Processes of Information Seeking in Decision Making.

by

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Abstract

In the first of two experiments, 32 individuals and 12 dyads were required to make two consumer decisions among 5 or 10 glues and 5 or 10 computers after examining any or all seven pieces of information about each. The participants sought information about one of the seven features of an alternative by pressing two buttons arranged in columns on a computer screen. One column represented the alternatives (glues or computers) and one column represented the features, which were displayed, on a computer screen. The main purpose of the first study was to investigate whether dyads examine more information than individuals do. The order in which participants examined information was also investigated by comparing the information seeking trajectories. No significant difference was found between the amount of information dyads and individuals examined. An analysis of information seeking trajectories showed no difference between dyads and individuals information seeking trajectory. Participants examined information alternative by alternative, row by row, as predicted by Expected value theory, but contrary to the Elimination by Aspects heuristic. An assumption was that the way information was displayed caused participants to examine information alternative by alternative.

The second experiment was conducted to investigate this assumption. In this experiment, the two columns of information were switched. 17 participants were tested individually in the second experiment. Results were consistent with the assumption that participants examined information, row by row, when information was presented in two columns. The results indicate that the way information is presented may affect how people examine information, and their decision.

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Introduction

Group decision making has long been justified by moral and democratic principles, especially the principle that those who are affected by a decision should have a voice in making it. Group decision making has also been justified by pragmatic principles, in particular by the claim that "two heads are better than one." The reasons for this pragmatic claim seem sound. Variations in human capacities and experiences guarantee that people have different strengths and limitations. If one group member's strengths compensate for the limitations of another, then the group should be stronger than its parts. Thus, if member A knows about manufacturing but not marketing, and member B knows about marketing but not manufacturing, then a joint decision by A and B about manufacturing and marketing a product should be superior than a decision made by A or B alone.

Unfortunately, what should occur according to pragmatic principles may not occur in fact. Group members with useful information often do not speak, or are not allowed to speak, or they do speak but are ignored. The perspectives of different members often lead them to prefer different alternatives, to argue about their preferences, and to seek compromises that satisfy no one.

The pitfalls and potentials of group decisions making have inspired generations of social psychologists to study how the pitfalls might be avoided and the potentials realized (for reviews, see Henry, 1995; Kerr, 1992; Parkes & Cawlin, 1995). Much of their work has documented the pathologies both of group decision making and of group problem solving such as shifts to risk and conservatism (e.g., see Chen, 1996; Lipshitz & Ilan, 1996; Ward & Reinger, 1996). Other work has explored why these pathologies occur

(e.g., see Janis & Mann, 1977). A primary suspect to emerge from these investigations is consensual ignorance. Anecdotal evidence suggests that groups often ignore alternatives or fail to consider them fully because the alternatives threaten the norms of the group or the preferences of its leader. Indeed, Janis and Mann note that some group members serve as "mind guards" to prevent upsetting alternatives from being discussed (1977, page 131). Other anecdotal evidence suggests that many alternatives are ignored because arguments about others have tired group members and consumed all available meeting time (Thorngate, personal communication, 1999). Rules of order are also to blame. Parliamentary procedure, for example, requires that alternatives be discussed and voted upon one at a time. Discussion and voting of even one alternative often takes hours, days, even weeks of meetings, and strains the attention of group members. The pain of deliberation can thus force members to choose the first alternative, rather than to consider several alternatives before making a decision (see Thorngate & Carroll, 1991).

Most of these investigations of the pathologies of group decision making suggest that a group becomes prone to making bad decisions when its members ignore available information. Of course, individuals also ignore information, and with the same consequences (see, for example, Hogarth, 1980; Payne, 1976; Thorngate & Maki, 1976). Do groups examine or ignore more information relevant to decisions than do individuals? Do groups examine information in a different way? How do group members divide their labour in seeking information? Do groups or individuals examine more information for important decisions than for unimportant ones? What is the relation between (1) the amount of information examined and (2) decision satisfaction among groups and individuals? The purpose of this study is to answer these questions.

Information Seeking and Individual Decision Making

In making decisions, people are often faced with a large number of alternatives. Because each alternative might have some features not found in others, multiple comparisons among alternatives and features is often necessary in order to assess which alternatives have various combinations of good and bad features. This suggests that decision makers should increase the amount of information they consider in making a decision as the number of alternatives or features increases.

The research literature shows that people rarely, if ever, look at all available information when they choose from many alternatives (Bettman, Luce & Payne, 1998; Payne, 1976; Taylor, 1987; Thorngate & Maki, 1976). Payne (1976), for example, asked participants to select their preferred apartment from descriptions of 2, 6, or 12 shown them. The descriptions included 2, 4, or 8 apartment features such as rent, number of bedrooms and parking. Participants were required to request apartment/feature information from the experimenter who recorded their requests. Payne found that when participants were choosing between two apartments, they examined almost all (81%) information for both alternatives. However, when faced with multi-alternative choices (6 or 12 apartments), much of the available information was ignored. For example, participants examined on average only 58% of the 36 pieces of information when choosing among six apartments, each described by six features, and only 51% of the 96 pieces of information when choosing among 12 apartments each described by eight features. In a similar study, Thorngate and Maki (1976) investigated the information seeking patterns of participants asked to choose among two, four or eight political candidates according to the candidates' public stand on two, four or eight election issues.

They found that participants choosing between two candidates examined at most 74% of their two, four or eight opinions. In contrast, most participants choosing among four or eight candidates examined a far smaller proportion of opinions, for example, 67% when choosing among four candidates with four opinions and only 56% when choosing among eight candidates with eight opinions.

Both the Payne (1976) and the Thorngate and Maki (1976) studies demonstrated that individuals do not search all the available information when they are faced with multi-alternative, multi-feature choices. Instead, as the number of alternatives and features increases, the proportion of available information examined decreases. It appears that above some limit, no more information is sought and decision makers instead become increasingly selective on what information they seek.

Reasons for ignoring information. Why do people ignore so much of the information available to them when making a decision? The research literature suggests several reasons including cognitive limitations, mood, time limitations, and the effect of prior knowledge (Robertson & Kassarian, 1991; Bettman, 1986; Cohen & Chakravart, 1990).

Cognitive limitations can affect the amount of information searched. One such cognitive limitation is short-term or working memory. Miller (1956) argues that people retain about 5 to 9 bits or pieces of information (7 plus or minus 2) in working memory. If more information enters, the first information is usually forgotten. To overcome this limitation, people often resort to “chunking”: organizing a set of information in order to retain some feature of it in memory. Decision making makes heavy demands on working memory, so we should expect that if a decision situation presents more information than

can be handled by working memory, the excess would be chunked, eliminated or ignored.

Mood may also affect pre-decision behaviour, including information seeking. People usually change their behavior according to their emotion. It is a common assumption, for example, that happy people are easier to persuade than others, which is why advertisers often use pictures or music to induce positive feelings. The research literature shows that positive or negative mood can affect decisions and judgments (Isen, 1984; Luce et al., 1997; Lewinsohn & Mano, 1993). Some researchers have shown that people in a pleasant mood process information with less thought or mental effort than people in a negative mood, and thus that the decisions of happy people are based on less information (Isen, 1984). Others have argued that people in a pleasant mood decide more deliberately, taking a longer time and searching more information (Lewinsohn & Mano, 1993). People in a positive mood usually are more optimistic than are others, therefore, they may be more confident with their decision than people in a negative mood. However, they may or may not search all information. Luce et al. (1997) reported that decision processing under increasing negative mood becomes more extensive, that is, people in a negative mood tend to examine the same information repeatedly. In many decision situations, this repetition may cause them to ignore additional information available to them.

Time limitations can also affect the amount of information decision makers examine. Zakay and Wooler (1984), for example, examined the effects of time pressure on the decision making process. They reported that people under time pressure examine fewer alternatives than people with no time pressure even if they were previously trained for making decisions. Deadlines often cause stress and people in stressful situations often

do not evaluate all the available information (Parkes & Cowlin, 1995). Therefore, they seek less information than people who are under no deadline pressure.

People with prior knowledge about the alternatives faced in a decision tend to examine less information than others do, simply because they can recall it without looking. Reilly and Conover (1983) reported a negative relation between familiarity with a product and the amount of information searched. They showed that people who are less familiar with a product search more additional information about it than do those who are more familiar with the product. People choosing among familiar alternatives were also more confident in their decision.

Information Seeking and Decision Making Strategies

Cognitive limitations, mood, and time limitations may account for much of the tendency to ignore available information in making decisions, but they do not tell which information will be sought or ignored. There is strong evidence that decision makers rarely select information at random. Instead, their information seeking trajectories follow patterns that can tell much about the decision making processes they employ.

According to Payne (1976), information seeking strategies come in two general types: alternative-by-alternative search strategies and feature-by-feature search strategies. A decision maker is faced with a matrix of several alternatives (rows). Each alternative is described by several features (columns) using the style of Consumer Reports. Payne discovered that when people must choose between only two alternatives, each described by two features, they generally look at both features of the first alternative, then look at both features of the second, then make their choice an alternative-by-alternative (row-by-row) search strategy. As the number of features increases, most people look at only a

subset of features of the first alternative, then look at the same subset of features of the second alternative before making their choice. Information is thus ignored by systematically eliminating features, presumably those least important for making a choice.

Payne (1976) found that when the number of alternatives increases beyond two, people shift their information seeking trajectory from alternatives to features. Instead of looking at features of one alternative, then looking at the same features of another, etc., most participants faced with four or eight alternatives began by looking at one feature of all alternatives, then looking at a second feature of a subset of the alternatives, perhaps a third feature of a subset of this subset, etc. until only one alternative remained. This feature-by-feature strategy allowed participants to eliminate alternatives from consideration as they went along, thus reducing the amount of information they needed to consider.

Thorngate and Maki (1976) replicated these results and provided a clear indication of the relation between information seeking strategies and decision making processes. The alternative-by-alternative information seeking strategy is what one would expect of someone conforming to the classic Expected Value or Subjective Expected Utility prescription for rational decision making (see Luce & Raiffa, 1957). Looking at some or all of the features of one alternative, and not re-examining them, strongly suggests that a decision maker is forming what may be called an overall impression of the alternative, remembering this overall impression as the important attribute of the alternative's "chunk" of features. The overall impression corresponds to the alternative's expected value or subjective expected utility. Proceeding alternative-by-alternative this way, a

decision maker leaves an information seeking trace that suggests he/she is collecting an overall impression of each alternative before making a choice. The finding that almost no one uses an alternative-by-alternative information seeking trajectory for choices having more than two alternatives reinforces the behavioural evidence that the Expected value and Subjective Expected Utility models of decision making do not describe how people make decisions (Bettman et al., 1998).

Examining information feature-by-feature is consistent with several lexicographic models of decision making. Lexicographic choice processes are those that place an order of importance on the features. This order of importance governs how people will examine information in making a decision. Decision makers first review all the features and pick the most important one. After comparing alternatives on that feature, they begin comparisons on the next most important feature. In this way, a Lexicographic procedure is like the Elimination by Aspects model of choice. Elimination by Aspects is just one of several lexicographic procedures described by Tversky (1972). According to Tversky's heuristic, decision makers solve the problem of excess information by first selecting the important feature or attribute of available alternatives and setting some minimal standard of this feature. For example, in choosing among ten new cars A, B, C, ..., J a buyer may decide that price is the most important feature and that no car can cost more than \$20,000. The decision maker then scans all alternatives for this feature and eliminates from further consideration all alternatives that do not meet the minimum standard. If two or more alternatives remain, then the second most important feature is selected, a second minimum standard is set, and the remaining alternatives are scanned. Having eliminated the others as too expensive, for example, a buyer may consider only cars C, E, G and H

looking for the one(s) with above average reliability. Again, alternatives from the new set that do not meet the minimum standard are eliminated. If two or more alternatives remain, a third feature is selected and a standard set. And so the Elimination by Aspects process continues until only one alternative remains, the one chosen.

The information seeking trajectories found in Payne's (1976) study and in Thorngate and Maki's (1976) study suggest that a majority of people shift to the elimination by aspects heuristic of making choices whenever the number of alternatives exceeds two. But the elimination by aspects choice method does not account for all the information seeking trajectory shifts reported in these studies. Thorngate and Maki describe several other decision making heuristics that generate unique patterns of information seeking. One is a winner versus challenger heuristic in which several alternatives are considered in pairs. A and B, for example, are first considered differentially (the additive difference heuristic, see Tversky, 1969), feature- by-feature, until a "winner" is chosen. The winner is then considered against a new challenger, say alternative C, and a second winner is chosen. The winner of this second match is then pitted against a third challenger (fourth alternative), and the process continues until a final winner is chosen. In one variation, the winner of an "A versus B" contest would be paired with the winner of a "C versus D" contest. These heuristics greatly reduce the amount of information needed to make a choice, and result in distinctive patterns of information re-examination not found in the elimination by aspects heuristic. Russo and Rosen (1975) found evidence for the winner versus challenger heuristic by studying eye movements of people making choices from information shown on slides of alternative x feature matrices. Thorngate and Maki also found about 10% of their participants

showing the winner versus challenger pattern. They also found that smaller percentages of participants either searched information in a patternless trajectory and chose an alternative seemingly at random, or chose the first alternative they examined and ignored the rest. Such trajectories remind us that decision makers are sometimes unmotivated to make choices and will select any alternative that gets the job done.

