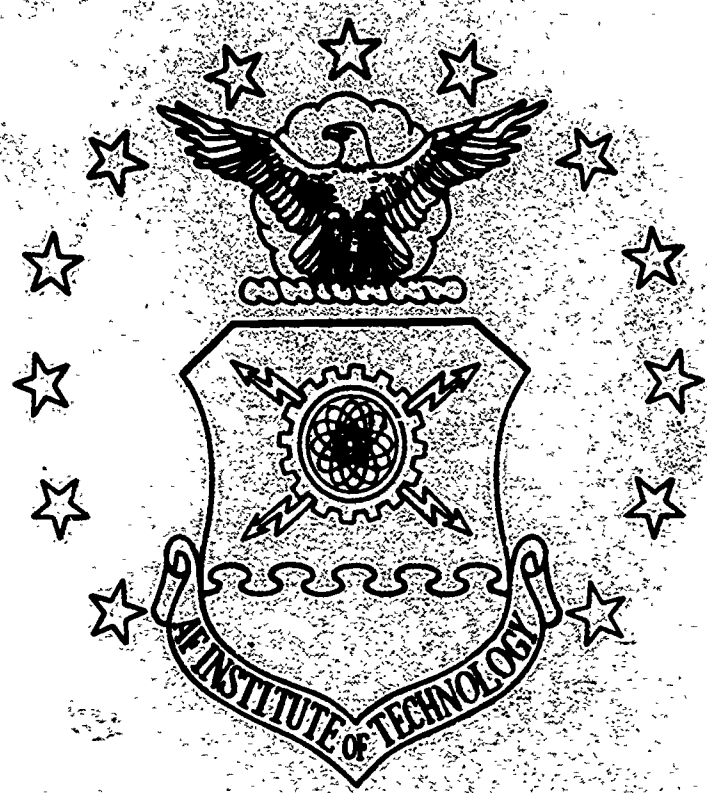ABSTRACT
        The importance of decision making to organizational
existence has provided ample justification for many forms of research
into the complex decision making process. The decision making process
in modern, large organizations draws inputs from and provides outputs
to many smaller internal decision units. Incompatible or conflicting
inputs and outputs may result in wasteful suboptimizations. The
research report of an investigation conducted among commissioned
officers in the U.S. armed forces examines one possible underlying
course of such conflicting inputs and outputs: the existence of
differences in decision makers' formal education and work experience
backgrounds. A decision making experiment was conducted to obtain
information bearing on relationships between choice of alternatives
and education background, work experience background, and the
decision maker's prescribed role. It was found that there were
tendencies toward differences in homogeneity of choice and in
adaptability to a change in role among individuals categorized into
several educational and experience background categories. Appendixes,
which provide the test instruments, education and experience
background categories, and test data specifying hypotheses of common
choice and change in alternative when role changed, comprise half the
document. (Author/JR)

A STUDY OF THE RELATIONSHIP BETWEEN
DECISION MAKER'S EDUCATION AND
EXPERIENCE AND ALTERNATIVE
CHOICE IN TRADE OFF
DECISIONS

Stephen E. Barndt, Lt Colonel, USAF

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UNITED STATES AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY
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The importance of decision making to organizational existence has
provided ample justification for many forms of research into the
complex decision process. The decision making process in modern,
large organizations draws inputs from and provides outputs to many
smaller internal decision units. Incompatible or conflicting
inputs and outputs may result in wasteful suboptimizations. In
this research, one possible underlying cause of such conflicting
inputs and outputs was investigated. That possible cause was the
existence of differences in decision maker's formal education and
work experience backgrounds. A decision making experiment was
conducted to obtain information bearing on relationships between
choice of alternatives and education background, work experience
background, and the decision maker's prescribed role. It was found
that there were tendencies toward differences in homogeneity of
choice and in adaptability to a change in role among individuals
categorized into several education and experience background cate-
gories.

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Air University

Air Force Institute of Technology

Wright-Patterson AFB, Ohio

By

Stephen E. Barndt
Lieutenant Colonel, USAF

January 1975

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INTRODUCTION

The individual is an imperfect decision maker.
Individuals, even in identical decision situations, do not
necessarily make identical choices. They perceive things
differently. Many factors probably affect the individual's
value system and hence his perceptions of what the problem
is, what the constraints are, what is important, what is
available, and what he should do.

As Newcomb (1950, p. 333) pointed out, because
decision makers differ in their previous experiences and what
they learned from them, they inevitably behave in different
ways, no matter how fully they may share group norms. Each
individual develops his own unique frame of reference and
he will see those things that are consistent with that frame
of reference (March and Simon, 1958, p. 152). Thus, no two
persons need behave exactly alike. On the other hand, simi-
larities in behavior are commonly observed. A number of
studies, including those by Dearborn and Simon (1958); Greene
(1969); Gross, Mason, and McEachern (1958); and Haire (1955),
among others, have shown that individuals possessing certain
education or experience background factors in common do
exhibit some similar behaviors or expectations.

Simon (1964) has indirectly highlighted the poten-
tial effects of differences in individual value systems on

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organizational decision making. Simon viewed decisions as being concerned with discovering courses of action that satisfy a set of constraints that define the organizational goal. He theorized that the decision maker will single out from among these constraints one or more as guides in the process of searching for alternatives. The decision will then be aimed at optimizing this 'goal-like' constraint, or generator, subject to the remaining constraints. A significant aspect of Simon's theory is that it points out how, through selection of different goal-constraint sets by decision makers, the organization's goal may be fully met and yet wasteful suboptimization may result. That is, although any one decision may be satisfactory (i.e., meet overall constraints), differences in the direction of the various decision maker's biases may result in undesirable suboptimization.

In this research, formal education and work experience background were posited as factors that affect the decision maker's role behavior through their influence on his value system and hence his goal-constraint set selection.

THEORY AND HYPOTHESES

Derived Theory

The derived theory underlying this research includes
work experience and formal education as variables that inter-
act with other variables in determining goal-constraint set
selection. The relationship of the formal education and work
experience variables to this selection is indirect. That is,
education and experience interact with other variables to
shape the decision maker's system of expectations and to
influence his perception of a prescribed role as sent to him.
The decision maker's expectations interact with the pre-
scribed role as he perceives it to form his conceived role.
Behavior then results from the decision maker's acting out
his conceived role as modified by environmental variables.

