ONE MORE TIME:
OVERALL DOMINANCE IN TOTAL ENTERPRISE SIMULATION PERFORMANCE

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ABSTRACT

The results presented here confirm, once again,that small samples of full-time student undergraduates in a capstone total enterprise (TE) simulation will show a pattern of performance where the dominant teams at the end on the competition will have established and maintained an early lead. Second, combined samples of full-time student undergraduates, *a fortiori*, will show a pattern of total enterprise simulation performance where the dominant teams at the end of the competition will have established and maintained an early lead. These findings present both opportunities and problems for TE simulation users.

INTRODUCTION

Previous studies (Patz, 1992, 1999a) reported overall dominance in total enterprise (TE) simulation performance using MICROMATIC (Scott & Strickland, 1985), the Multinational Management Game (Edge, Keys & Remus, 1985), the Business Strategy Game (Thompson & Stappenbeck, 1997,1998), and CORPORATION (Smith & Golden, 1989). That is, the performance leads of the top teams were established early and maintained throughout the various competitions.

On the other hand, J. Gosenpud and J. B. Washbush (personal communication, March 18, 1999) report never having observed this phenomenon in their TE studies. In addition, reviews of the Patz (1999a) paper implied that such performance patterns are of little interest.

Therefore, the purpose of this study is twofold. The first one is to demonstrate the existence and consistency of this phenomenon over numerous competitions. The second one is to begin a discussion of its implications for future users of TE simulations.

Hypotheses

Focusing on the first purpose, the hypotheses to be tested are obvious (the BBAs abbreviation refers to undergraduates rather than MBAs):

H1: Small samples of full-time student BBAs will show a pattern of TE simulation performance where the dominant teams at the end of the competition will have established and maintained an early lead.

H2: Combined samples of full-time student BBAs, *a fortiori*, will show a pattern of TE simulation performance where the dominant teams at the end of the competition will have established and maintained an early lead.

Also, as noted earlier (Patz, 1995), it is sometimes important to distinguish between full-time employed and full-time student samples. A failure to do so may lead to spurious results (Gosenpud & Washbush, 1996).

Method

A TE simulation was conducted in ten sections of an undergraduate, capstone policy course over a period of five semesters. Each section formed an independent industry, and a total of 420 students participated. All students were seniors majoring in the various fields of business administration. The Business Strategy Game was used in all sections, and the number of teams in each section is noted in Table 1. Furthermore, each team was self-selected.

Simulation Procedures

After one class session devoted to the clarification of simulation rules, evaluation procedures, and decision-making mechanics, a two-year practice decision sequence was completed. Questions pertaining to the results of each session were answered, and the evaluation procedure was restated. That is, students were reminded that the cumulative scores at the end of the simulation were the figures of merit.

The importance placed on ending cumulative scores rather than current period results emphasized long- rather than short-term strategies. Moreover, attention was direction to three specific conditions. First, the actual ending period of the simulation would remain unknown. (Each period is a year in the Business Strategy Game, and the length of the semester allowed for a maximum of ten periods of play.) Second, all teams were expected to end their management tenure with a going concern, not a firm stripped of long term potential in order to gain short-term ranking enhancements. Third, 20% of the semester grade for the course depended on ending cumulative score rankings.

Decisions were due at specific times, processed by the simulation model, and the results were available to participating teams with two days. This allowed five days before the next set of decisions, required on a weekly basis.

The participants were privy to the algorithm that determines cumulative scores in the simulation. These scores depended upon how each team's cumulative results compared with the leading team's results on each of six dimensions: sales revenue, total profit or earnings per share (EPS was used in all cases), return on equity, bond rating, stock value, and strategy rating. The percentage weights, respectively, were 5, 15, 20, 20, 20, and 20.

For example, if the cumulative sales of the leading team are 100, and the second place team's cumulative sales are 80, then the second place team's score on that dimension is (80/100)(5) or 4 where 5 is the above percentage weight assigned to sales revenue. Each team received a weekly (one year) summary of their year and game-to-date results, and prepared their next decisions based upon these statistics and a vast amount of other date provided the Business Strategy Game participant program.

RESULTS

Single factor, repeated measure analysis of variance statistics (Myers, 1972) are summarized in Table 1 for each of the ten individual industries. The single factor, of course, is the set of teams in each industry sorted by finishing position after seven decisions into top, middle, and last groups. (See Table 2 for a listing of these groups by industry.)

In all industries, except Industry 6, the F ratio is statistically significant. That is, the top groups attained and maintained an early lead over the middle ones; likewise, the middle groups attained and maintained an early lead over the last ones.

Graphically, these results are shown in Figures 1, 2, and 3 for Industries 1, 6, and 10. Note that even in Industry 6, the same trend has developed by Year 5. No doubt, continuation of the competition beyond Year 7 also would have led to a statistically significant result. As it is, the ratio for Industry 6 is $F = .0765$ ($p < .1$).

