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TEAM COHESION EFFECTS ON BUSINESS GAME PERFORMANCE

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ABSTRACT

Numerous relationships between student team cohesion and its effects on simulated company performance were hypothesized and tested within a fairly complex business game. Cohesion was both directly and indirectly related to a team's economic effectiveness.

INTRODUCTION

Teamwork and group decision making has usually been an integral part of a business game learning environment. The reasons for this can be traced to a number of supportive factors-- complex games require more brain- power and player-power, training [n the group decision making process is essential for real-world executive success, and the group itself is an additional learning source to that already provided by the simulation's model. Given the use of teams and groups in the typical game experience, a highly cohesive work group has been accepted as a prerequisite for both high learning and high performance. Although a number of studies have been conducted regarding gaining effectiveness and the relationship between a student's aptitudes and skills and gaming success, only recent interest has been shown in the particular group processes associated with exceptional game play. This paper presents a study of the role team cohesion and its determinants play in producing a business game team's superior economic performance.

LITERATURE REVIEW

Small Group Literature

The small group literature on cohesion is vast and can only be presented in a summary fashion here. A group's cohesion can be defined in terms of the degree of attraction the group holds for the individual, and the resulting desire of the group's members to remain in the group [5]. The cohesiveness of a group therefore revolves around such factors as personal liking or mutual admiration, personal similarities, the acceptance of the group's goals and activities, satisfaction with the leadership style exercised, the decision making process employed by the group, as well as its structure and overall climate. As traced by Shaw [29], cohesiveness as a construct has embraced three sequentially different meanings in the small group literature. In the first historical meaning cohesion is based on the individual's similarity to the group's collective configuration with similarity belonging to the social and/or personality realm rather than the intellectual [10]. A second historical aspect of cohesion is involved with the group's morale or motivation level as evidenced through the use of sociometric measurements, mutual peer nominations, and least preferred co-worker selections [291 . The last aspect deals with the group's basis for coordinating and controlling its efforts through personally expressed yet psychologically-based needs for authority [27] or dominance [7; 32].

The effects of intellectual variety on cohesiveness has generated mixed results. Shaw [281 found that correlations between teams with homogeneous SAT scores and performance on four-person problem solving teams were non-significant and ranged from -.07 to .38. On the other hand, both Goldman [9] and Laughlin, Branch and Johnson [17], when using respective two and three-member college student teams, found that performance improved the most for intellectually diverse teams.

The direct relationship between a team's cohesiveness and its productivity has been more exhaustively re- searched. High cohesion groups seem to set their performance standards more easily [61 and they offer a larger cluster of rewards to their members. Shaw and Shaw [30] found that cohesive groups of second grade students learned to spell more quickly while simultaneously providing social and personal support to their members.

Similar findings have also been found in industrial settings regarding goal accomplishment [261. A problem exists, however, regarding both the optimality and the sources of the goals or norms set by self-led teams. In newly-formed groups Bettenhausen and Murnighan [2] found that five-person laboratory groups used criteria from previous settings to guide their initial behavior. As time passed, however, adjustments were made between conceptions about the situation and the results obtained. Myers [221 and Sherif [31], employing groups whose norms and behaviors had already solidified, found that intergroup competition served to raise the norms employed by the groups. Accordingly, small groups can change their performance norms in a positive direction through either experience with the situation or through competition. Unfortunately, high cohesion can also place a limit on the performance ceiling chosen by a team. As found by both Couran [13] and Leana [181, for instance, highly cohesive groups are often less self-censoring and are less objective when dealing with their teammates for fear of hurting feelings or destroying the group's delicate solidarity. Accordingly, high cohesion can increase productivity to a certain point beyond which cohesion becomes dysfunctional and subsequently serves to inhibit the group's productivity but not to a lower level than would have existed without the initial degree of cohesion.

