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GROUP PERSONALITY COMPOSITION AND TOTAL ENTERPRISE SIMULATION PERFORMANCE

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ABSTRACT

Evidence is presented suggesting that total enterprise (TE) simulations are biased. They favor teams with members characterized by intuitive information processing and thinking decision-making styles as measured by the Myers-Briggs Type Indicator (MBTI) instrument. The dominance of such teams extends from an early competitive lead to an overall superior performance. These results, if consistent over TE simulations and participant populations, necessitate reconsideration's of why TE simulations are used, how they may become more flexible, and how they may be integrated with well-established information processing and decision making concepts. Among these concepts, ones suggested for future research, are the amount of information processed and the number of alternatives considered before rendering a complete TE decision.

INTRODUCTION

The purpose of this study is to examine some of the relationships between dominant personality types and group performance in a competitive total enterprise (TE) simulation previous studies at the individual level of analysis (Patz, 1988, 1989) summarize the principal integrative or cognitive patterns of undergraduates and MBAs in TE simulation environments. However, the performance measures are student attitudes toward the capstone policy course, not competitive results.

Furthermore, these cognitive patterns are general models. Each one was derived by averaging over a large sample, and their key use is in the design of capstone courses that kindle broad general management interests. They are not intended to deal with specific effects on simulation performance, but they do suggest the basic notion behind this research. That is, some cognitive patterns may be more efficient than others in dealing with the information processing and decision making problems common to TE simulation environments.

Myers-Briggs Type Theory

Information processing and decision making, of course, are central concepts in the Myers-Briggs adaptation of Jung's (1971) personality theory (Myers & McCaulley, 1985). More important, the Myers-Briggs Type Indicator (MBTI) instrument, provides a dominance model of an individual's information processing and decision making preferences. Most important, dominance model patterns within a group can be related easily to cumulative TE simulation performance scores.

Individual dominance models are derived from the four dichotomous individual preferences identified by the MBTI--attitudes, perception (information processing) functions, judgment (decision-making) functions, and the style of dealing with the outside world. Attitudes are concerned with:

1. Extraversion (E). People who tend to focus on the Outer world of people and things.

2. Introversion (I). People who focus more on their inner world of concepts and ideas.

The key perception and judgment functions represent an individual's orientation to consciousness. Perception is dichotomized into;

1. Sensing (S). People who prefer to work with what is "given" in the here-and-now, and thus become more realistic and practical.

2. Intuition (N). People who prefer to deal with meanings, relationships, and possibilities that go beyond the sensory information.

Likewise, judgment is divided into:

1. Thinking (I). People who prefer to make decisions on the basis of cause and effect, by analyzing and weighing the evidence.

2. Feeling (F). People who prefer to make decisions by relying primarily on personal and social values.

Last, whether or not people are basically extraverts or introverts, the style of dealing with the outside world is indicated by:

1. Judging (J). People who prefer to live in a planned, orderly way, wanting to regulate life and control it.

2. Perceiving (P). People who prefer to live in a flexible, spontaneous way, gathering information and keeping options open.

These four dichotomous dimensions--El, SN, TF, and JP--translate into 16 basic types such as ENTJ or ISFP where the fourth type letter, J or P, points to an individual's dominant and auxiliary perception and judgment functions. Tertiary and inferior perception and judgment functions are the opposite of the auxiliary and dominant functions respectively.

An ending J always points to the third letter of the four-letter type description, and an ending P always points to the second letter. The main difference Is between extraverts and introverts. For an extravert, the ending J or P points to the dominant function, and the other function is auxiliary. For an introvert, the ending J or P points to the auxiliary function, and the other one is dominant.

Consider, for example, the ENTJ and ISFP types just mentioned. For the ENTJ extravert, J points to T as the dominant function and N as the auxiliary. Sensing, 5, the opposite of the auxiliary N, is the tertiary. Feeling, F, the opposite of the dominant T, is the inferior.

For the ISFP introvert$_1$ P points to S as the auxiliary function with feeling, F, dominant. Thus, intuition, N, the opposite of 5, is the tertiary function, and thinking, T, is inferior.

Therefore, the dominance pattern of the ENTJ's perception (information processing) and judgment (decision-making) functions is TNSF. Likewise, the ISFP's dominance pattern for information processing and decision making is FSNT. In other words, the four letter type designations dealing with all four preferences are reduced to an ordering of the two dichotomous information processing and decision-making preferences.

