

Developments In Business Simulation & Experiential Exercises, Volume 22,1995

ARE GOOD SIMULATION PERFORMERS CONSISTENTLY GOOD?

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ABSTRACT

The present study examines the relationship between simulation team performance over two rounds of play in the same simulation game but under changed environmental and competitive conditions. The rigorously controlled experiment involving 555 students on 161 teams found a medium to strong relationship (correlation of .4419, significant at .000) between rank order performance in one round of the simulation competition versus rank order performance in the second round of the competition. It was concluded from this finding that simulation performance is relatively stable over time and that good performers will tend to remain good performers and poor performers will tend to remain poor performers.

INTRODUCTION

Every instructor using simulation games for any period of time has probably heard poor performing students complain that luck, rather than skill, accounts for the performance of the leading companies in the competition. While luck may play a part in any simulation competition, if simulation games are a meaningful educational experience, skill must be the most important factor in explaining good performance. This study seeks to provide some academic research on this topic and to support the notion that good performance in simulations is not solely the result of luck.

Past research has examined the relationship between student performance in simulation competitions and a wide range of variables. Among the variables examined have been numerous personality characteristics, locus of team control, achievement motivation, previous academic performance, time pressure, ethnic origin of team members, gender, team size, previous business experience, team organizational structure, method of team formation, and grade weighting (see for example Anderson and Lawton 1992, Brenenstuhl and Badgett 1977; Butler and Parasuraman 1977; Chisholm, Krishnakuman and Clay 1980; Edge and Remus 1984; Faria 1986; Gentry 1980; Gosenpud 1989; Gosenpud and Miesing 1992, Hergert and Hergert 1990; Hsu 1984; Moorhead, Brenenstuhl and Catalanello 1980; Newgren, Stair and Kuehn 1980; Patz 1990; Roderick 1984; Walker 1979; Washbush 1992, Wheatley, Anthony and Maddox 1988; and Wolfe, Bowen and Roberts 1989). Summarizing much of the past research have been major review articles by Greenlaw and Wyman (1973), Keys (1976), Wolfe (1985), Miles, Biggs and Shubert

(1986), Wolfe and Keys (1990) and Randel, Morris, Wetzel and Whitehall (1992).

The present study examines whether good simulation performance is repeatable and thus attributable to the differing skills and abilities between simulation teams as opposed to being due to some element of luck. This represents an issue not previously covered by any reported simulation research.

LITERATURE REVIEW

While no previous research has specifically addressed the issue reported in this paper, several related areas of research on factors that might explain good performance in a simulation competition will be discussed. For example, it is possible that good students will consistently outperform poor students. To test this, a number of studies have examined the relationship between grade point average (GPA) and simulation performance. While several studies have reported a positive relationship to exist (Hsu 1989, Wolfe and Keys 1990, and Wolfe and Chanin 1993) many others have found no such relationship to exist (Faria 1986, Gosenpud 1987, Gosenpud and Washbush 1991, Norris and Niebuhr 1980 and Wellington and Faria 1992).

Learning is another obvious factor that might lead to good simulation performance and several studies have examined the relationship between simulation performance and learning. Learning is generally measured by performance on end of course examinations. While two studies have reported a relationship between simulation performance and performance on mathematical problems (Faria and Whiteley 1989 and Whiteley and Faria 1990), many more studies report no relationship between superior simulation game performance and performance on course final examinations (Anderson and Lawton 1992, Washbush and Gosenpud 1993, Wellington and Faria 1991, and Whiteley 1993).

A number of studies have examined and compared the personality traits of successful simulation game players and successful business executives (Babb, Leslie and VanSlyke 1966, Gray 1972, McKinney and Dill 1966, Vance and Gray 1967, and VanSlyke 1964). These studies have generally shown that the characteristics of successful game players conform to those of

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successful business executives. Additional studies have examined the decision-making styles of successful simulation participants and successful business executives (Babb and Eisgruber 1966 and Wolfe 1976). These studies have reported the decision-making styles of successful executives and game players to be similar.

Several longitudinal studies have been undertaken in which a student's business game performance is compared to some measure of subsequent business career success (e.g., number of promotions, job title, salary level, number of salary increases, management level in the company hierarchy, etc.). Good simulation performance might suggest something about an individual's managerial skills and, hence, serve as a predictor of later career success. One early longitudinal study (Norris and Snyder 1982) did not find a correlation between business game performance and later career success but two more recent, and more comprehensive, studies have reported such a correlation (Wolfe and Roberts 1986 and Wolfe and Roberts 1993).

