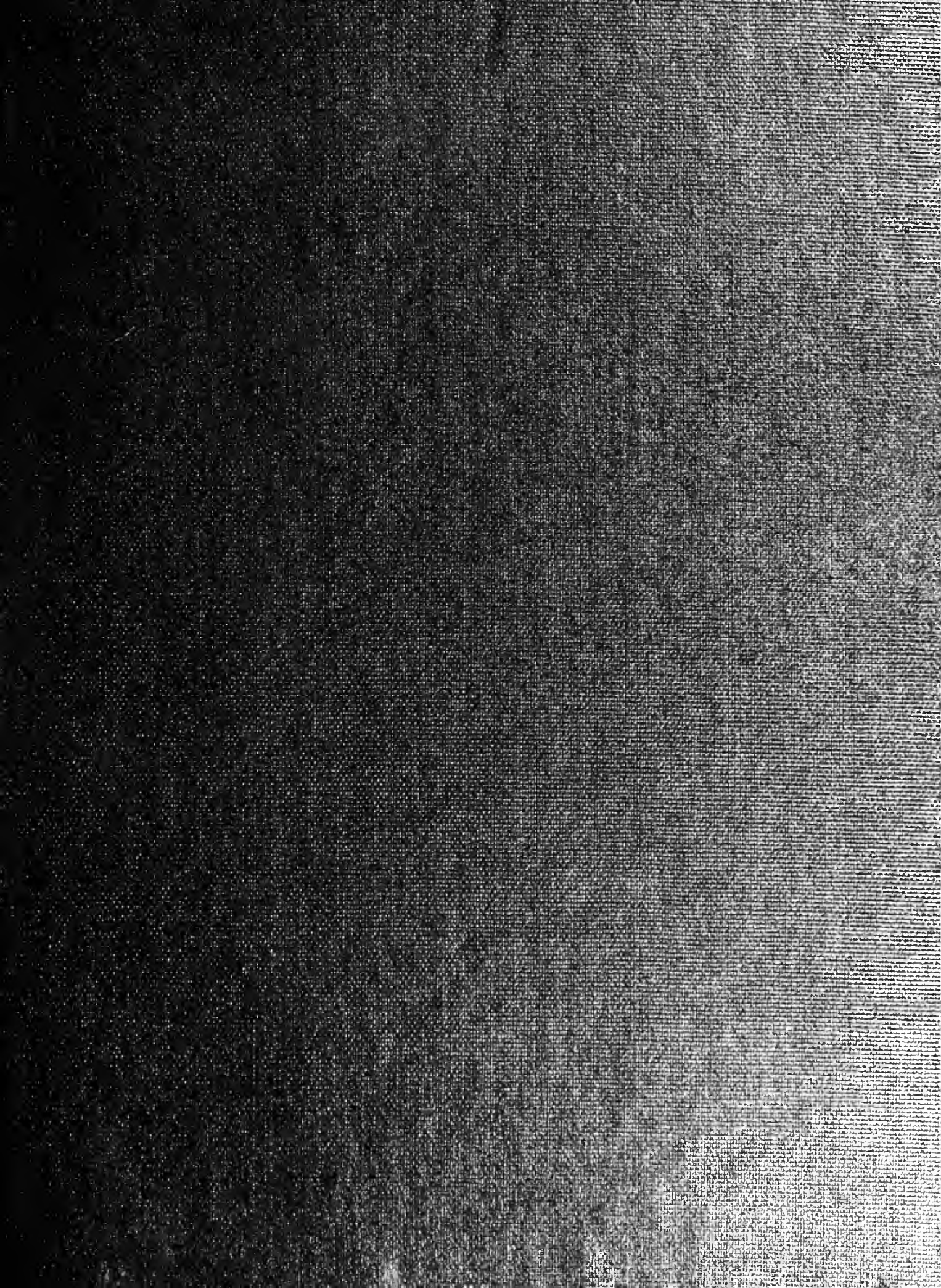

Faculty Working Papers

EFFECTS OF THE EXPERT, DEVIL'S ADVOCATE, AND DIALECTICAL INQUIRY METHODS ON PREDICTION PERFORMANCE

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Summary

The dialectical inquiry (DI), the devil's advocate (DA), and the expert (E) approaches are three potential aids for making decisions under uncertainty. This study examines the comparative effectiveness of these aids. Furthermore, an objective, nonemotional DA (DA_1) is differentiated from an emotional, "carping-critic" DA (DA_2). Results indicate that when the state of the world conforms to the assumptions underlying a plan, the E approach is found to be superior to the DI approach. When the state of the world is opposite to the assumptions in the plan, the DA_1 and DI are superior to the E approach. When the state of the world is midway between the assumptions of the plan and counter-plan, the DA_1 is superior to both the DI and the E approaches. The results provide support for the recommendation to use an objective, nonemotional DA approach in actual decision-making situations.