A derived model of goal-constraint set selection
(Figure 1) explains role behavior (actual selection of a
goal-constraint set as evidenced by the decision) as a func-
tion of the decision maker's conceived role and the particu-
lar environment within which the decision situation exists.
The conceived role, in turn, is a function of the prescribed
role (expectations of other members of the role set as per-
ceived by the decision maker) and the expectations the deci-
sion maker has concerning appropriate behavior. The latter

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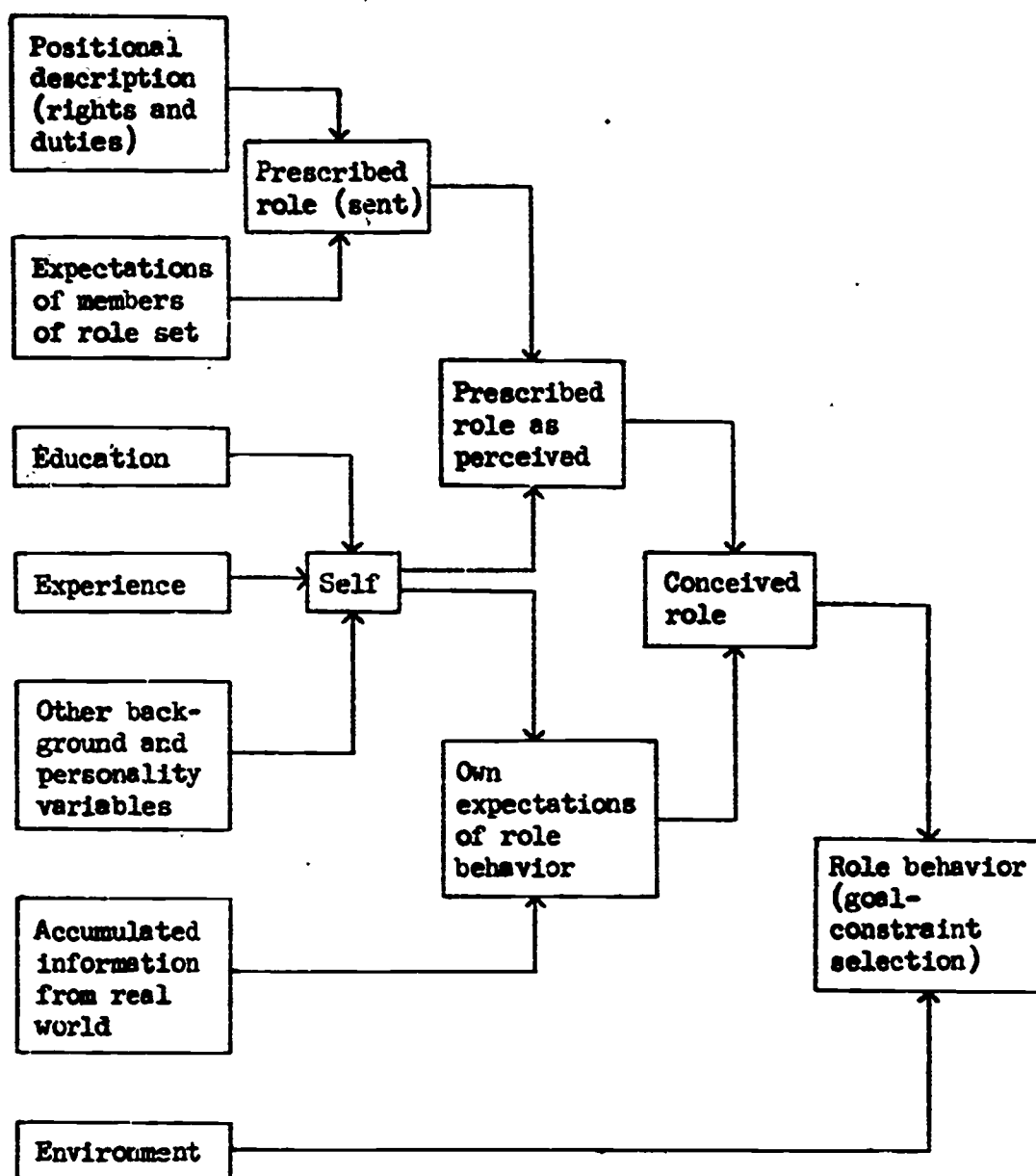
Fig. 1 --Goal-Constraint Set Selection Model

is partly influenced by education and experience. The perception of expectations of other members of the role set is also influenced by experience, including education.

Implications of the
Derived Theory

An implication of this theory is that if the decision maker does not perceive that others expect him to behave in a particular way with respect to choice in a particular decision situation, other variables including formal education and work experience will be of relatively greater importance in shaping his behavior. It should then be possible to predict that given the same environment and the same decision situation where there are no perceived expectations of right or wrong, better or worse, or desirable or undesirable behavior, individuals with similar education or experience will behave in a similar manner. If the decision situation involves a choice from among given alternatives, the expectation is that 'similar' individuals will choose the same alternative.

Another implication is that where the decision maker perceives expectations of others relating to his behavior in a particular decision situation, his role behavior may or may not be consistent with those expectations, his own expectations, or both. That is, self-expectations and perceived expectations of others may not be the same or there may be self-role conflicts as suggested by Sarbin (1954). The derived theory does not allow a prediction relative to strength of influence of self-expectations and perceived prescribed role on role behavior. However, as before, it can be predicted that regardless

of what the prescribed role is, individuals with similar education and/or experience will make the same choice given the same prescribed role, environment, and decision situation.

Finally, because educational and work experience backgrounds differ, it might be expected, in the situation where expectations of others are nonexistent, that differences in the alternative choices that are predominant among different education and/or experience groups would preclude identification of a common preferred choice. Then, given a particular prescribed role, if all education and/or experience groups exhibited a preference for the same alternative it might be concluded the influence of prescribed role was more powerful than that of education and/or experience. Also if some groups that had made a particular choice under one role changed their choice when given a different prescribed role while other groups did not, an explanation might be that the relative influence of education or experience was less in the former than the latter.

Hypotheses

Tests of the following specific hypotheses provided the answers necessary to provide support or nonsupport for the implications of the theory. Each of these hypotheses is in relation to the choice made from among alternatives equally satisfactory in terms of organizational goal achievement.

1. Hypothesis 1: Other things being equal, deci-
sion makers with similar education backgrounds and subject
to the same prescribed role situation will make the same
choice from among alternatives.

2. Hypothesis 2: Other things being equal, deci-
sion makers with similar work experience backgrounds and
subject to the same prescribed role situation will make the
same choice from among alternatives.

3. Hypothesis 3: Other things being equal, deci-
sion makers with similar education and similar work experi-
ence backgrounds and subject to the same prescribed role
situation will make the same choice from among alternatives.

4. Hypothesis 4: Decision makers with differing
educational and experience backgrounds will not exhibit a
preference for the same alternative when role is not pre-
scribed.

5. Hypothesis 5: Decision makers with differing edu-
cational and experience backgrounds will exhibit a preference
for the same alternative when a common role is prescribed.

6. Hypothesis 6: Decision makers with similar
formal education and/or work experience backgrounds that are
presented with problems under different prescribed roles will
shift to a choice from among available alternatives that is
consistent with the behavioral expectations associated with
those roles.

METHOD

General Approach

Relationships between choice of alternatives and formal education background, work experience background, combination of education and work experience background, and role were investigated utilizing data obtained in a decision making experiment. Subjects were commissioned officers of the United States armed forces. Each was given three problems and asked to choose what he thought was the best of three alternative solutions to each. Subjects also provided a resume of their work experience and their college level education.

Each of the problems was designed to offer clear cut alternatives, to be brief, to concern a subject with which the decision maker would have some familiarity as a military officer, and to put him in a riskless choice situation. All three problems involved a choice from military hardware items, each of which was stated to fully satisfy all organizationally imposed constraints. The problems, as presented, did not contain any criteria that would point to the superiority of any one alternative with respect to attainment of the organization's goals.

Problems differed with respect to the setting, the positional duties and responsibilities of the decision maker,

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and the specific choices available. However, each problem
did involve similar performance-cost trade off possibilities.
That is, the subject was required to choose an alternative
that met or exceeded stated performance minimums at not more
than some stated cost. Of the three alternatives within the
cost and performance constraints, one offered lowest cost
(and lowest performance), another offered highest performance
(and highest cost), and the third occupied the middle ground
as a compromise between cost and performance.