In sum, research on information seeking has documented the amount of information considered and ignored in making individual decisions and given some idea about why so much is ignored. Studies of patterns of information seeking have allowed us to guess at the most likely choice heuristic an individual uses to make a decision and have documented several different choice heuristics (for reviews, see Hogarth, 1980, Bettman et al., 1998). Research in the area has shifted from accounting for choice variability by a single heuristic to accounting for heuristic variability. It has also documented many of the pitfalls and limitations attached to each heuristic, such as the elimination by aspect heuristic's sensitivity to the order in which features are examined (Tversky, 1972) and the sensitivity of the winner versus challenger heuristics to error (Thorngate, 1981).

Curiously, however, research on group decision making has failed to exploit this knowledge. As a result, there is almost no comparable information about the proportion of available information considered and ignored in making group decisions, or about the popularity of various choice heuristics used by groups. There is, however, a large body of research on group dynamics and group decision making which suggests several interesting hypotheses about information seeking and decision making processes in groups.

Information Seeking and Group Decision Making

Although there is a large body of literature on group decision making (for reviews, see Brandstatter, Davis & Schuler, 1978; Fisher, 1980; Witte & Davis, 1996), there is little overlap with the literature on individual decision making. Perhaps this is not surprising. Psychologists who study decision making in groups tend to concentrate on the group dynamics leading to a joint decision. It is axiomatic, of course, that there are no group dynamics in individual decision making.

Even so, many of those who study group decision making discuss the use of information in making group decisions, and often attempt to relate the use of information to the quality of the group decision. For example, several studies have examined how group discussion affects the quality of a group decision (Henry, 1995; Hirokawa 1980; Innami, 1994; Laughlin, 1988). Henry (1995) and Innami (1994) found that when a group member shares information with other members, it generally has a positive influence on the quality of their joint decision. Laughlin (1988) and Hirokawa (1980) investigated the quality of group discussions. Their results suggest that groups making good decisions spend more time discussing alternatives than do groups making bad decisions. The best decisions are made when group members not only exchange information but also take time to evaluate each alternative carefully.

Caplow (1954) suggests that group interaction usually involves both cooperation and conflict. Each member of a group has both common and unique motives, values and goals. While they can pursue common goals cooperatively, their unique goals may conflict. Seeking more available information may provide a solution to the conflict. As a result, the group would seek more information than would any of its members if making

the decision alone. For example, two members of an office group may cooperatively pursue a common goal of choosing a reliable photocopier, but one member may prefer a cheap photocopier and the other member may prefer a photocopier with many features. To resolve their conflict, the group may seek information about many more photocopiers than would either of its members in hopes of finding one with low price and many features.

Yet there are at least two factors that may lead groups to examine less information than do individuals. The first factor is time. Groups usually take more time to evaluate the pros and cons of alternatives than individuals do. When there is more than one opinion in a group, members spend more time discussing and evaluating each alternative. Thorngate and Carroll (1989) reported that discussion in groups, even for one alternative, can take so much time that the pain of deliberation can force members to select the first alternative, rather than consider other alternatives. Time pressure can also lead groups to seek less information. Parkes and Cowlin (1995) examined groups' discussion under time pressure. Participants in their study were tested with different sets of alternatives (two, three, or four) to raise funds for a school without increasing tuition fees. For each set, various deadlines were set (5, 10, or 13 minutes). They found that groups under more time pressure would discuss less information than groups with less time pressure. As the number of alternatives increased, the deadline effect also increased; under time pressure, groups try to eliminate many alternatives quickly and then discuss the few that remain (see Zakay & Wooler, 1984). This strategy is suggestive of the elimination by aspects heuristic of individual choice.

A set of phenomena known as groupthink also affects information seeking in decision making. Strong cohesiveness between members of a group often causes them to selectively ignore some information in order to obtain consensus, especially information that challenges group norms (Janis & Mann, 1977). In these situations, members of the group are more concerned about maintaining group consensus than about making a good decision. Many failed political and business decisions can be traced to this aspect of groupthink. Janis reported several case histories of infamous group decisions (e.g., the Bay of Pigs, Thalidomide, Pearl Harbor) that illustrate how groupthink prevents group members from evaluating a large amount of information. Therefore, if group cohesiveness increases, the chances that the group discusses or seeks more information should decrease.

In summary, there are reasons to believe that under some conditions groups will examine more information before making decisions than will individuals, and under other conditions they will examine less. When there is conflict among group members, we should expect more information seeking, and when there is cohesiveness, we should expect less. However, groups in conflict are likely to argue about each piece of information they obtain, and thus take more time making a decision. The extra time may lead to more time pressure or fatigue, and inhibit their motivation to seek additional information. The natural variability of groups might cancel out their average information seeking behaviours (some groups seeking more, some seeking less, than is sought by the average individual). But we should then find a difference in the variability of information seeking distributions: more groups than individuals should show either

relatively low or relatively high information seeking. The proposed study is designed to examine these differences.

There remains the issue of the trajectory of information seeking in groups and its relation to the group process used in making decisions. What might we expect of a group asked to choose among several alternatives, each described by several features? The work of Thorngate and Carroll (1989) suggests that groups may be more prone to examine information alternative by alternative. This is, after all, the method suggested by Robert's Rules or Order and other variations of parliamentary procedure in making decisions one motion at a time. However, the results of the studies by Zakay and Wooler, (1984) and by Parkes and Cowlin (1995) suggest that groups are more likely than are individuals to use an elimination by aspects heuristic. It is also conceivable that groups whose members have conflicting motives, values or goals might resort to more random patterns of information seeking than we would expect of individuals. This might happen, for example, if group members argue about the best method of considering information and decide to do a little of each. This study attempted to categorize the information seeking trajectories of individuals and groups in order to compare the relative frequencies of various alternative-by-alternative, feature-by-feature and mixed patterns. The study also recorded the conversations of group members as they sought information, hoping to estimate the extent of their conflict or cohesion and other aspects of their dynamics, and to investigate post hoc how these indicators might relate to the amount and pattern of information sought.

Information Seeking and the Importance of a Decision

Sometimes people are faced with decisions that could change their lives or the lives of others, and sometimes with decisions that make almost no difference to anyone. The first kind we call important decisions; the second we call trivial. Choosing a job or a drug treatment or a house are examples of important decisions; choosing a toothpaste or a cake mix are examples of trivial decisions.

It is reasonable to hypothesize that when people are faced with making important decisions they will take more time, evaluate more alternatives and seek more information than when making trivial decisions. Some of the reasons are motivational. Because important decisions, by definition, affect lives more than trivial ones, good important decisions are usually more rewarding, and bad ones are usually more punishing, than good or bad trivial decisions. For example, a decision maker should be more motivated to choose a good car than to choose a good breakfast cereal simply because a bad car is a \$30,000 mistake, but a bad cereal is a \$2 mistake. This motivation should in turn lead a decision maker to seek more information about a car than about a cereal.

There is at least one more reason to expect that people will examine more information before making an important decision than before making a trivial one. Trivial decisions tend to be repetitious and frequent; important decisions tend to be singular and infrequent. Thus, we may decide what to eat for lunch seven times a week, and decide whom to marry only once in our life. When satisfying decisions are repeated, we tend to rely increasingly on habit to make them (James, 1890). However, because important decisions tend to be infrequent, we usually cannot rely on habit to make them. Instead of habit, we are likely to seek information. As a result, both the rarity of

important decisions and the motivation to make good ones should cause decision makers to seek more information before making the former. We might expect that groups will also seek more information when a decision is important than when it is trivial.

Curiously, there is not much research on the relation between the importance of a decision and the amount of information sought before making it. However, the effects of the importance of decisions on people's motivation and group discussion have been studied (for example, see Converse & Cooper, 1978; Kerr, 1992). Some research shows that people tend to take less risk and spend more time for an important decision (Berkman & Gilson, 1981; Converse & Cooper, 1978; Lambert, 1972). Lambert (1972), for example, examined the relation between choice behavior and item values. He found that when participants were asked to choose among high-value items such as stereos and tape recorders, they take more time to make a decision and they usually select a higher price product than a lower price one. When they were asked to choose a low-value item such as coffees and toothpaste, they took less time and selected "bargain" alternatives. What were the participants doing in the extra time spent choosing among expensive items? Lambert does not say. However, I can speculate that the extra time was used to consider or to search additional information.

Converse and Cooper (1978) examined the relation between decision and attitude. They found that as a decision became important, participants' attitude in selecting items would change. They noted that "as the importance of the decision increases beyond a moderate level, participants may begin a careful survey of all the evidence relevant to their decision... greater importance may also activate greater attention to accuracy" (p. 52). For example, people may not be very concerned about the price or quality when

they buy toothpaste. On the other hand, buying a car is important and people usually look for more information about the quality, price and even the color of their choices.

There is some evidence that the importance of a decision may also affect information seeking by groups. Because groups are less concerned about the outcome of a decision about trivial issues, members may be more tolerant of others' opinions. Therefore, group members may not seek information to resolve differences of opinion when the decision is trivial. Kerr (1992) examined how the importance of an issue affected the process of group decision making. He found that groups more often reach unanimous agreement on unimportant issues than on important issues. For example, when everybody in a family is involved in making a decision, it is probably much easier to make a unanimous decision about a particular type of dishwasher liquid than about which brand of new car to buy. This suggests that there is less conflict among group members when making unimportant decisions, and thus less reason to seek information in hopes of resolving conflict.

According to the studies discussed above, it is reasonable to hypothesize that there is a direct relation between the importance of a decision and the amount of information sought prior to making the decision about a product, both for individuals and for groups. A third objective of my proposed study was to test this hypothesis. I varied the importance of a decision by asking individuals and dyads to choose a low-priced and a high-priced product.

Group Versus Individual Differences in Satisfaction

A fourth objective of my study was to investigate whether or not there was a relation between information seeking and satisfaction, both in group decisions and in

individual decisions. It seems reasonable to assume that the more information decision makers examine prior to a decision, the greater the satisfaction with their final choice. This is because the more information a decision maker examines, the greater the chances that he/she will find a satisfying alternative. For example, if a decision maker is faced with selecting one of 10 possible holidays, but looks at no information about them, then he/she would have only a 1 in 10 chance of choosing the holiday most satisfying to him/her. In comparison, if the same decision maker examined, say, 25 features of each of the 10 holidays, then he or she should have a much better chance of knowing which is most satisfying for him/her.

The relationship between information seeking and satisfaction in groups may, however, not be as simple as it is with individuals. Although I did not find any research that compares the satisfaction levels of individuals and groups members, it is possible to speculate about such differences. When group members disagree about the best alternative, they may seek more information about compromise alternatives. Yet when a group decision is a compromise among the competing preferences of group members, we would expect some members to be less satisfied that they would be with their individual first preference. Thus, groups might not only seek more information than would individuals to resolve their disagreement, but they might also show a lower average level of satisfaction with their compromise alternative. This possibility will be explored in the present research.

In my study, in order to investigate how satisfied individuals and group members were with their decision, a question related to their satisfaction was presented to the members of each dyad and to each individual. I compared the rating of each group

member's satisfaction with individuals' rating in order to determine whether or not there were differences. I predicted that the average satisfaction of individuals making choices would be higher than the average satisfaction of each member of a dyad making choices.

The Present Study

In summary, the first purpose of the present study was to test the hypothesis that groups sought more information than individuals did by comparing the amount of information sought by individuals and dyads. The second purpose of the present study was to classify the choice heuristics and examine whether or not groups were more likely to use different heuristics than were individuals by comparing the information seeking trajectories of individuals and dyads faced with examining a different number of alternatives. The third purpose of the study was to determine if individuals and dyads examined more information when making an important decision than when making an unimportant decision. The fourth purpose of the study was to determine if individuals were more satisfied with their decisions than were dyads. The fifth purpose of this study was to examine if dyads spent more time to make a decision than did individuals.

In order to serve these five purposes, individuals and dyads were asked to make two consumer decisions differing in importance and number of alternatives. Half of the individuals and half of the dyads made their two choices among five alternatives; the other half made their two choices among ten alternatives. Also, all participants were asked to choose among glue as a low value item (unimportant) and among computers as a high value item (important). The result was a 2 (decision makers = individual versus dyad) x 2 (alternatives = number of alternatives) x 2 (importance = levels of importance) design. Decision makers and alternatives were between-subject variables; importance

was a within-subject variable.

The consumer decision tasks were variations of those used by Payne (1976) and by Thorngate and Maki (1976). Participants were asked to choose one of either five or ten household glues (low importance) or one of either five or ten computers (high importance). In all cases, seven features of each glue (e.g., price, colour) and each computer (e.g., price, hard disk capacity) were available to view. Information about the glues and computers were taken from recent issues of Consumer Reports, which summarize alternatives and their features in a convenient matrix form. The choice tasks were presented on a computer screen requiring choosers to click on an alternative and a feature to view the information about the corresponding cell (alternative-feature combination). These clicks were recorded, as were the glue and computer choice made. Following each choice, participants were asked to rate their satisfaction with the chosen alternative.