Effects of the Expert, Devil's Advocate, and
Dialectical Inquiry Methods on Prediction Performance

Dialectical inquiry (DI) was proposed as an aid to corporate decision making by Mason (1969). Mason, following C. West Churchman's (1971) interpretation of Hegel, suggested that a dialectical approach to decision making should involve examining a situation completely and logically from two different and opposing points of view. First, a prevailing or recommended strategic plan and the data which were used to derive it are identified. An attempt is made to identify the assumptions underlying the plan. Next, a counterplan is identified which is feasible, politically viable, and generally credible but which rests on assumptions which are the opposite of those supporting the plan. A structured debate is then conducted in which those responsible for formulating strategy hear arguments in support of both the plan and the counterplan. This debate, in contrast to a traditional management briefing, consists of a forceful presentation of two opposing plans which rest on different interpretations of the same organizational data bank.

The DI approach is, according to Mason, distinctly superior to what he calls the expert (E) approach which is seen as the most common approach to strategic planning used by business. In this approach members of a planning department or consultants provide expert advice regarding the plans the organization should follow. The planners make a study of the organization's environment (opportunities and threats), its resources (strengths and weaknesses), its personal values, and its social responsibilities. The result of this study is a set of planning recommendations which are usually presented to management in the form of a strategic briefing session. Mason suggests that the planning recommendations contain hidden assumptions which are very frequently not communicated to management. This is one of the most critical

drawbacks to this approach (Mason, 1969, pp. B406-B407).

Another approach to strategy formulation is the Devil's Advocate (DA) technique. Mason (1969) asserts that this approach should be more effective than the E approach but less effective than the DI approach. In this approach, a planner appears before the organization's management and advocates a plan in a manner similar to that of the E method. Management or another planner then takes the role of an adverse and often carping critic of the plan. An attempt is made to determine all that is wrong with the plan and to expound the reasons why the plan should not be adopted. Mason suggests that while this approach does expose some underlying assumptions, it does so in the context of what is wrong with them rather than what they should be. It does not serve to develop a new managerial world view. For this reason, Mason feels that the DI method should be more helpful in the strategy formulation task than the DA approach (Mason, 1969, pp. B407-B408).

Previous Research on the Two Strategy Formulation Aids

Until very recently, previous research on the benefits of DI had consisted of three field studies. In the first of these, Mason (1969) conducted a case study on "RMK Abrasives." He presented a plan and a counterplan before top management. The major hypothesis of the study was that the management decision makers would form a new, encompassing grasp of the planning problem when exposed to a DI. Mason reports that interview and questionnaire responses from the RMK managers indicated a favorable disposition toward the DI approach.

Mitroff, Barabba and Kilmann (1977) arranged DI lectures for employees at the Bureau of the Census in Washington, D.C. After the lecture, the Census employees were segregated into five relatively homogeneous groups wherein employees shared agreement on assumptions underlying some of the planning issues.

Each of the groups produced a planning report and one person from each group was selected to integrate the five reports into a final planning report. The final version was supposed to represent a synthesis of the various courses of action developed by each group. Mitroff, et al., report the participants and researchers identified several issues in the integrated plan as exciting and innovative.

Laurenço and Glidewell (1974) used a DI to explain a conflict situation between a local television station and its corporate headquarters. The local station desired autonomous local operations and the headquarters desired close control. The resolution of this conflict reportedly led to a synthesis that involved a constructive change in the base of power. Laurenço and Glidewell (1974, p. 503) conclude "The trend of the synthesis was away from legitimate power and its coercive supplement and toward identification and expertise." Thus, the three field studies do provide some support for the assertion that the dialectical approach is perceived as effective by those participating in the planning process in which it is used.

