI_i + \beta_5 NDI_i + \beta_6 PDN_i + \beta_7 NDN_i + \varepsilon_i
\end{equation}

where \( i, j \in \{1, 2, 3\}, i \neq j \) signifies the family member (teenager, mother, or father). Note that the dependent variable \( \Delta P_i^e \) is the change in preference due to discussion for the person. Unlike the dyadic study, there is no misspecification problem since person \( i \)'s expectation for person \( j \)'s preference \( \overline{P}_{ij} \) is measured and subtracted from person \( j \)'s revealed pre-discussion preference \( P_j^e \). The informational influence term (\( \beta_2 \)) contains the pre-discussion certainty \( C_i^e \), the individual's attribute importance rating \( A_i \), and the individual's product attribute evaluation \( R_i^e \). This is multiplied by the person's susceptibility to informational influence from the other person \( II_{ij}^e \). The information term is implicitly summed over the five attributes and the two other persons in the group. The normative influence term (\( \beta_3 \)) contains the disconfirmation of the preference expectation multiplied by the susceptibility to normative influence \( N_{ij}^e \). The terms on the second line of equation (9) are the subjective disconfirmation terms, which are, in the order shown, positive and negative disconfirmation of information, and positive and negative normative
disconfirmation related to preference expectations. Positive and negative disconfirmation are defined such that a negative (positive) disconfirmation rating is coded as such, with a zero value coded for positive (negative) disconfirmation. The positive and negative disconfirmation ratings are summed over the two other persons in the family. H1 predicts that the disconfirmation coefficients \( \beta_4 \) through \( \beta_7 \) will be positive, although note that these coefficients relate to the "subjective" disconfirmation and not the "objective" effects of disconfirmation. H2 predicts that negative disconfirmation will be larger than positive. H3a and H5 predict that \( \beta_2 \) and \( \beta_3 \) will be positive.

The results of the preference regression are given in Table 15. Preferences of the three family members for the three vacations are pooled for the analysis. Note that all coefficients except the constant and the change in certainty are positive and significant as expected (influence of attribute information is mildly significant, and positive informational disconfirmation has a weak effect). Tests reveal that the negative and positive disconfirmation coefficients do not significantly differ, such that H2 is not supported. Reanalyzing the data without distinguishing between positive and negative disconfirmation shows that both informational and normative disconfirmation are highly significant, as shown in Table 16. Thus, the analysis supports H1a, H1b and H5, with some support for H3a, and no support for H2.

Analysis of the data without the "subjective" disconfirmation terms is shown in Table 17. This regression includes only those variables which involve the "objective" updating of preferences according to the model of Chapter 3. Comparing the regression results with and without the subjective disconfirmation terms indicates that subjective disconfirmation indeed has a positive impact on preference revision \( (F(2,498)=27.3, p<0.001) \), in addition to the
“objective” disconfirmation effects. Thus, as in the consumer satisfaction literature, subjective perceptions of disconfirmation appear to be important in addition to “objective” disconfirmation measures.

Table 15: Results of Preference Revision Analysis for Family Members: separating positive and negative disconfirmation

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>coefficient value</th>
<th>standard error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in certainty from discussion</td>
<td>$\beta_1$</td>
<td>-0.11</td>
<td>0.24</td>
</tr>
<tr>
<td>Product attribute information</td>
<td>$\beta_2$</td>
<td>17.12</td>
<td>9.48</td>
</tr>
<tr>
<td>Normative influence of others</td>
<td>$\beta_3$</td>
<td>0.34</td>
<td>0.05</td>
</tr>
<tr>
<td>Pos. informational disconfirmation</td>
<td>$\beta_4$</td>
<td>1.88</td>
<td>1.33</td>
</tr>
<tr>
<td>Neg. informational disconfirmation</td>
<td>$\beta_5$</td>
<td>2.25</td>
<td>1.23</td>
</tr>
<tr>
<td>Pos. normative disconfirmation</td>
<td>$\beta_6$</td>
<td>2.68</td>
<td>1.33</td>
</tr>
<tr>
<td>Neg. normative disconfirmation</td>
<td>$\beta_7$</td>
<td>2.37</td>
<td>1.17</td>
</tr>
<tr>
<td>constant</td>
<td>$\beta_0$</td>
<td>-0.03</td>
<td>1.33</td>
</tr>
</tbody>
</table>

Dependent variable: Change in preference due to discussion. $R^2=0.31$, Adjusted $R^2=0.30$, N=504
Refer to equation (9) for complete definitions of the independent variables.

Table 16: Results of Preference Revision Analysis for Family Members: no distinctions between positive and negative disconfirmation

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>coefficient value</th>
<th>standard error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in certainty from discussion</td>
<td>$\beta_1$</td>
<td>-0.11</td>
<td>0.24</td>
</tr>
<tr>
<td>Product attribute information</td>
<td>$\beta_2$</td>
<td>17.11</td>
<td>9.46</td>
</tr>
<tr>
<td>Normative influence of others</td>
<td>$\beta_3$</td>
<td>0.34</td>
<td>0.05</td>
</tr>
<tr>
<td>Informational disconfirmation</td>
<td></td>
<td>2.08</td>
<td>0.75</td>
</tr>
<tr>
<td>Normative disconfirmation</td>
<td></td>
<td>2.51</td>
<td>0.74</td>
</tr>
<tr>
<td>constant</td>
<td>$\beta_0$</td>
<td>-0.04</td>
<td>0.73</td>
</tr>
</tbody>
</table>

Dependent variable: Change in preference due to discussion. $R^2=0.31$, Adjusted $R^2=0.30$, N=504
Refer to equation (9) for complete definitions of the independent variables.
Table 17: Results of Preference Revision Analysis for Family Members: omitting subjective positive and negative disconfirmation variables

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>coefficient value</th>
<th>standard error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in certainty from discussion</td>
<td>$\beta_i$</td>
<td>-0.01</td>
<td>0.25</td>
</tr>
<tr>
<td>Product attribute information</td>
<td>$\beta_2$</td>
<td>29.72</td>
<td>9.78</td>
</tr>
<tr>
<td>Normative influence of others</td>
<td>$\beta_3$</td>
<td>0.47</td>
<td>0.05</td>
</tr>
<tr>
<td>constant</td>
<td>$\beta_0$</td>
<td>0.05</td>
<td>0.77</td>
</tr>
</tbody>
</table>

Dependent variable: Change in preference due to discussion. $R^2$=0.23, Adjusted $R^2$=0.23, N=504
Refer to equation (9) for complete definitions of the independent variables.