Experiment 1: Methods

Participants

A sample of 47 undergraduate students enrolled in Introductory Psychology at Carleton University participated in this study; 23 were tested individually and 24 were tested in dyads. Each participant was given course credit for his/her participation. They were randomly assigned to an experimental condition. 20 were male and 27 were female.

Design

A 2 x 2 x 2 mixed factorial design was employed in this study. There were three independent variables. The first (between subjects) independent variable was the number of decision makers: individuals versus dyads. This variable was used to study the effect of group decision making on the dependent variables.

The second (between subjects) independent variable was number of the alternatives that were shown to the participants. Half of the participants were asked to choose one of 5 alternatives, while the other half were asked to choose one of 10 alternatives. This variable was used to determine how the number of alternatives given to the participants affected information seeking.

The third (within subjects) independent variable was item value. All participants selected a glue, an item of low monetary value presumably of low importance, and a computer, an item with high monetary value and presumably of high importance. This variable allowed me to investigate the effect of price/importance on how participants seek information

The dependent variables in this experiment were (1) the amount of information that participants examined before making each decision, (2) the amount of information that

participants re-examined, (3) the order in which participants examined the information: (a) same-alternative, same-feature (b) same-alternative, different-feature (c) different-alternative, same-feature (d) different-alternative, different-feature; (4) the time participants spent to make a decision, (5) participants' rating of satisfaction with their decision, and (6) item chosen by participants. Conversation between dyad members as they made their decisions was recorded in order to conduct separate analyses of their group dynamics and the relation of these dynamics to the process of information seeking, choice and satisfaction.

Each individual and each dyad were asked to make two decisions, each decision representing a unique combination of number of alternatives and item value. There were two such combinations of alternatives (5 and 10) and items (glue and computer): 5G 5C and 10G 10C. For example, one individual was asked to choose one of five brands of glue and one of five brands of computer. Another individual was asked to choose one of ten brands of computer and one of ten brands of glue. Each individual and each dyad received one of the two combinations. The order of presentation of each element in a combination was counterbalanced. Thus, for example, six of the 12 individuals given the 5C 5G combination were first asked to choose one of five glues, then to choose one of five computers; the other six individuals were first asked to choose one of five computers, then one of five glues.

Materials

Background questionnaire. In the background questionnaire, participants were asked to provide information about their level of education, gender, major subject, and familiarity with the products to be chosen (see Appendix B).

Stimuli. The information about glues and computers presented in this study were taken from the Consumer Reports Magazine issues published in 1999. Features of these items included price, color, etc. but did not include brand name. Brand name was excluded because it would likely reduce the amount of information examined by those who “buy brand”. Each item (glue and computer) was described by 7 pieces of information. Appendixes F2, F4 show the information used for 10 glues and 10 computers. In the 5 alternative case (F1 & F3), the alternatives were selected randomly from the 10 available alternatives with different levels (low, moderate and high price). The same set of 5 alternatives was presented to all of the individuals and dyads.

Each task was displayed on a computer and controlled by a computer program written in Visual Basic. For each product there were two columns of buttons. The left column presented alternatives and the right column features. Participants clicked an alternative and then clicked features to review information about the alternative (see Appendix D). Visual Basic recorded each click along with the time of each click (see Appendix E for sample).

Post-choice questionnaire. The post-choice questionnaire was given to participants immediately after each of the two decisions was made (see Appendixes C1 and C2). Items in the questionnaire were included to determine participants’ satisfaction with their decision as well as conflict and cohesion between dyad members. The questionnaires that were given to dyad members and individual participants were the same except the one for dyads had two extra questions exploring dynamics in joint decision making (Questions 3 and 4). Each member of a dyad answered the questionnaire privately.

Procedure

The experiment was held in room A428 of the Loeb Building at Carleton University. The purpose of the experiment was first explained briefly and participants were asked to read and sign an Informed Consent form. Participants were also reminded that they could withdraw from the experiment any time. Next, participants completed the background questionnaire.

Participants were then asked to sit in front of a computer, and were given a few minutes to become familiar with the task. The instructions were read to participants (see Appendix A). Individuals were asked to assume that they had a roommate with whom they had decided to buy these products, but that their roommate had asked them to make a choice for both of them. Dyads were asked to assume that they were roommates who wanted to buy these products for themselves. In the dyad condition, the flip of a coin was employed to determine which of the two participants controlled the mouse, and the name of the mouse controller was noted. When each dyad began its first task, a recorder was utilized to record any conversation between the dyad members, and was turned off as soon a decision was made.

When each of the two choices was made, each participant was given a post-choice questionnaire (see Appendixes C1 and C2) to complete. In order to protect the privacy of the dyad members, each was asked to fill out the questionnaire at opposite sides of the research room, and was not allowed to see each other's questionnaire responses. At the end of the session, participants were debriefed and thanked for their time and participation.

Results

Amount of Information Examined

To investigate whether or not the amount of information examined by participants depended upon the number of decision makers (1 or 2), the number of alternatives (5 or 10), or monetary value (low or high), a 2 x 2 x 2 mixed factorial design ANOVA was employed on the total amount of information examined. No significant main effects or interactions were found, with the exception of the main effect of number of alternatives. The average number of cells sought by participants when they were faced with 10 alternatives ($M = 86.83$) was significantly more than the average when they were faced with 5 alternatives ($M = 59.73$), $F(1, 32) = 5.588$, $p = .025$. The difference between the average amount of information examined by dyads ($M = 79.45$) and the average amount of information examined by individuals ($M = 70.65$) was not significant, $F(1, 32) = .782$, $p = .383$. The difference between the average amount of information sought by participants when selecting a glue ($M = 77.28$) and when selecting a computer ($M = 70.05$) was not significant, $F(1, 32) = 1.722$, $p = .199$. There were no significant interactions found between the number of alternatives and value of items, $F(1, 32) = .158$, $p = .693$, the number of decision makers and the number of alternatives, $F(1, 32) = .555$, $p = .356$; and the number of decision makers and value of items, $F(1, 32) = .062$, $p = .805$. Also there was no significant interaction found between the number of alternatives, the number of decision makers and value of items, $F(1, 32) = 2.127$, $p = .155$.

The result did not support the hypothesis that people seek more information when a decision is important. I occasionally questioned some individuals and dyads about their

selections after completing the experiment. Among 6 dyads and 10 individuals interviewed, 4 dyads and 6 individuals related that they looked for more information when they examined glue because they were not familiar with the information that appeared in the experiment. Also, questions six and nine in the background questionnaire revealed that participants had less knowledge about glues ($M = 4.20$) than about computers ($M = 5.37$). Thus, it seems that unfamiliarity with product increases information seeking more than importance of the decision.

To investigate whether the differences found between the amount of information participants examined when they were faced with 5 alternatives or 10 alternatives were caused by the amount of information available (70 cells of information in the 10-alternative condition versus 35 cells in the 5-alternative condition), or by the re-examination of information already viewed examined, the proportion of the amount of available information to information viewed by the participants was calculated. The average proportion of cells examined when participants were faced with 5 alternatives ($M = 1.70$) was significantly higher than the average proportion of information examined when participants were faced 10 alternatives ($M = 1.24$), $F(1, 32) = 5.27$, $p = .025$. There was no significant difference found between the average proportion of cells examined when selecting a glue ($M = 1.54$) and the average proportion of cells examined when selecting a computer ($M = 1.39$), $F(1, 32) = 1.26$, $p = .269$.

These results show that participants viewed a greater number of cells than the number available, leading to two possible hypotheses concerning how participants examined information. The first is that participants examined all available information and then reviewed certain data. The second hypothesis is that participants ignored some

features and repeatedly re-examined others. To investigate these possibilities, the number of cells never examined was analyzed. The difference between the average amount of information ignored when participants were faced with 10 alternatives ($M = 12.55$) and the average amount of information ignored when participants were faced with 5 alternatives ($M = 4.35$) was significant, $F(1, 32) = 3.27$, $p = .048$. This result supports the second hypothesis, namely, that participants ignored some of the data and repeatedly re-examined others. Participants examined 82% of the 70 pieces of information and 87% of 35 pieces of information. However, in previous studies by Payne (1976) and Thorngate and Maki (1976) participants ignored more than 50% of information when they were faced with multi-alternatives.

Trajectories of Information Seeking

In order to investigate participants' trajectories, the order of button clicks for information about alternative-feature pairs was examined. Four kinds of transitions between any click and the next one were possible. A "same-alternative, same-feature" transition revealed that a participant was examining the same information again. A "same-alternative, different-feature" transition revealed that a participant was examining the same glue or computer but looking at a different feature of it. A "different-alternative, same-feature" transition revealed that a participant was examining a different glue or computer with respect to the same feature (e.g., price). Finally, a "different-alternative, different-feature" transition revealed that a participant was switching both the alternative and the feature examined from one click to the next. Consider, for example, a participant who first clicked alternative A feature 1, then clicked alternative A feature 2, then B2, then B1, the B1 again, and finally C3. The A1-A2 transition and the B1-B2 transition

would count as two of the “same-alternative, different-feature” kind. The A2-B2 transition would count as one “different-alternative, same-feature”. The B1-B1 transition would count as one “same-alternative, same-feature”, and the B1-C3 transition would count as one “different-alternative, different-feature”. Participants following a traditional Expected Value rule of choice should examine information alternative-by-alternative, row-by-row and thus should generate a high proportion of “same-alternative, different-feature” transitions (and same-alternative, same-feature transitions if they were forgetful). Participants following a lexicographic or Elimination by Aspects rule of choice should engage in a series of alternative-alternative comparisons within a chosen feature, and thus should generate a high proportion of “different-alternative, same-feature” transitions (and same-alternative, same-feature transitions if they were forgetful).

Separate 2 x 2 x 2 mixed factorial design ANOVAs were employed to investigate whether or not the number of decision makers (1 or 2), the number of alternatives (5 or 10), or value of items (low or high) would affect participants’ trajectories. An analysis of variance on same-alternative, different-feature trajectory revealed no significant main effects or interactions, with the exception of a main effect of number of alternatives. The difference between the average amount of information examined by participants facing 5 alternatives ($M = 39.91$) was significantly lower than the average amount of information examined by those facing 10 alternatives ($M = 66.83$), $F(1, 32) = 9.496$, $p = .004$. The average amount of information examined by dyads ($M = 58.50$) was not significantly higher than the average amount of information examined by individuals ($M = 51.28$), $F(1, 32) = .947$, $p = .338$. It seems that by increasing the number of alternatives, the tendency to examine information according to a same-alternative, different-feature

trajectory increased. The average amount of information examined when a glue was displayed ($M = 56.74$) and when a computer was displayed ($M = 50.77$) was not significant, $F(1, 32) = 1.537$, $p = .224$. Also, there were no significant interactions found between the number of alternatives and the number of decision makers, $F(1, 32) = .646$, $p = .428$; the number of alternatives and the value of items, $F(1, 32) = .140$, $p = .710$; and the number of decision makers and value of items, $F(1, 32) = .407$, $p = .528$. Similarly, there was no significant interaction found between the number of alternatives, the number of decision makers and the value of items, $F(1, 32) = 1.158$, $p = .290$.

An analysis of variance also revealed no significant main effects or interactions when participants examined information by a different-alternative, same-feature trajectory. The difference between the average amount of information individuals examined ($M = 10.33$) and the average amount of information dyads examined ($M = 9.70$) using this trajectory was not significant, $F(1, 32) = .047$, $p = .829$. The average amount of information examined by participants who were faced with 10 alternatives ($M = 9.085$) was not significantly higher than the average amount of information examined by participants who were faced with 5 alternatives ($M = 11.20$). The average number of cells examined when participants chose a computer ($M = 11$) was not higher than the average number of cells examined when participants chose a glue ($M = 9.23$), $F(1, 32) = .966$, $p = .333$. Also, there were no significant interactions found between the number of alternatives and the number decision makers, $F(1, 32) = .373$, $p = .546$; the number of alternatives and the value of items, $F(1, 32) = .445$, $p = .510$; and the number of decision makers and the value of items, $F(1, 32) = .171$, $p = .682$. Similarly, there was no

significant interaction found between the number of alternatives, the number of decision makers and the value of items, $F(1, 32) = .928$, $p = .343$.