As was implied in the previously cited work of Shaw and Shaw [30], a successful workgroup needs to concurrently satisfy the team's needs for task accomplishment and social pleasure. High cohesion supports these dual needs by efficiently responding to task performance pressures as in Back [1] and Thibaut and Strickland [33] while simultaneously self-rewarding the group internally. Employing Cattel's [3] syntality theory, highly cohesive groups are more effective because relatively little energy is required to maintain the group and therefore the group can direct most of its energy towards goal accomplishment rather than towards internal conflict, conflict management, and fence-mending.

Business Game Literature

A number of business game-based studies have included cohesion, or its assumed proxy, as a factor in game performance. Negative relationships were found in two early studies. McKenney and Dill [20] found that retained teams from a human relations course did not outperform newly-formed teams (and ones which were presumed to be less cohesive) drawn from the same human relations course when they played a game later

in an MBA program. A study be Deep, Bass and vaugrin [41 employed a similar methodology. The performance of one set of intact teams trained via a T-group experience was compared against that obtained by another set of randomly-assigned teams in the very complex Carnegie Tech Management Game. Although the T-group trained teams experienced superior ease of contact, familiarity, and mutual admiration, they did not outperform the control-group teams. Cohesion, which was measured by the degree participants wanted to retain their current team's membership, was negatively related to all measures of economic results-- profit, stock price, and planning costs.

Another recent group of studies has examined the ef- fects of team self-selection, and presumed initially high team cohesion, on game results. A study by Norris and Niebuhr [23] employed self-selected teams versus instructor assigned teams playing The Executive Game [14] for 10.0% grade credit. The self-selected teams were not superior performers although highly cohesive teams, when measured by a modified version of Sea- shore's [26] group cohesion scale, correlated $R = .52$, $p < .05$ with rate-of-return on equity after controlling for grade point average. Norris and Niebuhr concluded that the superior teams obtained cohesion over the course of the simulation's 12 decision rounds and this final cohesion was not based on criteria employed initially in each team's self-selection process.

Another study of this type by Miesing and Preble [21] used very large 12-13 member MBA teams playing The Management Game [191 in a business policy course. Self-selection was employed for five of the six firms created within the course. The two highest performing teams were the most cohesive while the lowest performing team was the least cohesive. Similar results were also obtained by Hsu [15] who created fourteen teams within Tempomatic IV [25] playing for 60.0% course grade credit. Although the self-selected teams featured better communications and the randomly-assigned teams misunderstood their own initial goals, economic performance was not related to either team assignment method employed in the study.

Two recent studies employing cohesion as a game performance factor have been conducted by Gosenpud and assorted colleagues. The first study by Gosenpud, Miesing and Milton [111 placed Business Policy course seniors on 2-5 member teams playing The Executive Came for two simulated years. Team assignment methods were not stated and only 10.0% of the course's final grade was directly related to the team's rate-of-return on equity. Although the team's cohesion was specifically measured in their study only forecasting accuracy, strategic stability, price strategy, and formal planning were significantly related to the firm's economic performance. A factor analysis based on player responses obtained at the simulation's mid-point, however, found that cohesion was a major contributor to a factor that could be labeled "Strategic Management". The following year Gosenpud, Milton and Larson [12] performed a longitudinal study within a simulated three-year run using the more complex Tempomatic IV game. Teams were instructor-assigned to insure the presence of at least one Accounting major per team and firm size was held constant at four players per firm. Game performance, which accounted for 25.0% of the Business Policy course's grade, was measured by an economic performance composite index. Although cohesion was not measured directly, many elements supportive of high group cohesion were found to be significantly related to game performance-- a group made up of non-strangers, few problems with workload distribution, everybody pulling their own weight, and belonging to a team that was enjoyable as well as constructive.

One last study should be cited as it dealt with the issue of a team's size which to some degree impacts on its ability to be cohesive. Gentry [8] found that team dissension (the opposite of cohesion) increased with the firm's size with dissension measured by the mean squared deviations in team peer ratings. Firm performance was related to the performance of the team's most talented member with dissension being in- consistently related to firm performance.