The change in influence perceptions due to discussion is now analyzed. A person’s overall vacation certainty was calculated as the average attribute certainty for the vacations. The change in self-rated influence is positively correlated with the pre-discussion certainty for the vacation decision influence ($p=0.09$), and the relative amount of useful information provided ($p=0.02$), but not for the relative consideration given to family members’ preferences ($p=0.22$). The significant correlation with informational influence, together with a mildly significant correlation for decision influence and an insignificant correlation with normative influence, likely reflects the certainty measure being specific to attribute information. It does appear, however, that greater certainty results in a greater self-perceived post-discussion influence, supporting H4a. Analyzing how the other family members viewed on average a person’s influence after discussion, compared to before discussion, shows no significant correlation with certainty. H4b is therefore not supported.

**Group Preferences and Decisions.** Analyses of the group-level preference revisions are presented below, using regression analysis similar to that for the individual preferences. Table 18 shows the results for the average individual preference after discussion, and Table 19 presents results for the group
preference. Since revisions in group-level preferences are compared to the average of the pre-discussion preferences, and since the normative influence variable contains the pre-discussion preferences, the group-level preference after discussion, and not the change in preference, is the dependent variable to avoid misspecification.

Table 18: Results of Post-discussion Average Preference Analysis

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>coefficient value</th>
<th>standard error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in certainty from discussion $\beta_1$</td>
<td>0.01</td>
<td>0.07</td>
<td>0.95</td>
</tr>
<tr>
<td>Product attribute information $\beta_2$</td>
<td>1.37</td>
<td>0.53</td>
<td>0.01</td>
</tr>
<tr>
<td>Normative influence of others $\beta_3$</td>
<td>0.10</td>
<td>0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>Informational disconfirmation</td>
<td>1.05</td>
<td>0.27</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Normative disconfirmation</td>
<td>0.45</td>
<td>0.24</td>
<td>0.06</td>
</tr>
<tr>
<td>Pre-discussion average preference</td>
<td>0.76</td>
<td>0.07</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>constant $\beta_0$</td>
<td>7.69</td>
<td>2.61</td>
<td>0.004</td>
</tr>
</tbody>
</table>

Dependent variable: Average of individual post-discussion preferences for the family
$R^2=0.71$, Adjusted $R^2=0.70$, N=168

Table 19: Results of Group Preference Analysis

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>coefficient value</th>
<th>standard error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in certainty from discussion $\beta_1$</td>
<td>-0.02</td>
<td>0.09</td>
<td>0.94</td>
</tr>
<tr>
<td>Product attribute information $\beta_2$</td>
<td>1.64</td>
<td>0.67</td>
<td>0.02</td>
</tr>
<tr>
<td>Normative influence of others $\beta_3$</td>
<td>0.03</td>
<td>0.05</td>
<td>0.54</td>
</tr>
<tr>
<td>Informational disconfirmation</td>
<td>1.23</td>
<td>0.34</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Normative disconfirmation</td>
<td>0.62</td>
<td>0.30</td>
<td>0.04</td>
</tr>
<tr>
<td>Pre-discussion average preference</td>
<td>0.89</td>
<td>0.09</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>constant $\beta_0$</td>
<td>3.21</td>
<td>3.27</td>
<td>0.33</td>
</tr>
</tbody>
</table>

Dependent variable: Family preference.
$R^2=0.67$, Adjusted $R^2=0.65$, N=168
The regression results show that, for the post-discussion preferences, the informational influence, normative influence, and disconfirmation terms are all positive and significant, as they were for the analysis of the individual preferences. For the group preference, however, the normative influence term is still positive but not significant. The positive and significant coefficient for the informational influence related to attribute information supports H3b. Table 20 summarizes the conclusions for the hypothesis testing for the family vacation analysis.

Table 20: Summary of Hypothesis Testing for Family Vacation Study

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1  a) greater preference revision for greater disconfirmation,</td>
<td>supported</td>
</tr>
<tr>
<td>b) with upward (downward) revision for positive (negative) disconfirmation</td>
<td></td>
</tr>
<tr>
<td>H2  effect of negative disconfirmation on preference revision larger than</td>
<td>not supported</td>
</tr>
<tr>
<td>for positive disconfirmation</td>
<td></td>
</tr>
<tr>
<td>H3  a) the greater a group member's uncertainty the greater the</td>
<td>supported</td>
</tr>
<tr>
<td>preference revision, and b) the greater the difference in uncertainty</td>
<td></td>
</tr>
<tr>
<td>among group members the greater the group-level preference revision</td>
<td></td>
</tr>
<tr>
<td>H4  The greater a group member's uncertainty, the less the a) self-rated</td>
<td>a) supported</td>
</tr>
<tr>
<td>influence after discussion, and b) the less influence as rated by</td>
<td>b) not supported</td>
</tr>
<tr>
<td>other group members</td>
<td></td>
</tr>
<tr>
<td>H5  The greater the influence susceptibility, the greater the preference</td>
<td>supported</td>
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<td>revision</td>
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Examining the group preferences more closely, 18% of the families chose a vacation that before discussion was preferred by only one or none of the family members. For another 13% of the families, each person preferred a different vacation before discussion.

Utilizing the simple group choice model of a weighted average of the pre-discussion preferences, where the weights are the average decision influence for
each person (the average is over the influence for a person as rated by all three family members), the group preference for each vacation can be calculated and a prediction made for the family choice. For 30% of the families an incorrect prediction results from using such a static preference model. The same group choice model is again used, except the post-discussion individual preferences as predicted by the disconfirmation model are utilized instead of the pre-discussion preferences. The disconfirmation model predicts somewhat better than the static preference model, with incorrect predictions for 23% of the families.