Analyzing the trajectories revealed a surprising result. On average in both conditions (5 and 10), 70% of participants' information seeking transitions were same-alternative, different-feature; only 16% were different-alternative, same-feature. Participants in this study used a different transition from Thorngate and Maki's (1976) and Payne's (1976) participants. Their participants most often examined information according to the different-alternative, same-feature trajectory when they were faced with many alternatives, as predicted by Tversky's (1972) Elimination by Aspects heuristic

Time Spent to Choose

Analysis of variance was conducted to evaluate the time spent to make decisions by dyads vs. individuals, with 5 vs. 10 alternatives, and about glue vs. computer. There were no significant differences found in main effects and interactions with the exception of the main effect of number of alternatives. The average amount time spent by participants spent who had 10 alternatives ($M = 6.59$ min.) was significantly greater than the average amount of time spent by participants who had 5 alternatives ($M = 4.21$ min.), $F(1, 32) = 4.61$, $p = .042$. The average amount of time spent by dyads to make a decision ($M = 6.09$ min.) was not significantly greater than the average amount of time spent by individuals ($M = 4.32$ min.), $F(1, 32) = 2.13$, $p = .154$. There was no significant difference found between the time participants spent choosing a glue ($M = 4.95$ min.), and when choosing a computer ($M = 4.89$ min.), $F(1, 32) = .843$, $p = .675$. No significant interactions were found between the number of alternatives and the number of decision makers, $F(1, 32) = 1.97$, $p = .170$; the number of alternatives and the value of items, $F(1, 32) = 2.57$, $p =$

.121; and the number of decision makers and the value of items, $F(1, 32) = 1.72$, $p = .199$. Also, no significant interaction was found between the number of alternatives, the number of decision makers and the value of items, $F(1, 32) = .513$, $p = .479$.

The results showed that by increasing the amount of available information, the time participants spent to make a decision increased; however, the time did not increase proportionally (the time taken to choose when 70 pieces of available information was not 100% longer than the time taken when 35 pieces of information were available). The analysis of time also showed the value of item did not affect the time spent by participants. Participants spent almost the same amount of time for making a glue and a computer decision. Also, dyads spent the same amount of time to make a decision as individuals did in both conditions (5 vs. 10 and glue vs. computer).

Satisfaction of choice

In order to determine whether or not satisfaction of participants was related to the number of decision makers, number of alternatives, or monetary value, a three-way mixed factorial analysis was performed. On a scale of 0 to 9, the average individuals' satisfaction ($M = 7.15$) was not significantly different from that of dyads' ($M = 7.41$), $F(1, 32) = .685$, $p = .414$. The average satisfaction for the 5 ($M = 7.15$) and 10 alternative ($M = 7.33$) conditions were again, not significantly different, $F(1, 32) = .326$, $p = .572$. Similarly, the average satisfaction when a computer was chosen ($M = 7.54$) was not significantly greater than when for a glue ($M = 6.94$), $F(1, 32) = 3.582$, $p = .068$. Finally, no significant interactions were found between the number of alternatives and the value of items, $F(1, 32) = .033$, $p = .954$; the number of alternatives and the number of decision makers, $F(1, 32) = 2.78$, $p = 1.40$; or the number of decision makers and the

value of items, $F(1, 32) = 4.18$, $p = .211$. Also, no significant interaction was found between the number of alternatives, the number of decision makers and the value of items, $F(1, 32) = .513$, $p = .479$. In brief, dyads and individuals showed no reliable difference in satisfaction with their decisions in different conditions (neither 5 vs. 10 alternatives nor low vs. high values).

Gain of Item

In order to gain more insight into the decision making of groups and individuals, the distribution of the actual items chosen by participants was obtained (Figure 1). As explained in the Methods section, some participants were given 10 alternatives and the other participants were given 5 alternatives. Participants given five alternatives were shown glues 2, 3, 4, 5 and 6 from the original 10 glues, and shown computers 3, 4, 5, 6 and 10 from the original 10 computers. The presentation order of these five glues and computers was randomized for each participant. Fourteen (40%) of participants chose glue #2 and 24 people (69%) selected computer #10. Among the participants who selected glue #2, 6 were individuals (26%) and 8 were dyads (66%) (see Figure 2). A two-way chi-square (individuals verses dyads, and glue 2 verses all other glues) was employed to investigate whether or not more dyads selected glue # 2 or other glues than individuals did. The result of the chi-square showed that a greater proportion of dyads chose glue #2 than individuals did, $\chi^2(1, N = 35) = 5.4$, $p < .05$.

Also, among the participants who selected computer #10, 9 (75%) were dyads and 15 (65%) were individuals (see Figure 2). A two-way chi-square (individuals verses dyads, and computer 10 verses all other computers) was employed to investigate whether or not more dyads selected computer #10 or other computers than individuals did. The

result of two-way chi-square showed no significant difference between dyads and individuals in computer decision $\chi^2 (1, N = 35) = .27, p > .05$. It seems that when a decision is important groups and individuals may make similar decisions.

Among the participants who selected glue #2, 9 (29%) were faced with 5 alternatives and 5 (14%) were faced with 10 alternatives. A two-way chi-square was employed to investigate whether or not more participants who were faced with 5 alternatives selected glue # 2 or other glues than participants who were faced with 10 alternatives did. There was no significant difference found between participants who selected from 5 and those who selected from 10 alternatives, $\chi^2 (1, N = 35) = 2.23, p > .05$. Also, among participants who selected computer # 10, 14 (40%) were faced with five alternatives and 10 (29%) were faced with ten alternatives. A two-way chi-square test showed no significant difference between participants who were faced with five and ten alternatives, $\chi^2 (1, N = 35) = 2.9, p > .05$ (Figure 3). Participants who chose from a few alternatives make the same decision as participants who selected from many alternatives. The result indicated that receiving more information may not affect people's choice.

Figure1: The number of individuals selecting each glue and computer.

Figure 2: The number of dyads and individuals choosing each glue and computer.

Figure 3: The number of participants who selected among 5 or 10 glues and computers.

Analysis of Verbal Transcripts

Because no significant differences were found between the amount of information sought by dyads and that sought by individuals, the need to look for clues to account for such differences by analyzing the verbal transcripts of dyads' conversations was reduced. However, informal evaluation revealed that conflict between dyad members was rare and conversation was focused primarily on which cell to click on next.

The conversations were classified into three categories according to the type of comments. The first type concerned only what to click on next, including phrases such as "Let's look at computer 4" or "What is the price of glue 5?" The second type of comments denoted disagreement, including phrases such as "I wouldn't buy this [your favorite] computer" or "If you want that one, you should pay for it". The third type indicated indifference, including phrases such as "I don't know anything about computers, you make a decision" or "Whatever you choose, I agree".

Nine of the 12 dyads' conversations fit into the first category; approximately 90 % of their conversations were procedural. The conversation of two of the dyads fit into the third category. In the selection of a computer, approximately 75% of the conversation indicated indifference and 20% was procedural. In the selection of a glue, 85% of the conversation was procedural, and the other 15% indicated disagreement. One of the 12 dyads showed considerable conflict during their decision making, thus fitting into the second category. In the selection of the computer, approximately 92% of the conversation was disputatious and the other 8% was procedural. In the selection of a glue, 70 % of the conversation was procedural, and 25% was disputatious. The most disagreement between dyad members happened when trying to decide on which computer to select. As

well, dyads who exhibited indifference did not make cooperative decisions. In fact, one of the members asked the other to make decision for him/her.

To investigate more about the dyad that had conflict during their decision, other dyads were compared with this group. Dyads with no conflict examined an average of 73.11 cells whereas the dyad with conflict viewed 135.5. The dyads with no conflict examined an average of 68.27 cells when choosing a computer, whereas the dyad with conflict viewed 151. The dyads with no conflict examined an average of 77.96 cells when selecting a glue, whereas the dyad with conflict viewed 120. Although the dyad with conflict examined more information than average when they selected a glue, they didn't have any conflict during the decision making process. Rather it seemed that they just were inclined to discuss and review each item of information.

Also, the satisfaction of dyads was compared. The average satisfaction (on a scale of 0 to 9) when selecting a computer was 7.91 for dyads without conflict and 6 for the dyad with conflict. The average satisfaction when selecting a glue was 7.2 for dyads without conflict and 7.0 for the dyad with conflict.

The dyads without conflict and the dyad with conflict were also compared with respect to the time spent to make a decision. The dyads without conflict spent an average of 4.64 min., whereas, the dyad with conflict spent 18.3 min. The dyads without conflict spent an average of 4.45 min. to choose a computer, whereas the dyad with conflict spent 23.20 min. In addition, the dyads without conflict spent an average of 4.97 min. to select a glue, whereas the dyad with conflict spent 11.40 min.

Although there was not enough data to analyze dyad conflict, this data does suggest that when there is conflict between members of a dyad, they examine more information

and spend more time to make a decision. Also, they may be less satisfied with their decision than those without conflict.

Discussion

In the introduction section, five hypotheses were proposed. The main purpose of this study was to investigate whether or not groups seek more information when making a decision than do individuals. The second purpose was to determine the effect of number of available alternatives from which to choose and monetary value of choices on the amount of information people seek when making a decision. The third purpose of this study was to examine information seeking trajectories that participants used. The fourth purpose was to compare the time participants spent to make a decision. Finally, the fifth purpose was to examine participants' satisfaction with their decisions.

To investigate the hypotheses in this study, two groups of decision makers, individuals and dyads, were asked to choose among alternatives for two products, a glue and a computer. Some of the participants were required to choose among five alternatives and others were required to select among ten alternatives.

The result of an analysis of variance did not support the first hypothesis: the amount of information sought by dyads and individuals was not significantly different. According to an evaluation of the dyad members' conversations, most did not disagree during the decision making process. Thus, a necessary condition for testing the hypothesis that dyad members would resolve disagreements by seeking more information was rarely met. It may be the case that when members of a group have common interests or goals, they will agree on what information to seek. Therefore, they might not seek more information than individuals do, for the reason that they are acting in concert.

Also, group members showed about the same satisfaction with their decisions as individuals did. When the members of a group have similar goals, their satisfaction

increases. For example, if all members of a group are looking for a low priced computer, they may be satisfied with their decision. However, when members of a group exhibit their disagreement during the decision making process, their satisfaction declines. In the present study, one dyad disagreed during the decision making process. The members of this group reported a lower than average level of satisfaction with their decision about the computer when compared to the other dyads. In addition, this dyad also examined more information than the average amount of information examined by the other dyads.

Based on the analysis of time spent in decision making, individuals and dyads spent about the same amount of time to make their decisions. The results show that having agreement between the members of a group reduces the time they spend on discussion. This may be because they look only at information which interests both or upon which both agree, rather than at all the information available. Also, because they have similar goals, they may have less discussion about their decision. However, the dyad who disagreed spent more time to make a decision than the average time spent by the other groups. This suggests that when there is conflict between members of a group, they spend a large amount of time to find something to agree on. In this experiment, the dyad members with conflict did not find any computer that both agreed upon, and one member finally became tired of arguing and suggested to other member that "If you want this [your favorite] computer you pay for it."

The importance of the decision (computer versus glue) did not seem to affect how much information was sought by participants. During informal questioning, participants indicated they were more familiar with information about computers than about glues. Questions six and nine in the background questionnaire also revealed that participants

had more knowledge about computers than about glue. However, the conversation of the dyad with conflict revealed that there was more disagreement on making a decision about a computer than about a glue. The results showed that when people are unfamiliar with information about a product, they might seek more information than when they are familiar with a product. However, when a decision is perceived as important, there may be more discussion before making a decision. In addition, the way information was presented may have caused participants to examine more information. In this study, the information about glues and computers was displayed in two columns of buttons. This method of presentation might have made examining the information easier.

Previous studies show that the proportion of information sought to amount of available information decreases as the number of alternatives increases (Payne, 1976; Thorngate & Maki, 1976). The present study supports this finding. Participants in this study examined a larger amount of information than did participants in previous research. Also, they re-examined a considerable amount of information while ignoring a little information. It is possible that the amount of information participants examined is a result of the items being selected, that is, a computer and a glue as opposed to a political candidate (Thorngate & Maki) or apartment (Payne). However, the way information was presented might be the cause of the increase in information seeking. For example, in previous research, information was presented to the participants by the experimenter. However, in this study, participants reviewed the information simply by clicking on the information on a computer screen. This design may have been the cause of the participants' extensive re-examination of information.

To summarize, dyads in Experiment 1 had no conflict during the decision making process. They made decisions cooperatively with the exception of one group. They examined the same amount of information as individuals did. They also showed the same satisfaction about their decision that individuals did. In addition, more than half of the dyads and individuals chose the same computer. Apparently, dyads and individuals in this study showed similar behavior. The reason may be the small size of groups or simply the fact that they agreed with each other on their decisions. It would be interesting in future studies to ask participants to make decisions individually and in larger size groups to learn more about people's decision making behavior in groups.

In reviewing the information seeking trajectories of participants, surprising results in previous research were discovered. Payne (1976) and Thorngate and Maki (1976) found that when people are faced with more alternatives they examine information alternative by alternative within a feature, presumably to eliminate available information. For example a common style would be: alternative A feature 1, alternative B feature 1, alternative C feature 1, etc. In contrast, most participants in this study looked at the alternatives in the order they were presented: alternative A feature 1, alternative A feature 2, alternative A feature 3, alternative B feature 1 alternative B feature 2, alternative B feature 3, etc.

In this study, unlike previous studies, the experiment was conducted on a computer screen. There were two columns on each screen. The first column presented a number of alternatives and the second column displayed a number of features (see Appendix D1). Participants examined each alternative or feature by clicking on a cell. As explained above, most of the participants in this study clicked on the first alternative and examined

all features, then clicked on the second alternative and examined all of its features and so on.

