INDIVIDUAL AND ORGANIZATIONAL LEARNING IN A TOP MANAGEMENT GAME

Joseph Wolfe
Experiential Adventures LLC
jwolfe8125@aol.com

Guy Deloach
Tourou University
gdeloach@skydancercorp.com

ABSTRACT

A wide variety of methods have been used to assess the validity of a business game experience. This paper employed Choo's (1998) theory of the knowing organization to judge the efficacy of a strategic management-type game. A contiguous three-part organizational learning system comprised of knowledge creation, environmental sense making and actionable decision making was used in a before/after research design. All companies increased their knowledge levels as decision-making groups. Within each team learning levels were uneven. The firms with the greatest learning gains were the most profitable. A top-performing company was one that had at least one high-performing player and a high average knowledge level. The group was also superior at mobilizing the knowledge it possessed and in applying that knowledge to the challenges presented by the game they played.

INTRODUCTION

When participants engage in a computer-facilitated business game they live in a completely simulated environment. This is because they never walk through the factories they run. Also they never handle the products they sell nor do they face the human resources they hire and fire. Instead they make decisions about their situation. This means the typical business game has its players operate in a knowledge-use and knowledge-acquisition mode. This requires the reception and handling of information about their company and its industry. Thus the basis for evaluating a business game's value or teaching effectiveness can rest on the degree to which its players improve on their ability to create, process and apply knowledge to the useful ends required by the game.

Looking at today's business world it has been recognized that a real-world organization's ability to learn, or become "knowing" about its situation, is essential for its survival and growth. Firms competing in the 19th, and much into the 20th century achieved their competitive advantage through the management of tangible assets such as inventory, property, plant, and equipment (Chandler, 1990). By the end of the 20th century, however, the typical firm's competitive advantage has come from acquiring and controlling intangible assets. In 1982 62.0 percent of an industrial firm's market value resided in its tangible assets. Ten years later these assets amounted to only 38.0 percent (Blair, 1995) of all assets. By the 20th century's end this ratio had fallen even further (Webber, 2000). Clearly today's managers operate in a decision-making world that has shifted from managing tangible assets to one that emphasizes the management of those that are intangible.

Because of this real-world reality a sophisticated business game may be the ideal learning application. This is because everything a game presents to its participants is intangible and the team's success depends on its information processing abilities and its ability to learn from its actions (Wenzler & Chartier, 1999). The only real assets a game team possesses are of a cognitive and intellectual nature and those are the assets an organization must have if it is going to be a successful organizational learner. A business game's management team can only be as good as the skills, experiences and motivational levels it possessed at the game's beginning or later acquired based on its play of the game. Using the organizational learning model a successful team will be one that had high initial knowledge, recognized what it did not know, and then proceeded to acquire what had to be known and then applied this knowledge to the game's challenges.

This paper presents a study of companies in a business game to see if they (1) evinced the attributes that allow an organization to become knowing, (2) manifested both individual and organizational learning, and (3) exhibited a positive relationship between organizational learning levels and company economic performance. If these results are obtained a new basis for judging business gaming effectiveness has been created thereby confirming that a business game can be used for teaching and illustrating the need for creating organizations that can learn from their experiences.

BACKGROUND AND KEY CONCEPTS

It has become *au courant* in academic circles to advance the concept of the learning organization. This idea has been expressed in the form of Toffler's "Third Wave" (1980), Senge's "Fifth Discipline" (1990) or Argyris' "Organizational Learning" (1992). As revelationary as all these efforts sound the concept that the firm must act as a sensing and responding organism dates as far back as the 1960s in Cyert and March's (1963) *A Behavioral Theory of the Firm.* Further, the label "organizational learning" itself did not come from the mind of Chris Argyris but instead came from the world of business games. It was coined by Cangelosi and Dill (1966) when they described the existence of

progressively more-sophisticated decision-making behaviors by teams playing *The Carnegie Tech Game* (Cohen, Dill, Kuehn & Winters, 1964). They observed that companies went through four organizational learning phases, with each phase associated with the team's goal structure, the bases for their decisions, the decision-making processes used and the structure employed for bringing about their decisions.

