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C-TASKS: AN EXERCISE AND IN-CLASS EXPERIMENT IN THE EFFECTS OF CREATIVE AND NON-CREATIVE TASKS ON GROUP STRUCTURES AND GROUP PERFORMANCE

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Classroom exercises have long been used in the teaching of graduate and undergraduate management and organizational behavior courses and have been found to be quite valuable in illustrating a variety of important concepts. The Moon Survival Kit (group decision making), the Disarmament Exercise (inter-group conflict) and the Tinkertoy Tower (effects of structure on performance and satisfaction) are examples of experiential media widely used for developing and demonstrating concepts in group dynamics. In these group exercises, group organization structure is either ignored or is specified and used as an independent variable. An exercise which would demonstrate the sources and effects of an emergent organization, that is; reflecting a contingency theory of organization structure, would seem a particularly useful addition to the repertoire of experiential learning in business education. There is also a need for additional experimental work in "contingency" oriented organization study. Control of conditions and inductions, and accurate measurement are needed, however, to permit the data to be used for research purposes.

This paper reports on an experimental classroom exercise and in-class experiment which is designed to demonstrate the effects of different types of tasks on the emergence of Organization structure and on group member satisfaction. A limited discussion of relevant literature describing the conceptual development of the dynamics of task group structure, group performance and member satisfaction as interrelated variables follows. The exercise and its administrative procedures are then described in some detail. Reported in the concluding sections are the results of the use of this exercise for 13 groups of students in organization behavior classes at the University of Kentucky. Main effects serving to assist in classroom learning are reported first. Secondary effects and other findings of interest in organizational research follow. The paper concludes with recommendations for the use of this design in both exercise and experimental modes.

CONCEPTUAL FRAMEWORK FOR THE EXERCISE

Field research in large industrial organizations in Great Britain and the United States has suggested that effective organizations develop specialized organization structures and systems to accommodate and adapt to different industrial technologies [3, 12] and degrees of environmental uncertainty [9]. That is to say -- organization structures are contingent

upon environmental factors. Charles Perrow, in further theoretical development of the contingency concept, has developed an elaborate set of two dimensional matrices which form an analytic framework for comparing organizations. In this framework the technology variable is seen as having a prime effect on organizations since it determines the ways in which people interact to transform materials. Organization structure is considered a variable dependent upon technology and the raw material to be transformed. (i.e.; together the task to be accomplished by persons in the organization). In the Perrow framework, a technology where problems are analyzable and where few exceptions are found is labeled a “routine” form of technology. Its diametric opposite is the “non- routine” technology.

Grimes, Klein and Schull, in an empirical test of the matrix model of organization (a concept very similar to the Perrow four part descriptive model) argue persuasively that standardized, repetitive, or similar tasks and a high degree of task specialization and role specificity are found associated with the “routine” technology of the Perrow model. Unique, novel or complex tasks and personal specialization and a low level of role specificity are associated with a technology which they describe as “heuristic” and which corresponds to the “non-routine” technology of Perrow.

Grimes, et al proposed in their field study that in routine technologies, task specialization and simple bureaucratic structures would be found. In the heuristic technology, a collegial organization form is more likely: “Participative decision making, minimal positional authority, peer control and planning, and task-intrinsic satisfaction would be characteristics of this strategy.” [4, p. 14].

Partial support for the matrix model was noted. While evidence seemed fairly strong that task units were more autonomous in the heuristic than in routine technologies, the proposition that individual workers would function with more autonomy in heuristic technologies was not supported.

Main Effects: Tasks and Organization Structures

The theoretical development and empirical testing noted above leads to the proposition that a task group will respond to a task and its associated technology by adapting an appropriately complex organization structure. Routine, repetitive, non-creative tasks given to a group will result in the emergence of more complex organization forms. Less complex organization forms will emerge as groups address unique, novel, or creative tasks. Three principal dimensions of organization structural complexity drawn from the literature are used in the study: Task-role specialization, extent of bureaucratic hierarchy (organizational-role specialization), and formality

of decision making procedures. Organization Structures and Satisfaction

Robert House suggests in his Path Goal Theory of Leadership that structuring behavior by the leader can have a curvilinear relationship to member goal attainment and satisfaction. Too little structure results in ambiguity and a lack of path-goal clarity. Too much structure is redundant, and interferes with task accomplishment. The Bavelas/Guetzkow and Simon communications experiments of the 1960's found a simple negative relationship. High levels of organization structure were associated with low satisfaction, and low structure with higher satisfaction.