The research design was a combination of a controlled
experiment where an experimental variable (role) was intro-
duced and concomitant changes in the dependent variable were
observed and a factorial design where groups having differ-
ent characteristics of interest were observed and their
behaviors compared. In the experiment each individual served
as his own control. He first worked a problem where no role
was specified. Following this he worked the two additional
problems under differing role prescriptions. These role pre-
scriptions were introduced by providing a position title and
brief list of formal duties and responsibilities. It was
assumed that the decision maker would develop perceptions
of the expectations of others within the pretended role set.
The basis of these perceptions are the aforementioned posi-
tional duties and responsibilities and the individual's
knowledge of and experience with people and functions of a
similar nature in the military setting.

Variables

The study tested the relationships between three independent variables singly or in combination with a single dependent variable.

The dependent variable was the alternative selected. Each alternative was thought of as offering some different level of hardware performance on a continuous distribution of possible performance. The decision maker in the experiment was given a choice of three levels on a performance continuum that ranged from zero to some unspecified maximum. These three levels were not precisely defined in terms of location on the continuum but they were orderable. Specifically, alternative 3 was greater than alternative 2, which in turn was greater than alternative 1, all in terms of performance.

Formal education and work experience were normative independent variables where respondents were classified on the basis of their backgrounds. Thirteen potential categories of education background were derived based on combinations of four undergraduate and most recent graduate fields of specialization (Table 1). Possibilities included combinations of economics based fields; sciences and applied fields; social sciences, humanities, and arts; and no education at the graduate level or both graduate and undergraduate level. Experience was categorized into one or a combination of five basic experience backgrounds shown in Table 1.

TABLE 1

CATEGORIES OF THE EDUCATION AND
EXPERIENCE VARIABLE

Education*	Experience
00 - no college education	A - operations
10 - science and applied fields	B - scientific, engineering, maintenance, or research and development
20 - social sciences, humanities, and arts	
30 - economics based disciplines	C - technical support (materiel and fiscal)
	D - technical support (other)
	E - professional

*Note: Full coding used four digits - the first two for
undergraduate and the second two for graduate level
education

Prescribed role was the independent variable manip-
ulated by the researcher. Subjects were asked to make
decisions in three role capacities. One of these was a no
role specified capacity and served as the control. The no
role situation was created by presenting a problem without
any attached positional descriptions or expectations of any
sort. It was presumed that in such a situation an individ-
ual's own value system will be more free to dictate which
constraint will serve as the goal and, consequently, determine
the alternative to be chosen. The other two problems presumed
the subject would assume a performance oriented and a cost
oriented role. Performance and cost were selected as the
underlying orientations for these roles because the problem
constraints were in terms of performance and cost. Perform-
ance and cost were assumed to be constraints well recognized
by military officers in general and the subject of trade off
between these factors is covered at length in the cost-
effectiveness literature. The positions used in the pre-
scribed role problems were those of aeronautical engineer and
procurement officer. It was felt that these are represent-
ative of positions that evoke performance and cost oriented
role expectations, respectively. A pretest of the question-
naire on fifty-nine subjects with extensive military
experience supported these assumptions.

The Sample

The sample consisted of those officers of the United States armed forces who were attending United States Air Force professional military schools. Selections for attendance at these schools is competitive. Those officers with the most promise for increased responsibility, growth, and advancement are selected. Officers attending these schools, because of their demonstrated performance in positions of trust and their potential, are likely to be placed in positions of even greater trust. In short, they can be expected to be assigned to those kinds of positions where difficult and far reaching decisions are made. It was assumed, then, that the sample of officers was representative of that future population of top level decision makers who have and will meet the criteria of selection for attendance at a professional military school.

Total enrollment in the three Air Force professional military schools included 1,108 United States military officers. Of these, 586 subjects completed questionnaires. Complete anonymity precluded checking for nonrespondent bias by comparing respondents with nonrespondents. Necessity dictated the check be made by comparing early respondents with late respondents. The rationale for this approach rests on the finding that subjects who send in their questionnaires late are roughly similar to nonrespondents (Oppenheim, 1966, p 34).

No statistically significant differences were found between
the responses of early and late respondents at a .01 level
of significance.

Statistical Techniques

The chi-square goodness of fit test with Yates
correction, as recommended by Lordahl (1967, pp. 202-203) and
Hays (1963, p. 586), was used to test hypotheses of prefer-
ence related to educational experience background, work experi-
ence background and role (hypotheses 1 through 5). Hypotheses
1, 2 and 3 involving different backgrounds but similar role
prescriptions utilized the responses of all subjects falling
in each background category. Tests of hypotheses 4 and 5
involved a random selection of 100 subjects from the total
sample. In all cases, following Edwards (1958, p. 152), once
the alternative with the greatest frequency was found, the
distinction between the other two alternatives was of no
interest. A choice of either of the other two alternatives
provided information to test the statistical significance of
the alternative chosen with the greatest frequency. Conse-
quently, the not most frequently chosen alternatives were
combined into a single category simply called "not most fre-
quent"

Hypothesis 6, concerned with difference of choice
under changing roles, was tested with the sign test.

Homogeneity of Choice
Among Similar Back-
ground Categories .

Nearly all categories subjected to the chi-square
goodness of fit test were found to prefer one alternative to
the others in one or more of the problems. However, few
categories exhibited a preference in all three problems.
Failure to support the hypothesis of a common choice among
members of a particular education, experience, or education/
experience background category most often occurred when prob-
lem 1 (no role) data was tested. A hypothesis that a common
choice did exist among members of a background category gen-
erally occurred when problem 2 (performance role) and problem
3 (cost role) data was tested. Only four cases, each, of
failure to support a hypotheses of common choice were found
when testing problem 2 and problem 3 data. Table 2 shows
categories subjected to testing of each hypothesis and the
results of the test as applied to data from each problem.

The hypothesis that decision makers with similar
formal education backgrounds choose the same alternative was
supported in all three problem situations for only two of
the categories tested. Both of these categories, the sciences
and applied fields (1000) and the economics based fields
(3000), involved only undergraduate level education. At

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TABLE 2

TESTS OF HYPOTHESES OF NO COMMON CHOICE

Hypothesis	Category	Problem 1 (1)	2 (P)	3 (C)	Hypothesis	Category	Problem 1 (1)	2 (P)	3 (C)
1	0000			N	3	1000A	X*	X**	X**
						1000B	X**		
	1000	X**	X**	X**		1000F		X**	X**
	1010		X**	X*		1000H		X**	X**
	1030		X*	X**		1010B	X*	X**	X*
	2000		X**	X**		2000A		X*	X**
	2020		X**	X*		2000D			
	3000	X**	X**	X**		3000A		X**	X**
	3030			X*		3000C	X**	X*	
2	A	X*	X**	X**					
	B	X*	X**	X**					
	C	X**	X**						
	D		X**	X**					
	F	X**	X**	X**					
	G		X**	X**					
	H		X**	X**					

Note: An X* indicates a preference found to be significant at
α = .05. X** indicates a preference found to be signifi-
cant at α = .01. A blank indicates no reason to reject
the null hypothesis (of no common choice). N indicates
not tested. Only categories representing 15 or more
respondents were subjected to testing because of limita-
tions in the use of χ^2.

another extreme, those respondents with no college level field
of specialization (0000) and those with economics based under-
graduate plus graduate specialization (3030) did not show a
common choice of alternatives in either the first or second
problem. The remaining categories tested showed preferences
only in the case of problems 2 and 3.