While field studies are certainly a valuable first step in examining the DI, it is necessary to examine DI effects under more controlled conditions. Inherent in the field studies were a large number of uncontrolled variables which make it difficult to determine the unique effect of one factor. In addition, the DI was not directly compared to alternative techniques.

Another line of research (Cosier and Rose, 1977; Cosier, 1978; Cosier, Ruble and Aplin, 1978; Cosier and Aplin, 1979; Cosier, 1980) attempted to evaluate the value of conflict and the comparative effectiveness of the DA and DI approaches in more controlled settings. With the exception of Cosier and Aplin (1979), these studies dealt with a financial prediction task which involved uncertainty and "cognitive conflict" (interpretive disagreement).

In these studies, subjects who were asked to make predictions of price/earnings ratios, were given cue values of current ratios, inventory turnover, and debt-to-equity ratios. These cue values were developed in such a way that there was never a perfect correlation between any of the cue values or any combination of them and the price/earnings ratio. In other words there was always some uncertainty built into the prediction task.

Using a laboratory paradigm Cosier and Rose (1977) examined the effects of conflict on decision quality. Subjects were trained to make predictions of price/earnings ratios for a fictitious company using three cue dimensions. The cue disimensions consisted of three pieces of financial data. Cue #1 was the current ratio, Cue #2 was the inventory turnover, and Cue #3 was the debt-to-equity ratio for the fictitious company. One group was given feedback during training to foster heaviest reliance on cue #1, moderate reliance on cue #2, and minimal reliance on cue #3. The other group of subjects was trained in the opposite manner--heaviest reliance on cue #3, moderate reliance on cue #2, and least reliance on cue #1. After training, both groups of subjects were exposed to another decision maker. Unknown to the subjects, this other decision maker was programmed to agree with the training policy experienced by the first group of subjects. Thus, during the prediction phase following training, one group of subjects in the low cognitive conflict condition interpreted cue information similar to a counterpart, while a second group in a high cognitive conflict condition interpreted cue information highly divergent from a counterpart. During the initial state of the after-training prediction phase (which involved equally weighted cues for maximum accuracy), subjects in the high cognitive conflict condition made significantly better predictions (less error) than subjects in the low cognitive conflict condition.

Thus, Cosier and Rose may have evidence that the conflict generated by the DI may in fact be functional.

Since Cosier and Rose (1977) did not directly compare the DI to alternative techniques, further research was needed. One alternative technique that deserved examination was the devil's advocate (DA). Dale (1975, pp. 113-11-) proposes "the staff man might act as a devil's advocate, bringing out all the reasons why the proposal should not be accepted. In that way, the decision maker can at least be aware of the possible perils, as well as the advantages in any course proposed to him." Cosier (1978) conducted a study using a controlled paradigm that allowed a comparison between the DA and DI. Subjects were presented with planning information from two "experts." In the DA condition, one expert recommended a plan of action and another expert criticized that plan of action. In the DI condition, one expert recommended an action plan and the other expert recommended a conflicting counterplan. Subjects made predictions within three distinct contexts. Unknown to the subjects, the first context was consistent with the recommendations in the plan, the second context was consistent with a compromise between the plan and the counterplan, and the third context was consistent with the counterplan. The results indicate the DA method may be preferable to the DI. In the third context, subjects in the DA condition predicted significantly better than subjects in the DI condition. In addition, the DI was not superior to the DA in the other two contexts.

Cosier, Ruble, and Aplin (1978) and Cosier (1980) reported results from two controlled studies that cast further doubt on the unqualified merits of the DI. They found that even though the conflict component of the DI was perceived as more useful in some instances, in general the DI did not lead to significantly more accurate predictions when compared to alternative planning approaches.

Finally, a field study by Cosier and Aplin (1979) attempted to evaluate the comparative effectiveness of the DI, DA, and E approaches at producing

planning statements. Subjects were planners within the United Way of America. Planners were divided into 4 groups, each of which was assigned to one of four treatment conditions--E (expert), DI, DA, and the C (control). A case and a "planning committee report," dealing with a particular United Way Association, were mailed to each of the planners in the DI, DA, and E conditions giving a description, brief analysis of the facts in the case, and a set of specific recommendations. In the DA condition, a critique of the planning committee report criticizing its underlying assumptions but suggesting no alternative course of action was also given to the planners. In the DI condition, rather than a critique of the planning committee report, the planners received a counterplan based on different assumptions than those underlying the report. In the control condition, the planners received no additional materials beyond the case.