Others have also noted the existence of phases or learning stages in games. Gosenpud & Wolfe (1990) tape recorded one company's series of decisions for ten decision rounds using *The Business Management Laboratory* (Jensen & Cherrington, 1977). They discerned three developmental stages. The first was one where the firm's members organized and oriented themselves, set goals and attempted to understand the simulation's parameters. The second stage employed a more-thorough analysis of the firm's position while creating a set of prioritized and integrated goals. The team's last stage found the firms finding satisfaction with the way it was performing. At this stage operations became routinized and impersonal. The existence of learning stages has also been observed by Wolfe (1976), Gosen & Washbush (2004) and Peach & Platt (1990).

The studies cited thus far have explained company learning behavior but in a *post hoc* fashion. Rather than determining if learning has occurred after the fact, Choo (1998) has developed a contemporaneous and diagnostic theory of organizational learning. In his theory three areas work together to facilitate the organization's needs for learning and innovation. The firm's decision makers first engage in Sense Making. At this stage shared meanings and perceived threats and opportunities arise based on beliefs and interpretations of what is being signaled by the environment. Based on these beliefs an awareness of a gap in the knowledge needed to either remedy the situation or capitalize on the opportunities offered by the environment. If there is a sensed need the firm engages in Knowledge Making. Here the company imports knowledge or culls what is needed internally from those in the management group. Once this step has been completed the firm has closed the knowledge gap and now has a new set of capabilities with which to deal with the perceived situation. This now leads to Decision Making where the firm takes action and engages in successful, goal-directed adaptive behavior.

While this scenario has illustrated a positive result, such is not always the case with those who play a business game or engage in the real world of business. Organizational learning *can* come about by chance but it is better obtained if it is done as the consequence of rational and deliberate group actions (Kululanga, Edum-Fotwe & McCaffer, 2001). Student teams are staffed with members who have been thrown together in some artificial fashion. They are also placed in important roles which they are unaccustomed to playing. This makes it difficult for them to construct rational learning systems. The group's dynamics and personalities can also distort what is sensed by the group. Because of this it is difficult for the team to assess what must be done early in the game if it is going to achieve long-term success.

The (1998) model can do much to explain what happens in a business game. Accordingly this resource-based view of the strategic management of a firm will be used to test various propositions regarding how organizational learning is brought about via sense making, knowledge making and decision making.

HYPOTHESES TESTED

The background information and literature review suggests the testing of the following hypotheses, stated in their positive form. The hypotheses are also stated as organizational level tests as this is a study of organizational learning and how well the management group's intellectual resources were mobilized and acquired if a knowledge gap was discerned.

H_4: Game teams will evidence increased Organizational Learning.

The first three hypotheses tested whether the elements that theoretically lead to organizational learning changed during the business game used in this study. The fourth hypothesis tested for the existence of overall organizational learning. The fifth hypothesis has been introduced to address in a new fashion the conflicting findings on the validity of a business game experience. Easterby-Smith (1997) has observed that a defining characteristic of the strategic management field is its belief there is a relationship between the degree the firm learns from its experiences and the profit it can obtain. Accordingly, if this same relationship exists in this experimental situation there is proof that the most profitable teams are the ones that (1) learn or change the most, or (2) did the best job of applying what they knew as a group to the situation (Bierly, Kessler & Christensen, 2000). In either case business gaming's validity will have been evidenced.

METHODOLOGY

Junior and senior-level business school students (n = 84) in four strategic planning courses played *The Global Business Game* (Wolfe, 2003) for 12 simulated business quarters. All students had completed the university's core business curriculum. They played the game for 10.0% of the course's grade based on their company's economic performance. An additional 10.0% of their grade was based on their teammates' evaluation of their contribution to their company's performance. The subjects were randomly placed on 6-member teams in two separate but economically identical industries. Industries A and B contained eight and six respective companies in competition with each other in their own industries.