6.5 Summary, Discussion, and Limitations

The analysis of preference revisions for the vacation study supports the hypothesized effects of informational influence (H3a and H3b), normative influence (H5), and expectation disconfirmation (H1a and H1b). A person’s self-influence perceptions also changed significantly due to discussion according to one’s pre-discussion uncertainty (supporting H4a), but the same was not true when analyzing how other family members perceived the person’s influence (no support for H4b). There was no support for the hypothesized differences between positive and negative disconfirmation (H2). Overall, the analyses of individual and group preference revisions due to discussion show social influence and disconfirmation to be significant explanatory variables.

The individual preference revision analysis suggests that the perceived disconfirmation (informationally and normatively) has a significant effect in addition to an “objective” updating. In making this conclusion, an implicit assumption is that the vacation attribute information and preferences were actually revealed during the family discussion. If so, then the informational and normative influence variables, which are multiplied by disconfirmation
according to the preference model, completely characterize the preference revision due to such "objective" disconfirmation. In that case, any additional effect of subjective disconfirmation suggests that individuals revise preferences more than they "should" when experiencing disconfirmation. On the other hand, if information and preferences are not fully revealed, then significance of the subjective disconfirmation variables may simply reflect a noisy measurement of the objective disconfirmation, and not indicate "irrational" preference shifts.

To explore the issue further, measures of the influence attempts were used as additional independent variables in the preference revision analysis. If an individual rated his or her persuasive influence attempts as being low, then information and preferences may not have been revealed in discussion by that person. As such, one's preference revision should be positively related to the influence attempts of the other family members. Inclusion of the influence attempts into the preference revision analysis show the influence attempt coefficients to be not significantly different than zero. Although not a direct measurement of how each individual perceived the information revealed by others, the results still suggest that subjective disconfirmation is important. The extent to which this represents misperception of information and preferences revealed in discussion, and/or some type of behavioral bias or "overreaction" to disconfirmation is open for further research.

Evaluating the disconfirmation model to predict group choice did show some improvement over a static preference group choice model, where disconfirmation and social influence are not considered. Although not a rigorous examination of predicting group choice (i.e., the model was not calibrated with one set of data and then used to predict choice for a hold-out sample), and despite a modest improvement in prediction accuracy, the results suggest that
the disconfirmation model can improve the analysis and understanding of group
decision-making. Further research could compare a group choice model based
upon disconfirmation, as formulated here, with other group choice models.

The measurement of informational and normative influence susceptibility
also warrants further study. In general, both the susceptibility to influence and
the manifestation of influence attempts characterize the dynamics of a group
decision (Corfman and Lehmann 1987; Thomas 1982). The measures used for the
analysis involved influence susceptibility and perceptions of one’s own influence
attempts, but not strictly how influence attempts were perceived by others in the
group. Scale development should focus on these different aspects of influence
susceptibility and manifest influence perceptions. Future content analysis of the
actual family discussions may shed further light on this issue.

Finally, specifying precisely what the group norm is for which normative
influence exists warrant further research. In social psychology the group norm is
often phrased as risk attitudes, and the assumption is generally made that the
norm is implicit in group members’ preferences. In the family vacation study the
attribute importances were measured before and after discussion to see if this is a
potential aspect of normative influence. Analysis indicates that for three of the
five attributes (climate, comfort, and activities) the importance ratings changed
significantly due to discussion (p=0.02 for climate and comfort; p=0.001 for
activities). The changes in attribute ratings due to discussion were not
significantly different across experimental conditions, nor across the initial
information, suggesting that the importance revisions are not based upon
information. Therefore, the potential exists that normative influence manifests
itself as modifications in attribute importances. Further research in this area
could help clarify the meaning and measurement of a group norm.
7. Conclusions

At a fundamental level, group decisions reflect the outcome of a social influence process which can revise the preferences of individual group members. Previous research on group decision-making has been limited in that the impact of social influence on preference revisions is generally not explicitly modeled or considered. A result of such a research approach is that most group choice models utilize only the pre-discussion preferences to analyze group decisions. This "static preference" view ignores the variety of preference shifts that can occur as the result of social influence, such as when a dyad chooses to purchase a product even when their pre-discussion preferences indicate they would not.

This dissertation contributes to the group decision-making research by explicitly considering social influence and the resulting impact on preference revisions within the group. The primary contributions lie in three particular areas. First, expectation disconfirmation is theorized and demonstrated to be an important variable in explaining preference revisions due to group discussion. Unlike previous research which tends to consider only certain types of preference shifts, such as polarization, the inclusion of disconfirmed expectations applies more generally to group decision-making. This is because disconfirmation can be positive or negative, leading to upward or downward preference revisions for individual group members. The pattern of preference shifts within the group therefore reflects the disconfirmation experienced by each person, which can but need not lead to polarization.

The theoretical framework was expressed more completely through hypotheses which presented the fundamental components of the social influence process and their effects on preferences. Specifically, preference revisions occur
based upon pre-discussion expectations being disconfirmed by the information and preferences revealed by others during group discussion. Disconfirmation determines the direction of the preference revision, and greater (in magnitude) shifts occur for greater levels of disconfirmation. The magnitude of a person’s preference shift is augmented by one’s susceptibility to social influence, either informationally or normatively. Informational influence depends upon the relative uncertainty among the group members about product-specific information. Susceptibility to normative influence captures the extent to which a group member considers and adjusts to the preferences of other group members, independent of information.