There are two possible hypotheses why participants in this experiment sought information in an alternative-feature trajectory rather than the feature-alternative trajectory found in the research conducted by Thorngate and Maki and by Payne. The first hypothesis is that people generally examine information using the alternative-feature trajectory. They look at one alternative and examine all available features then look at the next alternative and examine its features, and so on. The second hypothesis is that people have a certain pattern for examining information. They simply examine everything that appears on the right side of the field of vision first. This style could be termed the 'odometer style', in that the item furthest to the right is affected first, and then the second from the right and so on. In other words, they examine information with the odometer style. If the first hypothesis is correct, changing the way information is presented should not affect the way people examine information. However, if the second hypothesis is correct, people should change their trajectory of examining and processing information if the way information is presented is changed.

In order to investigate these hypotheses, a second experiment was conducted in which the location of alternatives and features was revised. In this experiment, the features were in the first column and the alternatives were in the second column. If the first hypothesis is correct, participants should examine information by looking at the first alternative and its features before examining the second alternative. If the second hypothesis is correct, participants should look at the first feature and alternatives then look at the second feature and alternatives and so on.

Experiment 2: Methods

Participants

A sample of 40 undergraduate students enrolled in Introductory Psychology at Carleton University participated in this study; 23 participants were individually tested in Interface 1 (I used the participants already tested in Experiment 1) and 17 participants were individually tested in Interface 2. Among participants, 19 were male and 21 were female. The most common majors were psychology (15 / 40) and engineering (6 / 40).

Design

A 2 x 2 x 2 mixed factorial design was employed in the second study. There were three independent variables: the first independent variable (between subjects) was type of interface. Participants in Interface 1 (see Appendix D1) were shown two columns. The first column displayed alternatives and the second column displayed features. In Interface 2 (see Appendix D2), alternatives and features were reversed. Participants in this interface were shown features in the first column and alternatives in the second column.

The second independent variable (between subjects) was the number of alternatives that were presented to participants. Half of the participants chose one of five alternatives and the other half selected one of ten alternatives.

The third independent variable (within subjects) was item to be chosen. All participants selected glue as the low monetary value item and computer as the high monetary value item. Half of the participants selected a glue then a computer, and the other half chose a computer then a glue.

The dependent variables in this study were (1) the order in which participants examined the information: (a) same-alternative, same-feature, (b) same-alternative,

different-feature, (c) different-alternative, same-feature, and (d) different-alternative, different-feature during decision making; (2) the amount of information that participants examined before making a decision, (3) the time participants spent to make a decision, (4) participants' satisfaction with their decisions, and (5) participants' item choice.

Materials

The materials that were available to participants were the same as those in Experiment 1. However, the way the task was presented on screen was different for some of the participants.

Background questionnaire. Participants answered questions about their gender, level of education, major subject, and familiarity with computers and glues (Appendix B).

Stimuli. The information available to participants was the same as the one in Experiment 1. In interface 1 (see Figure 4a), participants were shown two columns of buttons; clicking a button in the left column selected an alternative computer or glue, and clicking a button in the right column selected a feature (price, speed, etc.). In Interface 2 (see Figure 4b), participants were shown two columns of buttons the same as Interface 1; clicking a button in the left column selected a feature (price, speed, etc.), and clicking a button in the right column selected an alternative, computer or glue. The computer program saved the results of clicking and time (see Appendix E1 and E2).

Figure 4: Demonstration of two types of interface on the computer screen

Post-choice questionnaire. The questionnaire available to participants was the same the same questionnaire administered in Experiment 1 (Appendix C1). This questionnaire was used to examine participants' satisfaction with their decisions.

Procedure

The experiment was held in room A428 of the Loeb Building at Carleton University. After the nature of the experiment was explained to the participants, they were asked to read and sign an Informed Consent form. Participants then completed the background questionnaire.

Each participant was asked to sit in front of the computer, after which they were provided an explanation of the experiment. Half of the participants chose among five glues and five computers while the other half selected among ten glues and ten computers. In order to counterbalance for order effects, half of the participants were asked to first chose the glue after the computer, while the other half were asked to select the computer before the glue.

After each decision was made, each participant was given a post-choice questionnaire (Appendix C1) and asked to complete it. At the end, participants received a debriefing, and were thanked for their time and participation.

Results

Amount of Information Examined

A 2 x 2 x 2 ANOVA was employed to investigate how three independent variables (number of alternatives, value of items and type of interface) affected the amount of information participants examined. No significant main effects or interactions were found, except for a main effect of number of alternatives. The average amount of information examined when participants were faced with 10 alternatives ($M = 82.21$) was higher than the average amount of information examined when participants were faced with 5 alternatives ($M = 58.65$), $F(1, 36) = 7.137$, $p = .011$. The average amount of information participants examined when they chose a glue was 69.55 and when they chose a computer was 70.60, an insignificant difference, $F(1, 36) = .169$, $p = .687$. Also, there was no significant difference found between Interface 1 ($M = 71.65$) and Interface 2 ($M = 69.92$), $F(1, 36) = .017$, $p = .898$. Similarly, no significant interactions were found between the number of alternatives and the value of items, $F(1, 36) = .659$, $p = .422$; the number of alternatives and the number of types of interface, $F(1, 36) = .576$, $p = .453$; or the value of items and the number of types of interface, $F(1, 36) = 2.76$, $p = .105$. Also, no significant interaction was found between the number of alternatives, the number of types of interface and the value of items, $F(1, 36) = .053$, $p = .819$.

The results of the ANOVA showed that participants examined more information when they were faced with many alternatives. In order to investigate whether these differences were caused by the availability of more information or not (70 cells of information in 10 alternatives condition versus 35 cells in 5 alternatives condition), the proportion of information participants searched for was examined. The main effect of

number of alternatives was significant; when there were 5 alternatives ($M = 1.61$) was significantly higher than when there were 10 alternatives ($M = 1.09$), $F(1, 36) = 7.742$, $p = .008$. However, no other significant main effects or interactions were found.

To investigate whether ignoring some of the information and re-examining other information caused the significant differences between five and ten alternatives, a $2 \times 2 \times 2$ ANOVA on the number of ignored cells was employed. The average number of cells that participants ignored when they were faced with 5 alternatives was 4.39 while the average number of cells participants ignored when they were faced with 10 alternatives was 14.31, $F(1, 36) = 14.95$, $p = .000$. The results of the ANOVA showed that participants ignored a large amount of information while they repeatedly re-examined other information. Studies 1 and 2 showed similar results. Participants in both studies ignored a lot of information while re-examining other information. Therefore, the way information was presented did not affect how much information was examined or ignored.

Trajectories of Information Seeking

In order to determine the trajectories participants used, the cell-to-cell information seeking trajectories were categorized into four different transitions: (1) same-alternative, same-feature transition, (2) same-alternative, different-feature transition, (3) different-alternative, same-feature transition, and (4) different-alternative, different-feature transition. A $2 \times 2 \times 2$ ANOVA was employed for each transition. There were no significant interactions. Table 1 presents the F test results of each main effect; table 2 shows the mean of main effects of interface.

Table 1

Result of the Main Effects of One-way ANOVAs for Four Transitions.

Measure	Main effects		
	Interface	Alternatives	Value of item
SA-SF	F= .9	F= .9	F= .4
SA-DF	F= 28.3*	F= 15.8*	F= .4
DA-SF	F= 32.2*	F= .6	F= 4.8*
DA-DF	F= 4.3*	F= 4.6*	F= .001

Note. SA-SF = same-alternative, same-feature, SA-DF = same-alternative, different-feature, DA-SF = different-alternative, same-feature, and DA-DF = different-alternative, different-feature.

df = 1, 35, * $p < .05$

Table 2

Result of Mean Interface for Four Transitions.

Measure	Main effects	
	Interface 1	Interface 2
SA-SF		
Mean	.63	.38
SA-DF		
Mean	51.28	21.11
DA-SF		
Mean	10.33	40.94
DA-DF		
Mean	8.63	6.15

As shown in Table 1 and 2 and noted in Experiment 1, participants in the Interface1 condition showed a strong tendency to examine information with the same-alternative, different-feature transition. This is the trajectory that involves examining several features of one alternative, then examining several features of another alternative, etc. There were

no significant interactions but the main effects of the number of alternatives and the types of interface were significant (Table 1). The average amount of information sought with the same-alternative, different-feature transition in Interface 1 was significantly higher than in Interface 2. In contrast, the average amount of information participants sought in the Interface 2 condition using the different-alternative, same-feature transition was significantly higher than in Interface 1. Participants in Interface 2 condition showed a strong tendency to examine information by using the different-alternative, same-feature transition. They examined several alternatives of one feature, then examined several alternatives of another feature, etc. This finding indicates that participants adopted an “odometer” heuristic for examining information. They first clicked on one item from the left column, then clicked down on the right column, then selected another item from the left column and clicked down on the right one, etc.

The main effect of the value of an item in the different-alternative, same-feature transition was significant. The average amount of information participants examined when they made a computer decision ($M = 26.15$) was higher than a glue decision ($M = 20.53$). The result of the main effect shows that when the decision was important, participants examined more information by using the different-alternative, same-feature transition than when the decision was not important. The main effect of number of alternatives using the same-alternative, different-feature transitions was significant. The average amount of information participants examined when they were faced with 10 alternatives ($M = 49.61$) was higher than with 5 alternatives ($M = 26.13$). The result of this main effect shows that participants who used same-alternatives, different-feature transition examined more information when they were faced with many alternatives.

A three-way ANOVA was also employed to analyze the different-alternative, different-feature transition. The main effects of interface and the number of alternatives were significant. The average amount of information participants examined when they were faced with ten alternatives ($M = 8.92$) was higher than when they were given five alternatives ($M = 6.08$). Also, participants in Interface 1 examined more information than participants in Interface 2 did. Similarly, the interactions between the number of alternatives and interface, $F(1, 36) = 5.87$, $p = .021$, and the type of interface and the value of items were significant, $F(1, 36) = 6.66$, $p = .014$. However, no significant three-way interaction was found between the number of alternatives, the number of types of interface and the value of items, $F(1, 36) = .302$, $p = .859$. The results of the main effects and interaction indicated that the examination of information by participants increased as the number of alternatives increased. Also participants in Interface 1 examined information with different-alternatives, different-feature transition more often than participants in Interface 2 did. The results also showed Interface 1 participants' strong tendency to examine information with same-alternative, different-feature and different-alternative, different-feature transitions. However, in Interface 2 participants examined information with a different-alternative, same-feature transition rather than any other transition.

Time Spent to Choose

In order to investigate whether or not the three independent variables (different types of interface, the number of alternatives or the value of items) could affect the time people spend to make a decision, a $2 \times 2 \times 2$ analysis of variance was carried out. There was no difference between the time participants spent on each interface, $F(1, 36) =$

2.173, $p = .149$; ($M1 = 4.30$ min, $M2 = 3.09$ min). This finding showed that designing different types of interfaces did not affect the time participants spent examining the information. However, the main effect of number of alternatives was significant, $F(1, 36) = 5.979$, $p = .020$; the average time participants spent when participants were faced with ten alternatives ($M = 4.78$ min) was significantly greater than when they were faced with five alternatives ($M = 2.69$ min). No significant interactions were found.

The results of these analyses revealed that the way information was presented did not affect the amount of information participants sought. However, participants spent more time when they were faced with many alternatives.

Satisfaction of Choice

A $2 \times 2 \times 2$ ANOVA was performed on satisfaction rating to determine whether the number of alternatives, the type of interface, and the value of items could affect participants' satisfaction. No significant differences were found in the main effects or the interactions, with the exception of an interaction between the value of item and interface, $F(1, 36) = 6.614$, $p = .014$. The average satisfaction of a glue choice in Interface 1 was 6.91 compared to 7.88 in Interface 2. The average satisfaction of a computer decision in Interface 1 was 7.39 compared to 6.59 in Interface 2. Although no significant relationships were found between the independent variables and satisfaction, it seems that different ways of presenting information might affect participants' satisfaction when the decision is important.

Gain of Item

In order to gain some insight into the decision making process, the distribution of the type of glue and computer that participants chose was analyzed. Among 40 participants, 21

chose computer #10 (52%) (see Figure 5). Among these participants, 15 (65%) chose computer #10 who were tested with Interface 1 and 6 of them (35%) were tested with Interface 2 (see Figure 6). A two-way chi-square test was conducted to determine whether or not more participants in Interface 1 selected computer # 10 versus other computers than participants in Interface 2 did. The result of the chi-square test showed a significant difference between participants' computer selections using Interface 1 or Interface 2, $\chi^2 (1, N = 40) = 3.44, p < .05$.

Among 40 participants, 10 (25%) selected glue #2, and 6 (26%) of them were tested with Interface 1 and 4 (23%) of them were tested with Interface 2. A two-way chi-test was employed to examine whether or not more participants in Interface 1 chose glue #2 versus other glues than participants in Interface 2 did. The result of the chi-square test showed no significant difference between participants' glue selection using Interface 1 and Interface 2, $\chi^2 (1, N = 40) = .10, p > .05$. The results showed that the participants used odometer style for searching information and they made similar decisions.

