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ABSTRACT

Strategic communication scholars agree that planning is critical to human action. An investigation tested plan modification aspects of cognitive planning theory. Two experiments tested whether success and failure of a plan served as predictors of plan modification and whether individuals can accurately predict whether and how they will modify a plan in a subsequent interaction. Twenty participants (communication students at a midwestern university) tried to reach an interactional goal with one interaction, then assessed their success and predicted future plans for a similar interaction. Participants then again tried to reach the same interactional goal. Results indicated that success and failure may influence predicted, but not actual modifications of a plan. Most participants modified their plans in a second interaction. Some basic assumptions of the plan modification model are upheld, while others are questioned. (Contains 17 references and 3 tables of data.) (Author/RS)

STUDENT PAPER

Plan Modification: An Examination of Cognitive Planning Theory

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PLAN MODIFICATION: AN EXAMINATION

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Plan Modification: An Examination of Cognitive Planning Theory

Abstract

This investigation tests plan modification aspects of cognitive planning theory. Participants took part in two experiments designed to test whether success and failure of a plan serve as predictors of plan modification and whether individuals can accurately predict whether and how they will modify a plan in a subsequent interaction. Twenty participants tried to reach an interactional goal within one interaction, then assessed their success and predicted future plans for a similar interaction. Participants then again tried to reach the same interactional goal. Results indicated that success and failure may influence predicted, but not actual modifications of a plan. Most participants modified their plans in a second interaction. Some basic assumptions of the plan modification model are upheld, while others are questioned.

Introduction

The process of plan modification in goal-seeking human interactions remains a sparsely investigated area in the healthily growing field of strategic interpersonal communication research (Daly & Wiemann, 1994). The present study examines plan modification in a test of cognitive planning theory as proposed by Berger (1988; Berger & diBattista, 1992; Berger & Jordan, 1992). It is expected that failure or success of a plan, as judged by the participants, will be a crucial factor in participants' predictions of plan modifications, but not in the actual modification of a subsequent plan. It is also expected that planners will not be able to actually predict if and how they will modify a plan for a subsequent interaction.

Strategic interpersonal communication has become an increasingly important field in the communication discipline in the last 15 years (Daly & Wiemann, 1994), and the role cognition plays in driving human behavior has been identified as a vital area of communication research (Berger, 1988; Berger & diBattista, 1992; Berger & Jordan, 1992; Berger & Kellermann, 1994; Cody & McLaughlin, 1990; Dillard, 1990; Greene & Lindsey, 1989). Scholars from various disciplines point to the need for further theory development and experimentation in this area (Berger, 1988; Berger & diBattista, 1992; Berger & Jordan, 1992; Berger & Kellermann, 1994; Daly & Wiemann, 1994; Dillard, 1990; Friedman, Scholnick & Cocking, 1987; Greene & Lindsey, 1989; Wilson, 1990). Daly and Wieman (1994) consider the lack of theory construction and theory-driven research a main limitation of current strategic interpersonal communication research. Researchers identify several reasons for further study of this area.

The shift to studies of cognition and its link to human behavior or action has been accompanied by a change in theoretical perspectives. Most strategy researchers

consider strategic action to be intentional action generated by a proactive communicator (Daly & Wiemann, 1994), implying a view of humans as purposeful, planning social actors rather than creatures guided by external rewards (Greene & Lindsey, 1989). Planning theories in particular address one of the fundamental research questions involving humans — how do humans reason and plan action (Schank, 1982)? Tactical communication research in the last several years has focused on cognition and message production (Cody & McLaughlin, 1990). The goal-planning-action (GPA) sequence can be used to generate possible explanations of human behavior (Dillard, 1990). However, the basic assumption guiding this investigation is that such models overemphasize the GPA sequence. Communication research indicates that current explanations and models, especially those stemming from artificial intelligence research and proposing human action as primarily guided by planning, are only partially adequate. Recent research shows that emotionally-based strategies may exist, and other research indicates that planning may be, at least in part, an on-line, ongoing process (Daly & Wiemann, 1994). Therefore, a cognitive planning theory must seek to include environmental, contextual, physiological and psychological factors in its framework.

However, strategic communication scholars agree that planning is critical to human action. Several scholars have examined cognition and action production from a strategic interpersonal communication perspective (Cody & McLaughlin, 1990). To date, Berger appears to have proposed the most developed theory linking cognition to action within a case-based planning framework. Still, the need to develop an overarching theory for strategic interpersonal communication from a planning perspective persists (Berger & Kellermann, 1994). Berger argues that planning is essential to human action, and that the link between cognition and action needs to be studied separately from the link between cognition and understanding because of the strong differences between action and understanding (Berger, 1988). In the process of understanding, social actors observe other actors' behavior and infer their goals and plans

from their observed behavior. In contrast, Berger's cognitive planning theory looks at how actors generate goals and plans then act based on the implementation of these plans.