The second primary contribution is the analytical complement of the theoretical framework. A model of preference revision was formulated which includes the effects of disconfirmed expectations and social influence. Unlike other models of group decision-making, the model of this dissertation can capture essentially any pattern of preference revisions, based upon whether group members have expectations that are too favorable or unfavorable. The model was utilized to study preference revisions for two empirical studies: a dyadic industrial purchase decision and a triadic family vacation decision. The results show that regardless of the nature of the preference shifts that occurred (whether polarizing shifts or not), the model framework was able to capture such revisions quite well. One possible reason is the inclusion of disconfirmed expectations, which determine the direction (upward or downward) of preference shifts for the group members. Analysis of the group preferences also suggested that the model can potentially improve the prediction of group decisions, compared to typical static group choice models which ignore preference revisions.
The third contribution lies in the empirical methodology and support of the theoretical model and hypothesized relationships. The analyses of preference revisions for both empirical studies showed that expectation disconfirmation significantly affected the observed preference revisions (H1a and H1b), as did informational influence related to uncertainty (H3a and H3b) and susceptibility to normative influence (H5). A person’s self-influence perceptions also changed due to discussion according to one’s pre-discussion uncertainty (supporting H4a), but the same was not true when analyzing how other group members perceived the person’s influence (no support for H4b). Although three of the hypotheses related to uncertainty (H3a, H3b and H4a) were generally supported, the statistical significance was encouraging but modest. One explanation is that uncertainty was simply not an important component of subject’s preferences due to the hypothetical group choice. Although the information and decision process were realistic for the studies, medical dyads did not actually purchase the product, and families did not actually go on their preferred vacation. A second explanation relates to uncertainty being measured with a five-point scale. This may provide insufficient latitude to capture changes in uncertainty due to discussion.

There was no support for the hypothesis that, similar to loss aversion, negative expectation disconfirmation would have a larger impact on preference changes than positive disconfirmation (H2). At first glance it is surprising that no support was found, given the observance of loss aversion in many different marketing contexts. In hindsight, however, a plausible explanation emerges as to why positive and negative disconfirmation have relatively equal effects. Cognitively, negative (positive) disconfirmation may not always be seen as a loss (gain). Consider someone who before discussion is unfavorable towards the
product, and learns in discussion that the product is even worse than expected. In the preference analysis this is a negative disconfirmation. However, it is not immediate that the person would code the negative disconfirmation as a loss, since the predisposition was already unfavorable. Indeed, such a person may cognitively view negative disconfirmation as a gain in this case, since further impetus is provided for the person's preference of rejecting the product. Of course, if the person was initially favorable towards the product, negative disconfirmation might then be seen as loss. Therefore, depending upon their inclinations of liking or disliking the product, individuals may code negative and positive disconfirmation as losses or gains in different situations. Empirically, then, negative and positive disconfirmation in and of themselves may not have different effects. Future research could place disconfirmation into terms of gains and losses, and examine whether loss aversion holds for preference revisions in group decision-making.

The empirical studies also contribute to the marketing knowledge of survey methodologies which place little or no structure on the task (e.g., Brucks 1985). Originally designed and utilized for new product research, Information Acceleration (I/A) was used here so that the group decision studies would reflect realistic and natural settings for the decision task. Besides providing greater external validity, I/A's multimedia survey methodology does not impose a particular structure on how individuals choose to search product information and formulate preferences before discussion. Since the goal is to examine preference revisions due to disconfirmation and social influence, it is important that individual group members be able to participate naturally according to their pre-discussion preferences and knowledge. Otherwise, group members might behave according to experimental constraints instead of according to their own
goals and preferences. This is not meant to discourage the use of manipulations or more common behavioral experimentation. Indeed, the vacation study manipulated the initial information, and in general controlled experiments can be very effective at isolating particular behavior. However, external and descriptive validity ultimately rest upon how people actually behave. For group decision research, the I/A multimedia procedure allows groups to naturally reach decisions according to information realistically accessed and evaluated by group members. The I/A procedure therefore offers an effective and efficient tool to study group decision-making.

Overall, the theory, model and empirical analyses demonstrate how social influence and expectation disconfirmation are significant explanatory variables of preference revisions due to group discussion. The primary contribution of this research lies in the explicit inclusion of the social influence process in studying group decision-making. The effects of social influence appeared not only in the theoretical framework and hypotheses, but also in the preference revision model. Including social influence, and particularly disconfirmed expectations, into an analysis of preference revisions allows general examination of group decision-making, regardless of whether or not preference shifts follow traditionally studied patterns of polarization. This dissertation represents the first known study to explicitly model, measure, and examine the impact of disconfirmed expectations on group decision-making and the revision of preferences due to the social influence process. Because of its theorized and empirically demonstrated significance, disconfirmed expectations should be included as a fundamental aspect of the group decision-making process in future studies.

By explicitly modeling and analyzing aspects of the social influence process, an improved understanding of group decision-making, such as for
organizational purchase decision, can be achieved. This research therefore fulfills in part the call for greater theoretical emphasis on the multi-person social processes of group decision behavior (Corfman and Gupta 1993; Johnston and Spekman 1987; Lilien, Kotler and Moorthy 1992; Wilson, Lilien and Wilson 1991). The empirical results of this dissertation demonstrate that including social influence and disconfirmed expectations can improve our understanding of group decisions, and potentially benefit group choice models in decision prediction. Before discussing various implications of the dissertation's results, several limitations to the study are first addressed.

7.1 Limitations

The main limitation is the distinctive measurement of the informational and normative concepts of the group decision process for the empirical studies. This touches upon two particular aspects of preference revisions and social influence. First, expectation disconfirmation was measured subjectively after group discussion, while an objective measure of disconfirmation was calculated based upon pre-discussion expectations. However, measures were not taken of how the group members perceived the information and preferences revealed by others in discussion. As a result, calculating disconfirmed expectations may not reflect instances where group members withhold information or indicate preferences that are not consistent with their true preferences. In other words, calculating “objective” disconfirmation gives a complete measure of disconfirmation only when the information and preferences of others are fully revealed and perfectly understood. This is obviously not always the case. Therefore, although the empirical analysis suggests that perceived disconfirmation has a significant effect in addition to an “objective” updating, it
is not clear whether this reflects imperfect revelation of information and preferences, or a "biased overweighting" of disconfirmation. Future studies should better ascertain perceptions and measure how information and preferences are revealed, such that potential subjective biases associated with the disconfirmed expectations can be explored. Effective methods to measure expectations without introducing biases should also be examined.