The game was played in its most complex version. Play began after the players and game teams had received six weeks of course instruction consisting of lectures and case studies. Six countries could be entered into, additional factories and distribution channels could be created and all economic factors changed in a normal, real-world fashion. Table 1 indicates the study group's characteristics after eliminating three players who did not complete the course. Each industry's participants were statistically identical regarding their grade-point-averages, ages and the proportions of their business school majors. Industry B, however, had a higher proportion of male students than female students ($p = .03$, one-tail test). An examination of the demographics associated with the three students who did not complete the course indicated their loss had no statistical impact on the population's beginning demographics.

TABLE1
STUDY GROUP DEMOGRAPHICS

Demographic	Industry		Significance
	A	B	
Male	68.8%	86.1%	0.03[a]
Female	31.3%	13.9%	
Age	22.52	22.06	n.s.
Grade Point Average	3.00	3.19	n.s.
Majors:			
Business Administration Science	83.3%	75.0%	
Business Administration Arts	2.8%	6.3%	
Masters in Classroom Teaching	2.8%	0.0%	n.s.
Accounting Science	5.6%	10.4%	
Computer Information Systems Science	5.6%	8.3%	

[a]One-tail test.

TABLE 2
ECONOMIC PERFORMANCE BY INDUSTRY

Average End-Game Performance	Industry		Significance
	A	B	
ROA	.32%	1.06%	n.s.
ROE	7.71%	1.34%	n.s.
E.P.S.	$0.063	$0.063	n.s.
Earnings (000,000)	$6.99	-$0.31	n.s.
High Earnings (000,000)	$20.38	$19.56	n.s.
Low Earnings (000,000)	-$10.28	-$13.88	n.s.

This study adopted Choo's (1998, xii) definition of learning and its behavioral result in a business game where a new level of understanding and application is brought about "…by converting and combining the expertise and know-how of their members." When this is successful the business game team can be innovative and can expand its firm's capabilities and earnings. In developing his theory Choo (1998) conducted structured, on-site interviews. The instrument used in this study was created by Hansen (2004) for an empirical test of Choo's (1998) organizational learning model. The instrument contained seven-degree Likert-type questions made up of three subscales that operationalized Choo's (1998) constructs of Sense Making, Knowledge Making and Decision Making. The resulting 30-item instrument was acceptable in terms of convergent validity as all Cronbach alpha values were at or above 0.71 (Sense Making Cronbach alpha = 0.85; Knowledge Making alpha = 0.89; Decision Making alpha = 0.71). The Sense Making subscale possessed 13 items, the Knowledge Making subscale had 11, and the Decision Making subscale had 6 measures. The summary "Organizational Learning" score for each management team was obtained by taking the weighted average of the instrument's three subscales. The instrument was administered in class after two rounds of play for player familiarization with the game and its demands and immediately after the competition had ended.

The study's statistical treatment entailed both parametric and non-parametric statistics. Although an examination of Table 2 indicates there was no statistically significant differences in the economic outcomes associated with each industry a conservative, non-parametric approach was used which used ranked data by industry. Therefore the rank test Spearman *rho* was used to examine correlations between company organizational learning measures and economic performance. Parametric measures were used in all other tests.

RESULTS

Hypotheses 1-4 were tested using parametric t-tests of significance. As shown in Table 3 significant improvements occurred in the group's Sense Making, Knowledge Making and Decision Making skill levels and awarenesses. Because of these improvements Organizational Learning occurred. In the area of Sense Making teams became more attuned to their industry's competitive situation as well as being more open about the perception of threats and opportunities. In Knowledge Making companies realized there were various short-falls in what they knew but they also saw that a certain degree of knowledge was hidden and available from within the group. Regarding Decision Making firms became more aggressive in making changes to their (1) product mixes, (2) factory and marketing operations and (3) company strategies.

TABLE 3

SCORE CHANGES

Average Construct Score	Game Period	
	Early	End
Sense Making	4.39	4.66[b]
Knowledge Making	4.31	4.93[c]
Decision Making	4.42	4.62[a]
Organizational Learning	4.37	4.75[c]

[a]Significant at the .05 level, one-tail test.
[b]Significant at the .01 level, one-tail test.
[c]Significant p < .001, one tail test.