Non-creative tasks are likely to be simpler, more repetitious, and less intrinsically satisfying in the routine technology than the unique creative tasks assigned in the heuristic situation. The simple negative relationship between structure and satisfaction therefore seems more likely, particularly when the participants are college students and the task exposure is of short duration.

The major first order relationships to be demonstrated by the C-Tasks exercises can be summarized as follows:

1. (a) The assignment of simple, non-creative routine and repetitive tasks to a group will result in the group forming an organization that has a more complex structure. The complexity will be based on a higher degree of task and organizational role specialization, and more formalized decision making rules.
- (b) The assignment of creative, novel, unique, non- repetitive tasks to a group will result in the group forming an organization with lower levels of task and organizational role specialization and with less formal decision making rules.
2. (a) Higher levels of expressed satisfaction will be associated with situations where tasks are creative and unique and structures less complex.
- (b) Lower levels of expressed satisfaction will be associated with situations where tasks are routine and non-creative and where structure is more complex.

Second Order Effects

Several additional types of relationships can be observed as tasks are given to groups and structures begin to evolve.

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The research findings on the relationships between structure and performance and between performance and satisfaction, however, are mixed, and suggest that these relationships are weak. Significant findings, therefore, may only be observed as a number of groups complete the experimental tasks, a situation that may not arise in the normal teaching process in a given semester or for a single class.

Structure-Performance Relationships

The Perrow model and the contingency view in general suggest that for simple repetitive tasks, higher degrees of effectiveness will be found where a bureaucratic organization with highly specialized task roles and formalized decision making exists. The early experimental work by Bavelas, and later Guetzkow and Simon and others on communication patterns and group effectiveness also supports this view. Routine task performance was highest in organizations which had a "wheel" (hierarchical) organization form. Non-routine tasks, however, were performed best with an 'all channel' network in many five person experimental groups.

This evidence generally suggests that structure and performance may be positively correlated with routine tasks and negatively correlated with non-routine tasks.

Performance-Satisfaction Relationships

The job satisfaction literature is replete with discussions of the causal relationships seen between satisfaction and performance. While some would argue for the traditional satisfaction→performance arrangement [6] the empirical evidence has not supported that view, [2] and indeed now seems much more strongly supportive of the performance-satisfaction position. [8, 11]

The design used in this experiment/exercise involves the measurement of group member satisfaction immediately following the completion of a task set. A positive significant correlation between productivity and satisfaction in this exercise would support the position of Porter and Lawler that performance leads to higher levels of satisfaction.

To summarize the two second order experimental effects anticipated, we note as follows:

3. (a) A positive correlation will be found between the degree of organization complexity and performance in the routine task situation.
- (b) A negative correlation will be found between the degree of organizational complexity and performance in the non-routine, creative task situation.

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4. A positive correlation will be seen between productivity and member satisfaction in both creative and non-creative task situations.

TASK DESIGN

Short humorous creative writing assignments seemed to be a promising task for the 'non-routine' condition that would be creative, novel, and unique, but not so complex as to take more than a brief time period. Four assignments were given. Two tasks involved rhymes, one required preparing a short prose paragraph and the last required the development of a catchy acronym.

A simple repetitive and easily standardized task involving little or no creativity is that of counting. The task set selected for the "routine" condition contained three group assignments in counting specified letters on specified pages in the students' textbook. Notepaper, textbooks, and the mental resources of the group members were the only materials needed for the exercise, and were available in the classroom.