Work experience backgrounds categorized as operations
(A); scientific, engineering, maintenance, or research and
development (B); and operations plus scientific, engineering,
maintenance, or research and development (F) were found to
exhibit a common preferred choice in all three problems.
The hypothesis that decision makers with similar work experi-
ence backgrounds choose the same alternative was only sup-
ported in two of the three problem situations for each of the
other experience categories. Category C, technical support--
materiel and fiscal, differed from these others in that a
common preferred alternative was chosen in problem 1 but no
common choice could be said to have been made in problem 3.

The hypothesis that decision makers with similar for-
mal education and similar work experience backgrounds choose
the same alternative was supported for all three problems in
the case of categories 1000A (operations experience and sci-
ence or applied fields education) and 1010B (scientific,
maintenance, engineering, or research and development experi-
ence and both undergraduate and graduate education in the
sciences or applied fields). Category 2000D, technical support
(other) experience and undergraduate education in the social

sciences or humanities, did not exhibit any common preferred choices. Category 3000C, technical support (materiel and fiscal) experience and undergraduate education in an economics based field, exhibited a common preferred choice in problems 1 and 2 but not 3. Other categories exhibited a common preferred choice in problems 2 and 3 only.

Homogeneity of Choice Under Differing Role Prescriptions

As shown in table 3, the random selection of 100 subjects of differing educational and experience backgrounds failed to exhibit a single preferred alternative in the no role problem situation at the .01 level of significance. Hence, there was no support for hypothesis 4.

Hypothesis 5 was tested with both problem 2 (performance role) and problem 3 (cost role) data from the 100 randomly drawn subjects. As shown in table 3, hypothesis 5 was supported at the .01 level of significance in both cases.

Differences in Choice Associated with Changes in Role

Application of the sign test to the choices of groups of subjects under the different prescribed role situations uncovered varying degrees of relationship between choice of alternatives and difference in role. At one extreme, where the sign test was found to be not significant, a null hypothesis (that prescribed role makes no difference in the choice of alternatives) could not be rejected. For other background

TABLE 3

TESTS OF HYPOTHESES OF PREFERENCE UNDER
DIFFERENT PRESCRIBED ROLES

Hypothesis	Problem	Alternative	Frequency of Choice					N	X^2
			Observed Frequency	Expected Frequency	Alternatives	Observed Frequency	Expected Frequency		
4	1	1	42	33.3	2 & 3	58	66.7	100	3.03
5	2	3	61	33.3	1 & 2	39	66.7	100	33.3**
5	3	3	49	33.3	1 & 2	51	66.7	100	10.4**

Note: ** indicates a preference for the same alternative found to be significant at $\alpha = .01$.
Absence of an asterisk indicates no reason to reject a null hypothesis of no preferred choice.

categories the sign test was found to be significant both in
the case of a change from a no role problem to a performance
role problem and a change from a performance role problem to
a cost role problem. This provided cause for rejecting the
null hypothesis and accepting the alternate hypothesis. That
is, for decision makers with certain similar backgrounds,
role did make a difference. These groups of individuals did
tend to choose alternatives that coincided with changed expec-
tations of what is appropriate behavior in a different role.
For other background categories, the sign test was significant
in the case of the differences between one pair of roles but
was not significant in the case of the difference between the
other pair. The lack of evidence of a relationship in the
latter case weakens the confidence in the alternate hypothesis.

Failure to exhibit a difference in choice from alter-
natives between the performance oriented problem 2 and the
cost oriented problem 3 may have been the result of a method-
ological deficiency. Several respondents' written comments
indicated that problem 3 may have been presented in a way that
in some cases prevented measurement of the effect of a change
in role. There was evidence that at least some respondents
were playing the role but had chosen the higher per per unit
cost alternative because they had perceived economies not
written in the problem--something not detected in the pretest.
In short, there is a possibility that individuals were playing
the cost oriented procurement officer role but their choices
did not reflect this fact. What was considered the high cost

alternative to the researcher may have been the lowest 'over-all' cost alternative to a respondent.

Table 4 shows the results of the sign test as applied to the various education and/or experience categories.

TABLE 4

RELATIONSHIP OF CHANGE IN CHOICE FROM
ALTERNATIVES TO CHANGE IN ROLE

Independent Variable	Education and/or Experience Category				
	Choice Related to Change from No Role to Performance Role and Performance Role to Cost Role[a]	Choice Related to Change from No Role to Performance Role or Performance Role to Cost Role[b]		Choice Not Related to Change from No Role to Performance Role and from Performance Role to Cost Role	
Education	1000** 1010** 3000	1030 2000 2030	3010 3030	0000 1020[c] 2010[c] 2020	
Experience	A** H**	B C D	F G	E	
Education/ Experience	1000A** 1010F	1000B 1000F 1000H 1030A 2000D 3000A 3000C		0000A[c] 1000D 1000G[c] 1010B 1030B[c] 1030C[c] 1030E[c] 1030F[c] 2000A	2000B[c] 2000H[c] 2010D[c] 2020D[c] 2020H[c] 3000D[c] 2000H 3030E[c]

[a]Inclusion in this column signifies the null hypotheses of no difference in choice of alternatives between no role and performance role and between performance role and cost role were both rejected at $\alpha = .05$. Rejection of both null hypotheses at $\alpha = .025$ is indicated with a double asterisk.

[b]Inclusion in this column signifies one but not both of the null hypotheses were rejected when $\alpha = .05$.

[c]Combined number of pluses and minuses less than 5 for one or both changes in choice.

DISCUSSION

Test of the Derived Theory

Generally, the research results support the derived theory although the influence of formal education and work experience appear to be less than implied in the theory. It was found in tests of hypotheses 1, 2 and 3 that individuals with similar experience or education backgrounds did often behave similarly (prefer the same alternative). This similarity of choice was observed in the case of both no role and prescribed role problems, although frequency of occurrence was greater in the latter than the former case. The greater homogeneity of choice in the prescribed role problems is fully complementary with the results of hypothesis 4 and 5 that supported the importance of role, even among individuals of diverse backgrounds, as related to preference from among alternatives. On the other hand, in the tests of hypothesis 6, there were occurrences of a collective failure of members of some background categories to choose different alternatives, in terms of performance and cost combinations, when given problems implying different behavioral expectations. Such instances point out the probable existence of differences in the relative influence of role and education/experience among background categories.

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Implications

Caution must be exercised to avoid making inferences
that violate the limitations of the research. Inferences are
confined to that population of military officers described or
to groups of similar individuals. Further, because the
research was macro in nature, implications are necessarily
general.

The first of two particular questions this research
attempted to answer was: do military officers with similar
formal education or work experience backgrounds tend to
choose the same constraint as more goal-like? The research
provided evidence that members of certain background groups
did tend to place the same emphasis on either cost or per-
formance as a more goal-like constraint. That is, they
preferred the same alternative in a trade off decision.
Particular education backgrounds found to be associated with
a homogeneity of choice included undergraduate training only
in (1) the economics based disciplines and (2) the sciences
or applied fields. Experience backgrounds showing homogeneity
were (1) the scientific, maintenance, engineering, and research
and development fields, (2) operations, or (3) combinations
of the two. The social sciences and humanities education back-
grounds and the technical support (other) experience backgrounds
were those less likely to exhibit a homogeneity of choice.