For an extravert, the dominant preference is what the world sees. The supporting auxiliary, tertiary, and inferior preferences are introverted. For an introvert, the auxiliary preference, supported by the tertiary and inferior ones, is what the world sees. The dominant one i& introverted.

Hypotheses

Myers-Briggs theory goes beyond these basic statements, but a wore complete exposition is not required for the purposes of this paper. IC is sufficient to recognize that a dominance ordering or model refers to an individual's information processing and decision making, or perception and judgment, preferences when dealing with the outside world.

In particular, several TE simulation hypotheses may be formed based upon dominance models. They may be argued theoretically, but their most persuasive support derives from MBTI research results. Myers & McCaulley (1985, chap. 4) summarize these findings and have interesting conclusions for NT types. One example is:

> NT people prefer intuition for purposes of perception, but they prefer the objectivity of thinking for purposes of judgment. They too focus on possibilities, theoretical relationships, and abstract patterns, but they judge these with impersonal analysis. Often the possibility they pursue is a technical, scientific, theoretical, or executive one, with the human element subordinated [Italics added].
>
> NTs tend to be logical and ingenious. They are best in solving problems within their field of special interest, whether scientific research, mathematics, the more intricate aspects of finance, or any sort of development or pioneering in technical or administrative areas [italics added]. (p. 35)

Another example is that NT symbolizes the information processing and decision making preferences of "people who prefer intuition and thinking; focus attention on possibilities and handle these with impersonal analysis; thus they tend to become logical and ingenious and find scope for their abilities In theoretical and technical developments" (p. 35).

These characteristics map one--to--one onto those designed into TE games. TE simulations are impersonal. They are not concerned with real salespeople, production workers, or managers. Labor and financial crises are paper and pencil exercises. However, TE exercises do require application of technical, scientific, and theoretical knowledge acquired in accounting, economics, finance, and statistics courses.

Furthermore, they are long-term endeavors. Intuition, an explicit consideration of future possibilities, is essential, and all these qualities are combined in a basically administrative arena. That is, deadlines have to be met, and decision errors are not excused.

Therefore, taking into account these empirical observations on N and T dominant types, the three key hypotheses of this study are concerned with the emergence of superior performance, the maintenance of superior performance, and the final performance of competing TE simulation teams.

> H1: N and T dominant teams will establish an early lead in a TE competition.
>
> H2a: Once N and T dominant teams establish a TE competitive lead, the lead will be maintained.

Or, restating this hypothesis in terms of ending positions:

> H2b: Final performance of competing teams in a TE simulation will show a positive relationship with the degree of N and T dominance among team members.

METHOD

A TE simulation (Scott & Strickland, 1985) was conducted in two sections of a capstone MBA policy course. Six teams were established in each section, and each section formed an independent industry. A total of 60 students participated.

After one class session devoted to the clarification of simulation rules, evaluation procedures, and decision-making mechanics, a one-quarter practice decision was completed. Questions pertaining to the results of the practice session were answered in a brief period of the next class session, and the evaluation procedure was restated. That is, the students were reminded that the game--to-date rankings at the end of the simulation were the figures of merit.

The importance placed on ending game--to--date rather than current period results emphasized long--rather than short-term strategies. Moreover, attention was directed at three specific conditions. First, the actual ending period of the simulation would remain unknown. (The syllabus and the length of the semester actually allowed for a maximum of 12 quarters of play.) Second, all reams 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, 20Z of the semester grade for the course depended upon ending game--to--data rankings.

Seven performance dimensions were measured in order to obtain current quarter and game--to--date rankings: sales, net income, earnings per share, return on sales, return on assets, return on equity, and stock price. The percentage weights assigned to each of these dimensions respectively were 10, 20, 10, 5, 25, 20, and 10. Furthermore, the TE simulation used is programmed to standardize team scores on each dimension with the maximum possible score being the percentage weight for the dimension, and the minimum possible score being the negative of the maximum. Thus, a team's overall score, summed across the seven dimensions on either the current quarter or the game--to--date, could vary between 100 and -100.

Eight actual decision quarters were then conducted over a seven-week period, These quarters were number nine through sixteen Since the simulation has an eight-quarter history.