The planners were then asked to prepare a planning document which included:

1) A statement of the mission that the planners felt was appropriate for this particular United Way Association.
2) An analysis of the case including:
   a) a discussion of the problems and opportunities facing this Association.
   b) the reasons for the planners' selection of these particular problems and opportunities.
3) A set of specific recommendations they felt should be implemented in this United Way Association.

The subjects' planning documents were evaluated by judges. The judges reported consistent low ratings for those planners exposed to the DI condition across all criteria. Furthermore, an examination of the planning reports and the judges' opinions revealed that the reports of those exposed to the DI condition were characterized by an excessive lack of risk-taking and an underutilization of United

Ways's resources

Issues Examined in This Study

The results of the early field work seem to be contradictory to results of the work by Cosier and his colleagues. There are a number of possible explanations for this discrepancy, two of which were examined in the present research.

First, it may be that the way in which the DA critique is presented is different in the lab studies than in actual organizations. In organizations, the DA may frequently involve a very strong criticism of the accuracy of the E's interpretation. In contrast, the DA critique in the controlled studies has been a rather mild statement that the E's position should be questioned. In the present research, two separate DA statements were given to the subjects: one was a rather mild, "objective" DA statement and the other was a strong, "emotional" DA statement.

Second, the use of the DI in the early field work was accompanied by strong attempts to persuade those using the technique of its value. It may be that persuasion has a differential effect on the effectiveness of the various techniques. In the present research, the effects of a persuasive statement about the value of the techniques was assessed by giving half of the subjects using each technique a persuasive statement regarding the value of the technique.

This study also attempted to replicate the principal findings in the Cosier (1978) study. The effectiveness of the objective DA versus the DI in a context favorable to the counterplan was examined. As we noted earlier, Cosier (1978) found that the DA was associated with better decisions than the DI in this context. Also, the effectiveness of the E (an expert recommending a plan) versus alternative inquiry methods was examined. Surprisingly, Cosier (1978) found no significant differences between the E and the DA and DI techniques in a context favorable to the plan. This lack of E superiority is important when coupled with evidence that the DA may be superior when the counterplan represents reality. Cosier (1978) noted

that in his study the DA approach was never dysfunctional and seemed to be helpful in the counterplan-best context. Thus, the DA was recommended over the E without qualification of context.

Application of the Multiple-Cue Probability Learning Paradigm

The Multiple-Cue Probability Learning Paradigm (MCPLP) was employed to examine the relative effectiveness of the inquiry methods. In order to attempt replication of Cosier's (1978) findings, the MCPLP was necessary. In addition, the MCPLP, which has been used to address a variety of interesting Social Judgment Theory concerns (Brehmer, 1976 and 1979; Hammond, 1973; Hammond, Stewart, Brehmer, and Steinmann, 1975) has some distinct benefits. First, because the MCPLP is based in the Brunswick Lens Model (Brunswik, 1955), the decision maker is faced with inferring the values of a "hidden" criterion variable based on cue information from the environment (Mitroff, 1974). In addition, the MCPLP allows the environment to be programmed with uncertainty. Inferring the nature of a future "state of the world" within an uncertain environment is a central element of strategic decision making. Mason (1969, p. B403) specifically notes that the strategic decision maker "is concerned with future states of the world and hence makes predictions about them."

Second, the MCPLP allows objective measures of performance and experimental control that may reveal differences in the inquiry methods-task relationships. The inquiry methods are intended as techniques for influencing the cue-utilization policies of decision makers. If a particular inquiry method is superior in assisting decision makers to "read" their environments, then this should be reflected by a high degree of prediction accuracy.[1] As suggested by Brehmer (1976), the opportunity to examine the task-policy linkage under controlled conditions is inherent in the MCPLP. In fact, prediction accuracy reflects the difference between the decision maker's policy for using cue information and the

actual cue-criterion relationships defined by the task.

There are at least two limitations imposed by this application of the MCPLP. In this study, the MCPLP is only relevant for situations that involve prediction decisions over some period of time. Hence, it cannot be applied to "one-shot" decisions. Also, an environment that is random will not allow specification of cue-criterion probability relationships. Thus, decisions under total uncertainty are not addressed by this application of the MCPLP.