Hypothesis 5 examined the degree that organizational learning was related to firm economic success. The Spearman *rho*s by industry presented in Table 4 show there were significant and strong correlations between each of the supporting organizational learning constructs, as well as with Organizational Learning itself. Thus, the fifth hypothesis was accepted that high organizational learning is association with high economic performance with the constructs of Sense Making, Knowledge Making and Decision Making all contributing to the creation of more-knowing companies.

TABLE 4
COMPANY ENDING LEARNING MEASURES VS. COMPANY PERFORMANCE

Construct	Industry	
	A	B
Sense Making	.85[b]	.83[a]
Knowledge Making	.88[b]	.99[b]
Decision Making	.71[a]	.91[a]
Organizational Learning	.89[b]	.83[a]

[a]Significant at the .05 level, one-tail test.
[b]Significant at the .01 level, one-tail test.

The fifth hypothesis was tested further by examining the degree to which a team's scores improved over time. This is because those using a business game for teaching purposes are more interested in improving the student's knowledge level rather than merely rewarding what is already known. Table 5 presents company percents of score improvement by subscale, organizational learning and company earnings. In the case for both industries the major contributor to organizational learning came from increases in Knowledge Making rather than in Sense Making or Decision Making.

TABLE 5
COMPANY SCORE IMPROVEMENT VS. COMPANY PERFORMANCE

Construct	Industry	
	A	B
Sense Making	.55	.66
Knowledge Making	.67[a]	.90[b]
Decision Making	.29	-.49
Organizational Learning	.65[a]	.93[b]

[a]Significant at the .05 level, one-tail test.
[b]Significant at the .01 level, one-tail test.

DISCUSSION

Measuring learning, and what can or should be measured when attempting to establish the teaching ability of management games, has plagued the field for many years (Feinstein & Cannon, 2002; Gosen & Washbush, 2004). When measuring a team's learning performance based on its economic results the major question has become-- did the higher-performing teams do better because they learned more from the game's embedded teaching lessons, or did they learn the game's playing rules better? If it is the latter case the participants "gamed the game" rather than learning its more-basic lessons. Certainly luck, or a propitious assortment of players within a team, has a role in determining the firm's results (Bacon, Stewart & Anderson, 2001). And feelings run the gamut regarding group learning experiences (Feichtner & Davis, 1985; Hergert & Hergert, 1990; Pfaff & Huddleston, 2003) and the perceived value of a business game experience (Cabell, 1974; Dittrich, 1977; Georges & Romme, 2004; Miles, Biggs &. Schubert, 1986; Remus, 1977; Rollier, 1992; Summers & Boyd, 1985; Teach & Govahi, 1988). But still, what are the keys to a firm's success given the overall value of group learning experiences. And to what degree is that success tied to learning a particular course's academic content which was the real reason the game was chosen as a teaching device.

A further examination of player questionnaire scores was conducted to determine the learning levels obtained by individual students rather than the average of their management teams. Although this paper embraced the concept that the firm operates as a single-minded behavioral entity bent on survival, companies in reality are collections of individuals that more or less work together. Such is also the case within teams in business games based on their level of cohesiveness (Wolfe & McCoy, 2008). Strategic management's purpose is to bring about a unification of effort but such is not always the case. Those who have used learning groups have noted that not all in the group are able to learn. This is because of their psychological or social makeup (Sanders & Yanouzas, 1985). Others become marginalized and are not vital to the firm's success (Dill & Doppelt, 1963; Etzion & Segev, 1984), while others are habitual "loafers" and "free riders" who reap the benefits of the work of others (Joyce, 1999; Latane, Williams & Harkins, 1979; Strong & Anderson, 1990).

Significance of differences tests were conducted on the scores each player obtained by construct and Organizational Learning. In conducting these tests three outcomes were possible— the student's score could be either significantly lower, statistically the same, or significantly higher. If the score was

significantly lower the student either knew less than before playing the game, or was confused about what was known. If there was no statistically significant change it could be construed that knowledge was not gained or lost. Only if a statistically higher score was obtained could one assume learning had occurred. Table 6 indicates there were significant differences Before/After learning score results. No students knew less when the game was over but a nonsignificant number improved there Sense Making and Decision Making scores.