Several studies emphasize the need to further investigate strategic communication from a planning perspective. Waldron (1990) found that 44 percent of more than 2,000 subjects recalled having goal- and plan-directed thoughts during interactions. Communication research efforts have focused on the role of cognitive structures such as records, message design features and plans (Berger & diBattista, 1992) and the identification of goals and goal-specific strategies (Daly & Wiemann, 1994) and schemata (Berger & Kellermann, 1994). Further work on the processes of plan modification and predictors of strategy selection is needed (Berger & diBattista, 1992; Daly & Wiemann, 1994). This study focuses on these aspects.

Hammond (1989) and Schank (1982, 1989) strongly argue for a case-based approach to planning over previously generated rule-based approaches. Schank (1989) considers case-based reasoning "the essence of how human reasoning works" (p. xiii). According to case-based planning theories, individuals store failures as well as successes and are thus able to anticipate and avoid future plan failures (Hammond, 1989). Rather than recovering from errors and then forgetting the results of the recovery, planners learn from their errors (Hammond, 1989). According to Hammond (1989), planning failures are followed by repair of both the faulty plan and the faulty knowledge base that led to incorrect plan construction. As Berger (1988) reviews, one might expect planners to evaluate past experiences to determine what causes of action worked well and which did not, so that present plans could be improved. Since all planning tasks make use of past information, Hammond (1989) argues, the best approach to planning is to find and modify past plans rather than rebuild one from a set of rules each time.

Recent theory stresses the influence of specific episodes stored in memory, which led Berger and Jordan to determine the extent to which particularistic vs. generalistic experience is used as a basis for devising plans (Berger & Jordan, 1992). Subjects were instructed in the think-

aloud procedure and indicated their thoughts in trying to solve four problems. Results indicated significant variations in use of planning sources among the four goals, based, in part, on the degree of goal familiarity. Berger and Jordan (1992) concluded that planning is at least in part based on similar episodes retrieved from memory.

Daly and Wieman (1994) point out that planners do not necessarily dismiss unsuccessful strategies and that there is a discrepancy between strategies planners consider effective and strategies they actually use. These observations are important because plan modification is an essential element of case-based planning theories. Further studies on if and how individuals evaluate experiences and how these might translate into plan modification are thus needed. According to Hammond (1989) and Schank (1982), plan modification is vital to goal-seeking interactions because plans are indexed in a dynamic memory by goals, successes and failures, which may prevent individuals from repeating mistakes. Since the issue of plan modification seems to be of critical importance to evaluating the entire planning process, it seems important to design experiments that will attempt to empirically measure this process. More experimentation in this area will also allow for a closer examination of the interpersonal and psychological consequences of goal failure and success, an area of further research called for by Cody and McLaughlin (1990).

Berger and Jordan (1992) found that participants virtually never provided spontaneous evaluations of the efficacy of their prior experiences, and most appeared to simply retrieve the experience and use it uncritically to formulate their plan. Planners rarely indicate flaws in their previous courses of action to reach the same goal and their attempts to remediate these flaws in current plans. Berger and Jordan (1992) suggest that individuals may suffer from a success bias when planning or that individuals may not have been able to generate alternatives to their previous experiences. Still, they conclude that individuals appear

considerably less critical of their previous experience than might be expected. More work needs to be done to assess the adequacy of people as planners (Berger & Jordan, 1992).

To test the theoretical assumptions of case-based planning in regard to plan modification, the present study gave individuals the opportunity to evaluate their performance and reflect on planning modifications for future performances. Although case-based planning theories seem intuitively convincing because of their implications for cognition and communication efficiency, individuals' actual plan modification abilities still need to be tested experimentally. An initial study (author, 1995) found that while most individuals who predicted they would modify their plans actually modified them while engaging in future planning processes, many individuals who predicted they would not change their plans also modified them in their planning process.

The foregoing discussion suggests the following research question:

RQ1: Is previous success or failure of the planning process, as judged by the planner, a predictor of actual plan modification?

In his 1988 experiment, Berger reported examining the social goal of asking another person for a date through a questionnaire to which the participants responded while revealing their planning processes through think-aloud procedures. In order to test whether there is any relationship between the verbally reported planning sequences and actual performance, a pilot study was conducted, in which participants were instructed to engage in the date-request action with a confederate. The interactions were videotaped. However, because of the coding difficulties involved, the study did not compare the structure of plans as articulated in the protocols with the structure of actions shown in the interactions. Berger (1988) concluded that techniques must be developed to assess the extent to which plans are realized in social actions.