The second question this research attempted to answer
was: might there be differences in adaptability to changed
roles because of constraint biases resulting from educational or

experience backgrounds? Several background categories have been identified whose members did not exhibit a tendency to change their choice of alternatives, as predicted, when confronted with a new problem under a new role that implied a change in behavioral expectations. A presumption is that the background of such individuals had so affected their value systems that they did not play the role or were unadaptable to the role. The social sciences and humanities, no college field of specialization, and work experience in the professions were broad categories that failed to show any significant association between change of choices and change in role. On the other hand a significant association was found between the choices of individuals and the role situations in which they were placed by those who had received undergraduate educations in the economics based disciplines or the sciences or applied fields or who had operations work experience.

An implication of the research results is that education and experience background can influence goal constraint set selection and hence, choice from alternatives. A built-in bias toward considering particular constraints as more goal-like may develop through the processes of formal education and gaining work experience. Identification of those backgrounds that are more likely to produce goal-constraint bias may prove useful to the formulation of personnel placement policies, positional indoctrination programs, and personnel job rotation. However, further research designed to identify more narrowly defined backgrounds, that do or do not exhibit bias, would be called for to gain data necessary for specific programs.

APPENDICES

APPENDIX A

QUESTIONNAIRE

PROBLEM 1

Assume a mythical Air Force has determined there is a need for a specified number of light observation airplanes. Preliminary developments indicated airplanes meeting all specification minimums could be produced for not more than $250,000 each. Funding has been completed and the OK has been given to select an airplane design and award a fixed price contract for its production. Requirements that must be met among others are that the cost cannot exceed $250,000 per airplane and the airplane must be capable of staying airborne for at least 3 hours under certain stated conditions. Other things equal, the lower the cost per airplane, the more desirable is a particular design. Likewise, other things equal, the greater the endurance above the 3 hour minimum, the more desirable is a particular design.

Three airplane designs meet all the constraints. They are considered equal in respect to all requirements and specifications except the endurance capability and total unit cost. Airplane 1 is capable of 3 hours and 10 minutes of flight and will cost $190,000 per plane. Airplane 2 has an endurance capability of 3 hours and 30 minutes and will cost $210,000. Airplane 3's endurance is 4 hours and the cost per plane will be $240,000. You have been asked to recommend the purchase of one of the three designs. You understand that decisions of this magnitude have been made at your level in the past and have been approved by military and government officials. You may rely on the endurance and cost figures with 100% confidence.

Which design would you recommend for purchase?

Airplane 1 (3 hours & 10 minutes endurance/$190,000)_____

Airplane 2 (3 hours & 30 minutes endurance/$210,000)_____

Airplane 3 (4 hours endurance/$240,000)_____

-- Please record your choice on the --

Question/Answer Form

PROBLEM 2

Assume you are performing duty as an Aeronautical Engineer. In general, the Aeronautical Engineer conducts and manages research, design, development, installation, modification, and test of aircraft. Among his possible duties and responsibilities; he designs and develops aircraft; guided missiles, and related aeronautical equipment, engages in continuous development and modification and establishes engineering requirements to improve aircraft, guided missiles, and related aeronautical equipment. He develops design studies and monitors studies contracted to manufacturers, integrates design data concerning such factors as aerodynamic configurations, structural limitations, propulsion, mechanical and hydraulic requirements, components, systems, crew station arrangement, and safety devices. He evaluates plans and specifications for aircraft, guided missiles, and aeronautical equipment, considering such factors as military characteristics, fulfillment of performance requirements, compromises imposed by engineering, and other limitations such as cost, ease of maintenance and operation, methods of construction, feasibility, weight, and availability of materials. He recommends acceptance or nonacceptance of aircraft, guided missiles, and related aeronautical equipment.

You are a member of a panel of aeronautical engineers that have been tasked with evaluating several alternative means of increasing the ammunition capacity of a particular fighter aircraft. You are to recommend the best alternative in terms of the effect on aircraft speed and cost of modification. Any modification that would result in a loss of over 50 knots in speed is considered unacceptable. Likewise any modification that will cost more than $175,000 per airplane is unacceptable. The lower the cost of modification and the less the reduction of aircraft speed, the more preferable the alternative.

Three alternatives are feasible (meet the speed, cost, time, and all other constraints). Alternative 1 involves mounting guns in pods at a cost per plane of $125,000. Speed capability will be reduced by 50 knots. Alternative 2 involves minor modification of the fuselage exterior and rearrangement of some interior components. Cost will be $150,000 per plane. Speed capability will be reduced by 25 knots. Alternative three involves making more space available internally by "miniaturizing" and relocating subsystem components. This will result in a cost of $175,000 per plane. Aircraft speed capability will be virtually unaffected. The speed reduction and cost figures for each of these alternatives are known with 100% certainty. Other performance characteristics will not be adversely affected by any of the modifications.

Which of the three modification alternatives would you recommend?

Alternative 1 (minus 50 knots/$125,000)_____

Alternative 2 (minus 25 knots/$150,000)_____

Alternative 3 (no speed loss/$175,000)_____

-- Please record your choice on the --

Question/Answer Form

PROBLEM 3

A Procurement Officer may be required to perform any of a number of functions. In general, the Procurement Officer manages procurement activities and advertises, negotiates, awards, prepares, and administers contracts to acquire supplies and services through central and base procurement programs. He may be required to contract for supplies and services including end items of supplies and equipment, aircraft spares, aircraft missiles, support equipment, construction, utilities, architect-engineer, maintenance of facilities, systems and equipment, teaching and courses of instruction, flight instruction, airlift, and communications. He analyzes and acts on requests for purchases; determines the proper method of procurement and type of contract; negotiates new procurements and contact changes; holds formal bid openings; awards contracts; prepares and assembles contracts to accurately state contractual agreements; insures compliance with all statutory and regulatory requirements; administers contracts to completion; and terminates contracts for the convenience of the Government and for default. He considers price, quality, contractor personnel and physical facilities and capabilities in awarding contracts.

Assume you are a Procurement Officer and have been directed to decide which of several manufacturers should be awarded a contract for a large number of a new type "parachute" flare. Only flares costing $55 each or less and not exceeding a certain maximum weight are considered. Three companies' products meet all specifications and are otherwise equal except for weight and unit cost. Other things equal, the lower the unit cost (below the $55 per flare maximum), the better. Also, other things equal, the more improvement (reduction) in weight from the maximum allowable, the better. However, as mentioned, other things are not equal. Weight and cost tend to move in opposite directions. Company 1's flare is at the maximum weight but costs the least -- $50 per flare. Company 2's flare costs $52 but is lighter so that it is possible for a tactical airplane to carry 4% more of these flares than Company 1's flares. Company 3's flares are lighter yet. An airplane can carry 10% more of these flares than Company 1's. However, the per unit cost is correspondingly higher at $55.

Because there are no non-conflicting criteria that can be used to determine a "best" choice, you have been called upon to judge the three products in terms of the known cost and weight differences and decide the issue.

Which company would you award the flare contract?

Company 1 (max. weight-basic load of flares/$50 per flare)_____

Company 2 (lighter weight/carry 4% more flares/$52 per flare)_____

Company 3 (lighter weight-carry 10% more flares/$55 per flare)_____

-- Please record your choice on the --

Question/Answer Form

AU Survey Control Number AU-56

QUESTION/ANSWER FORM

1. What is your grade?_____branch of service?_____

2. What AU school are you enrolled in?_____

3. Read problem 1 and answer here.

   Which design would you recommend be purchased?