Literature Summary

Although exceptions exist, the small group literature [31] has generally found that a peer learning group facilitates academic achievement but that a heterogeneous ability grouping produces more learning than does a homogeneous grouping. Additionally, based on both self-reported and observational evidence, the group is an important source of learning as experiential group techniques produce significant knowledge level changes. A motivational factor enters the cohesion/productivity equation, however, as it has been found that sociometrically cohesive groups learn more than less cohesive groups but only when they want to learn.

From the business game literature it has been found that high team cohesion, when presumed to exist from either prior associations or self-selection, has not been related to firm performance. On the other hand, when cohesion has been directly measured either as a construct or by its elements, cohesion has been significantly related to team success. It has also been suggested that cohesion, and the basis of that cohesion, may evolve over the life-course of the team.

HYPOTHESES

The literature suggests that a team's degree of cohesiveness is positively related to its performance but that a number of personal and group dynamics factors are related to the team's ultimate level of cohesion. In a substantive fashion, it was hypothesized that a positive relationship exists between a team's cohesion and its economic performance. Although the process by which a team becomes cohesive was not examined in this study, it was hypothesized that the antecedents for team cohesion rested within the team's members in the form of similar aptitudes and achievement levels. Given the task and integrative complexity posed by the simulation, however, it is possible that an effective team must also possess effective skill diversity, mutual attraction, group effort, and effective leadership. Accordingly it was also hypothesized that high team performance was positively related to well-led functional heterogeneity.

In summary, the three following hypotheses were posed:

H_1: A positive relationship exists between a team's level of personal cohesion and its economic effectiveness.

H_2: A team's degree of personal cohesion is positively related to the degree that its members possess similar aptitude and achievement levels.

H_3: A positive relationship exists between a team's degree of accepted leadership and functional diversity and its economic effectiveness.

METHODOLOGY

Students (n 162) from four sections of a senior- level Business Policy course were randomly assigned to four or five-member teams that played 10 decision rounds of a moderately-complex [36] business game [19] for 40.0% grade credit-- an optimal amount of credit in this simulation from the perspectives of total learning and interest, and time and equitable rewards [41]. A total of 36 teams competed in six separate industries. Four class periods were devoted to a pre- game orientation, consultation for the first two decision rounds, and a post-game debriefing. Economic performance was standardized and converted into Z- scores for within and between industry comparability and was weighted in the following fashion for both game and course grade credit:

1. Total profit-- 55.0%
2. Rate-of-return on assets (ROA)-- 25.0%
3. Rate-of-return on equity (ROE)-- 20.0%

Academic aptitude and achievement was measured respectively by the student's composite SAT/ACT percentile score and all-University grade-point-average after Wolfe [35] while the measure of a team's cohesion was that employed by Deep, Bass and Vaughan [41. The following summarizes, with their literature-based justification(s), the experimental variables (X) and the output variables (Y) employed in this study:

X1 Grade homogeneity--the degree to which the team members' academic achievements are similar [9;171; the team's mean squared deviation in grades [8].

X2 Aptitude homogeneity--the degree to which the team members' aptitudes are similar [28]; the team's mean squared deviation in SAT/ACT percentile scores [8].

X3 Dominant team skill--the degree to which one academic major dominates the team's composition regardless of the degree to which ft is expressed [381.

X4 Mutual attraction--the degree of mutual, reciprocated personal attraction existing on the team [10]; the percent of current team members identified as being held in high esteem.

X5 Accepted leadership--the degree to which the team feels one person leads the team [l;33]; independent nomination of the same person as leader.

X6 Skill heterogeneity--heterogeneous functional skills [38]; the number of different academic majors on the team.

X7 Academic achievement--high academic achievement [34;35]; the team's mean University grade-point-average.

X8 High grade achiever--high individual grade achievement [8;35;38]; the grade-point-average of the highest academic achiever.

X9 Group effort--high group-oriented performance [6;30]; the mean hours the team worked on its average decision round.

Xl0 Leader contribution--task-oriented leadership [1; 33]; the accepted leader's team-perceived contribution to the team's economic performance.