TABLE 6
LEARNING SCORE RESULTS
BY CONSTRUCT

Construct	Learning Score Results*		
	Lower	Neutral	Higher
Sense Making	)	79	5
Knowledge Making	)	59	25
Decision Making	)	83	1

*Chi-square <.001.

Based on these results the game was effective only at teaching Knowledge Making as 29.8% of this construct's scores improved.

The results presented in Table 6 also indicate that any learning had to be attributed to the improved performance of relatively few individuals. If this is true construct knowledge gains were unequal within the game's companies. It also means the high correlations between a team's amount of learning and its economic performance came from having at least one high-scoring player and/or very few low-scoring players who did not drag down the team. Given the large team sizes used in this study it is likely Gentry's (1980) observation that large-sized teams, although they can become burdened by administrative affairs, also have an increased probability of inheriting an outstanding, ambitious player. The effects of high scoring and low scoring players, as well as within-team variances in knowledge levels, are presented in Table 7 as related to economic performance.

TABLE 7
LEARNING LEVEL RELATIONSHIPS WITH
FIRM EARNINGS BY INDUSTRY

Construct	Individual Score				Team	
	High		Low		Variance	
	A	B	A	B	A	B
Sense Making	-.05	.00	.11	.44	-.19	.77
Knowledge Making	.88[b]	.90[a]	.90[b]	.70	.69[a]	.43
Decision Making	.74[b]	.85[b]	.90[b]	.55	-.29	.81

[a]Significant at the .05 level, one-tail test.
[b]Significant at the .01 level, one-tail test.

The importance of having a high-scoring player on a team was significant in both Industries A and B for the Knowledge Making and Decision Making constructs. The importance of having a high floor on the team's knowledge, in the form of the poorest-scoring player having a relatively high score, was significant in Industry A and nearly significant in Industry B. In all cases the Sense Making construct had no significant relationship to the company's performance. This is a strange result within the Choo (1998) schema as it is through sense making that the company begins its educational process. This result, however may not fault Choo's (1998) framework but instead may be due to the nature of the simulation, or other simulations of its type. Wolfe and Castroviovanni (2006) found players in the same simulation used in this study did not pay particular attention to their firm's environment. Instead they concentrated on their decision making practices and the management of their internal affairs. Because of this it was concluded game-based laboratory research on the firm's ecology should not be performed and instead suggested group dynamics studies of the type presented here might be productive.

The last area presented in Table 7 dealt with each firm's within-team variance in knowledge scores. Supposedly, as a result of the sense making process and the application of a strategic vision, the firm becomes more homogenous regarding what it sees, what it thinks it knows and what it should do. Accordingly a high within-company variance in construct scores would indicate a lack of cohesiveness as the firm's members differ widely in their outlooks. While none of the correlations in Table 7 were significant, the correlations in Industry B approach significance and the *rho*s have a positive sign which indicates wide ranges in knowledge scores are associated with high earnings. Further research should be conducted to determine if this diversity reflects the availability of useful, alternative perspectives or a disquieting, negative effect on team productivity.

SUMMARY AND CONCLUSIONS

This paper has taken a systems resource perspective by examining a business game team's store of knowledge, whether already available from previous coursework or concurrent with the game itself. Because the study's game was housed in a strategic management course, and the ostensible purpose of the game was to facilitate the learning and application of strategic management concepts, the resource-based model suggests teams in such games need to mobilize their talents for knowledge acquisition. It was found game firms increased in their ability to increase their knowledge and enact their decisions although they did not increase their ability to make sense of their firm's environment. In total, organizational learning occurred and this learning was positively and significantly related to company earnings.

The ideal, productive team was one that had (1) high levels of those elements that made for organizational learning, (2) at least one player who scored high on those elements and (3) a relatively high-performing worst team member. This combination led to the creation of a company that obtained superior learning increases and these increases were associated with superior earnings. Further studies should be conducted using other relatively complex simulations to determine if these results are unique to *The Global Business Game.* Other research should be conducted using simpler games to see if the same, or comparable results could be obtained. If so, less class time may have to be spent by instructors and players to achieve the same learning benefits. Additional research should also be carried out with different student populations and instructors to determine this study's external validity.

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