   Airplane 1 (3 hours & 10 minutes endurance/$190,000)_____
   or
   Airplane 2 (3 hours & 30 minutes endurance/$210,000)_____
   or
   Airplane 3 (4 hours endurance/$240,000)_____.

   Please explain briefly your reason for this choice.

   _____

   _____

   _____

4. List your college level education. Include information on partially
   complete programs.

	Years of college	Type of degree	Major field of specialization	Minor fields if applicable
Undergraduate				
Graduate				
Graduate				

5. Read problem 2 and answer here.

   Which of the alternatives would you recommend?

   Alternative 1 (minus 50 knots/$125,000)_____
   or
   Alternative 2 (minus 25 knots/$150,000)_____
   or
   Alternative 3 (no speed loss/$175,000)_____

   Please explain briefly your reason for this choice.

   _____

   _____

   _____

6. List a brief resumé of your adult civilian and military work experience. Places and units of assignment are not important. Job title, speciality title (and code) and approximate period of time in each job will usually be sufficient. Include only permanent duty assignment jobs. For example, a mythical resumé might be: pilot training 1½ yrs, C-124 co-pilot and pilot 4 yrs, C-135 pilot 3 yrs, AFIT MBA student 1½ yrs, System Program Management Officer (AFSC 2944) with duty as Program Control Officer 1½ yrs, C-7A pilot 1 yr, ACSC. (Chronological order is not necessary.)

Resume: _____

_____

_____

_____

_____

_____

_____

7. Read problem 3 and answer here.

Which company would you award the contract?

Company 1 (max. weight-basic load of flares/$50 per flare)_____
                                    or
Company 2 (lighter weight-carry 4% more flares/$52 per flare)_____
                                    or
Company 3 (lighter weight-carry 10% more flares/$55 per flare)_____

Please explain briefly your reason for this choice.

_____

_____

_____

APPENDIX B

EDUCATION AND EXPERIENCE
BACKGROUND CATEGORIES

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TABLE 5

EDUCATIONAL CATEGORIES BY FIELD OF SPECIALIZATION
(representative fields of study)

Broad Category	Sciences and Applied Fields (10)		Social Sciences, Humanities, and Arts (20)		Economics Based Fields (30)
Sub Categories	Physical, Biological (11)	Applied Fields (12)	Social Sciences (21)	Arts and Humanities (22)	
Fields of Specialization	Biological Sciences (18) Physical Sciences (19)	Mathematics (17) Metallurgy (15) Education (16) Agriculture (15) Military Sc. (15) Medical and Dental (14) Pharmacy (14) Law (14) Industrial Arts (15) Computer Sc. (15) Physical Ed. (16) Engineering (except Industrial) (13) Geology (15) Architecture (15)	Political Sc. (26) Psychology (24) Sociology (24) Anthropology (24) Geography (27)	Literature (28) Languages (28) English (28) Fine Arts (29) Music (29) Philosophy (23) Speech (28) History (23)	Agricultural Economics (31) Public Administration (32) Economics (31) Operations Research (33) Management (32)

Note:

The two digit numbers following the fields or groups of fields of specialization are codes used in categorizing individual subjects.

TABLE 6

WORK EXPERIENCE CATEGORIES

Category/ Related Career Areas	Career Areas	Utilization Fields	Officer Speciality Codes	Basic Orientation
Operations	Operations	Pilot Navigator-Observer Aircraft Control Weapons Director Missile Operations Flying Safety Safety Space Systems Special Ops	10_,11_,12_ 15_,14_ 16_ 17_ 18_ 19_ 20_	Using Equipment to Accomplish Organization's Mission
Scientific-Engineering-maint.-R&D	Scientific & Development Engineering	Weather Scientific Research & Development Management Development Engr.	25_ 26_ 27_ 28_	Making and Repairing Things
	System Program Mgmt	Systems Program Management	29_	
	Communications Electronics	Comm-Elect.	20_	
	Electronic & Maint. Engineering	Missile Maint. Avionics Aircraft Maint. Munitions	30_ 32_ 43_ 46_	
	Civil Engineering	Civil Engr. Cartography	60_ 57_	
Technical	Materiel	Transportation Supply Services Fuels Supply Mgmt	60_ 62_ 63_ 64_	Spending

TABLE 6--Continued

Category/ Related Career Areas	Career Areas	Utilization Fields	Officer Speciality Codes	Basic Orientation
Support (Materiel & Fiscal)		Procurement Logistics	65_ 66_	Money
	Comptroller	Financial Data Automation Management Analysis	67_ 68_ 69_	
Technical Support (Other)	Personnel Resources Management	Administration Personnel Manpower Mgmt Educ. & Training	70_ 73_ 74_ 75_	Facilitating Things
	Information	Information	79_	
	Intelligence	Intelligence	80_	
	Security Police	Security Police	81_	
	Special Investigation	Special Investigation and Counter-intelligence	82_	
	Other Miscellaneous	Band Attache	87_	
Professional	Legal	Legal	88_	Helping Humans
	Chaplain	Chaplain	89_	
	Medical	Physician Health Svs Mgmt Biomedical Svs Dental Nurse Veterinary	90_ 91_	

Source: Adapted from Air Force Manual 36-23, 13 June 1969 and Air Force Regulation 36-23, 30 Jun 1959.

APPENDIX C

TEST DATA--HYPOTHESES OF
COMMON CHOICE

TABLE 7

X^2 ONE-SAMPLE TEST DATA--EDUCATION

Category (Role/Education/Experience)	Most Frequently Chosen Alternative			Not Most Frequently Chosen Alternatives			Number of Observations (N)	X^{2a}
	Alternative Number	Frequency of Occurence Observed	Hypothetical (1/3 of N)	Alternative Numbers	Frequency of Occurence Observed	Hypothetical (2/3 of N)		
N 0000	1	8	5.33	2, 3	8	10.67	16	1.32
P 0000	3	9	5.33	1, 2	7	10.67	16	2.83
C 0000							14	no test
N 1000	1	86	65.00	2, 3	109	130.00	195	9.70**
P 1000	3	128	64.00	1, 2	64	128.00	192	94.51**
C 1000	3	118	64.66	1, 2	76	129.32	194	64.77**
N 1010	3	31	23.33	1, 2	39	46.67	70	3.30
P 1010	3	45	23.33	1, 2	25	46.67	70	28.81**
C 1010	3	35	23.66	1, 2	38	47.32	71	4.95*
N 1030	1	22	15.66	2, 3	25	31.32	47	3.27
P 1030	3	24	15.66	1, 2	23	31.32	47	5.89*
C 1030	3	25	15.66	1, 2	22	31.32	47	7.49**
N 2000	1	33	28.67	2, 3	53	57.33	86	.77
P 2000	3	51	28.67	1, 2	35	57.33	86	24.93**
C 2000	3	48	28.33	1, 2	37	56.67	85	19.45**

TABLE 7 --Continued

Category (Role/Education/Experience)	Most Frequent Chosen Alternative			Not Most Frequently Chosen Alternatives			Number of Observations (N)	X^{2a}
	Alternative Number	Frequency of Occurence		Alternative Numbers	Frequency of Occurence			
		Observed	Hypothetical (1/3 of N)		Observed	Hypothetical (2/3 of N)		
N 2020	3	7	5.33	1, 2	9	10.67	16	.39
P 2020	3	12	5.33	1, 2	4	10.67	16	10.71**
C 2020	3	11	5.67	1, 2	6	11.33	17	6.17*
N 3000	1	46	31	2, 3	47	62	93	10.17**
P 3000	3	62	31	1, 2	31	62	93	45.01**
C 3000	3	55	30.33	1, 2	36	60.67	91	28.89***
N 3030	1	11	7	2, 3	10	14	21	2.62
P 3030	3	11	7	1, 2	10	14	21	2.62
C 3030	3	13	7	1, 2	8	14	21	6.48*

[a] A chi square marked with an asterisk (*) is significant at $\alpha = .05$. A chi square marked with a double asterisk (**) is significant at $\alpha = .01$. A chi square without any asterisk indicates nonsignificance and hence no reason to reject the null hypothesis at either level.