Yl Cohesion--the extent the current team would choose the same personnel for a similar game experience [4]; standardized to conform to the standardized output measures employed in Y2.

Y2 Performance--the team's economic performance; the team's weighted total profits, and rates- of-return on assets and equity; standardized after Scheffe [241.

Y3 Hi/Lo cohesion--a split-half version of the standardized team cohesion socres.

Y4 Hi/Lo performance--a split-half version of the standardized team performance scores.

RESULTS

H_1 stated that a positive relationship should exist between a team's cohesion and its economic effectiveness. Table 1 presents Pearson pair-wise correlations between all variables employed in this study. Cohesion (Y1) was correlated with economic effectiveness (Y2) at the $p < .05$ level. Turning to H_2 it was hypothesized that personal cohesion was positively related to similar team aptitudes and achievement levels. As shown in Table 1 cohesion was strongly related to the similarity of the team's cumulative grade-point-averages (X1) but not to aptitude homogeneity (X2). Viewed another way, however, Table 2 presents a discriminant analysis for dichotomized cohesion (Column 1) where leader contribution (X10) was the most important contributor to a very accurate discriminant function followed closely by grade homogeneity (X1) as a discriminating variable.

H_3 hypothesized that an effective team needed functional diversity operating within a team coordinated by an accepted leader. Table 1 found that neither accepted leadership (X5), the leader's economic contribution to the team (X10), or skill heterogeneity (X6) correlated with a team's dichotomized performance (Y4). Tested another way, Table 2 shows that the discriminant function for dichotomized performance (Column 2) lists the hypothesized variables X5, X6, and X10 in the last, seventh, and ninth positions with aptitude homogeneity (X2), group effort (X9), and high grade achiever (X8) being the most discriminating variables when classifying teams as being low performers.

DISCUSSION

Given the relatively large number of variables employed in this study a few additional observations can be made about the antecedents and results of a team's cohesion. Regarding cohesion's antecedents, only grade homogeneity and the leader's contribution to the team related directly to cohesion while other normally cited factors, such as mutual attraction, a dominant skill area, or similar aptitudes, were not significantly related to cohesion. The variable labeled mutual attraction (X4) proved to be very interesting in its operation. Players seemed to be attracted to those who had similar grade- point-averages, and this attraction was also related to the amount of time the players spent together, as well as making the team more cohesive (Y4). Unfortunately, this mutual attraction only served to make the team less economically effective. It appears that teams may either maximize their internally-controlled social rewards or engage in nominal or superficially pleasing personal relationships without dealing with the externally-derived and less controllable task demands created

TABLE 1

PEARSON CORRELATION COEFFICIENTS

Variable	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	Y1	Y2	Y3
Y4 Hi/Lo performance	.01	.25	-.10	-.27[c]	.05	.07	.26[a]	.26	-.35[a]	.00	.29[a]	.82[c]	.29[a]
Y3 Hi/Lo cohesion	.31[a]	.04	.11	.34[b]	-.04	.12	.01	.01	-.14	.40[c]	.85[c]	.26[a]	
Y2 Performance	-.01	.34[b]	-.16	0.23	-.06	.20	.12	.19	-.37[b]	-.08	.32[b]		
Y1 Cohesion	.41[c]	.17	.11	.11	-.22	.06	-.01	.05	-.10	.49[c]			
X10 Leader contribution	.53[c]	-.09	.18	.71[c]	.03	-.20	.01	.03	.40[b]				
X9 Group effort	.35[a]	-.32[c]	-.00	.35[a]	.11	.01	.01	.03					
X8 High grade achiever	.48[c]	.01	.10	.11	.04	-.12	.70[c]						
X7 Academic achievement	.02	-.02	-.06	.11	.16	.02							
X6 Skill heterogeneity	-.19	.06	-.84[c]	-.07	.05								
X5 Accepted leadership	-.13	.14	-.09	-.15									
X4 Mutual attraction	.47[c]	-.10	.04										
X3 Dominant team skill	.26	-.01											
X2 Aptitude homogeneity	-.09												
X1 Grade homogeneity	1.00												

[a] $p < .10$
[b] $p < .05$
[c] $p < .01$

by the simulation. This conjecture runs counter to the organizational development literature which believes that team socialization is a basic necessity for high productivity and therefore must exist before the team's task demands can be satisfied. Preliminary findings by Wolfe and Bowen [37] indicate that prior socialization through T-group training gives task teams an initial economic advantage but that this advantage is only temporary. Over the long term, the prior-socialized teams fared no better in their task although they evidenced and expressed higher morale, mutual trust, and feelings of self worth.