METHOD

Ninety-six subjects were "run" during a one-week period. Subjects, who were undergraduates from two organizational behavior classes, participated in the experiment in order to satisfy a course requirement. The subjects faced a series of financial prediction situations. Each situation was defined by three cue values: the current ratio (x_1); inventory turnover (x_2); and debt-to-equity ratio (x_3). Each prediction situation required that the subject predict a price/earnings (P/E) ratio (y_s). As noted by Cosier and Rose (1977) these financial labels were chosen because there is no empirical evidence to suggest any different a priori importance of the three cues and the labels should induce high subject involvement in the task. In addition, subjects were told in the written instructions to learn how to use the data as presented in this study to make their predictions.

All subjects received a packet of materials. Each packet contained written instructions, planning information, cue cards, and a response sheet. All instruction and plans were presented in written form. Subjects were told they would be predicting P/E ratios for three independent profit centers within ABC Electronics. Each profit center involved 20 monthly predictions and each center was to be treated as an independent operation. Subjects were told they had three sources of information to aid their predictions. Source one was the financial cue values, source two was feedback consisting of the correct P/E value after each monthly

prediction, and source three was planning information provided by staff experts.

Each profit center consisted of a distinct group of 20 index cards (or cue cards). Side one contained the three cue values (current ratio, inventory turnovern and debt-to-equity ratio) and side two contained the correct P/E ratio (y_c). The cue and criterion values were whole numbers which ranged from 1 through 20. Subjects were given a response form that contained three columns of 20 spaces for making monthly predictions. The procedure was explained as:

> Starting with the first card in your deck, each monthly prediction is done as follows:
>
> 1. Recall the planning information;
> 2. Consider the three "cue" values on side 1 of the card;
> 3. Recall any relevant historical information (after the first prediction for each profit center you will have historical information or feedback);
> 4. Record your prediction;
> 5. Turn the card over and view the correct response;
> 6. Continue to the next card.

Inquiry Methods

Each subject was randomly assigned to one of the four inquiry method conditions. In the E condition subjects were told they would consider information from a planning report written by "Expert A." The plan told each subject that based on Expert A's research primary weight should be placed on the current ratio when predicting P/E ratios. Subjects were told this opinion was based on "analysis of past data and the fact that the current ratio incorporates information about current assets and current liabilities." Expert A further recommended that a moderate amount of weight be placed on the inventory turnover value and little or no weight be placed on the debt-to-equity ratio.

In the DI condition subjects were told they would consider information from a plan and a conflicting counterplan. The counterplan was prepared by Expert B and was in fact a contradiction of the plan prepared by Expert A (the plan was the same document in all conditions). The counterplan did not directly criticize the plan, but instead was based upon conflicting assumptions. For example, Expert B stated that his analysis of past data dictated that primary weight should be placed on the debt-to-equity ratio when predicting P/E ratios. Expert B recommended moderate weight be placed on the inventory turnover value and little or no weight be placed on the current ratio. As was the case for Expert A, Expert B's rationale was based on a description of the three cues and prior research.

In the DA_1 condition, subjects were given a plan written by Expert A and a critique of the plan written by "Expert B." The critique questioned the conclusions and assumptions of Expert A but did not offer alternative propositions. For example, regarding the importance of the current ratio, Expert B noted his analysis revealed it was questionable to put primary weight on the current ratio and "It is quite possible that a high correlation may not exist between current ratios and P/E-ratios." All of the experts in this study were defined in the instructions as staff assistants employed by ABC Electronics to assist in planning.

Finally, in the DA_2 condition, the subjects were given a plan and critique as in the DA_1 condition. However, in this condition, the critique was worded much more strongly and was much more critical of Expert A than was the critique in the DA_1 condition. For example, regarding the importance of the current ratio, Expert B stated, "Expert A's assumption that there should be a high correlation between known current ratios and future P/E ratios is certainly not true in all cases and represents a dangerous overgeneralization which could lead to errors in prediction."

An attempt was made during all manipulations to capture the fundamental process defining each inquiry method. For example, the conflict inherent in competing recommendations was deemed the fundamental DI component (Mason, 1969). The dissent evidenced by a critical opinion was isolated as the key DA component (Mason, 1969).

