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TOTAL ENTERPRISE SIMULATION WINNERS AND LOSERS: A PRELIMINARY STUDY

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ABSTRACT

Thirty industry studies have shown that total enterprise (TE) simulations have a built-in bias. That is, the dominant teams at the end of a competition will have established and maintained an early lead. This is the case for both undergraduates ((BBAs) and graduates (MBAs). The results reported here are the beginnings of an extended study that compares the performance results of first and last place teams in 18 industries and 160 teams. A well-known TE simulation was used in all cases with identical scoring procedures and market economies. Preliminary results indicate that pricing and production capacity decisions are not as important as strategic ones: product line, quality, service, brand image, overall low cost, market share leadership, superior value, and market coverage.

INTRODUCTION

Previous studies (Patz, 1992, 1999, 2000) have shown that total enterprise (TE) simulations have a built-in bias such that the dominant teams at the end of a competition have established and maintained an early lead. This is the case for the TE simulations employed in the studies (Keys, Edge, & Wells, 1991; Scott & Strickland, 1985; Thompson & Stappenbeck, 1997). Given the consistency of these results, interesting questions arise concerning the competitive behavior of the first and last place teams, ignoring all others. Are there large, noticeable differences among them? If not, what accounts for the huge performance differences?

One place to begin, of course, is with standard economic theory (Carlson & Perloff, 1994) where profit, π, is equal to price, p, times the quantity sold, q, minus the cost of production, c(q). That is, $\pi = pq - c(q)$. Using production capacity as a surrogate for c(q) takes depreciation into account along with the other manufacturing costs that affect profits in most TE simulations.

In short, all other things being equal, if a firm's prices are too high relative to its industry, and its production capacity is too low, again relative to its industry, its profits and overall performance results will suffer. These considerations lead to the two preliminary hypotheses investigated in this study. That is:

H1: Compared to last place teams in a TE competition, first place teams do not price significantly above industry average prices.

H2: Compared to last place teams in a TE competition, first place teams will have sufficient production capacity, compared with industry averages, to meet market demand.

Other factors will be considered in future analyses. This one compares the first and last place teams in two industries competing with a well-known multinational TE simulation (Thompson & Stappenbeck, 1999). The results show that overall strategy is more important than pricing or production capacity.

METHOD

A TE simulation was conducted in 18 sections of an undergraduate, capstone policy course over a period of nine semesters. Each section formed an independent industry, and a total of 414 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.

Table 1
Data Sources

Business Strategy Game	Semester	Industry	Firms
Fall 1997	1	A1	9
		2	9
Spring 1998	2	B1	9
		2	9
Summer 1998	3	C1	7
		2	10
Fall 1998	4	D1	8
		2	8
Spring 1999	5	E1	8
		2	9
Fall 1999	6	F1	10
		2	10
Spring 2000	7	G1	10
		2	10
Summer 2000	8	H1	7
		2	10
Fall 2000	9	I1	9
		2	8
Totals		18	160

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.

SIMULATION SCORING

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

Key results of this study, using semester H for industries 1 and 2 noted in Table 1, are shown in Figures 1 to 5. The plots in Figures 1 through 4 show the differences from industry price and capacity averages for first place (W) and last place (L) teams. *Figure 5 plots the absolute average strategy scores for industries 1 and 2.* The price and capacity abbreviations indicate the following:

NA(W) = North American Winners
EU(W) = European Winners
AS(W) = Asian Winners
NA(L) = North American Losers
EU(L) = European Losers
AS(L) = Asian Losers

(The Business Strategy Game in a multinational TE simulation competed in North America, Europe, and Asia using American dollars, Euro-dollars, and Japanese yen.)

In industry 1, there are no pricing differences between the first place (W) teams and the last place (L) teams (F = 1.05, p = .4393). Likewise, there are no production capacity differences (F = 0.15, p = .9986). These results are graphed in Figures 1 and 2.

In industry 2, the pricing differences are significant (F = 6.53, $p < .0001$), but the production capacity differences are not (F = .44, p = .9196). See Figures 3 and 4. The first place (W) firms low price points appear to exacerbate the condition of the last place (L) ones. In short, hypotheses **H1** and **H2** are not supported.

More important, when considering the overall strategy ratings used in the Business Simulation Game, the differences are enormous, as shown in Figure 5. The differences between first place (W) and last place (L) teams in both industries yields an F-ratio of 16.16 and a probability of $p < .0001$ (see Table 2).

As shown in Figure 5, the last place teams appear to appreciate the importance of this factor in the last year. But, the recognition is too little, too late. Product line, quality, brand image, overall low cost, market share leadership, superior value, and market coverage do make a difference.

DISCUSSION AND FUTURE RESEARCH

These results, of course, are preliminary and the entire 18-industry study of first place and last place competitors needs to be completed. Two points, however, are worth further notice.

First, TE simulations can be designed, where the importance of the usual profit equation, $\pi = pq - c(q)$, in a complex multinational environment, does not exceed the importance of other strategic variables in overall performance success. Second, it appears that learning occurs in firms that do not recognize initially the importance of non-price and capacity influence on performance. Figure 5, at least at this stage of research, leaves no doubt concerning this observation.