The first four quarters required one set of decisions per week for tour weeks. The fifth week was devoted to confidential annual reports from each team. Two decisions per week were required during weeks six and seven in order to increase the level of "general-rnanagement-pressure." Then, the simulation was ended because first and last place teams were well established in each section.

The next class session was devoted to the MBTI instrument (Briggs & Myers, 1983). Each student was asked to complete the self-scoring questionnaire using only industry and team numbers for identification purposes. After the completed questionnaires were collected, the remainder of the class session was devoted to a discussion of Myers-Briggs type theory and the purpose of this research. In addition, an offer was made meet individually with any student who desired a more specific interpretation of their test instrument results.

RESULTS

A two-factor, repeated measure analysis of variance (Myers, 1972) comparing the two sections (industries) is shown in the first or top part of Table 1. Section is the between teams variable, and quarter is the within teams or repeated measure variable. Game-to-date or cumulative quarterly performance is the dependent variable as shown in Figure 1.

There is no overall performance difference between the two sections (p =.6184), although the average quarter--to--quarter performance varied 5 significantly as expected (p=.0005). Also, the quarterly performance differences between the two sections do not vary significantly as shown by the SectionQuarter interaction test Therefore, the two sections are combined for the remaining analyses.

Overall Performance Results

These tests compare the six teams from both sections with the highest ending cumulative scores against the six teams with the lowest. Their eight--quarter cumulative performance results are shown in Figure 2, and the quarter sixteen statistical summaries are collected in Table 2.

Note first in Figure 2 that the six teams with the highest scores in quarter 16 not only lead at the end, but they also lead throughout the entire competition. As summarized in Table 2, the first six reams ended with an average score of 85.5, and the last six ended with an average of 52.3. This 63% performance difference is significant (p= .0002) as is the difference in average N and T dominance percentages between the first and last six groups (83.8 vs. 58.7, p = .014).

Furthermore, continuing In Table 1, the correlation (r=. 634) between ending cumulative scores and the N and T dominance percentages in each group is significant (p.027). This confirms hypothesis H2b. Final TE simulation performance has a positive relationship with the degree of N and T dominance among team members.

TABLE 1
PERFROMANCE ANALYSES OF VARIANCE

Effect	df	MS	F	p
Two-Industry Comparison				
Section	1	1,418	.271	.6184
Team/Section	10	5,231		
Quarter	7	2,706	4.445	.0005
SectionQuarter	7	290	.476	.8491
TeamQuarter/Section	70	609		
First Six vs. Last Six (All Eight Periods)				
Order	1	14,826	3.811	.0769
Team/Order	10	3,890		
Quarter	7	2,706	4.377	.0006
OrderQuarter	7	194	.314	.9447
TeamQuarter/Order	70	618		
First Six vs. Last Six (Last Seven Periods)				
Order	1	11,905	3.795	.0775
Team/Order	10	3,137		
Quarter	6	3,125	4.736	.0007
OrderQuarter	6	196	.297	.9352
TeamQuarter/Order	60	660		
First Six vs. Last Six (Last Six Periods)				
Order	1	10,106	6.297	.0296
Team/Order	10	1,605		
Quarter	5	1,466	3.123	.0156
OrderQuarter	5	235	.501	.7762
TeamQuarter/Order	50	470		
First Six vs. Last Six (Last Five Periods)				
Order	1	10,297	17.606	.0021
Team/Order	10	585		
Quarter	4	66	.425	.7919
OrderQuarter	4	156	.979	.4313
TeamQuarter/Order	40	156		

Ending Order	Group Size	Dom N	Dom T	N and T%	Ending Score
First Six	4	2	2	100	99
	5	3	0	60	95
	5	3	2	100	88
	6	2	4	100	81
	6	3	2	83	76
	5	1	2	60	74
	Mean 5.2	2.3	2.0	83.8	85.5
Last Six	6	2	1	50	64
	5	1	2	60	57
	3	1	1	66	51
	5	1	2	60	51
	4	1	1	50	49
	6	2	2	66	42
	Mean 4.8	1.3	1.5	58.7	52.3
Mean Difference				25.1	33.2
t				2.951	6.419
p				.014	.0002
Correlation					.634
t					2.58
p					.027