Among the 11 participants who selected glue #2, 7 (17%) were tested with 5 alternatives while 4 (10%) were tested with 10 alternatives. The result of the two-way chi-square test showed no significant difference between selection among 5 and 10 alternatives, $\chi^2 (1, N = 40) = .36, p > .05$. Also, among the 21 participants who selected computer #10, 11 (28%) were faced with 5 alternatives and 10 (25%) were faced with 10 alternatives. The result of a two-way chi-square test did not find any significant difference between the outcomes of selecting among 5 alternatives or 10 alternatives, $\chi^2 (1, N = 40) = .4, p > .05$ (see Figure 7).

Figure 5: The number of participants choosing each glue and computer.

Figure 6: The number of participants who were tested in Interface 1 and Interface 2 to select glue and computer.

Figure 7: The Number of participants who selected among 5 or 10 glues and computers.

Discussion

The second experiment had four purposes. The main purpose of the experiment was to investigate whether or not people used different information seeking trajectories when information was presented differently. These trajectories were categorized into four transitions: (1) same-alternative, same-feature, (2) same-alternative, different-feature, (3) different-alternative, same-feature, and (4) different-alternative, different-feature. The second purpose of this study was to investigate the effect of information presentation on the amount of information participants sought. As well, the effect of number of alternatives (5 and 10), and value of item (low and high) on information seeking strategies and choices were investigated, as were participants' satisfaction and time spent making decisions.

In Experiment 2, participants received alternatives in the second column and its features in the first column. In Experiment 1, as was explained before, participants received alternatives in the first column and features in the second column (see Appendixes D1 and D2). Both types of interface were displayed on a computer screen. The two experiments were held at two different times, the first, during the summer and the second during the fall. However, this should not have had any effect on participants' decision making trajectories.

Comparisons of the results of the first and second experiment generally show that participants changed their information seeking trajectory in response to how information was displayed. In Interface 1, participants examined information alternative-by-alternative, a trajectory predicted by the SEU model of decision making. However, by reversing the order of the two columns of buttons in Interface 2 (alternatives and feature),

participants examined information feature-by-feature, a trajectory predicted by the competing Elimination by Aspects model of decision making. The current study suggests that people seek information in an “odometer style” when attributes are shown in columns. In Interface 1, alternatives were listed in the left column and its features were listed in the right column. Participants first clicked on an alternative and then checked all its features. In Interface 2, features were in the left column and alternatives were in the right column. Participants in Interface 2 clicked on features (i.e. feature one, two, ...) and then checked all alternatives (alternative one, two, ...). In both cases, the right column made more frequent transitions like the rightmost digit of an odometer.

These findings cast doubt on the generality of previous findings (Payne, 1976; Thorngate & Maki, 1976; Tversky, 1972) which suggest that people seek information lexicographically, feature-by-feature, eliminating alternatives to reduce cognitive effort. The present study suggests that we can manipulate people’s trajectory of seeking information by changing the way information is presented. Perhaps how people seek information has some effect on what people choose.

Participants using Interface 1 sought about the same amount of information as those using Interface 2. As the number of alternatives increased, participants ignored some information and re-examined other information. The value of the item (glue and computer) did not affect the amount of information participants sought. Participants in both types of interface examined about the same amount of information when they made glue and computer decisions, even though the background questionnaire revealed that participants were more familiar with computers than glues. The way information was displayed might be the reason that no significant difference was found between the

amount of information examined when making glue and computer decisions. Perhaps because the presentation so strongly suggested that people use the odometer style in processing information, the amount of information people sought did not differ between computers and glues.

The presentation method did not affect the amount of time participants spent to make a decision. However, the number of alternatives affected the amount of time participants spent to make a decision. Participants spent more time when they were faced with many alternatives than fewer alternatives. Although the time participants spent to examine 10 alternatives was high, they ignored some of the information and reviewed other information extensively. The result leads us to the question whether giving people more information could affect what people choose. The result of the chi-square tests in Study 1 and Study 2 showed more information might not make any difference on participants' choice. Participants faced with 5 alternatives tended to select the same glues and computers as the participants faced with 10 alternatives.

Participants' satisfaction does not seem to be related to the manner in which information is selected. The results of the satisfaction analyses suggest that people could be equally satisfied with their decisions even when information is presented by two different types of interface. Indeed, the way satisfaction was rated might have also affected the result. In the present study, satisfaction was simply rated from "not satisfied" to "very much satisfied". More detailed comments about the satisfaction of the decision such as "I am satisfied with my decision and it is the best choice" and "I am satisfied, but I don't care about my choice" are needed to further investigate people's satisfaction.

In future studies, it would be interesting to investigate the relationship between people's choice and satisfaction with the outcome of a decision.

The current study has found new information that provides a better understanding of people's decision making process. In this study, two different types of interface were used and in each case the information was offered in two columns of buttons. However, the results showed that participants had one popular heuristic of examining information: the odometer search. This heuristic can cause participants to examine information, alternative-by-alternative or feature-by-feature, depending on the order of the button columns. Therefore, by manipulating how information is presented we can change the order in which they seek information prior to a decision, which sometimes can result in a different decision. Another finding is that even though information seeking differences can sometimes lead to different decisions, people tend to be satisfied with their choice no matter which one they make. In addition, participants spend almost the same amount of time to examine information whether they used Interface 1 or Interface 2. Although by increasing the amount of available information the time participants spent to make a decision increased, it was not proportional (the time taken to choose when 70 pieces of information were available was not twice of the time taken when 35 pieces of information were available). Perhaps the odometer style strongly affects the time participants spent to examine information. Also, people with a large amount of information available make similar decisions as people with a smaller amount of available information. This shows that a small amount of information may be perceived to be sufficient to make a decision. Further research can be conducted to investigate how the odometer style can change people's decision making processing. And also it would be interesting to investigate

whether or not people change their information seeking by presenting different methods of information seeking.

This study has some general implications for direct marketing. The result show that the way information is displayed to customers affect their decisions. By manipulation the way information is displayed not only one can easily help customers to find what they are looking for but also enable retailers to display the products that customers may be interested to buy them. By advertising the right information in the right format, retailers can more effectively introduce their products to customers. This study also shows the effect of multiple alternative options. A large variety of options can enable retailers to satisfy the need of customers. However, too many options may not help customers to make a better decision. It may even confuse them.

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Appendix A

Introduction to Experiment

Thank you for participating in this experiment. The purpose of this study is to examine differences of groups and individuals in decision making.

Individual Participant

First, you will be required to answer a few background questions. Then, I will ask you to sit in front of a computer. On the first screen, you will select your state as an individual or a dyad. On the next screen, several background information questions such as your name, and student number will be asked. On the third screen, you will receive a screen shot to become familiar with the experiment. On the next section, you will be presented some products and information about them. Two different products will be presented: Glue, and Computer. Assume that you have roommate and your roommate and you decide to buy these products. He/She asked you to make a decision for both of you. You are able to browse through products and their information. When you decide on your favorite item, you can type the number in “choice box”. When each of the two choices is made, I will give you a rating scale to complete.

Dyad Participant

First, each one of you will be required to answer a few background questions, and then you will be sited in front of computer. I will flip a coin to determine which one of you will control the mouse. On the first screen, you will select your state as an individual or a dyad. On the next screen, several background information questions such as your name, and student number will be asked. On the third screen, you will receive a screen shot to become familiar with the experiment. On the next section, you will be presented

some products and information about them. Two different products will be presented: Glue, and Computer. Assume you are roommates and you have decided to buy these products. You are able to browse through products and their information. When you decide on your favorite item, you can type the number in “choice box”. At the end of each choice, you will receive a separate rating scale sheet. You will answer the rating scale individually and privately. Your conversation will be recorded.

You can take time as much as you need. Note that you can withdraw from the experiment anytime you wish. The entire experiment should not take more than 45 minutes.

Do you have any questions before you begin?

Appendix B

Background Questionnaire

1. Your sex: F: _____ M: _____
2. Your university major: _____
3. Year of study: _____
4. Have you ever bought glue? Yes: _____ No: _____
5. If yes, how long ago did you buy glue?
Month(s): _____ Year(s): _____
6. How knowledgeable do you think you are about glue?
Not at all 0 1 2 3 4 5 6 7 8 9 very much
7. Have you ever bought a computer? Yes: _____ No: _____
8. If yes, how long ago did you buy the last one?
Month(s): _____ Year(s): _____
9. How knowledgeable do you think you are about computers?
Not at all 0 1 2 3 4 5 6 7 8 9 very much

Appendix C1

Individual Participant's Questionnaire

Please answer the following questions at the end of each experiment. Please circle the appropriate number on the scale of 0 to 9.

1. On the scale of 0 to 9, how important was this decision to you?

Not at all important 0 1 2 3 4 5 6 7 8 9 extremely important

2. On the scale of 0 to 9, how satisfied are you with your choice?

Not at all satisfied 0 1 2 3 4 5 6 7 8 9 extremely satisfied

Appendix C2

Dyad Participant's Questionnaire

Please answer the following questions at the end of each experiment. Please circle the appropriate number on the scale of 0 to 9.

1. On the scale of 0 to 9, how important was this decision to you?
Not at all important 0 1 2 3 4 5 6 7 8 9 extremely important
2. On the scale of 0 to 9, how satisfied are you with your choice?
Not at all satisfied 0 1 2 3 4 5 6 7 8 9 extremely satisfied
3. On the scale of 0 to 9, how much do you agree with the decision made?
Not at all agreed 0 1 2 3 4 5 6 7 8 9 extremely agreed
4. On the scale of 0 to 9, how much conflict with the other participant did you feel when making this choice?
Not at all conflict 0 1 2 3 4 5 6 7 8 9 extremely conflict

Appendix D1

Screen Shot of Interface 1

Group and Individual decision making

Appendix D2

Screen Shot of Interface 2

Appendix E1

Sample of Clicking Record on Experiment 1

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"Time=",65663.85,#1899-12-30 18:14:23#
"Computer 1",65671.29,#1899-12-30 18:14:31#
"Price 1",65675.48,#1899-12-30 18:14:35#
"Speed 1",65698.38,#1899-12-30 18:14:58#
"Hard drive 1",65700.45,#1899-12-30 18:15:00#
"CD\DVD Ram 1",65701.84,#1899-12-30 18:15:01#
"Video card 1",65704.46,#1899-12-30 18:15:04#
"Sound card 1",65705.53,#1899-12-30 18:15:05#
"Monitor 1",65706.6,#1899-12-30 18:15:06#
"Price 1",65708.2,#1899-12-30 18:15:08#
"Speed 1",65710.19,#1899-12-30 18:15:10#
"Computer 2",65712.16,#1899-12-30 18:15:12#
"Price 2",65714.13,#1899-12-30 18:15:14#
"Speed 2",65716.84,#1899-12-30 18:15:16#
"Computer 3",65720.88,#1899-12-30 18:15:20#
"Price 3",65722.84,#1899-12-30 18:15:22#
"Speed 3",65725.26,#1899-12-30 18:15:25#
"Computer 4",65727.62,#1899-12-30 18:15:27#
"Price 4",65729.84,#1899-12-30 18:15:29#
"Speed 4",65732.73,#1899-12-30 18:15:32#
"Computer 5",65736.67,#1899-12-30 18:15:36#
"Price 5",65739.51,#1899-12-30 18:15:39#
"Price 5",65743.02,#1899-12-30 18:15:43#
"Speed 5",65743.88,#1899-12-30 18:15:43#
"Hard drive 5",65752.23,#1899-12-30 18:15:52#
"Hard drive 5",65763.89,#1899-12-30 18:16:03#
"Computer 3",65772.55,#1899-12-30 18:16:12#
"Price 3",65773.75,#1899-12-30 18:16:13#
"Computer 4",65775.23,#1899-12-30 18:16:15#
"Price 4",65776.77,#1899-12-30 18:16:16#
"Speed 4",65779.65,#1899-12-30 18:16:19#
"Hard drive 4",65781.34,#1899-12-30 18:16:21#
"CD\DVD Ram 4",65783.04,#1899-12-30 18:16:23#
"Video card 4",65788.66,#1899-12-30 18:16:28#
"Sound card 4",65790.12,#1899-12-30 18:16:30#
"Monitor4",65792.99,#1899-12-30 18:16:32#
"Price 4",65828.18,#1899-12-30 18:17:08#
"Computer 5",65841.56,#1899-12-30 18:17:21#
"Price 5",65842.62,#1899-12-30 18:17:22#
"Speed 5",65849.7,#1899-12-30 18:17:29#
"Hard drive 5",65851.03,#1899-12-30 18:17:31#

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"CD\DVD Ram 5",65852.81,#1899-12-30 18:17:32#
 "Video card 5",65857.02,#1899-12-30 18:17:37#
 "Sound card 5",65858.22,#1899-12-30 18:17:38#
 "Monitor 5",65859.53,#1899-12-30 18:17:39#
 "Video card 5",65863.55,#1899-12-30 18:17:43#
 "Hard drive 5",65868.91,#1899-12-30 18:17:48#
 "Price 5",65878.75,#1899-12-30 18:17:58#
 "Computer 3",65885.61,#1899-12-30 18:18:05#
 "Price 3",65886.66,#1899-12-30 18:18:06#
 "Computer 2",65888.18,#1899-12-30 18:18:08#
 "Computer 4",65889.98,#1899-12-30 18:18:09#
 "Price 4",65890.88,#1899-12-30 18:18:10#
 "Computer 5",65894.95,#1899-12-30 18:18:14#
 "Price 5",65897.31,#1899-12-30 18:18:17#
 "Speed 5",65898.94,#1899-12-30 18:18:18#
 "5",65905.39,#1899-12-30 18:18:25#