MEASUREMENTS

Productivity was measured for each task by clocking the time in minutes and seconds required for task accomplishment. A check of reported count against a verified actual count for the non-creative task and an evaluation by a three judge panel for the creative task served as quality measures. Satisfaction was measured by a standardized job satisfaction measure (Minnesota Satisfaction Questionnaire-Short Form) after the completion of an entire task set. Student observers' ratings measured the degree of structural complexity observed as the group addressed its tasks. Structural complexity was weighted by the time of duration of each degree of complexity.

PROCEDURES

The class was broken into randomly assigned five person groups. Groups were separated physically in order that they could work on tasks with a minimum of distraction, and were assigned an observer who was provided with instruction sheets and briefed on the types of structure characteristics to record. Observers were told not to disclose the characteristics they were observing, and to place themselves in a position to observe, but where their notes could not be seen by group members.

Groups were told that they would be assigned different tasks to perform, but were not told what the tasks were, nor were they told that they would eventually work on all tasks. When groups and observers were in place, the non-creative task assignments were given to half of the groups and creative tasks to the remainder. The clock was started.

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As tasks were accomplished, the administrator recorded the time, the count (if non-creative) and briefly checked the creative tasks to see that they met the minimum standards spelled out on the assignment slips. The note paper containing the creative task products was kept by the administrator for quality evaluation. When each group was finished with the first task set, they were given a 20 question satisfaction questionnaire to complete, then asked to wait for all groups to finish the first task set.

When the last group had completed the satisfaction questionnaire, the exercise was re-started. Groups were now assigned the task set which they had not completed in the first half, and the exercise proceeded exactly as it had during the first half of the period.

Quality judging and data analysis were accomplished after the completion of both task sets. During the first few minutes of the class period following the completion of the exercise the empirical results of the exercise were distributed and participants critique was requested.

RESULTS: THE EXERCISE AS EXPERIENTIAL LEARNING

As a successful experiential learning exercise, one would like to see the main effects appear on a reliable basis and demonstrate easily observable differences for even a few groups without highly refined statistical testing. Table 1 indicates that the average amount of structural complexity found in non- creative task groups is clearly higher than that found in the creative task groups. This difference is statistically significant and the pattern was seen in 12 of the 13 groups involved in the exercise. The first main effect, therefore, is readily observed in the exercise. The induction of a non- creative, routine, repetitive simple task results in the emergence of more complex organization structures.

TABLE 1
Structure, Performance and Satisfaction in
Groups Performing Creative and Non-Creative Tasks (N13)

	MAIN EFFECTS		SECONDARY EFFECTS	
	Average <u>Structure*</u>	Average <u>Satis.*</u>	<u>Structure!</u> <u>Perf. Corr.</u>	<u>Performance!</u> <u>Sat. Corr.</u>

Non-Creative Tasks	2.55	64.12	+.23 (n.s.)	+.40 (p<.10)
Creative Tasks	1.84	70.95	+.22 (n.s.)	+.42 (p<.08)

* Differences significant at $p < .001$

The second ;main effect expected was that higher satisfaction would be found where structure was lower and tasks

were more intrinsically interesting. As can be noted in Table 1, the second main effect is also clearly seen. Not only is the average satisfaction score visibly higher for creative group tasks, but the differences seen are statistically significant. The exercise seems to meet operational objectives in reliably demonstrating both main effects. Organization structure is affected by the types of tasks, and expressed satisfaction is clearly different in the two task/structure situations.

Secondary effects can be taken from data available only with repeated use of the exercise. Table 1 includes the results of Pearson correlation of group productivity (measured in completion time) and group structure scores for the 13 groups. Low and non-significant correlation coefficients are observed. The third effect which was anticipated does not appear, and apparently cannot be demonstrated with the C-Task design.

The fourth effect expected with the C-Task design was a positive correlation between performance and satisfaction. Correlation coefficients of .40($p < .10$) and .42($p < .08$) are reported for the non-creative and creative tasks respectively. Given the limited sample size and the lack of any rewards system, the results, nonetheless seem to offer tentative support to the Porter and Lawler Performance→Satisfaction model.