Figure 1. Cumulative TE Performance Results by Industry

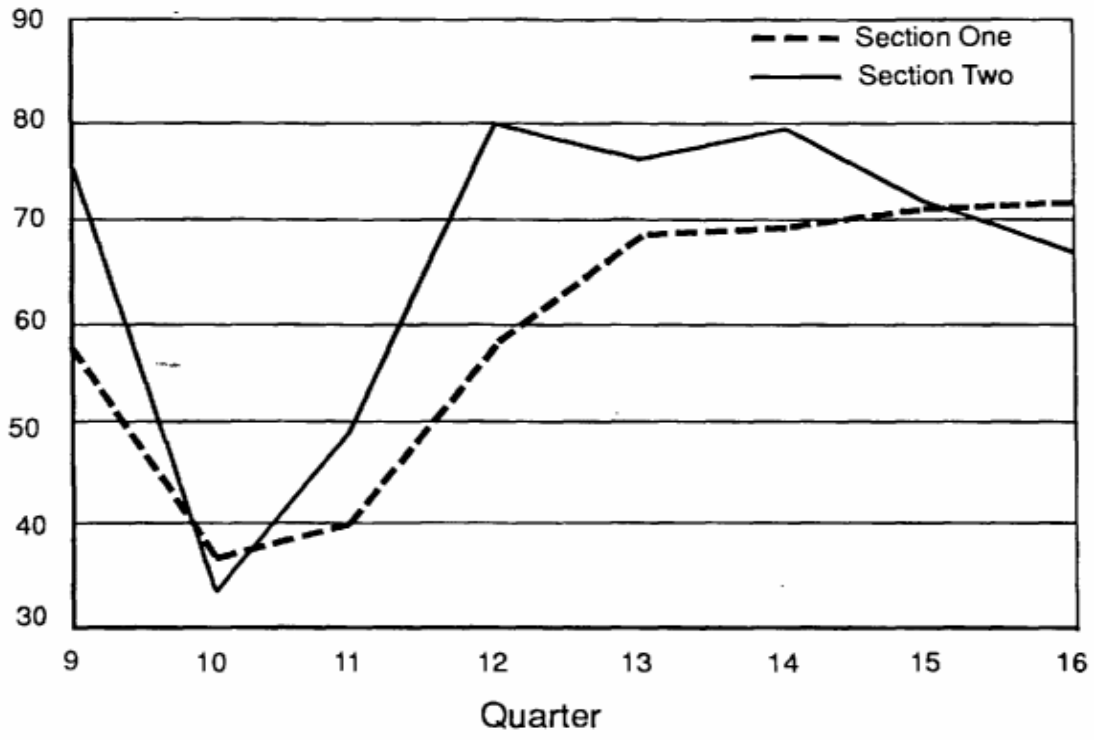
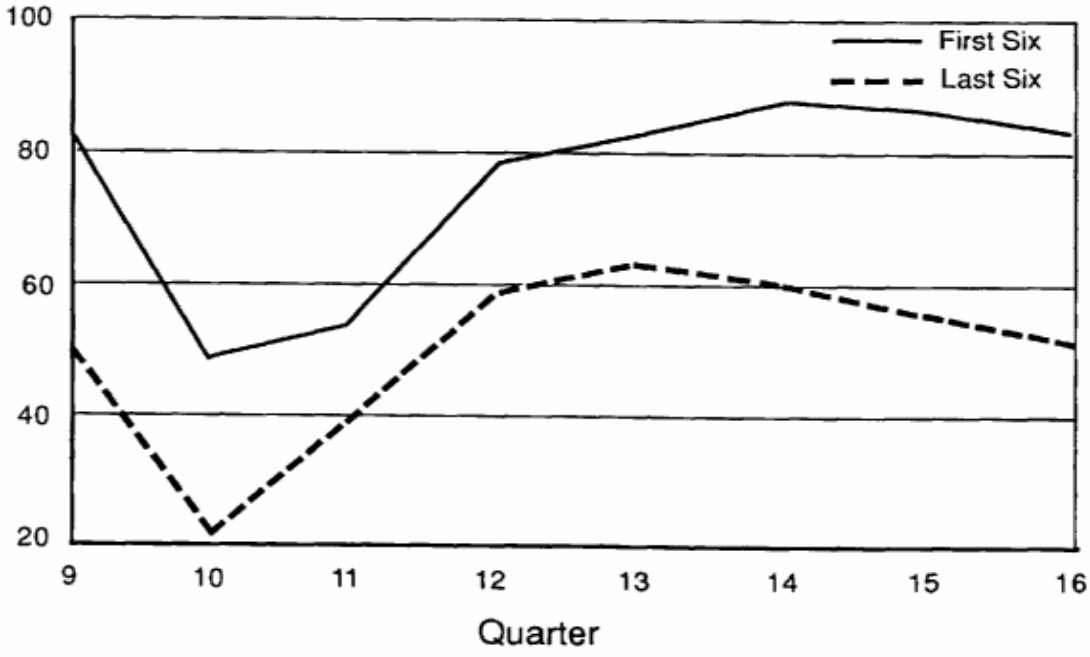