Four studies have reported that successful business simulation game firms practice strategic management (Gosenpud, Miesing and Milton 1984, Gosenpud and Wolfe 1988, Miesing 1982, and Wolfe and Chanin 1993). In these studies, strategic management was considered to exist when the simulation team developed clear goals, analyzed the external environment in which they were operating, understood their strengths and weaknesses, developed clear strategies as part of a formal plan, monitored their performance, and took corrective action when needed.

PURPOSE AND HYPOTHESES

Past research has suggested that good simulation performance might be related to student grade point average, student learning in the simulation competition, the personality characteristics of the simulation participants, the decision-making style of the participants, or the degree of formal planning of the superior performing teams. As well, several longitudinal studies have suggested that good simulation performers will be more successful in later business careers. If any, or all, of the above is true, this would suggest that good simulation performers should be consistently good over time in repeated simulation competitions.

The purpose of the present study is to determine whether, in fact, good simulation game performers are consistently good. That is, in separate simulation competitions, will good performing teams continue to perform well even under conditions in which the simulation environment and competition have changed?

No past research has examined this issue.

Based on the findings from previous research and, where previous research is lacking, based on what would seem to be intuitively logical, the following hypotheses have been formulated for testing purposes.

- H1: In a second round of a simulation competition, teams exhibiting higher rank order performance in the first round of the competition will outperform teams exhibiting lower rank order performance.
- H2: Performance in one round of a simulation competition will be related to performance in the second round of a simulation competition.

METHODOLOGY

The subjects for the research to be reported here were 555 students in four sections of a principles of marketing course. All four sections were taught by the same instructor, used the same textbook, viewed the same videos, and took common multiple choice midterm and final exams. The simulation game used was

LAPTOP:

A Marketing Simulation (Faria and Dickinson 1987), a simulation game specifically developed for use in introductory marketing courses. Students were divided into teams of three or four players. In total, 161 simulation teams divided into 28 industries of six teams each completed the simulation exercise. Several teams dropped out of the course/simulation competition after the competition had started. In these cases the decisions of these "missing" teams were made by the computer, which used an average composite of all of the current decisions of the teams in the industry. This meant that the computer decisions were within "industry" averages and maintained some "industry" rationale but had no other particular strategy behind them.

In all sections of the course, fourteen decisions were made in the simulation competition and the simulation game counted towards 25 percent of the students' final grade. The simulation game was divided into two rounds of seven decisions. In each round, teams made a trial decision, followed by six performance decisions. After the first round of seven decisions, the teams were randomly reassigned to industries with the constraint that each industry had to have a representative round one performer at each rank. Specifically, each round two six team industry was composed of round one finishers who ranked first, second, third, fourth, fifth and sixth.

LAPTOP is a simulation game, which provides for adjustments in the game parameters to allow for varying

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simulation environments. It was felt that in order to weed luck from skill, a change in the simulation environment in round two from round one would be made so that teams would have to adapt their decision-making and not carry on with the same strategies that were successful in the first round. As a further change, randomly reassigning teams to different industries would mean facing different competitors with potentially different decision-making styles and strategies.

In addition to making decisions in the simulation competition, the teams were required to set sales and earnings objectives. Furthermore, as individuals, the students were required to complete a self-report attitude survey to be submitted with each decision. Among other things, the attitude survey measured time spent making each decision; expected team ranking at the end of the competition; team cohesiveness (4 item scale, mean alpha reliability = .9092); simulation enjoyment (3 item scale, mean alpha reliability = .8922); simulation learning rating relative to lectures, cases, and readings (3 item scale, mean alpha reliability = .9074); perceived appropriateness of the simulation evaluation method being used; the degree to which the students felt that their simulation performance reflected their managerial abilities; and a rating of each group member's contribution to the simulation. Each student's overall grade point average was also obtained from university records. Finally, simulation performance was measured in four ways: (1) final team ranking within the industry (from first to sixth place), (2) final team ranking collapsed into three categories (good performers [industry ranking of first or second], medium performers [ranking of third or fourth], and poor performers [ranking of fifth or sixth]), (3) cumulative earnings per share, and (4) a relative earnings measure termed the EPS gap.

H₁ was tested with ANOVA using round one rank order performance and collapsed rank order performance as factor variables versus the four performance variables of round two rank order performance, collapsed rank order performance, cumulative earnings per share, and relative earnings per share as measured by the EPS gap.

H₂ was tested using simple bivariate correlation between the round one cumulative performance versus the round two cumulative performance on actual rankings, collapsed rankings, cumulative earnings per share and relative earnings per share as measured by the EPS gap.