Similarly, for Industry 10, the basic pattern is not established until Year 6. Nevertheless, the F ratio is significant due to the consistent performance deterioration of the last groups. In short, hypothesis **H1** is confirmed.

A parallel three-factor, repeated measure analysis of variance for the entire sample reaches the same conclusion. These results are summarized in Table 3 and Figure 4. This time the factors are:

A = Semester (1 through 5)

B = Industry Within Each Semester (1 and 2)

C = Finishing Position (Top Groups, Middle Groups, and Last Groups)

Notice in Table 3 that the only statistically significant result is for Finishing Position ($F = 19.7761$, $p < .0001$). Not one interaction is significant. In the combined sample, the top teams at the end of the competition established and maintained an early lead. This confirms hypothesis **H2**, and Figure 4 contains the graph of this result.

DISCUSSION

Once again, these results are not spurious. They have been demonstrated repeatedly using different simulations and different populations. Full-time employed BBAs and MBAs exhibit the same results, as do full-time student BBAs. Dominant teams at the end of a TE competition will have established and maintained an early lead.

Problems

All of this raises several key issues. First, why bother with a semester long competition when the final results can be predicted after a few trials? Second, are there flaws in the algorithms that drive these simulations, flaws that prohibit the recovery of teams with poor early performance? Third, what, if any, learning occurs after a few trials? This last question can be asked for all teams—top as well as mediocre and poor performers.

If the answers to these three questions are:

1. Don't' bother.
2. Yes, there are.
3. None!

then there are serious consequences regarding the use of TE simulations in Business Policy and Strategy courses. Their main utility would be experiential, exposing students to the milieu of general management. Any consideration of their use as a graded exercise would be questionable.

Supposing that these predictable performance patterns are a result of the algorithms that drive TE simulations, other questions arise regarding the use of standard economic theory (Carlson & Perloff, 1994) in the design of TE simulations. Generally, the TE simulation design follows that assumption that the structure of an industry determines its processes which, in turn, determines its performance.

More complicated assumptions are (1) structure, process, and performance interact rather than exist in the simple linear Structure→Process→Performance pattern (Patz, 1999b), (2) at least the structure of an industry is an open system (Patz, 1987), and (3) both of the first two alternatives are true.

Regarding the third problem, learning, this is still a basic mystery regarding TE simulations (Gosenpud, Washbush, Patz, Scott, Wolfe & Cotter, 1999). Other than measuring how well students understand the rules of any game, how to input decisions, and whether or not they understand the results, TE simulation learning remains an elusive concept.

Opportunities

Elusive or not, it is a basic and major challenge for TE simulation researchers. As noted in another article (Patz, Keys & Cannon, 1998):

Pedagogical research is aimed at producing results–not at advancing the current fashionable and almost always fleeting notions of an elite at a local university or editorial staff at a widely distributed journal. Moreover, the production of results in academic and actual business circumstances requires a far greater understanding of human information

processing and decision making, group and organizational dynamics, and market forces than we now have in our leading textbooks. As the famous psychologist, Kurt Lewin, noted many years ago, "If you want to understand something, try to change it."

Learning results, of course, are central to the mission of TE simulations. Results such as those reported here are repeatable, consistent over a wide range of conditions, and lend themselves to basic learning research.

The construction of almost any TE design that would reverse these findings would be a first step. Without any theoretical guidance, this will be a hit and miss process at first. But, the existence of at least two paradigms that produce opposite results would provide the necessary beginnings.
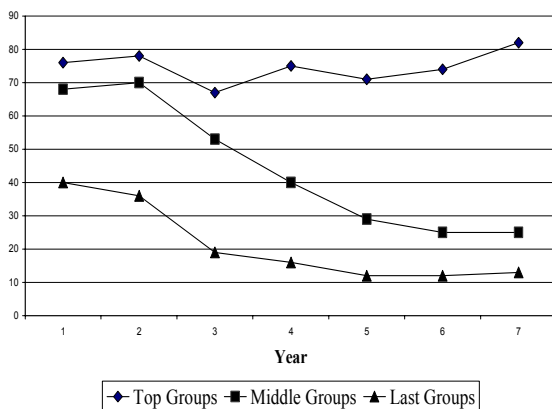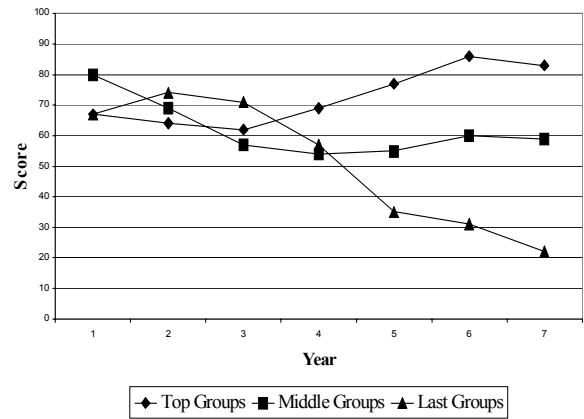
FIGURE 2
INDUSTRY 6