In the C-Tasks exercises, half of the groups are given the creative task to perform as the first task set. The other half are started on the non-creative task. The following section examines the task sequence for the 13 groups to determine if this variable produces any systematic effect on structure, performance, quality or satisfaction.

Task Order Effects

An examination of Table 2 indicates that the order of tasks given to groups seems to have no statistically significant effect on the average group structure, quality, or expressions of satisfaction for either task. Task order differences are seen in only one area of measurement: performance in the creative task. Groups assigned this task first were noticeably slower in the performance of the creative task than were the groups which performed the non-creative task as their first task.

A tentative explanation of these findings is that the structure developed in the non-creative task serves as a communication network which allows the group to re-organize itself as well as to address the network task. Without this established network, the non-creative task first groups must deal with both the ambiguity in group relationships and task structure ambiguity. These findings raise issues of consid-

erable practical Interest in considering the processes of team formation, crew training or other small group development, particularly where unified, yet creative effort is required.

RECOMMENDATIONS FOR CONTINUED USE OF C-TASKS

The C-Task exercise can be improved for experiential learning by some relatively simple changes. Quality issues are not a part of the C-Tasks design. Quality checking, however, can help to assure that groups attend to the task, and can serve as a medium for inter-group competition to heighten interest. The 3 judge quality evaluation panel is somewhat cumbersome, and could be easily replaced by a student volunteer or research assistant acting as a single quality evaluator without impairing the main effects seen in the exercise.

TABLE 2
GROUP PERFORMANCE, QUALITY, STRUCTURE, AND
SATISFACTION BY TASK ORDER GROUPINGS

Task Order	Non-Creative Tasks				Creative Tasks			
	Perf. (Compl. Time)	Avg. # Err- ors	Avg. Struc- ture	Avg. Satis.	Perf. (Compl. Time)	Qual. Rat- ing	Avg. Struc- ture	Avg. Satis.
Non-Creative Task First N=7	31.34	309.5	2.47	64.6	28.48	6.64	1.85	71.25
Creative Task First N=6	28.86	420.0	2.64	63.50	40.15	6.52	1.82	71.13
Significance of Differences	n.s.	n.s.	n.s.	n.s.	p<.05	n.s.	n.s.	n.s.

The statistical analysis of differences between groups can delay reporting and may chill student interest. Work sheets should be set up well ahead of time so that structure observations and weighting for calculation of weighted structures can be easily summarized for a quick statistical test.

The satisfaction measure used (MSQ) is lengthy and is not entirely suitable for a classroom exercise. A five question, self scoring satisfaction questionnaire, which will lend itself to easy summarization, should be used. As with structure, work sheets should be set up so that satisfaction data can be easily recorded and statistically tested. After all data is recorded on the worksheets, the instructor and a graduate assistant can readily test the data using conventional pocket calculators and simple tests (t-testing).

Several modifications might be needed for more exhaustive testing of the C-Tasks exercise as an experimental design.

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The most significant flaw appears to be the observation and evaluation of organization structure by a single student for each group. In a more carefully controlled situation, the group can be observed by a set of trained observers whose ratings would then be evaluated for reliability. A relatively non-obstructive solution is to use video tape equipment to record group interaction. The video tapes can then be viewed by a single set of trained observers to obtain consistent and reliable assessments of structure.

Finally, all groups should be exposed to the same environmental conditions and should be free to move chairs or tables to accommodate or facilitate task accomplishment. In the exercises reported here, classroom equipment prevented this movement, and since groups occupied different locations in the classroom, some groups may have been hampered by these physical constraints.

In summarizing these findings, the C-Tasks exercise seems to be a successful experiential learning device. Main effects are clearly demonstrated, and student interest and enthusiasm are sustained. Minor changes are suggested which can smooth administration.

As an experimental design, C-Tasks is quite promising. The changes which appear needed for improvement of control and measurement are relatively minor and would permit the careful examination of the dynamics of group organization structure formation under controlled conditions, but under circumstances that would not inhibit the needed atmosphere of spontaneity.

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