Persuasion

In addition to being assigned to one of the four inquiry method conditions each subject was randomly assigned to one of two persuasion conditions. Subjects in the weak persuasion condition were simply given a statement describing the inquiry method. There was no attempt to persuade them of the value of the method. Subjects in the strong persuasion condition were given a description of the inquiry method they were to use as well as a summary of the past uses of the technique, and its proven value. Finally, subjects in this "persuasion" condition were asked to make strong effort to use the technique to improve their predictions.

Context of the Decisions

Unknown to the subjects, the three independent profit centers represented three different decision-making contexts or "states of the world." State one (S1) was programmed such that: $r_{x_1y_c} \approx .80$, $r_{x_2y_c} \approx .50$, and $r_{x_3y_c} \approx .20$. This state was constructed to be in general agreement with the plan offered by Expert A. Expert A's plan is in fact predicated on assumptions reflected in the .8-.5-.2 correlation scheme. Notice world state schemes are "hidden" from direct view of the subjects. S3 was created so that $r_{x_1y_c} \approx .20$, $r_{x_2y_c} \approx .50$, and $r_{x_3y_c} \approx .80$. Thus S3 was in essential agreement with the assumptions and recommendations in the counterplan. A "compromise" state was represented by S2. The cue weights in S2 were created so that all three cues would be of equal importance: $r_{x_1y_c} \approx .55$, $r_{x_2y_c} \approx .55$, and $r_{x_3y_c} \approx .55$. Since multicollinearity was near zero, the coeffi-

cient of determination ($R^2_{xy_c}$) in all world states was primarily determined by the three cue-criterion correlation schemes in each world state ($R^2_{xy_c} = \sum_{i=1}^{3} r^2_{x_i y_c}$. In all three world states $R^2_{xy_c} = .88$. Notice unexplained error variance (randomness) was present in all states of the world.

In order to prevent confounding world states with sequence, the states were assigned from a latin squares scheme. This created a between-subjects factor that will be called "order." Order consists of three conditions: S1, S2, S3; S3, S1, S2; S2, S3, S1.

Dependent Measure

The dependent measure used to assess prediction accuracy is the average absolute error for each world state (i.e. $\frac{\sum |y_c - y_s|}{20}$ where y_s is the subject's prediction and y_c represents the criterion value per month). This measure was used by Cosier and Rose (1977), and Cosier (1978 and 1980) as an indicator of prediction performance. In order to avoid some difficulties associated with absolute measures all subjects considered the same cue values in each state of the world. In addition, all subjects were told this measure was the criterion for performance.

Although this dependent variable has the advantage of being an "objective" performance measure, some information is admittedly "lost" within each block of 20 predictions. Unfortunately, we cannot break the 20 trials into smaller blocks and maintain equal and comparable sets of cue-criterion relationships. The "correct" answers, which involve some error due to uncertainty, are based on a 20 trial constraint. The total number of predictions in the study (60), however, were broken into 3 sets of 20 to allow some insight into performance effects over time.

RESULTS

Manipulation Checks

In order to determine if the subjects seemed to read the planning information, an item on the post-task questionnaire asked which cue dimension that Expert A recommended be highly emphasized. Four specific possibilities (current ratio, inventory turnover, debt-to-equity ratio, and P/E ratio) and an "I don't know" choice were available. Ninety-nine percent of the subjects provided the correct response (the current ratio). The subjects were also asked if they treated each profit center as independent of the others. Seventy-five percent agreed or strongly agreed with the statement that the profit centers were independent (8% were neutral). Thus the vast majority of subjects were able to recall Expert A's primary recommendations and reported treating the profit centers as independent units.

An item on the post-task questionnaire asked whether the subjects perceived a strong attempt at persuasion. A continuous 10 c.m. line was anchored by "Yes, a strong attempt" and "No, no attempt." Subjects in the persuasion condition reported a significantly stronger attempt ($F = 7.73$, $p < .01$) than subjects in the no-persuasion condition.

Finally, subjects were asked to circle the statement that described the information that they received from the expert(s). Five choices were available--1) Two divergent and conflicting sets of recommendations; 2) Two different but non-conflicting sets of recommendations; 3) One set of recommendations and a critique; 4) One set of recommendations and a supportive statement; and 5) A single set of recommendations. Seventy-nine percent of the DI subjects picked 1),

and 88% of the E subjects picked 4) or 5). Interestingly, while 63% of the DA_1 subjects selected 2) or 3), only 37% of the DA_2 subjects selected 2) or 3). Sixty-three percent of the DA_2 subjects selected 1) as best describing their information. These data show that the perceptions of the experts' information did vary, depending upon the inquiry method ($\chi^2 = 93.0$, $p < .001$). Furthermore, the most frequent reports of "conflicting recommendations" were present in the DI and DA_2 conditions.