The second limitation related to empirical measurement is that social influence has informational and normative components, but there exist no valid scales that could be utilized for the analysis. Very few previous studies have explored the distinct role or import of these social influences in the marketing context, aside from reference group effects on individual decision-making (Bearden and Etzel 1982; Bearden, Netemeyer and Teel 1989; Park and Lessig 1977). Although useful as a guide, reference group influence is treated as a personality trait for individual decision-making, and thus has limited direct application to group decision influence in specific situations. Antecedents to decision influence in organizational and family decisions have been studied, but, again, these influence concepts are not generally formulated nor measured as informational and normative. Attempts to develop valid social influence scales should be included in future research.

Given that the social influence process and the preference revision model are described and expressed in informational and normative terms, better measurement and understanding of these influences should allow for improved and more comprehensive analysis of group decisions. For example, consider that one of the group members is viewed to have expert knowledge relevant to the group decision. It is not entirely clear to what extent informational and normative influences interact in this case, given that preferences may in some
way signal, favorably or unfavorably, information about the decision alternative. Are group members susceptible to influence from the expert because they perceive any revealed information to be valid, or because they desire to not appear “ignorant” in the eyes of the expert and therefore go along with whatever the expert says, or both? Are there differences in how informational and normative influences impact a group member’s private revision of preference, versus how that person publicly states his or her preference to the group? Past research in marketing and social psychology have not fully addressed these issues. More studies are needed to distinguish among these types of influence, both in terms of susceptibility to influence (as focused upon in this dissertation), and how influence attempts are perceived within the group. Recent research on persuasion knowledge effects may give useful direction for studying influence perceptions (Boush, Friestad and Rose 1994; Friestad and Wright 1994). The research approach presented in this dissertation may also provide some guidance, since the effects of influence on the individual and group-level preferences can be explicitly modeled and examined.

The model and empirical studies followed the implicit assumption in social psychology that a group norm is reflected in the preferences of the group members. One implication is that normative influence is somewhat generically modeled and measured as how one’s preference is affected by the preferences of others. Therefore, explanations of the results are limited in that the origins of any group norms relevant to the decision are not specified. The family vacation study did suggest that the attribute importances may be affected by social influence. Although an intuitive concept of a group norm or standard, particularly when using multiattribute utility functions to model preferences, a relationship between attribute importances and normative influence has not been
established. Analyzing the effects of normative influence could obviously be improved if the object of that influence (the group norm) is better understood beyond preference in general.

Besides these influence measurement issues, the present empirical studies did not fully examine whether the proposed model can predict group choice better than various types of static preference models. The empirical analyses indicated that prediction could indeed be improved, but strict comparisons were not made since, for example, a holdout sample was not used for the prediction. An improvement is still expected, however, since a sizable proportion of the groups (around a third) did demonstrate a group preference and choice that differed from a weighted average of the pre-discussion preferences, typical of most group choice models. By considering disconfirmed expectations, the preference revision model of this dissertation does not make a static preference assumption, such that "non-averaging" preference shifts can be captured.

Finally, the model and empirical studies did not consider strategic behavior of persons within the group. As mentioned earlier, group members might not fully reveal the information they know, or may be misleading about which alternative they prefer. Although such strategic behavior was not expected to be significant for the empirical studies, due to the hypothetical nature of the choices, many organizational and family decision processes could involve strategic behavior. Examples include "turf wars" within organizations, and behaviors within families where one person gives in to the wishes of another so that the chances of "winning" the next decision are higher. Extensions of the model to incorporate strategic behavior are left for future research. Even without explicitly modeling strategic behavior, however, the analysis and results of this dissertation have numerous implications, as discussed next.
7.2 Implications

The effects of disconfirmed expectations and social influence on preference revisions have several implications for group decision-making. One set of implications concerns the group itself, in terms of the size of the group and, for organizational decisions, who should be members of the group so that a decision can be made in the best interest of the organization. Focusing on the informational influences of the group decision, one reason for having a group (instead of an individual) make the decision is that different types of expertise can be represented. For an organizational purchase decision, for example, different functional areas can be represented in the group due to the various marketing, purchasing, technical, and managerial issues involved. The preference revision model highlights how the relative precision of the information exchanged impacts the preferences within the group. Therefore, if the group is represented by experts who indeed possess with reasonable certainty the needed information, the options under consideration can be evaluated rather precisely. Also, the larger the group, the larger the information set that would be pooled. While adding to the precision, this would also increase the labor costs for the decision. The organization could weigh these informational benefits and costs to determine an optimal group size.

Informational influence is just part of the social influence process, however. Normative influence also impacts the group preference. If the group norm is more important to the group than the specific information, then the use of experts may provide little benefit. For example, consider our oft-used vendor example. If group members feel the organization has an onerous review process whenever new vendors are approved, a group norm of maintaining the status
quo might become prominent. Information specific to the new vendor may be ignored relative to the normative considerations. The group might then take the safe alternative that favors current vendors, even if the new vendor provides some clear benefit to the organization. In this case, the use of experts does little to impact the decision, since normative issues dominate. Recognizing this, the organization could provide incentives so that the group's norms are consistent with those of the organization. Alternatively, the organization could choose the group members such that the desired norms are strongly represented. One approach might be for the managerial representative to have a higher position (e.g., a vice president) than others in the group. In this way, the desired informational influences could be maintained by the experts within the group, while the desired normative influences could be exercised through a highly-influential manager whose norms closely coincide with the organization. Of course, such a solution would have merit only if the group still contained the necessary expertise, and if the senior manager did not purposefully or inadvertently control the entire decision process. Thus, an organization must balance the needs for information with the desire for decisions to reflect the organizations' norms.

In many situations, whether within organizations or families, decision groups often have a history of being together and making decisions. The decision history of the group may impact not only the perceptions of informational and normative influence for the group members, but also the expectations as well. In essence, the decision history is an information set on which the expectations about others' preferences might be based. Disconfirmed expectations may therefore have a dynamic element over time as the group makes more and more decisions together. Eventually, group members may be
able to have very precise expectations about how others in the group would prefer an alternative for a particular decision situation. The result would be that normative effects would be small for that decision, not because there is no susceptibility to normative influence, but rather because there is no normative expectation disconfirmation. This may point to the benefits of using established groups to make informationally intensive decisions, since normative effects will not be as relevant.