TABLE 8

χ^2 ONE-SAMPLE TEST DATA--EXPERIENCE

Category (Role/Education/Experience)	Most Frequently Chosen Alternative			Not Most Frequently Chosen Alternatives			Number of Observations (N)	χ^{2a}
	Alternative Number	Observed	Hypothetical (1/3 of N)	Alternative Numbers	Observed	Hypothetical (2/3 of N)		
N A	1	80	64.66	2, 3	114	129.32	194	5.11*
P A	3	133	64.33	1, 2	60	128.67	193	108.36**
C A	3	119	64	1, 2	73	128	192	69.62**
N B	1	50	39	2, 3	67	78	117	4.24*
P B	3	61	39	1, 2	56	78	117	17.78**
C B	3	62	39.66	1, 2	57	69.32	119	18.91**
N C	1	24	13	2, 3	15	26	39	12.72**
P C	3	23	13	1, 2	16	26	39	10.41**
C C	3	19	13	1, 2	20	26	39	3.49
N D	1	22	17.33	2, 3	30	34.67	52	1.50
P D	3	28	17.33	1, 2	24	34.67	52	8.95**
C D	3	34	17	1, 2	17	34	51	24.02**
N F	1	38	25.33	2, 3	38	50.67	76	8.77**
P F	3	50	25.33	1, 2	26	50.67	76	34.59**
C F	3	40	25	1, 2	35	50	75	12.62**

TABLE 8 .--Continued

Category (Role/Education/Experience)	Most Frequently Chosen Alternative			Not Most Frequently Chosen Alternatives			Number of Observations (N)	X^{2a}
	Alternative Number	Frequency of Occurence		Alternative Numbers	Frequency of Occurence			
		Observed	Hypothetical (1/3 of N)		Observed	Hypothetical (2/3 of N)		
N G	1	11	7	2, 3	10	14	21	2.62
P G	3	15	7	1, 2	6	14	21	12.05**
C G	3	13	6.65	1, 2	7	13.32	20	7.68**
N H	1 and 3 tie					46.67	71	no test
P H	3	55	23.33	1, 2	15	46.67	70	62.46**
C H	3	43	23.33	1, 2	27	46.67	70	23.63**

[a] A chi square marked with an asterisk (*) is significant at $\alpha = .05$. A chi square marked with a double asterisk (**) is significant at $\alpha = .01$. A chi square without any asterisk indicates nonsignificance and hence no reason to reject the null hypothesis at either level.

TABLE 9

X^2 ONE-SAMPLE TEST DATA--EDUCATION AND EXPERIENCE

Category (Role/Education/Experience)	Most Frequently Chosen Alternative			Not Most Frequently Chosen Alternatives			Number of Observations (N)	X^{2a}
	Alternative Number	Frequency of Occurence Observed	Hypothetical (1/3 of N)	Alternative Numbers	Frequency of Occurence Observed	Hypothetical (2/3 of N)		
N 1000 A	1	36	26.66	2, 3	44	53.32	80	4.40*
P 1000 A	3	58	25.66	1, 2	19	51.32	77	59.26***
C 1000 A	3	48	26.66	1, 2	32	53.32	80	24.44***
N 1000 B	1	21	12.33	2, 3	16	24.67	37	8.12**
P 1000 B	3	16	12.33	1, 2	21	24.67	37	1.22
C 1000 B	3	18	12.33	1, 2	19	24.67	37	3.25
N 1000 F	1 and 3 tie						32	no test
P 1000 F	3	22	10.66	1, 2	10	21.32	32	16.53***
C 1000 F	3	21	10.66	1, 2	11	21.32	32	13.62***
N 1000 H	3	12	8.66	1, 2	14	17.32	26	1.40
P 1000 H	3	21	8.66	1, 2	5	17.32	26	24.28***
C 1000 H	3	16	8.66	1, 2	10	17.32	26	8.10**
N 1010 B	3	20	13.33	1, 2	20	26.67	40	4.28*
P 1010 B	3	23	13.33	1, 2	17	26.67	40	9.46**
C 1010 B	3	21	13.66	1, 2	20	27.32	41	5.14*

TABLE 9 --Continued

Category (Role/Education/Experience)	Most Frequently Chosen Alternative			Not Most Frequently Chosen Alternatives			Number of Observations (N)	X^{2a}
	Alternative Number	Frequency of Occurence		Alternative Numbers	Frequency of Occurence			
		Observed	Hypothetical (1/3 of N)		Observed	Hypothetical (2/3 of N)		
N 2000 A	3	17	13	1, 2	22	26	39	1.41
P 2000 A	3	20	13	1, 2	19	26	39	4.88*
C 2000 A	3	21	12.66	1, 2	17	25.32	38	7.28**
N 2000 D	1	8	5.67	2, 3	9	11.33	17	.89
P 2000 D	3	9	5.67	1, 2	8	11.33	17	2.12
C 2000 D	3	9	5.67	1, 2	8	11.33	17	2.12
N 3000 A	1	15	12.33	2, 3	22	24.67	37	.57
P 3000 A	3	31	12.33	1, 2	6	24.67	37	40.16**
C 3000 A	3	27	12	1, 2	9	24	36	26.28**
N 3000 C	1	13	6.33	2, 3	6	12.67	19	9.02**
P 3000 C	3	11	6.33	1, 2	8	12.67	19	4.12*
C 3000 C	3	10	6.33	1, 2	9	12.67	19	2.38

[a]A chi square marked with an asterisk (*) is significant at $\alpha = .05$. A chi square marked with a double asterisk (**) is significant at $\alpha = .01$. A chi square without any asterisk indicates nonsignificance and hence no reason to reject the null hypothesis at either level.