FIGURE 3
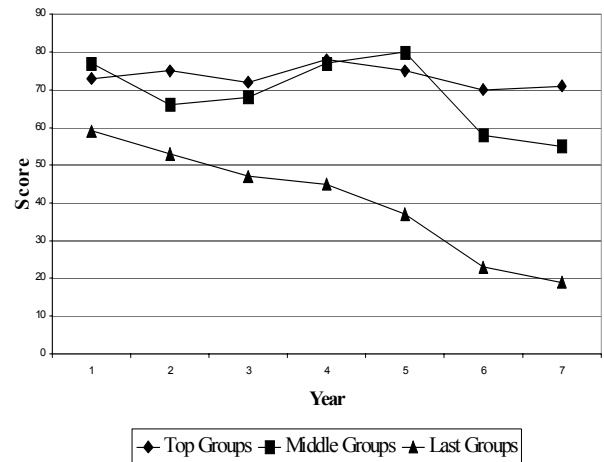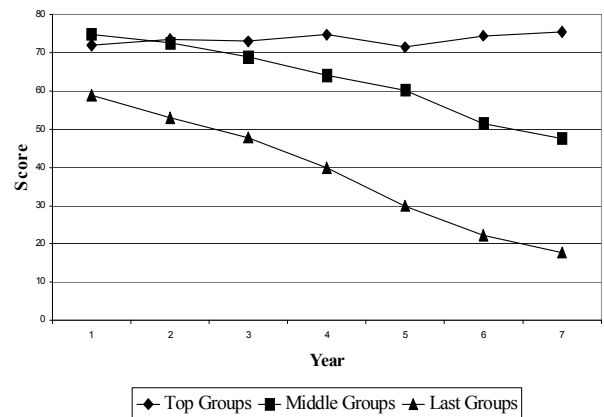**INDUSTRY 10**

FIGURE 1
INDUSTRY 1

FIGURE 4
ALL INDUSTRIES

REFERENCES

Edge, A. G., Keys, B., & Remus, W. E. (1985). *The Multinational Management Game* (2nd ed.). Plano, TX: Business Publications, Inc.

Carlton, D. W., & Perloff, J. M. (1994). (2nd ed.) *Modern industria organization.*Reading, MA: Addison-Wesley.

Gosenpud, J., & Washbush, J. B. (1996). Total enterprise simulation performance as a function of Myers-Briggs personality type.*Simulation & Gaming*, 27 (2), 184-205.

Gosenpud, J., Washbush, J. B., Patz, A. L., Scott, T. W., Wolfe, J. A., & Cotter, R. (1999). A test bank for measuring total enterprise simulation learning. *Developments in Business Simulation and Experiential Exercises*, 26, 82-92.

Keys, B., Edge, A. G., & Wells, R. A. (1991). *The Multinational Management Game* (3rd ed. Homewood, IL: Irwin.

Myers, J. L. (1972). *Fundamentals of experimental design*. (2nd ed.) Boston: Allyn and Bacon.

Patz, A. L. (1987) Open system simulation and simulation based research. *Developments in Business Simulation & Experiential Exercises,* 14, 160-165.

Patz, A. L. (1992). Personality bias in total enterprise simulations. *Simulation &Gaming*, 23(1), 45-76.

Patz, A. L. (1995). Revisiting personality bias in total enterprise simulations.*Developments in Business Simulation & Experiential Exercises*, 22, 24-30.

Patz, A. L. (1999a). Overall dominance in total enterprise simulation performance *Developments in Business Simulation & Experiential Exercises,* 26, 115-116.

Patz, A. L. (1999b). A linear programming approach to open system total enterprise simulations. *Simulation & Gaming*, in review.

Patz, A. L., Keys, J. G., & Cannon, H. M. (1998). Back from the future: An ABSEL "Merlin" exercise for the year 2005. *Simulation & Gaming, i*n review.

Scott, T. W., & Strickland, A. J., III (1985). *MICROMATIC*. Palo Alto, CA: Houghton-Mifflin.

Smith, J. R., & Golden, P. A. (1989). *CORPORATION*. Englewood Cliffs, NJ: Prentice-Hall.

Thompson, A. A., & Stappenbeck, G. J. (1997). *The Business Strategy Game* (4th ed). Homewood, IL.: Irwin.

Thompson, A. A., & Stappenbeck, G. J. (1998). *The Business Strategy Game* (5th ed Homewood, IL.: Irwin