Of course, if the norms of an established group happen to not coincide with those of the organization or some stated purpose, the use of an ad hoc group of experts may be optimal. Indeed, this may be one motivation why an "outside panel of experts" is sometimes used by organizations to review business practices. An ad hoc panel may be better able than an internal group to reach consensus using stated objectives. The internal group could be affected by various norms and organizational culture that are in part the subject of the review.

Another issue is that of various post-decision processes and behavior, such as satisfaction with the decision and commitment to the decision. Since these are largely tied to an individual's post-decision preference for the group choice, understanding how disconfirmed expectations and social influence revise an individual's preference should be helpful. For example, despite the large literature on consumer satisfaction with purchase decisions, there is relatively little research which explores the satisfaction of the buying group in industrial purchase decisions. Since satisfaction in general is often modeled based upon the disconfirmed expectations of product performance, the potential exists, in concept, for group satisfaction to additionally be dependent upon expectation disconfirmation due to group discussion.
Furthermore, disconfirmed expectations may affect not only a group member's satisfaction with the product chosen, but also satisfaction with the decision process and the group itself. Both could impact the commitment a person has to implementing the group decision, and/or the repeat purchase behavior of that group member in making future decisions. Therefore, disconfirmed expectations could have different forms and different effects for group satisfaction and post-satisfaction behavior. For example, suppose that someone in the decision group is an expert with perfect knowledge about all of the vendors under consideration, and prefers Vendor C. If this person were treated as an individual consumer, satisfaction models would suggest that the person's satisfaction with any vendor chosen would be the same, controlling for actual vendor performance. Suppose, however, that the group decided not to choose Vendor C, but, because of normative influences, choose Vendor G. The expert's satisfaction with the group decision process would likely be low since Vendor C was not chosen. If this process dissatisfaction also affects how the chosen vendor is evaluated, the normatively disconfirmed expectations may impact the expert's dissatisfaction with Vendor G. In future decisions the expert may then try and stress the perceived error in choosing Vendor G, and advocate reducing component purchases from that vendor. Disconfirmed expectations may therefore be relevant not only for preference revisions, but also for post-decision behaviors such as satisfaction and commitment.

Lastly, the essential basis of concepts like expectations, certainty, and informational influence is that of information. Information search and product learning in the group context have been fundamentally unexplored, although principles of individual information search will obviously apply to some extent. Also, under cases of strategic behavior, such as for negotiations between
industrial buyers and sellers, strategies are based upon expectations which are updated as the negotiations progress. If, as the empirical studies presented here suggest, there are subjective aspects or even overreaction to disconfirmation, buying and selling strategies might involve some type of "expectation management" so that the decision process can be better controlled and anticipated. Due to its explicit consideration of disconfirmed expectations, the analytical model and empirical studies should offer a useful and important starting point for further research on these and other aspects of group decision-making.

7.3 Conclusion

This dissertation has described an analytical model and two empirical studies which present disconfirmed expectations as an important component of the group decision process. The results suggest that the model can effectively capture and explain preference revisions in a general manner. This is because disconfirmed expectations can be positive or negative and lead to preference revisions of different magnitudes based upon social influence susceptibility. Thus, unlike most other models of group decision-making, the preference revision model is not restricted to situations where preferences polarize, or where the group preference represents some type of weighted average of the pre-discussion preferences. As the first study to explicitly demonstrate the important role of disconfirmed expectations, it is hoped that this research will provide the basis for future research into the group decision process.
Appendix A: Sample Computer Screens from Industrial Purchase Survey
Figure A1: Computer Screen for Information Search

The CBC Mini-Lab delivers accurate, in-office hematology results in as few as 6 minutes. Your staff assistant can now perform routine blood analyses while your patients are still in your office.

The result. A faster diagnosis. And you don't have to hassle with outside labs.

The CBC Mini-Lab is easy to use. Simple walk-away capability allows your assistant to place a sample in the machine and press a button. That's it.

So why are your patients waiting?

For details, call us toll-free at 800-555-HEMA.

WHY ARE YOUR PATIENTS WAITING?

Figure A2: Magazine Advertisement
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BUFFY COAT ANALYSIS
A Laboratory Tool Functioning as a Complete Blood Cell Count

John Warren, MD, Michael Laidlaw, MD

We have developed a system for the quantitative analysis of the buffy coat in centrifuged whole blood samples. This analysis, performed in a modified microhematocrit tube, provides hematocrit and hemoglobin values, total WBC count, platelet count, and a separation of the leukocyte population into granulocytes and non-granulocytes. All results are available within 10 minutes, and correlate well with existing methods. The system is expected to provide a rapid means of performing a complete cell count in a physician's office. (1995;262:611-615)

The complete blood cell (CBC) count is the most widely requested and, perhaps, the single most important laboratory test performed on blood. In a majority of the cases it is performed to obtain general information rather than a specific diagnosis. In these instances, the CBC count functions as a screening test, and the maximum use of the test is obtained when the results are immediately available to the physician. The system we developed works on the principle of physically expanding and separating the buffy coat into three distinct layers that consist of granulocytes, non-granulocytes (lymphocytes and monocytes), and platelets. These expanded layers are quantified, providing hematocrit and hemoglobin values, total WBC count, platelet count, and a clinically useful partial differential cell count.

Feb. 4, 1995 - Vol 262, No. 5
Buffy Coat Analysis, Warren & Laidlaw 611

Ashley and Associates
Certified Public Accountants
Boston, Massachusetts

March 18, 1995

Dear Doctor's Name

At your request I have analyzed the cost implications of the "CBC Mini-Lab" diagnostic instrument. I have attached a graph depicting the payback period for your practice's average test volume, assuming a $20,000 purchase price. The time to recover the purchase cost of the device and the average annual revenues are indicated. Please note that the calculations are after taxes (35% tax rate), and include a straight-line, five-year depreciation of the instrument. Costs for CLIA compliance are included. The overall impact to staff workload is very modest, in my view, given the instrument's ease of use and walkaway capability, and the elimination of staff time to liaison with outside labs and to re-contact patients. I did not include any interest costs you would incur if you utilized the manufacturer's purchase finance plan. I have assumed a 20-day work month. Details of the CLIA costs and the calculation of the net revenue per test are shown on the next page. The payback/revenue graph is on third page.