The use of a collapsed ranking measure was instituted because LAPTOP, like most simulations, can produce wide variations in earnings from industry to industry. It was felt that uncovering

differences between good and poor simulation teams might require a broader measure to describe good, medium and poor performance but still be based on rankings. Further, there may be little actual difference between a first and second place, third and fourth place, or fifth and sixth place industry ranking position.

FINDINGS

The overall findings from the ANOVA and correlation analyses are reported in Tables 1 and 2. The findings would support the acceptance of both H₁ and H₂. To test H₁, the simulation teams were divided into six rank order groups based on their order of finish (from first to sixth) in the first round of the competition. A collapsed set of three rankings, good performers (first or second), medium performers (third or fourth), and poor performers (fifth or sixth) was also used. The significant ANOVA results reported in Table 1 would lend support to H₁. Teams that were highly ranked in the first round of the simulation competition generally outperformed less highly ranked teams in the second round of the competition. The collapsed ranking data provides the strongest support for the acceptance of H₁ since the findings are significant and the relationships are transitive for all categories. The property of transitive relationships has exceptions for the cumulative earnings and the earnings per share gap for the six rank order analysis. However, the lack of transitivity may be explained by the fact that the simulation competition encompassed 28 industries allowing for wide variations in cumulative earnings per share and earnings per share gaps from industry to industry. The fact that the rank data is significant and holds its transitive nature is the main basis of support for this hypothesis.

H₂ examined the relationship between performance in the first and second rounds of the competition. The findings from the bivariate correlation analysis indicate that round two simulation performance is related to round one simulation performance although the strength of the relationship is only medium to strong ($r > .3$ but $< .5$, Cohen and Cohen 1983, p. 61).

In order to determine if there were any differences between individuals on good performing teams (finished first or second in both rounds of the competition) and individuals on poor performing teams (finished fifth or sixth in both rounds), a t-test was conducted comparing attitudes toward the simulation exercise, time spent making decisions, simulation performance expectations, team cohesiveness, and grade point average. A comparison of midterm and final examination scores was also undertaken. These findings are reported in Table 3.

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The findings reported indicate that there was no significant differences between the good and poor performers with respect to grade point average or team cohesiveness. However, good performers did spend more time on their simulation decisions and,

simulation, and perceived educational benefit of the simulation.

DISCUSSION AND CONCLUSIONS

The research reported here sought to examine how consistent team

**TABLE 1.A
RESULTS OF ANOVA TESTS OF H1 BY
PERFORMANCE RANKS**

Round 2 Performance Measures					
Round 1 Rankings	N	Mean Round 2 Ranking	Mean Round 2 Collapsed Rank	Mean Round 2 EPS	Mean Round 2 EPS GAP
1	28	2.25	1.36	66.51	22.16
2	28	3.11	1.79	62.53	29.21
3	27	3.15	1.81	66.35	23.92
4	26	3.50	2.03	56.37	33.35
5	25	4.36	2.44	34.77	55.23
6	27	4.52	2.48	38.58	51.24
ANOVA Results					
Total N	161		161	161	161
df	5		5	5	5
F Value	8.086		9.26	4.22	4.43
Significance	.0000		.0000	.0013	.0008

**TABLE 1.B
RESULTS OF ANOVA TESTS OF H1 BY COLLAPSED
PERFORMANCE RANKS**

Round 2 Performance Measures					
Round 1 Collapsed Rankings	N	Mean Round 2 Ranking	Mean Round 2 Collapsed Rank	Mean Round 2 EPS	Mean Round 2 EPS GAP
1	56	2.67	1.57	64.52	25.69
2	53	3.32	1.92	61.46	28.55
3	52	4.44	2.46	36.75	53.16
ANOVA Results					
Total N	161		161	161	161
df	2		2	2	2
F Value	17.451		19.732	9.967	10.274
Significance	.0000		.0000	.0001	.0001

**TABLE 2
CORRELATION RESULTS BETWEEN ROUND 1 AND
ROUND 2 PERFORMANCE MEASURES**

Performance Variables	N	Correlation	Sig.	Power of Test
Rankings - Rnd 1 vs 2	161	.4419	.000	> .995
Collapsed Rank - Rnd 1 vs 2	161	.4439	.000	> .995
EPS - Rnd 1 vs 2	161	.2728	.000	.780*
EPS Gap - Rnd 1 vs 2	161	.2869	.000	.840
Rnd 1 Rank vs Rnd 1 EPS	161	-.6598	.000	> .995
Rnd 1 Rank vs Rnd 2 EPS	161	-.3061	.000	.900
Rnd 1 Rank vs Rnd 2 EPS Gap	161	-.3129	.000	.900
Rnd 1 Rank vs Rnd 2 Collapsed	161	-.4670	.000	> .995
Rnd 2 Rank vs Rnd 2 EPS	161	-.6834	.000	> .995
Rnd 2 Rank vs Rnd 1 EPS	161	-.3298	.000	.900
Rnd 2 Rank vs Rnd 1 EPS Gap	161	-.3486	.000	.900
Rnd 2 Rank vs Rnd 1 Collapsed	161	-.4202	.000	> .995