This is of particular importance because a 1983 study by Berger and Kellermann suggests that persons may be partially unaware of how they achieve their conversational goals, even when they are aware of those goals, and that they may not have very well-articulated conversational goals during ordinary conversational conditions. As Berger and Kellermann (1983) state, this raises questions about the validity of self-report data about interactions.

This study allowed for the comparison of predictions and actual performances by asking participants who had engaged in a goal-directed social interaction to describe their planning process and goal achievement as well their predicted plan adjustment for the next interaction. The assumption was, based on the findings of Berger and Kellermann (1983) that there would be a difference between individuals' self-reported planning process and their actual behavior. This assumption is based on the fact that some have questioned the accuracy of self-report data to reflect the planning procedure as well as Berger's own (1988) question whether individuals are able to distinguish between possible and probably worlds in their planning.

This leads to the second and third research questions:

RQ2: Can individuals accurately predict whether they will modify plans in second interactions?

RQ3: Do individuals self-reported planning processes accurately predict their subsequent performance?

The purpose of the present investigation is to test theoretical assumptions of plan modification, to generate further data and to replicate findings. This will be accomplished by using experimental designs similar to Berger and diBattista (1992) and Berger and Jordan (1992).

Method

Participants

Twenty communication students (14 female, 6 male) at a Midwestern university participated in this study for extra credit. All students took part in two sessions; the second session took place two weeks after the first one.

Procedures

Experiment 1: Participants reported individually to the communication lab and were asked to take part in one short (5 min.) role play, in which they attempted to achieve a specific goal. They were given a note card specifying the scenario, which is identical to the scenario used by Berger and Jordan (1992) and author (1995), so that the results of this study could be compared. A confederate, who was instructed to act normally, was the participants' partner in the interaction, which was audiotaped.

> The scenario was:
>
> You are interested in persuading another person to accept your personal opinion about whether alcohol consumption in dormitories at your university should or should not be banned. How would you go about getting the person to agree with your opinion on this issue?

After the role play, participants underwent a short exit interview. The interviewer solicited answers to a questionnaire with several open-ended items, in which the participants were asked to rate achievement of their interactional goal a success or failure, how they thought they achieved the goal, if they were planning to change their plan for a similar interaction, and if so, how. This interview was tape-recorded. Participants were then thanked. As Ericsson and Simon (1993) summarize, retrospective reports are now commonly accepted sources of data on cognitive processes in humans. An obvious problem involving subjects' verbal descriptions of

their own cognitive processes is that the information subjects retrieve during their actual performance may differ from the information they retrieve during the report. However, since this problem is a topic of this investigation, the technique seems appropriate.

Experiment 2: Two weeks later, the participants reported individually to the communication lab and were again asked to take part in one short (5 min.) role play, in which they attempted to achieve the same goal as in Experiment 1. A confederate, who was instructed to act normally, was the participants' partner in the interaction, which was audiotaped. After completing the task, the students were thanked.

Protocol Analyses

The audiotapes of the role plays and the audiotaped exit interview were transcribed. To address Research Question 1 (*Is previous success or failure of the planning process, as judged by the planner, a predictor of actual plan modification?)* the transcripts of Experiments 1 and 2 were coded. First, an analysis of all transcripts yielded a list of potential information or action units, which were collapsed into 18 conceptual action units (CAUs). Using the transcripts, one coder identified the occurrence of CAUs within each subject's response in each experiment. Multiple instances of a CAU within a response were counted only once. Results of the questionnaire the participants responded to after Experiment 1 were tabulated. An individual tabulation of results for each subject was necessary to be able to compare that subject's self-predicted response in Experiment 1 with that subject's action in Experiment 2.

Insert Table 1 about here

Since subjects indicated their perception of whether they succeeded or failed to reach their goals in Experiment 1, it was hypothesized that the detailed match of individual

performances would be able to indicate whether individuals who fail to reach their goal and state that they intent to modify their plans actually do so in the next interaction. Significant differences in the CAUs used in Experiment 1, the CAUs used in Experiment 2 would indicate actual plan modifications and significant differences between the CAUs predicted in the interviewe and the CAUs used in Experiment 2 would be able to indicate successful plan modification based on previous failure.