If your average test volume is sustained, and no more drastic changes in reimbursements occur, you can recover the purchase price of the instrument and post revenue gains. This assumes the instrument remains operational for at least several years. Please feel free to call if I can answer any questions or be of further service.

Sincerely,

Robert Ashley, CPA

Robert Ashley, CPA

Figure A3: Medical Journal Article

Figure A4: Memorandum from Accountant

- 139 -
Figure A5: Medical Technician Colleague

Figure A6: Physician Colleague
Figure A7: Product Salesperson and Demonstration
Appendix B: Sample Computer Screens from Family Vacation Survey
The Magazine Of Travel - April 1996 Issue

Review Article: Resort - Huatulco, Mexico

(A review of a recent visit by a Magazine of Travel staff reporter.)

(continued from previous page)

Overall Impressions -

My overall impression of Resort in Huatulco: I'm impressed with this resort on the southern Pacific coast of Mexico. And who wouldn't be impressed with the magnificent bays and beaches, the pristine grounds of the Resort village, the gorgeous climate, and the myriad of activities to keep anyone and everyone active and happy.

Like all Resorts, everything is included in a single price for your week-long vacation, including the food and most activities. The best part of Huatulco (besides its beauty) is that the menus are full and exciting. The menu of food comes from 5 restaurants, serving cuisine from around the world. I actually enjoyed each meal, and there was always plenty of food and drink. The menu of activities is just as intriguing, with over 20 sports to choose from, plus shopping and sightseeing excursions in and around nearby Oaxaca (90 miles away). One week in Huatulco only gives you a taste of all it has to offer (hint to my editor: SEND ME BACK!).

My only complaint lies in the relative sparseness of the rooms. Like most (but not all) Resorts, the rooms are mostly comfortable, but not exactly luxurious or super-large. However, I spent such little time in my room, that the only amenity I cared to notice was the hammock on my private terrace overlooking the bay.

My recommendation: GO to HUATULCO!

Figure B1: Positive Initial Information for Mexico Vacation

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The Magazine Of Travel - April 1996 Issue

Review Article: Resort - Huatulco, Mexico

(A review of a recent visit by a Magazine of Travel staff reporter.)

(continued from previous page)

A few things to note -

Despite the advantages of Resort, Huatulco, there are a few things to keep in mind about this resort on Mexico's southern Pacific coast. First, don't expect a large, luxurious room - you won't find one. Rooms are sparse and functional.

Also, be aware that, although I had good weather on my visit, you should expect an occasional shower, especially in the summer months. These are usually confined to the late afternoon.

An excursion to the area in and around Oaxaca lets you see some impressive architecture and ruins, not to mention the fascinating local culture and shopping. Resort Huatulco and Oaxaca are 90 miles apart, however, meaning you have to do a bit of traveling to take advantage of Oaxaca. You can arrange a quick yet costly flight to Oaxaca, or endure a road trip that takes about two hours each way. There's plenty to do in Huatulco, but it would be a shame to miss the treasures of Oaxaca.

Finally, I did notice a number of families at Resort Huatulco. The village is really more suitable for families with older children, although kids 6 years old and above can be accommodated.

Figure B2: Negative Initial Information for Mexico Vacation
The Magazine Of Travel - April 1996 Issue

Review Article:  Resort  - Eleuthera, Bahamas

(A review of a recent visit by a Magazine of Travel staff reporter.)

(continued from previous page)

A few things I noticed -

I have a confession to make: the first thought that popped into my mind when I wandered down to the beach at Resort, Eleuthera, was PARADISE! It might be the best beach in the Caribbean.

It’s not surprising, then, that nearly everything at this Resort revolves around the beach. The sport activities primarily involve the beach—sailing, snorkeling, scuba diving, and even water skiing. There are also picnics at the beach, nature walks along the beach, and volleyball (you guessed it) at the beach. Doing anything away from the beach means going outside the Resort village. That’s not bad, since the skinny island of Eleuthera has much to offer along its 100-mile stretch.

Although I took this trip myself (it’s a tough job here at the Magazine!), I did talk with a number of families who were vacationing at this Resort. All I saw were smiles, regardless of age. One couple said the only disappointment they noticed in their children was how sad they were when it was time to go back home. Such is life in paradise!

Families can enjoy the pristine beach at Eleuthera

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The Magazine Of Travel - April 1996 Issue

Review Article:  Resort  - Eleuthera, Bahamas

(A review of a recent visit by a Magazine of Travel staff reporter.)

(continued from previous page)

Overall Impressions -

I would recommend taking advantage of the area attractions, since the activities at the Resort village in Eleuthera are somewhat limited, at least when compared to other Resorts. I tend to like variety, but if you’re happy with spending your week just playing on the beach, then Eleuthera should be fine for you. Everyone at the village, including families, did seem to keep themselves occupied in various ways.

The rooms at Resort Eleuthera are also not up to par for a Resort village. The buildings are rather old and in need of a face-lift. The other areas of the village, like the pool, restaurants, and nightclub, didn’t seem to show the same signs of age as my room.

One thing to keep in mind: although the climate at Eleuthera is superb, the mosquitoes think so, too. Bring along your bug spray. Everything considered, Eleuthera is truly a beach paradise worth visiting – but maybe just once.

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Figure B3: Positive Initial Information for Bahamas Vacation

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Figure B4: Negative Initial Information for Bahamas Vacation
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The Magazine Of Travel - April 1996 Issue

Review Article: Resort - Florida

(A review of a recent visit by a Magazine of Travel staff reporter.)

(continued from previous page)

Overall Impressions -

The Resort Florida is about what you would expect: A nice resort that specializes in golf and tennis, and that's close enough to Orlando so that you can take advantage of the many sights there.

They call Resort FL one of Resort 's Finest, and that seems to be true, at least based on my visit. The rooms are fairly large and quite comfortable, and have a refrigerator and TV, which are usually absent at other Resort villages. Overall, this Resort resort ranks right up there with other luxury hotels or resorts.