 "Time=",65959.98,#1899-12-30 18:19:19#
 "Glue 1",65966.63,#1899-12-30 18:19:26#
 "price 1",65967.49,#1899-12-30 18:19:27#
 "Package 1",65970.57,#1899-12-30 18:19:30#
 "Strength 1",65977.38,#1899-12-30 18:19:37#
 "Water resistance 1",65979.56,#1899-12-30 18:19:39#
 "filling gap 1",65981.13,#1899-12-30 18:19:41#
 "Setting time 1",65983.74,#1899-12-30 18:19:43#
 "color 1",65984.76,#1899-12-30 18:19:44#
 "Glue 2",65993.59,#1899-12-30 18:19:53#
 "price 2",65994.65,#1899-12-30 18:19:54#
 "Glue 3",65996.14,#1899-12-30 18:19:56#
 "price 3",65996.96,#1899-12-30 18:19:56#
 "Package 3",66006.25,#1899-12-30 18:20:06#
 "Strength 3",66007.32,#1899-12-30 18:20:07#
 "Water resistance 3",66008.69,#1899-12-30 18:20:08#
 "filling gap 3",66010.04,#1899-12-30 18:20:10#
 "Setting time 3",66012.33,#1899-12-30 18:20:12#
 "color 3",66014.34,#1899-12-30 18:20:14#
 "Setting time 3",66017.79,#1899-12-30 18:20:17#
 "price 3",66026.91,#1899-12-30 18:20:26#
 "Glue 4",66031.09,#1899-12-30 18:20:31#
 "price 4",66032.56,#1899-12-30 18:20:32#
 "Glue 5",66034.15,#1899-12-30 18:20:34#
 "price 5",66034.95,#1899-12-30 18:20:34#
 "Glue 1",66036.88,#1899-12-30 18:20:36#
 "price 1",66037.82,#1899-12-30 18:20:37#
 "Setting time 1",66041.64,#1899-12-30 18:20:41#
 "Package 1",66050.24,#1899-12-30 18:20:50#
 "Strength 1",66053.27,#1899-12-30 18:20:53#

"Water resisted 1",66054.77,#1899-12-30 18:20:54#
"color 1",66061.83,#1899-12-30 18:21:01#
"Glue 2",66065.63,#1899-12-30 18:21:05#
"price 2",66066.62,#1899-12-30 18:21:06#
"Package 2",66067.69,#1899-12-30 18:21:07#
"Glue 3",66075.43,#1899-12-30 18:21:15#
"price 3",66076.57,#1899-12-30 18:21:16#
"Glue 4",66078.61,#1899-12-30 18:21:18#
"price 4",66079.95,#1899-12-30 18:21:19#
"Package 4",66081.26,#1899-12-30 18:21:21#
"Glue 1",66093.94,#1899-12-30 18:21:33#
"Package 1",66095.02,#1899-12-30 18:21:35#
"Glue 3",66097.18,#1899-12-30 18:21:37#
"Glue 4",66099.55,#1899-12-30 18:21:39#
"price 4",66100.59,#1899-12-30 18:21:40#
"Package 4",66101.6,#1899-12-30 18:21:41#
"Glue 5",66107.08,#1899-12-30 18:21:47#
"price 5",66107.69,#1899-12-30 18:21:47#
"Package 5",66108.73,#1899-12-30 18:21:48#
"Strength 5",66111.16,#1899-12-30 18:21:51#
"Water resistance 5",66113.8,#1899-12-30 18:21:53#
"filling gap 5",66114.86,#1899-12-30 18:21:54#
"Setting time 5",66115.65,#1899-12-30 18:21:55#
"color 5",66116.74,#1899-12-30 18:21:56#
"price 5",66118.2,#1899-12-30 18:21:58#
"Glue 1",66119.1,#1899-12-30 18:21:59#
"price 1",66121.3,#1899-12-30 18:22:01#
1,66126.2,#1899-12-30 18:22:06#