Prediction Performance

A four-factor ANOVA consisting of three between-subjects factors (inquiry method, persuasion, and order) and one within-subjects factor (context) was used to analyze the performance data for the subjects.

Table 1 shows that a context X inquiry method interaction ($F = 5.39$, $p < .01$) as well as a context X order interaction ($F = 5.06$, $p < .01$) were present. These interactions required simple-effects analyses for interpretation.

Insert Table 1 Here

Regarding the inquiry method X context interaction, significant inquiry method effects were found for each context. The Duncan multiple range technique revealed that within the S_1 context (plan best) the subjects exposed to the E inquiry method predicted significantly better ($p < .05$) than those exposed to the DI (see Table 2 for the mean absolute error values). Within the S_2 context (counterplan best) the subjects exposed to the DA_1 and DI predicted significantly better ($p < .01$) than subjects exposed to the E inquiry method. Within the S_3 context (compromise between the plan and counterplan) the superiority of the subjects exposed to the DA_1 over the DI and the E inquiry methods was significant at the .05 level.

Insert Table 2 Here

As noted earlier, a context X order interaction was also found. Significant simple effects were found for contexts at each order. Using the Duncan multiple range technique, subjects using Order 1 (S1, S2, S3) predicted significantly better in S3 than either S1 or S2 ($p < .01$). In Order 2, (S3, S1, S2) prediction error was significantly less in S2 than in S3 ($p < .01$) and less in S1 than S3 ($p < .01$). In Order 3, (S2, S3, S1) prediction error was significantly less in S1 than in S2 or S3 ($p < .01$ and .05 respectively). In addition, subjects predicted significantly better in S3 than S2 ($p < .01$).

These data suggest subjects improved their predictions over time. In order to verify this possibility, a supplementary analysis was run examining "sequence" (position of context over time) as a within-subjects factor. This analysis revealed a sequence main effect ($F = 9.97$, $p < .01$). This effect reflected prediction improvements (at .01) between each set of 20 predictions over time.[2]

DISCUSSION

The conclusions from the present study are basically consistent with those of the earlier work by Cosier and his colleagues. In this study, there was a significant context X order interaction as well as a significant context X inquiry method interaction. The context X order interaction and the subsequent examination of "sequence" demonstrates that the subjects were able to improve their prediction performances over time.

The context X inquiry method interaction, and subsequent analysis, suggest that in situations in which an expert's plan reflects the true state of the world, the DI technique is actually detrimental to prediction performance. In this case, simply giving individuals the expert's analysis and plan is likely to lead to more accurate prediction performances than giving individuals DI information.

Interestingly, this superiority of the E approach over the DI in S1 was not found by Cosier (1978).

It is important to note, however that the E method was not significantly superior to either DA technique in S1. This finding, which is consistent with results in Cosier (1978), suggests that the DA approach may not impair decision making under the plan-best condition.

When the expert's plan represents the opposite of the true state of affairs, both the "objective" DA (DA_1) and the DI methods of presenting planning information may be superior to the E approach. Thus, the conflict introduced by both methods is apparently helpful in situations where the true state of the world is quite different from the assumptions with the expert's plan.

Finally, when the true state of the world is midway between the assumptions contained in the expert's plan and those contained in the counterplan, the objective DA method (DA_1) may be superior to both the E and the DI approaches.

Mason (1969) has criticized the DA approach on the grounds that it involves simply the criticism of a plan with no suggestions of alternative plans. It may be that this feature of the DA approach is actually a strength rather than a weakness. Planners faced with two contradictory sets of analysis and recommendations may in fact be tempted to make a choice between them, either fully accepting the assumptions underlying the plan or the counterplan. When the plan represents the true state of the world this would explan why the E approach is superior to the DI. The DI approach may lead some subjects to initially choose the counterplan which would lead to poorer prediction performance. When the plan represents the opposite of the true state of the world, however, the subjects' choice of the counterplan would lead to superior prediction performance, explaining why the DI approach may be superior to the E approach in this situation.