Of additional note is the existence of three variables which bore no significant relationship to either the team's performance or its cohesion. Having a recognized leader, diverse skills, or one bright "star" on the team did not appear to have a positive effect on the team's performance although the low performance discriminant function found the high grade achiever variable (X8) to be a relatively powerful discriminator. This is unusual as one could reason that a team might pick its brightest star by either design or de- fault to be its recognized leader, or that the fairly complex and diverse business game employed in this study would require a team possessing a heterogeneous skill base that was held together by a strong leader. Despite the number of nonsignificant relationships found, however, four factors with eigenvalues exceeding 1.00 emerged from the study. Table 3 displays the results of a factor analysis using VARIMAX rotation where within-factor loadings greater than .50 have been marked with an asterisk. The first factor could be labeled "Teamwork" as it loaded most highly on mutual attraction, the leader's contribution, and cohesion. Factor 2 could be labeled "Team Skill" as it loaded on skill heterogeneity and dominant team skills. Factors 3 and 4 could be respectively labeled "Academic Ability" and "Academic Similarity". Based on these factors, business game play entails teamwork, academic achievement, and the existence of clearly-defined academic disciplines.

TABLE 2

DISCRIMINANT ANALYSIS: POOLED WITHIN-GROUP CORRELATIONS AND CLASSIFICATION ACCURACY

High Cohesion		Low Performance	
Variable Order	Correlation	Variable Order	Correlation
X1	.29529	X8	-.37443
X10	.28062	X9	.36765
X4	.20062	X7	-.31694
X6	.18462	X2	-.28398
X2	.16956	X4	.24606
X9	-.15256	X3	.11324
X3	.11042	X6	-.08149
X5	-.05599	X1	-.06447
X7	-.03373	X10	-.05850
X8	-.03225	X5	-.05131
88.8% Accurate		85.2% Accurate	

CONCLUSION

At a most elementary level it was found that cohesion was positively related to a team's economic performance. The antecedents of cohesion are less clear. One antecedent, similar academic achievement, was related to a team's level of cohesion, but similar academic majors and similar aptitudes were not related to a team's cohesiveness. The role of leadership, while not examined in all its dimensions, was also problematical. One analysis found that the economic contribution of the team's leader was related to its cohesiveness but that accepted leadership was related to low team performance. More important than cohesion itself, research should be conducted on how teams become cohesive in an evolutionary or longitudinal sense and whether the more economically productive cohesion-building process emanates from a task or social basis.

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TABLE 3

FACTOR ANALYSIS

Variable	Factor 1	Factor 2	Factor 3	Factor 4
X1 Grade homogeneity	.46136	-.14550	.14851	.81899*
X2 Aptitude homogeneity	-.03545	.01316	-.01246	-.02048
X3 Dominant team skill	.07685	.84098*	-.03356	.12682
X4 Mutual attraction	.74559*	-.01669	.08822	.13073
X5 Accepted leadership	-.04010	.06719	.15745	-.18630
X6 Skill heterogeneity	-.04014	.99232*	-.03703	-.01533
X7 Academic achievement	.11879	.04678	.87845*	-.18231
X8 High grade achiever	-.02507	-.09410	.89342*	.43173
X9 Group effort	.31251	.09740	.02142	.16479
X10 Leader contribution	.89729*	-.14338	.01779	.08332
Y1 Cohesion	.65303*	.03514	-.08145	.23729
Y2 Performance	-.00900	.14672	.13937	.08352

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