Appendix E2

Sample of Clicking Record on Experiment 2

```

"Time = ",60994.8,#1899-12-30 16:56:34#
"Price",61002.99,#1899-12-30 16:56:42#
"Glue 1",61006.54,#1899-12-30 16:56:46#
"Glue 2",61011,#1899-12-30 16:56:51#
"Glue 3",61013.5,#1899-12-30 16:56:53#
"Glue 4",61015.9,#1899-12-30 16:56:55#
"Glue 5",61019.24,#1899-12-30 16:56:59#
"Glue 6",61020.94,#1899-12-30 16:57:00#
"Glue 7",61022.49,#1899-12-30 16:57:02#
"Glue 8",61024.72,#1899-12-30 16:57:04#
"Glue 9",61026.23,#1899-12-30 16:57:06#
"Glue 10",61029.92,#1899-12-30 16:57:09#
"Glue 10",61029.93,#1899-12-30 16:57:09#
"Glue 4",61034.44,#1899-12-30 16:57:14#
"package",61036.74,#1899-12-30 16:57:16#
"Glue 4",61039.54,#1899-12-30 16:57:19#
"Glue 1",61046.17,#1899-12-30 16:57:26#
"Glue 10",61050.82,#1899-12-30 16:57:30#
"Glue 10",61050.82,#1899-12-30 16:57:30#
"Glue 9",61054.59,#1899-12-30 16:57:34#
"Glue 8",61059.73,#1899-12-30 16:57:39#
"Glue 7",61062.1,#1899-12-30 16:57:42#
"Glue 6",61065.31,#1899-12-30 16:57:45#
"Glue 5",61066.97,#1899-12-30 16:57:46#
"Glue 4",61069.64,#1899-12-30 16:57:49#
"Glue 9",61073.65,#1899-12-30 16:57:53#
"Price",61080.29,#1899-12-30 16:58:00#
"Glue 9",61082.07,#1899-12-30 16:58:02#
"package",61085.12,#1899-12-30 16:58:05#
"Glue 4",61086.38,#1899-12-30 16:58:06#
"Glue 3",61089.2,#1899-12-30 16:58:09#
"Glue 2",61092.16,#1899-12-30 16:58:12#
"Strenggh",61096.66,#1899-12-30 16:58:16#
"Glue 1",61098.41,#1899-12-30 16:58:18#
"Glue 2",61101.97,#1899-12-30 16:58:21#
"Glue 3",61104.32,#1899-12-30 16:58:24#
"Glue 4",61106.9,#1899-12-30 16:58:26#
"Glue 5",61109.38,#1899-12-30 16:58:29#
"Glue 6",61112.58,#1899-12-30 16:58:32#
"Glue 7",61114.41,#1899-12-30 16:58:34#
"Glue 8",61116.12,#1899-12-30 16:58:36#

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"Glue 9",61117.8,#1899-12-30 16:58:37#
"Glue 10",61121.39,#1899-12-30 16:58:41#
"Glue 10",61121.39,#1899-12-30 16:58:41#
"Water resistance",61125.6,#1899-12-30 16:58:45#
"Glue 1",61126.68,#1899-12-30 16:58:46#
"Glue 2",61130.65,#1899-12-30 16:58:50#
"Glue 3",61132.79,#1899-12-30 16:58:52#
"Glue 4",61135.89,#1899-12-30 16:58:55#
"Glue 5",61138.55,#1899-12-30 16:58:58#
"Glue 6",61140.9,#1899-12-30 16:59:00#
"Glue 7",61142.45,#1899-12-30 16:59:02#
"Glue 8",61143.75,#1899-12-30 16:59:03#
"Glue 9",61145.23,#1899-12-30 16:59:05#
"Glue 10",61147.46,#1899-12-30 16:59:07#
"Glue 10",61147.46,#1899-12-30 16:59:07#
"Filling gap",61150.21,#1899-12-30 16:59:10#
"Glue 1",61153.24,#1899-12-30 16:59:13#
"Glue 2",61159.53,#1899-12-30 16:59:19#
"Glue 3",61161.49,#1899-12-30 16:59:21#
"Glue 4",61164.55,#1899-12-30 16:59:24#
"Glue 5",61166.32,#1899-12-30 16:59:26#
"Glue 6",61167.93,#1899-12-30 16:59:27#
"Glue 7",61169.25,#1899-12-30 16:59:29#
"Glue 8",61171.39,#1899-12-30 16:59:31#
"Glue 9",61172.89,#1899-12-30 16:59:32#
"Glue 10",61174.93,#1899-12-30 16:59:34#
"Glue 10",61174.94,#1899-12-30 16:59:34#
"setting time",61178.09,#1899-12-30 16:59:38#
"Glue 1",61179.48,#1899-12-30 16:59:39#
"Glue 2",61182.89,#1899-12-30 16:59:42#
"Glue 3",61185.59,#1899-12-30 16:59:45#
"Glue 4",61187.84,#1899-12-30 16:59:47#
"Glue 5",61192.65,#1899-12-30 16:59:52#
"Glue 6",61194.88,#1899-12-30 16:59:54#
"Glue 7",61196.39,#1899-12-30 16:59:56#
"Glue 8",61198.11,#1899-12-30 16:59:58#
"Glue 9",61199.71,#1899-12-30 16:59:59#
"Glue 4",61204.6,#1899-12-30 17:00:04#
"Glue 9",61205.96,#1899-12-30 17:00:05#
"Glue 10",61207.04,#1899-12-30 17:00:07#
"Glue 10",61207.04,#1899-12-30 17:00:07#
"Color",61210.34,#1899-12-30 17:00:10#
"Glue 1",61212.33,#1899-12-30 17:00:12#
"Glue 2",61214.02,#1899-12-30 17:00:14#
"Glue 3",61215.04,#1899-12-30 17:00:15#
"Glue 4",61216.1,#1899-12-30 17:00:16#
"Glue 5",61218.13,#1899-12-30 17:00:18#

"Glue 6",61219.17,#1899-12-30 17:00:19#
 "Glue 7",61220.81,#1899-12-30 17:00:20#
 "Glue 8",61222.21,#1899-12-30 17:00:22#
 "Glue 9",61223.78,#1899-12-30 17:00:23#
 "Glue 10",61225.74,#1899-12-30 17:00:25#
 "Glue 10",61225.75,#1899-12-30 17:00:25#
 "Glue 9",61231.89,#1899-12-30 17:00:31#
 "Glue 8",61233.14,#1899-12-30 17:00:33#
 "Glue 7",61235.45,#1899-12-30 17:00:35#
 "Glue 6",61236.67,#1899-12-30 17:00:36#
 "Glue 5",61237.8,#1899-12-30 17:00:37#
 "Glue 4",61239.47,#1899-12-30 17:00:39#
 "Glue 3",61240.25,#1899-12-30 17:00:40#
 "Glue 2",61241.65,#1899-12-30 17:00:41#
 "Glue 1",61243.01,#1899-12-30 17:00:43#
 "Price",61244.85,#1899-12-30 17:00:44#
 "Glue 1",61246.09,#1899-12-30 17:00:46#
 "Glue 2",61247.4,#1899-12-30 17:00:47#
 "Glue 3",61249.29,#1899-12-30 17:00:49#
 "Glue 4",61251.33,#1899-12-30 17:00:51#
 "Glue 5",61252.77,#1899-12-30 17:00:52#
 "Glue 6",61254.24,#1899-12-30 17:00:54#
 "Glue 7",61255.36,#1899-12-30 17:00:55#
 "Glue 8",61256.46,#1899-12-30 17:00:56#
 "Glue 9",61257.65,#1899-12-30 17:00:57#
 "Glue 10",61258.85,#1899-12-30 17:00:58#
 "Glue 10",61258.86,#1899-12-30 17:00:58#
 "Glue 7",61260.44,#1899-12-30 17:01:00#
 "Strength",61263.78,#1899-12-30 17:01:03#
 "Glue 7",61265.66,#1899-12-30 17:01:05#
 "setting time",61270.63,#1899-12-30 17:01:10#
 "Glue 7",61271.5,#1899-12-30 17:01:11#
 "Glue 10",61275.83,#1899-12-30 17:01:15#
 "Glue 10",61275.83,#1899-12-30 17:01:15#
 "Color",61277.18,#1899-12-30 17:01:17#
 "Glue 10",61278.23,#1899-12-30 17:01:18#
 "Glue 10",61278.23,#1899-12-30 17:01:18#
 "Glue 9",61280.89,#1899-12-30 17:01:20#
 "Glue 8",61282.36,#1899-12-30 17:01:22#
 "Price",61286.31,#1899-12-30 17:01:26#
 "Glue 8",61287.9,#1899-12-30 17:01:27#
 "Filling gap",61290.31,#1899-12-30 17:01:30#
 "Glue 7",61291.34,#1899-12-30 17:01:31#
 "Water resistance",61293.2,#1899-12-30 17:01:33#
 "Glue 6",61294.18,#1899-12-30 17:01:34#
 "Strength",61295.91,#1899-12-30 17:01:35#
 "Price",61308.44,#1899-12-30 17:01:48#

"Glue 1",61310.36,#1899-12-30 17:01:50#
 "package",61315.1,#1899-12-30 17:01:55#
 "Glue 1",61316.08,#1899-12-30 17:01:56#
 "Glue 3",61318.75,#1899-12-30 17:01:58#
 "Price",61321.23,#1899-12-30 17:02:01#
 "Glue 3",61322.29,#1899-12-30 17:02:02#
 "Glue 9",61327.46,#1899-12-30 17:02:07#
 "Color",61328.9,#1899-12-30 17:02:08#
 "Glue 9",61331.37,#1899-12-30 17:02:11#
 "setting time",61335.79,#1899-12-30 17:02:15#
 "Glue 9",61336.66,#1899-12-30 17:02:16#
 "Color",61365.82,#1899-12-30 17:02:45#
 "Glue 10",61366.55,#1899-12-30 17:02:46#
 "Glue 10",61366.55,#1899-12-30 17:02:46#
 "Glue 9",61368.09,#1899-12-30 17:02:48#
 "Glue 8",61369.24,#1899-12-30 17:02:49#
 "Glue 7",61371.53,#1899-12-30 17:02:51#
 "Glue 6",61372.45,#1899-12-30 17:02:52#
 "Glue 5",61373.93,#1899-12-30 17:02:53#
 "Glue 4",61376.25,#1899-12-30 17:02:56#
 "Glue 9",61380.65,#1899-12-30 17:03:00#
 "Price",61384.9,#1899-12-30 17:03:04#
 "Glue 9",61385.89,#1899-12-30 17:03:05#
 "Strength",61388.7,#1899-12-30 17:03:08#
 "Glue 9",61389.79,#1899-12-30 17:03:09#
 "setting time",61392.53,#1899-12-30 17:03:12#
 "Glue 9",61393.62,#1899-12-30 17:03:13#
 "Glue 8",61397.44,#1899-12-30 17:03:17#
 "Glue 7",61398.67,#1899-12-30 17:03:18#
 "Glue 6",61401.84,#1899-12-30 17:03:21#
 "Glue 5",61403.49,#1899-12-30 17:03:23#
 "Glue 4",61405.11,#1899-12-30 17:03:25#
 "Glue 3",61406.34,#1899-12-30 17:03:26#
 "Glue 2",61407.39,#1899-12-30 17:03:27#
 "Glue 1",61408.84,#1899-12-30 17:03:28#
 "Glue 2",61410.63,#1899-12-30 17:03:30#
 "Price",61411.87,#1899-12-30 17:03:31#
 "Glue 2",61412.64,#1899-12-30 17:03:32#
 "package",61414.42,#1899-12-30 17:03:34#
 "Glue 2",61415.47,#1899-12-30 17:03:35#
 "Strength",61419.78,#1899-12-30 17:03:39#
 "Glue 2",61420.67,#1899-12-30 17:03:40#
 "2",61429.36,#1899-12-30 17:03:49#

61490.16,#1899-12-30 17:04:50#
 "Price",61499.41,#1899-12-30 17:04:59#
 "Computer 1",61500.52,#1899-12-30 17:05:00#

"Computer 2",61503.49,#1899-12-30 17:05:03#
 "Computer 3",61505.98,#1899-12-30 17:05:05#
 "Computer 4",61509.68,#1899-12-30 17:05:09#
 "Computer 5",61511.75,#1899-12-30 17:05:11#
 "Computer 6",61512.89,#1899-12-30 17:05:12#
 "Computer 7",61515.87,#1899-12-30 17:05:15#
 "Computer 6",61517.64,#1899-12-30 17:05:17#
 "Computer 7",61519.31,#1899-12-30 17:05:19#
 "Computer 8",61520.64,#1899-12-30 17:05:20#
 "Computer 9",61522.11,#1899-12-30 17:05:22#
 "Computer 10",61523.69,#1899-12-30 17:05:23#
 "Computer 1",61525.84,#1899-12-30 17:05:25#
 "Computer 10",61528.07,#1899-12-30 17:05:28#
 "Computer 9",61529.92,#1899-12-30 17:05:29#
 "Computer 8",61532.27,#1899-12-30 17:05:32#
 "Computer 7",61533.47,#1899-12-30 17:05:33#
 "Computer 6",61534.66,#1899-12-30 17:05:34#
 "Computer 5",61535.93,#1899-12-30 17:05:35#
 "Computer 4",61537.68,#1899-12-30 17:05:37#
 "Computer 3",61539.5,#1899-12-30 17:05:39#
 "Computer 2",61541.89,#1899-12-30 17:05:41#
 "Computer 1",61544.21,#1899-12-30 17:05:44#
 "Computer 10",61548.18,#1899-12-30 17:05:48#
 "Speed",61551.75,#1899-12-30 17:05:51#
 "Computer1",61553.15,#1899-12-30 17:05:53#
 "Computer 2",61554.5,#1899-12-30 17:05:54#
 "Computer 3",61556.12,#1899-12-30 17:05:56#
 "Computer 4",61557.47,#1899-12-30 17:05:57#
 "Computer 5",61558.84,#1899-12-30 17:05:58#
 "Computer 6",61561.04,#1899-12-30 17:06:01#
 "Computer 7",61562.55,#1899-12-30 17:06:02#
 "Computer 8",61563.85,#1899-12-30 17:06:03#
 "Computer 9",61565.45,#1899-12-30 17:06:05#
 "Computer 10",61567.08,#1899-12-30 17:06:07#
 "Computer 9",61569.85,#1899-12-30 17:06:09#
 "Price",61571.25,#1899-12-30 17:06:11#
 "Computer 9",61573,#1899-12-30 17:06:13#
 "Computer 10",61574.94,#1899-12-30 17:06:14#
 "Speed",61577.44,#1899-12-30 17:06:17#
 "Computer 10",61578.48,#1899-12-30 17:06:18#
 "Hard-drive",61580.74,#1899-12-30 17:06:20#
 "Computer 1",61582.17,#1899-12-30 17:06:22#
 "Computer 2",61584.11,#1899-12-30 17:06:24#
 "Computer 3",61586.41,#1899-12-30 17:06:26#
 "Computer 4",61587.84,#1899-12-30 17:06:27#
 "Computer 5",61590.45,#1899-12-30 17:06:30#
 "Computer 6",61591.92,#1899-12-30 17:06:31#

"Computer 7",61593.68,#1899-12-30 17:06:33#
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Appendix F1

Five Samples of Glue

Alternatives	Price	Package	Strength	Water resistance	Filling gaps	Setting Time	Color
Glue #1	\$ 0.85	2 g. tube	Very Good	Poor	Poor	10 sec.	Clear
Glue #2	\$ 2.25	Two 1-Oz. syringes	Fair	Very Good	Excellent	30 min.	Clear
Glue #3	\$ 17.80	8-oz.bottle	Very Good	Good	Excellent	20 min.	Tan
Glue #4	\$ 3.00	1.oz. blister pack	Fair	Good	Excellent	30 min.	Clear
Glue #5	\$ 6.00	4-oz.bottle	Fair	Poor	Fair	5 sec.	Clear

Appendix F2

Ten Samples of Glue

Alternatives	Price	Package	Strength	Water resistance	Filling gaps	Setting Time	Color
Glue #1	\$ 3.00	Two 0.07-oz.tubes	Good	Good	Very Good	60 sec.	Clear
Glue #2	\$ 0.85	2-g tube	Very Good	Poor	Fair	10 sec.	Clear
Glue #3	\$ 2.25	Two 1-0z. syringes	Fair	Very Good	Excellent	30 min.	Clear
Glue #4	\$ 17.80	8-oz.bottle	Very Good	Good	Excellent	20 min.	Tan
Glue #5	\$ 3.00	1.oz. blister pack	Fair	Very Good	Excellent	30 min.	Clear
Glue #6	\$ 0.90	5-oz.bottle	Fair	Poor	Fair	poor	White
Glue #7	\$6.00	4-oz.bottle	Fair	Poor	Fair	2 sec.	Clear
Glue #8	\$ 1.25	1-oz.tube	Good	Poor	Fair	5 min.	Clear
Glue #9	\$ 8.25	8-oz.bottle	Very Good	Good	Excellent	15 min.	Tan
Glue #10	\$ 1.90	4-oz.bottle	Poor	Fair	Very Good	30 min	Yellow

Appendix F3

Five Samples of Computer

Alternatives	Price	Speed	Hard-drive	CD/DVD Ram	Video card	Sound card	Monitor
Computer #1	\$1,295	550 MHz.	13 GB	40x CD	8 MB	16 Bit	15"
Computer #2	\$1,025	500 MHz	8.4 GB	52x CD	8 MB	16 Bit	15"
Computer #3	\$ 699	433 MHz	8.4 GIG	48x CD	8 MB	16 Bit	15"
Computer #4	\$2,799	733 MHz	20.4 GB	6x DVD	32 MB	128 Bit	19"
Computer #5	\$1,695	600 MHz	18 GB	6x DVD	32 MB	128 Bit	17"

Appendix F4

Ten Samples of Computer

Alternatives	Price	Speed	Hard-drive	CD/DVD Ram	Video card	Sound card	Monitor
Computer #1	\$ 1,598	600 MHz	13 GB	48x CD	16 MB	none	17"
Computer #2	\$ 895	450 MHz	13 GB	40x CD	8 MB	16 Bit	15"
Computer #3	\$ 1,295	550 MHz	15 GB	48x CD	8 MB	16 Bit	15"
Computer #4	\$1,025	500 MHz	8.4 GB	52x CD	8 MB	16 Bit	15"
Computer #5	\$699	433 MHz	8.4 GB	48x CD	8 MB	16 Bit	15"
Computer #6	\$2,799	733 MHz	20.4 GB	6x DVD	32 MB	128 Bit	19"
Computer #7	\$2,399	750 MHz	20.4 GB	50x CD	32 MB	128 Bit	19"
Computer #8	\$969	500 MHz	8.4 GB	40x CD	8 MB	None	15"
Computer #9	\$2,095	700 MHz	20 GB	6x DVD	32 MB	128 Bit	17"
Computer #10	\$1,695	600 MHz	18 GB	6x DVD	32 MB	128 Bit	17"

Appendix G

Informed Consent Form

The purpose of the informed consent is to insure that you understand the purpose of this study and the nature of your involvement. The informed consent must provide sufficient information such that you have opportunity to determine whether you wish to participate in the study.

Present study: Processes of Information seeking in decision making

Purpose. The purpose of this study is to examine differences of groups and individuals in decision making.

Task Requirement. You will be required to select an item from different products such as a glue and a computer, which will be shown to you on computer screen. These products are taken from Consumer Reports. After each task you will be asked several questions about your choice. The conversation of dyads will be recorded.

Anonymity/Confidentiality. The data in this experiment are completely confidential. All data are coded such that your name is not associated with the data. The data are available to investigators who are involved in this study.

Potential Risk/Discomfort. There is no potential physical or mental risk in this experiment.

Right to Withdraw. You have the right to withdraw from the experiment any time you wish without academic penalty.

Research Personal. The experiment will be held in room A428 Leob Building at Carleton University. People who are involved in this research and may be contacted at

anytime are Leila Fatehi (investigator, 520-2600 ext. 8204), Dr W. Thorngate (Faculty Sponsor, 520-2600 ext. 2706). Should you have any ethical concerns about this study then please contact Dr. M. Gick (Chair of Psychology Department Ethical Committee, 520-2600, ext. 2664) or Dr. K. Matheson (Chair of the Psychology Department, 520-2600, ext. 2648).

Signature

I have read the above form and understand the condition of my participation in this experiment. My signature indicates that I agree to participate in this experiment.

Participant's name: _____

Participant's signature: _____

Investigator's name: _____

Investigator's signature: _____

Date: ____/____/____

Appendix H

Debriefing

I would like to thank for your time and participating in this experiment.

The purpose of this study is to examine whether or not groups seek more information when they make decisions than individuals do. For decades, social psychologists have studied decision making. They were interested in studying how people make good or poor decisions. There are several reasons that people make poor decision: they may not have enough information, there may be enough information but they do not examine it, or the decision may simply not be important for them. There are several reasons why people don't look for all available information including mood, time limitations, prior knowledge and cognitive limitations such as memory constraint. It has been suggested that people may search for more information when they make decisions in a group.

In this study, I am interested in examining whether or not people look for more information when they are making decision in groups rather than as individuals. I will also compare how satisfied people are with their decisions in both situations. Finally, I will examine the relation between the amount of information that groups and individuals seek and the value of items (glue as a low-value item and computers are high-value items).

If you wish to discuss any additional aspects of the research feel free to contact Leila Fatehi in room A422 Loeb (Principal Investigator, 520-2600, ext. 8204) or Dr. Warren Thorngate (Faculty Sponsor, 520-2600, ext. 2706). If you have any question and/or ethical concerns regarding this experiment, you may also contact either of the following faculty members; Dr. M. Gick (Chair of the ethical committee, Psychology Department, 520-2600, ext. 1664); Dr. K. Matheson (Chair of the Psychology Department, 520-2600, ext. 2648).