Figure 2. Cumulative TE Performance Results by Order



Emergence and Maintenance

Hypotheses Hi and H2a are also confirmed by the four remaining repeated measure analyses of variance in Table 1. These summaries show Order (First Six, Last Six) as the between teams variable, and Quarter is the repeated measure. One analysis is for all eight periods, two others are for the last seven and last six periods, and the final one is for the last five periods-quarters 12 through 16.

In all of these, the OrderQuarter interaction is riot significant. That is, quarterly performance differences between the first six and last six teams do not have any unusual variations. However, the overall quarterly performance averages do vary significantly for all eight, the last seven, and the last six periods. The respective probability estimates are .0006, .0007, and .0156.

Note, however, that the average quarterly performances do not vary significantly over the last five periods (p= .7919). This is the usual TE simulation pattern. Beginning turbulence yields gradually to stable performance. Also, large initial performance variances tend to mask the development of superior simulation strategies.

This is shown by the Order effect for all eight and the last seven periods. The performance differences do not quite reach the customary .05 significance level. The results are E= .0769 and .0775 respectively. But, the comparable results for the last six and last five periods are p = .0296 and .0021. N and T dominant teams do establish an early performance lead and maintain It in a competitive TE simulation.

DISCUSSION

Generalization of these results, of course, is restricted to populations of the type used in this study as well as the specific TF simulation. Verification will depend upon similar results being obtained with different games and participant samples. Similarly, more refined treasures of information processing and decision-making styles (Driver, 1983, 1987) can be used to check the MBTI instrument. In the meantime, some interesting propositions are worth considering.

TE Simulation Bias

First, it is possible that TE simulations are biased, designed by NT types for NT types. Yet the world of business is not conducted in an exclusive NT fashion. The Myers & McCaulley (1985, Appendix D) data indicate a wide dispersion of business professionals over all the basic MBTI types.

Going beyond the data, it may be that business school curricula are designed by NT types for NT types. If this is the case for simulations, curricula, or both, then some serious questions need to be asked regarding their purposes. Why should basic learning experiences for a profession be confined to a narrow segment of the information processing and decision making styles within that profession? Is it not possible to design more robust learning experiences, ones that account for significant variations in individual information processing and decision style preferences? Are simulations specifically and curricula generally trapped in a continuous repetition of current pedagogical devices? Do business education programs, by their very nature, inhibit the learning process by focusing on a restricted segment of the total population

Some Future Directions

Clearly, without additional data, these questions may proceed without limit. Reasonable bounds can be established, however, with the development of some practical research directions. Several avenues are possible, and three are immediately possible.

First, as already noted, more refined information processing and decision making style measures are required. The MBTI instrument only scratches the surface of these phenomena. It does not indicate, for example, the amount of information that individuals process and the number of alternatives that they consider before reaching conclusions. At the very least, this sort of information would supplement rather than replace sensing (5) and intuitive (N) information processing as well **as** thinking (T) and feeling (F) decision making preference data.

Second, group personality compositions can be constructed before conducting competitive TE simulations rather than noting their makeup at the conclusion of the game. In other words, it may be possible to force performance results in various directions by using test instruments to form groups with uniform or predetermined percentages of information processing and decision making characteristics.

Third, as noted in other studies (Patz, 1987, in press) , open system simulations can be constructed that favor one or more information processing and decision making styles. Furthermore, they can be constructed to switch the styles favored during the administration of the game. The purpose of such an effort would be to affect performance midstream, enhancing results for some groups and diminishing them for others.

These three and similar research possibilities lie well within the limits of current simulation and experiential learning technologies. Equally important, they focus on the most fundamental facets of human behavior. They are concerned with the basics of perception and judgment, how people process information and make decisions.

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