There can be little doubt that Resort FL will please anyone wanting to spend their vacation on the golf course or on the tennis court. The Resort FL staff can help you improve your game. Although I spent most of the week
golfing, I thought I'd work a little on my tennis game. My instructor was absolutely terrific. Everyone had high marks for the golf and tennis staff. There were other activities to enjoy as well, such as water skiing, sailing, and the circus workshops for those daring visitors.

Unfortunately, the high marks didn't extend to the food. This was a bit puzzling, given the otherwise fine accommodations, but towards the end of the week I found myself not looking forward to dinner. The only other drawback to Resort FL, especially for summer vacations, is the Florida weather: hot and humid, with occasional rain and a hurricane or two just so you remember where you are.

Although I did not take any excursions, Orlando and the surrounding area are waiting if you don't want to spend all week with a golf club or tennis racquet (Orlando is two hours away). Frankly, I was perfectly happy with what Resort FL does best - golf and tennis for people like me.

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Figure B5: Initial Information for Florida Vacation

The Magazine Of Travel - April 1996 Issue

Review Article: Resort - Florida

(A review of a recent visit by a Magazine of Travel staff reporter.)

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Things to do -

Two words summarize Resort Florida: golf and tennis (or, if you like, tennis and golf). But you don't have to be a golf or tennis fanatic to enjoy Resort FL.

First of all, you can just take advantage of the facilities to improve your golf or tennis game. The instructors canably handle players of all abilities and ages. My two children (ages 10 and 14) spent most of the week learning tennis (I suppose now I'll have to buy them both new racquets). This meant that during the day my spouse and I could play golf together - a rare treat.

Not everyone's lives revolve around golf and tennis, however. Many families staying at Resort FL would make day trips to Orlando, complete with Disney and Universal Studios, Sea World and Busch Gardens and Epcot. But don't forget the nearby Kennedy Space Center, or Palm Springs, or deep-sea fishing in the Atlantic Ocean, or a quick flight to Nassau, Bahamas for a night at the casinos.

You certainly can't do it all in a week, but most families have already been to Orlando at least once. That means that Resort Florida lets you have the Florida vacation that you want. A whole week of golf? No problem. A quick drive to see the kids the space shuttle? Easily done. A peek at the new Lion King attraction at Disney? Why not? After all, it's your vacation.

Many excursions can be easily made from Resort FL, like to the Kennedy Space Center.

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Figure B6: Second Magazine Excerpt for Florida Vacation
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Click on an information source to learn more about Eleuthera, Bahamas. When you have finished gathering enough information to evaluate this place as a possible destination for your family vacation, click "DONE."

Magazine Article  
(Average time to search: 2 minutes)

TV / Video Promotions  
(Average time to search: 5 minutes)

Color Brochures  
(Average time to search: 4 minutes)

Evaluation by Visitors  
(Average time to search: 2 minutes)

Travel Agent  
(Average time to search: 2 minutes)

Figure B7: Computer Screen for Information Search

Family Travels - Spring 1996

The Best of Mexico: Family Fun in Oaxaca and Huatulco

The heart of every Mexican town and city is the zocalo, the main square, but there is consensus among tourists that, as a place to relax and watch the world go by, none can compare with the zocalo in the south-western city of Oaxaca. From morning until late at night, the pavement cafes are filled with visitors and locals in short-sleeved shirts sipping a coffee, a beer, an extended breakfast, or an even more extended lunch. As night falls the many bands of trumpets, guitars, and singers ply their trade among the tables, the trilling music bouncing off the walls of the Palacio de Gobierno on one side and the massive Cathedral on the other. Couples stroll under the huge banyan trees in the garden at the center or pause to survey the scene from the pretty little nineteenth-century bandstand.

This is where people come to see all of Mexico in a week. The beautiful colonial city of Oaxaca is surrounded by great archeological sites such as Mitla and Monte Albán. India villages, old monasteries and magnificent scenery.

is also only a few hours’ drive from the Pacific beaches of Huatulco, a pristine resort area. Together, Oaxaca and Huatulco certainly represent the best of Mexico for an exciting family vacation.

Figure B8: Magazine Article
Like a piñata full of surprises, southwestern Mexico is rich in diversity, embracing both ancient and modern arts and architecture. Spanish and native Zapotec Indian cultures. In the nearby capital city of Oaxaca, baroque cathedrals and Spanish colonial buildings vie for your attention with the bustle of the colorful marketplace. Only a few savvy travelers have discovered the exquisite seaside areas of Huatulco.

Figure B9: Excerpt from Resort Brochure

And there's so much more. With more islands than the entire Caribbean combined, it's not surprising that you'll find the authentic Paradise Island in The Islands of The Bahamas. Because our islands provide irresistible opportunities and attractions to delight you - from cracked conch dinners to rare conch pearls, from romantic sailboat cruises to sun-drenched beaches. You can idle your time away, or enjoy the warmth of our Bahamian hospitality. Discover the extraordinary. It's all waiting for you in The Islands of The Bahamas.

Figure B10: Excerpt from Area Tourism Brochure
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Huatulco Customer Survey

Please comment on what you LIKED about your family vacation

The bays and beaches are simply amazing. Very relaxing – we’d practically have the beach to ourselves.

Sunset cruise of the bays was very nice.

The kids had lots of activities to choose from. The staff does a good job of keeping the teens happy – my kids were excited to get up in the morning and get an early start on the fun. The Teen’s Club idea is good.

Figure B11: Example of Customer Satisfaction Information - Likes

Eleuthera Customer Survey

Please comment on what you DISLIKED about your family vacation

The rooms were rundown. Beds were hard as a rock.

Apart from the beach there weren't alot of activities. I liked the water sports, but my sister isn't into that much, so she seemed ready to go home after a week.

Figure B12: Example of Customer Satisfaction Information - Dislikes
References


Kaciak, Eugene, and Jordan Louviere (1990), "Multiple Correspondence Analysis of Multiple Choice Experiment Data," Journal of Marketing Research, 27 (November), 455-465.