* Power < conventional .80 (Cohen and Cohen 1983, p. 162)

by the end of the competition, were more accurate in achieving their reported objectives. At the end of both rounds of the competition, poor performers had decidedly different attitudes as to expected finishing position, belief that their simulation performance reflected their managerial ability, enjoyment of the

**TABLE 3
A T-TEST COMPARISON OF INDIVIDUAL
CHARACTERISTICS AND ATTITUDES OF MEMBERS OF
GOOD AND POOR PERFORMING TEAMS**

Variable	Good Performers	N	Poor Performers	N	T	Sig.
Compared to Other Learning						
Beginning	2.77	89	2.90	68	-.67	.503
Round 1 Ending	2.38	90	3.13	68	-3.41	.001**
Round 2 Ending	2.32	90	3.48	66	-4.88	.000**
Appropriateness of Evaluation						
Beginning	3.00	89	2.76	68	1.17	.243
Round 1 Ending	2.43	90	3.25	68	-3.26	.001**
Round 2 Ending	2.38	90	3.98	66	-5.70	.000**
Reflects Managerial Ability						
Beginning	3.02	89	3.14	68	-.55	.581
Round 1 Ending	2.25	90	3.57	68	-4.94	.000**
Round 2 Ending	2.12	90	3.91	68	-6.61	.000**
Simulation Enjoyment						
Beginning	2.32	89	2.45	68	-.73	.466
Round 1 Ending	2.13	90	2.81	68	-3.45	.001**
Round 2 Ending	2.18	90	3.20	66	-4.36	.000**
Team Cohesiveness						
Beginning	1.97	89	1.74	68	1.53	.128
Round 1 Ending	1.69	90	1.66	68	.27	.784
Round 2 Ending	1.68	90	2.02	66	-1.67	.099*
Expected Finishing Rank						
Beginning	2.16	86	2.07	66	.53	.600
Round 1 Ending	1.25	90	4.46	66	-17.74	.000**
Round 2 Ending	1.18	90	4.86	65	-20.85	.000**
Time Devoted To Decision						
Beginning	152.55	84	125.17	63	1.87	.063*
Round 1 Ending	95.24	83	52.53	67	3.06	.003**
Round 2 Ending	76.20	88	50.00	61	2.76	.007**
Objective Achievement						
Beginning	64.64	92	63.67	68	.23	.815
Round 1 Ending	86.72	92	68.05	68	5.44	.000**
Round 2 Ending	80.58	92	72.75	68	2.73	.007**
Grade Point Average	6.96	89	6.83	68	.36	.718
Midterm Examination Grade	13.85	92	15.89	68	-4.68	.000**
Final Examination Grade	28.20	91	31.13	68	-3.66	.000**
Simulation Grade	22.68	92	16.45	68	28.74	.000**

** significant difference < .05
* marginally significant difference < .10

performance would be over two rounds of a simulation competition. The findings indicate a medium-to-strong relationship between rank order performance in one round of simulation play versus a second round ($r = .4419$). The conclusion that the relationship is medium-to-strong is based on Cohen and Cohen (1983, p. 61) who state that according to convention in psychological investigations, strong effect sizes are ones where $r = .5$ while medium effect sizes have an r of approximately $.3$.

This research supports the notion that simulation performance shows some consistency over time. Good decision-making ability carries over from competition to competition, as does poor decision-making or managerial ability. With respect to antecedent characteristics of "good decision-makers versus "poor" decision makers, the findings seem to indicate that as far as grade point averages, beginning attitudes toward the simulation exercise, and team cohesiveness, there were no significant differences. As such, these indicators cannot be relied upon to identify good decision-makers.

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Over time, the attitudes of good and poor performers changed, good performers enjoyed the competition more and poor performers less, but this is to be expected. Further, this attitude change is a reflection of the simulation results and not a characteristic that the participants brought to the competition.

Based on the findings from this research, it would seem that good simulation performers are consistently good and, as such, good simulation performance can be attributed to factors other than luck. As suggested by the learning, decision-making style, and later career success research described earlier, good performing simulation participants do have a skill or decision-making approach that consistently separates them from poor performers. As well, if good simulation performers are consistently good over time, there is every reason to believe that these good performers will also become more successful business managers as suggested by the research of Wolfe and Roberts (1986 and 1993).

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