To address Research Question 2 (*Can individuals accurately predict whether they will modify plans in second interactions?*) predictions of plan modification made in the interview were compared, on a per-subject basis, with actual performance in Experiment 2. To address Research Question 3 (*Do individuals self-reported planning processes accurately predict their subsequent performance?*) the planned CAUs reported in the interview were compared with the CAUs actually used in Experiment 2. Individuals' responses to the open-ended items in the questionnaire and comments made during the interview were analyzed for additional information about the cognitive planning process as it relates to plan modification. It was expected that individuals' predictions about the exact content of their plan modification would not be accurate compared to their actual behavior in a subsequent interaction

Data Processing

An independent coder and the researcher coded one-third of the subjects' responses for all categories achieving 82% agreement. Differences in coding were resolved through discussion.

Results

Research Question 1 examined whether previous success of failure of the planning process, as judged by the planner, is a predictor of plan modification. This experiment

found that 80% of the participants considered their efforts to reach the interactional goal successful, and 20% said they failed. Mean success rating on a scale of 1 (not at all successful) to 7 (very successful) was 4.15 (unsure). The most frequently occurring success ratings on the scale were "somewhat successful" (45%) and "successful" (45%). Forty percent of those individuals who said they succeeded said they would modify their plan, and 60% said they would not. In contrast, 60% of those individuals who said they failed said they would modify their plan, and 40% said they would not. Overall, 45% of all participants said they would change their plan, and the majority, or 55%, said they would not.

Insert Table 2 about here

Research Question 2 was designed to measure whether individuals can accurately predict whether they will modify plans in future interactions. Of all participants, 70% modified their plans as manifested through the use of CAUs in the second interactions. Of the 9 participants who predicted they would modify their plan, 6 (or 66%) actually did; 3 (or 34%) did not. Of the 11 individuals who predicted they would not modify their plan, 3 (27%) did not, and 8 (or 73%) did modify their plan. Eleven of the 20 participants (55%) did not accurately predict whether or not they would modify their plan, and 45% made accurate predictions.

Insert Table 3 about here

Research Question 3 examined whether individuals' self-reported planning processes accurately predict their subsequent performance. The question was designed to investigate if individuals were able to predict how they would modify their plans. The answers to the open-

ended items discussed during the interview were compared with the actual performance in the case of the 9 subjects who accurately predicted that they would modify their plans. Of the 9 subjects, 3 (33%) predicted and exhibited no plan modification, so the data generated by the remaining 6 subjects were used. Only 1 of the 6 subjects made entirely accurate predictions about their plan modification. For example, one subject accurately predicted that plan modification would include assessing the other's reaction. In the second interaction, the subject included questions and attempt's to assess the other's reaction. However, the subject also predicted not to change arguments used in the plan, and in actuality dropped 3 of the original CAUs and added 1 new CAU. Another subject predicted that the modified plan would include additional arguments and that the arguments previously used would remain part of the plan. While new arguments were added, several arguments previously used were dropped in the second interaction. Most participants in the study, regardless of failure or success, indicated that they would change the structure and organization of their plan, but not the arguments used.

Discussion

This investigation examined and tested certain aspects of cognitive planning theory as proposed by Berger (1988; Berger & diBattista, 1992; Berger & Jordan, 1992; Berger & Kellermann, 1994). The present study found that a consistent relationship between success and failure of a plan and actual plan modification does not exist, as expected. The findings raise questions about the cognitive planning process as a case-based phenomenon while confirming some aspects of Berger's theory.

Research Question 1 examined whether previous success of failure of the planning process, as judged by the planner, is a predictor of plan modification. As might be predicted from common knowledge, participants who said they succeeded were more likely to predict

they would not modify their plan, and participants who said they did not succeed were more likely to predict that they would modify their plan. The high number of participants who considered their efforts successful supports Berger's assumption of a potential success bias. Berger and Jordan (1992) suggest that individuals may suffer from a success bias when planning and conclude that individuals appear considerably less critical of their previous experience than might be expected. Such a success bias could explain why the majority of participants predicted that they would not change their plan. It also appears important to consider that 40 percent of those individuals who said they succeeded nevertheless predicted they would modify their plans. Similarly important is that 40 percent the participants who said they had failed to reach the persuasion goal said they would not adjust their plan. These results seems to indicate that the relationship between previous experience, success/failure judgment and plan modification is more complex than indicated by artificial intelligence models. The findings contradict the idea that plans are indexed in a dynamic memory by goals, successes and failures, which may prevent individuals from repeating mistakes (Hammond, 1989; Schank, 1982). It appears that factors other than success or failure influence the intent to modify a plan. It seems the mere fact of trying out a plan may prompt a desire to modify the plan in a subsequent interaction.