The DA approach, on the other hand, does not encourage a planner to make a choice between two contradictory plans. Rather, it encourages the planner to examine the assumptions underlying the expert's plan. Subjects using this approach might have a greater tendency to develop assumptions based on data from the environment rather than accepting the assumptions of either a plan or a counterplan. This would help to explain why, in a situation in which the state of the world conforms to neither the plan nor the counterplan, the DA technique was found to be superior to both the E and the DI approaches.

These data provide some support for a point made by Mason (1969). He suggested that a potential problem with the DA is that it may be perceived by decision makers as an overly negative, carping kind of criticism and that this perception may reduce the effectiveness of the DA. In this study, the DA_1 critique was worded as a reasonably objective, unemotional statement while the DA_2 did have elements of carping criticism. The DA_2's failure to be associated with superior performances when compared to the DI and E indicates that this strong emotional condition may be detrimental to the effectiveness of the DA in some circumstances. This leads to the suggestion that when the DA is used, care should be taken to avoid the negative, carping sort of criticism Mason (1969) condemns.

This study provides evidence that the relationship between the task and the inquiry method is crucial. When comparing the E and the DI, this study suggests the "best" method is unclear. In S1, the task is best-matched with the E technique. In S3, however, the task is best-matched with the DI. Since it is difficult to specify the context before the decision is made, the choice between E and DI is problematic. The "objective" DA, however, has not been significantly inferior to the E in S1. In addition, it has been significantly more helpful than the E and DI techniques in other contexts. Thus, over all contexts, the DA approach appears to be at least as good, or better than the alternative inquiry methods.

It can also be argued that due to the uncertainly generally associated with organizational decision making, it is reasonable to suspect that the assumptions underlying the plan will not all be correct. Nor is it likely that all of the assumptions underlying the counterplan will be correct. In many decision situations, the true state of the world may lie somewhere between the plan and the counterplan, the situation in which the objective DA was shown to be superior in the study.

Interestingly, the persuasion factor had little effect on prediction performance. Telling subjects that a technique was useful did not result in increased objective performance. Criticisms of previous controlled studies suggesting the results are of limited generalizability because of a lack of an indoctrination program may be unwarranted.

Of course, one can argue that the operationalizations of the factors in this study do not accurately represent the "real-world" inquiry methods. This possibility, which is characteristic of any controlled study, suggests the need for future research using a variety of paradigms before the DI is offered to practitioners as an aid for making corporate decisions. Case studies and field experiments may prove helpful. These methods, however, may lack the control over confounding factors and clear performance measures available from laboratory designs. Continuing research into the DI may help us decide whether models, such as "Strategic Assumptions Analysis" (Mitroff and Emshoff, 1979) that assume the validity of the DI, are premature. It may be that an objective, factual-based DA component should be offered in lieu of a DI component in strategy models.

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FOOTNOTES

[1] Inferences about inquiry method differences, of course, require random assignment and common task situations across subjects.

[2] Sequence is merely a reordering of the contexts (when required) in temporal order. Sequence was not run at the same time with the context factor because of the lack of independence between the two factors. A sequence X context interaction, therefore, makes little sense given the nature of the factors.

Table 1

ANOVA for Prediction Performance

Source	df	MS	F
Subjects	95	1.05	
Inquiry Method (B)	3	2.10	2.18
Persuasion (C)	1	0.20	.20
Order (D)	2	2.95	3.00
B x C	3	0.27	.27
B x D	6	1.76	1.79
C x D	2	.97	.99
B x C x D	6	.60	.61
Error (Between)	72	.98	
Within	192	.37	
Context (A)	2	.16	.51
A x B	6	1.65	5.39*
A x C	2	.15	.50
A x D	4	1.55	5.06*
A x B x C	6	.32	1.05
A x B x D	12	.43	1.42
A x C x D	4	.22	.73
A x B x C x D	12	.20	.66
Interaction	144	.31	
Total	287	.60	

*$p < .01$

Table 2

Inquiry Method and Order Mean Absolute Error Values at Each Context

Context	Inquiry Method				Order		
	DI	DA_1	DA_2	E	1	2	3
S1	2.98	2.56	2.72	2.41	2.70	2.58	2.72
S2	2.91	2.38	2.76	2.91	2.65	2.46	3.12
S3	2.54	2.45	2.77	3.16	2.43	2.86	2.90