APPENDIX D

TEST DATA--CHANGE IN ALTERNATIVE
WHEN ROLE CHANGED

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TABLE 10

SIGN TESTS

Category	Role Being Contrasted (change in independent variable)	Change in Response[a] and Significance[b] of the Sign Test		
		+	-	Sign Test
0000	N to P	6	4	NS
	P to C	3	4	NS
1000	N to P	95	21	S**
	P to C	37	61	S**
1010	N to P	26	8	S**
	P to C	5	22	S**
1020	N to P	3	1	NS
	P to C	2	1	NS
1030	N to P	20	16	S**
	P to C	12	16	NS
2000	N to P	36	13	S**
	P to C	14	23	NS
2010	N to P	5	1	NS
	P to C	2	2	NS
2020	N to P	7	2	NS
	P to C	4	5	NS
2030	N to P	9	0	S**
	P to C	2	3	NS
3000	N to P	50	4	S**
	P to C	13	25	S*
3010	N to P	5	0	S*
	P to C	0	4	
3020	N to P	2	1	NS
	P to C	0	1	
3030	N to P	8	1	S**
	P to C	4	3	NS

TABLE 10 --Continued

Category	Role Being Contrasted (change in independent variable)	Change in Response[a] and Significance[b] of the Sign Test		
		+	-	Sign Test
A	N to P	105	18	S**
	P to C	30	58	S**
B	N to P	40	13	S**
	P to C	21	29	NS
C	N to P	20	3	S**
	P to C	7	11	NS
D	N to P	19	6	S**
	P to C	10	9	NS
E	N to P	4	3	NS
	P to C	2	6.	NS
F	N to P	37	10	S**
	P to C	14	25	NS
G	N to P	10	2	S**
	P to C	3	6	NS
H	N to P	37	7	S**
	P to C	11	26	S**
0000A	N to P	3	2	NS
	P to C	1	1	NS
0000B	N to P	1	0	
	P to C	0	1	
0000C	N to P	0	1	
	P to C	2	0	NS
0000D	N to P	0	0	
	P to C	0	0	
0000F	N to P	1	.	NS
	P to C	0		
0000H	N to P	1	0	
	P to C	0	0	

TABLE 10--Continued

Category	Role Being Contrasted (change in independent variable)	Change in Response[a] and Significance[b] of the Sign Test		
		+	-	Sign Test
1000A	N to P	44	3	S**
	P to C	11	27	S**
1000B	N to P	18	5	S**
	P to C	9	11	NS
1000C	N to P	2	0	
	P to C	0	0	
1000D	N to P	3	3	NS
	P to C	3	2	NS
1000E	N to P	0	1	NS
	P to C	0	1	
1000F	N to P	15	4	S**
	P to C	8	9	NS
1000G	N to P	1	2	NS
	P to C	1	0	NS
1000H	N to P	12	3	S**
	P to C	5	11	NS
1010A	N to P	2	1	NS
	P to C	0	2	
1010B	N to P	10	6	NS
	P to C	3	8	NS
1010D	N to P	2	0	
	P to C	1	0	NS
1010F	N to P	8	1	S**
	P to C	1	7	S*
1010G	N to P	1	0	
	P to C	0	1	
1010H	N to P	3	0	
	P to C	0	4	

TABLE 10 --Continued

Category	Role Being Contrasted (change in independent variable)	Change in Response[a] and Significance[b] of the Sign Test		
		+	-	Sign Test
1020A	N to P	0	0	
	P to C	0	0	
1020E	N to P	0	0	
	P to C	0	0	
1020F	N to P	0	1	
	P to C	1	0	
1020G	N to P	1	0	
	P to C	0	0	
1020H	N to P	2	0	
	P to C	1	1	NS
1030A	N to P	8	1	S**
	P to C	3	5	NS
1030B	N to P	2	1	NS
	P to C	3	2	NS
1030C	N to P	1	1	NS
	P to C	1	2	NS
1030D	N to P	1	0	
	P to C	0	0	
1030E	N to P	1	1	NS
	P to C	1	1	NS
1030F	N to P	2	2	NS
	P to C	3	3	NS
1030G	N to P	2	0	
	P to C	0	0	
1030H	N to P	3	0	
	P to C	1	3	NS
2000A	N to P	14	10	NS
	P to C	9	11	NS

TABLE 10 --Continued

Category	Role Being Contrasted (change in independent variable)	Change in Response[a] and Significance[b] of the Sign Test		
		+	-	Sign Test
2000B	N to P	4	1	NS
	P to C	1	2	NS
2000C	N to P	3	0	
	P to C	0	2	
2000D	N to P	6	0	S**
	P to C	2	4	NS
2000F	N to P	3	1	NS
	P to C	0	1	
2000G	N to P	0	0	
	P to C	0	1	
2000H.	N to P	6	1	NS
	P to C	2	2	NS
2010A	N to P	1	0	
	P to C	0	0	
2010D	N to P	1	1	NS
	P to C	2	1	NS
2010F	N to P	1	0	
	P to C	0	0	
2010G	N to P	1	0	
	P to C	0	1	
2010H	N to P	1	0	
	P to C	0	0	
2020A	N to P	2	0	
	P to C	1	1	NS
2020B	N to P	1	0	
	P to C	0	0	
2020D	N to P	1	1	NS
	P to C	1	1	NS

TABLE 10--Continued

Category	Role Being Contrasted (change in independent variable)	Change in Response[a] and Significance[b] of the Sign Test		
		+	-	Sign Test
2020E	N to P	0	0	
	P to C	0	1	
2020F	N to P	1	0	
	P to C	0	1	
2020G	N to P	0	0	
	P to C	1	0	NS
2020H	N to P	2	1	NS
	P to C	1	1	NS
2030A	N to P	3	0	
	P to C	1	2.	NS
2030B	N to P	0	0	
	P to C	1	0	NS
2030C	N to P	1	0	
	P to C	C	0	
2030D	N to P	2	0	
	P to C	0	1	
2030F	N to P	3	0	
	P to C	0	0	
2030G	N to P	0	0	
	P to C	0	0	
2030H	N to P	0	0	
	P to C	0	0	
3000A	N to P	24	1	S**
	P to C	3	8	NS
3000B	N to P	4	0	
	P to C	2	5	NS
3000C	N to P	11	0	S**
	P to C	4	5	NS

Table 10--Continued

Category	Role Being Contrasted (change in independent variable)	Change in Response[a] and Significance[b] of the Sign Test		
		+	-	Sign Test
3000D	N to P	3	1	NS
	P to C	1	0	NS
3000F	N to P	3	0	
	P to C	1	2	NS
3000G	N to P	2	0	
	P to C	1	1	NS
3000H	N to P	3	2	NS
	P to C	1	4	NS
3010A	N to P	1	0	
	P to C	0	0	
3010C	N to P	2	0	
	P to C	0	2	
3010E	N to P	2	0	
	P to C	0	2	
3010H	N to P	0	0	
	P to C	0	0	
3020C	N to P	0	1	
	P to C	0	0	
3020G	N to P	1	0	
	P to C	0	1	
3020H	N to P	1	0	
	P to C	0	0	
3030A	N to P	3	0	
	P to C	1	1	NS
3030B	N to P	0	0	
	P to C	2	0	NS
3030C	N to P	0	0	
	P to C	0	0	

TABLE 10 --Continued

Category	Role Being Contrasted (change in independent variable)	Change in Response[a] and Significance[b] of the Sign Test		
		+	-	Sign Test
3030D	N to P	0	0	
	P to C	0	0	
3030E	N to P	1	1	NS
	P to C	1	1	NS
3030F	N to P	0	0	
	P to C	0	0	
3030G	N to P	1	0	
	P to C	0	1	
3030H	N to P	3	0	
	P to C	0	0.	

[a]Plus (+) assigned when subject chose a higher performance alternative. Minus (-) assigned when a lower performance alternative was chosen.

[b]Significance at α = .05 indicated by S*. Significance at α = .025 indicated by S**. Nonsignificance indicated by NS. Tests of significance are one-tailed with number of fewer signs predicted to be minus for N to P and plus for P to C.

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