Research Question 2 was designed to measure whether individuals can accurately predict whether they will modify plans in future interactions. The most striking finding in regard to this research question was that the majority of the participants (55%) did not accurately predict whether or not they would modify their plan. Several explanations are possible for this phenomenon. It is possible that part of the planning process occurs on an unconscious level and is not reflected accurately by self-report procedures. It is also possible that humans are, at least in part, inadequate planners, who are not able to retrieve and modify plans based on failure or success. It is also possible that humans have these planning capacities but are not able to adequately judge success or failure of a plan due to the success bias, which

may prevent them from taking advantage of their indexing and planning abilities. Yet another explanation is that on-line, continuous processing and planning plays a greater role than previously assumed.

Another important finding is that the participants' incorrect predictions generally relate to unpredicted occurrence of plan modification. In other words, participants are more likely to inaccurately predict that they will not modify a plan than inaccurately predicting that they will modify a plan. This finding is important because it could indicate that humans are indeed fairly accurate planners, and that the discrepancy between predicted and actual plans stems from unpredictable, on-line additions rather than an inability to correctly predict plan modification.

Research Question 3 examined whether individuals' self-reported planning processes accurately predict their subsequent performance. The question was designed to investigate if individuals were able to predict how they would modify their plans. The findings in regard to this research question support the findings of Research Question 2 in that only one subject made entirely accurate predictions about their plan modification. An interesting finding was that most participants in the study, regardless of failure or success, indicated that they would change the structure and organization of their plan, but not the arguments used. However, the majority of the participants did change the arguments used from the first to the second interaction.

Overall, the study confirmed that failure or success of a plan, as judged by the participants, will be a crucial factor in participants' predictions of plan modifications, but not in the actual modification of a subsequent plan. The study also raised, as expected, doubts about aspects of current planning models because of its findings that planners will not be able to actually predict if and how they will modify a plan for a subsequent interaction.

Limitations and Future Research

The findings of this study need to be replicated with a larger number of participants to allow for statistical analysis of the results. A larger number of participants would also make the study more generalizable to the general population.

Differences documented between individuals' planned and actual performances and individuals' apparent inability to accurately predict or assess their verbal behavior raise questions about fundamental assumptions of cognitive planning theories. It is hoped that this study not only adds to the knowledge base in this area but also helps determine what questions need to be asked in further investigations.

Clearly, as this study indicates, case-based planning is part of the human cognitive planning process. However, further investigations need to address what other factors may affect the planning process (e.g. psychological factors) and whether on-line processing takes precedence of case-based, preceding planning processes.

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Table 1

CONCEPTUAL ACTION UNIT DEFINITIONS
(in part based on Berger & diBattista)

Conceptual Action Unit	Persuasion Goal
Academic Argument	Planner stresses academic concerns should come first in students' lives.
Assess Reaction	Planner inquires about target's point of view.
Authority	Planner argues higher authority requires agreement (law, supervisors).
Decrease Argument	Planner argues drinking would decrease if his or her policy existed.
Economy Argument	Planner cites financial/economic considerations to back argument.
Expertise	Planner cites own experience to back argument.
Health Argument	Planner cites health concerns related to drinking to back argument.
Irrelevance Argument	Planner argues individuals will drink despite or because of law/policy.
Make Understand	Planner wants other to understand her or his point of view, even if other does not agree.
Multiple Effect Argument	Planner argues drinking would cause series of other problems.
Negative Example	Planner attempts to persuade by giving negative examples of what would happen if his or her point of view would not be set into reality.
Negative Influence	Planner argues change in policy would encourage others to drink.
Noise Argument	Planner argues noise would be a problem/not a problem.
Philosophical Argument	Planner argues her or his point of view based on values and philosophies.
Positive Example	Planner attempts to persuade by giving positive examples of what would happen if her or his point of view were set into reality.

CONCEPTUAL ACTION UNIT DEFINITIONS

Conceptual Action Unit	Definition
Safety	Planner cites safety concerns for others to convince target.
Specific Episode	Planner cites specific episode to illustrate point of view.
Utilitarian Argument	Planner argues her or his point of view is practical and easily applicable.

Table 2

Predicted Plan Modification as a Function of Plan Success

	Total	Would Change	No Change
Number of Participants Who Succeeded	15	6	9
Number of Participants Who Failed	5	3	2
Total	20	9	11

Table 3

Actual Plan Modification as a Function of Plan Success

		Changed Plan	Did Not Change Plan
Succeeded	15	11	4
Failed	5	3	2
Total	20	14	6