Of course, several other points need to be addressed. Among these are the relevance of routine $\pi = pq - c(q)$ models (Patz, 2000) in simulation designs. Given the past record of predictive success (Harrison, 1999), there is no reason to believe that simple or even complex economic models are a useful guide to decision making.

Figure 1. Industry 1 - Price Deviations

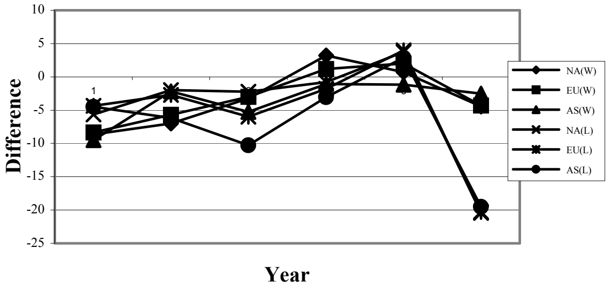


Figure 2. Industry 1-Capacity Deviations

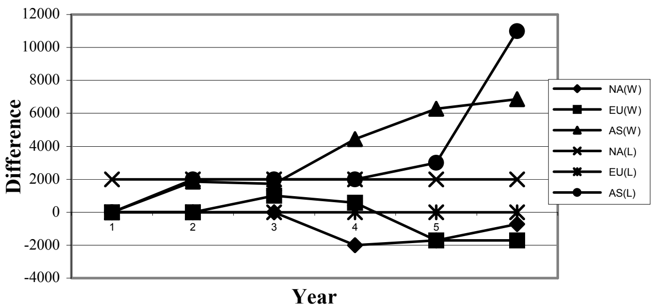


Table 2

Strategy Analysis of Variance Summary Table

Source	SS	df	MS	F	p
Between Ss	0.1667	3	0.0555		
Within Ss	78081	44			
Between Groups	65855	11	5989	16.16	<.0001
Error	12227	33	371		
Total	78082	47			

Second, the information society—as the industrial society before it—has enhanced standards of living beyond any past predictions. The key point of this phenomenon for TE simulation designers is to reach beyond their paradigms and design programs that challenge the imaginations of competition participants. There is no reason to complain about the current costs and minimal rewards associated with continuing current designs.

Last, behavioral research—such as the results reported here—are necessary to validate the TE simulation design purposes. Learning can be measured, but TE simulations need to be designed with the learning purpose as paramount.

Figure 3. Industry 2 - Price Deviations

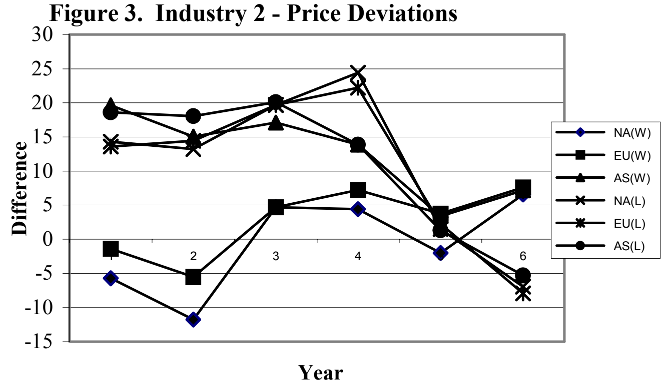


Figure 4. Industry 2 - Capacity Deviations

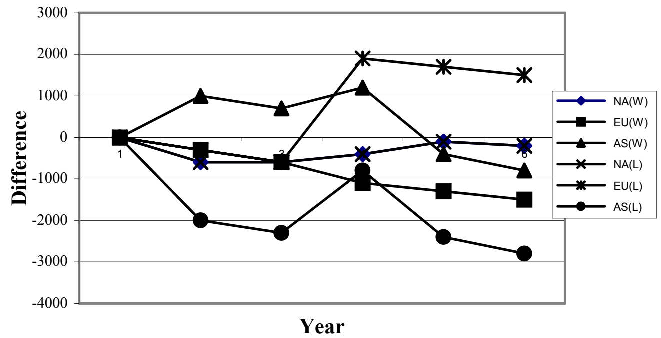
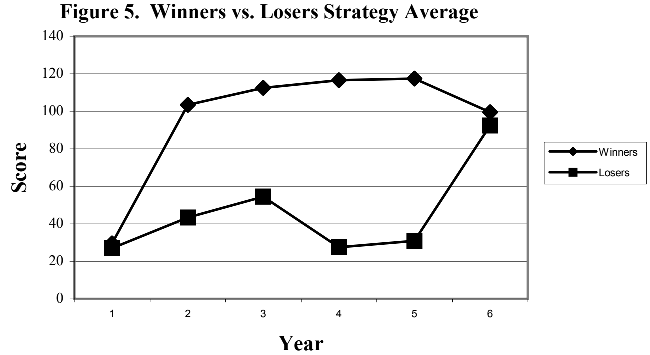


Figure 5. Winners vs. Losers Strategy Average



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