REVISITING PERSONALITY BIAS IN TOTAL ENTERPRISE SIMULATIONS

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ABSTRACT

Group personality composition does affect total enterprise simulation results when the competitors are full-time employed business students. In this study, the information-processing and decision-making preferences, as measured by the Myers-Briggs Type Indicator (MBTI) instrument, correlate highly with performance results using the Multinational Management Game with full-time employed undergraduate student teams. The correlation is r = .747, and this value is consistent with the previous findings using full-time employed graduate teams--.627, .707, and .787. These results contrast sharply with failed attempts to demonstrate the same relationship with undergraduate, full-time student teams of smaller sizes using the same total enterprise simulations. This distinction and its consequences are suggested as important, future ABSEL research directions.

INTRODUCTION

Recent attempts to replicate personality bias effects on total enterprise (TE) simulation results (Patz, 1 990, 1992) have met with little or no success (Anderson & Lawton, 1991; Anderson & Lawton, 1993; Washbush, 1992). Two studies (Gosenpud & Washbush, 1992; Michael, Johnson, Fleming, & Lynch, 1991) indicate weak but generally inconclusive support for the proposition that group personality composition affects TE performance results. Moreover, Anderson & Lawton (1993) and Washbush (1992) question the finding that once high performing TE teams establish a competitive lead, they maintain that lead throughout the exercise.

A summary of the these findings is shown in Table 1. It includes the basic dimensions underlying this research, and the differences are obvious. None of the studies have replicated the samples reported by Patz (1990,1992). The subjects are undergraduates (BBAs) rather than graduates (MBAs); team sizes, in general, have been smaller except for the studies that provide weak support; and the subjects are not employed full-time.

Therefore, a key question is now obvious. How does group personality composition affect TE simulation performance when comparing full-time employed BBAs with never full-time employed BBAs in teams of somewhat larger sizes?

TABLE 1
RECENT TOTAL ENTERPRISE SIMULATION PERSONALITY BIAS STUDIES

Study Authors/Dates	Subjects	MBTI Measure	Team Size	NT% Effect	TE Simulation	Employed Full-Time
Patz (1990)	MBA	Dominance	3-8	Strong	MICROMATIC	Yes
Patz (1992)	MBA	Dominance	4,5	None	CORPORATION	Yes
	MBA	Dominance	6,7	Strong	MICROMATIC	Yes
	MBA	Dominance	5,8	Strong	Multinational Management Game	Yes
Anderson & Lawton (1991)	BBA	Type	1	None	MICROMATIC	No
Michael, et al. (1991)	BBA	TDI	8	Weak	MICROMATIC	No
Gosenpud & Washbush (1992)	BBA	Dominance	1-4	Weak	MICROMATIC	No
		Type	1-4	None	MICROMATIC	No
Washbush (1992)	BBA	Dominance	3,5	None	MICROMATIC	No
Anderson & Lawton (1993)	BBA	Dominance	1	None	MICROMATIC	No

GROUP PERSONALITY COMPOSITION

For purposes of the above cited studies, group personality composition is measured using the MBTI or Myers-Briggs Type Indicator test instrument (Myers & McCaulley, 1 985). It classifies individuals on four dichotomous preference dimensions--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 (5). 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 (T). 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.

Type

These four dichotomous dimensions translate, of course, into 1 6 basic types such as ENTJ or ISFP. A complete list is given in the first column of Table 2 along with the MBTI dominance orderings in the second column. As shown in the second column, for each of the 1 6 basic types in the first column, the information-processing functions (S and N) and the decision-making functions CT and F) are ordered from left to right with the dominant one first, the auxiliary one second, and so forth. Of the four functions--S, N, T, and F--the dominant one is most available for conscious use and is the function on which the individual relies most. All other functions are less accessible for conscious, controlled use, and the least accessible or inferior function is always the opposite of the dominate one.

In other words, the MBTI instrument types an individual on the El, SN, TF, and JP dimensions shown in column 1 in Table 2. Then MBTI theory translates each type into an individual's dominant, auxiliary, tertiary, and least preferred modes of behavior when processing information and making decisions in-groups.

For example, consider an ENTJ individual as part of a decision making group. According to MBTI theory, as noted in the second column of Table 2, this person has a TNSF dominance ordering. That is, in-group decision making

sessions, this person prefers to make decisions on the basis of cause and effect, by analyzing and weighing the evidence (T). When this fails, the backup behavior is intuitive information processing CN)--dealing with meanings, relationships, and possibilities that go beyond the sensory information. The remaining backup behaviors can be discerned by referring to the S and F definitions described above.

TABLE 2
MBTI DOMINANCE TRANSLATIONS

Initial Type Indications	Information Processing/Decision Making Dominance Orderings
ISTJ	STFN
ISFJ	SFTN
INFJ	NFTS
INTJ	NTFS
ISTP	TSNF
ISFP	FSNT
INFP	FNST
INTP	TNSF
ESTP	STFN
ESFP	SFTN
ENFP	NFTS
ENTP	NTFS
ESTJ	TSNF
ESFJ	FSNT
ENFJ	FNST
ENTJ	TNSF

Dominance

The issue of concern in this study is dominance--column 2 of Table 2. The two studies cited previously (Patz, 1 990; 1 992) indicate that groups with high levels of N, T, or both N and T dominance prevail in TE simulations. The simplest measure of N and T dominance in a group is obtained by determining what percentage of members in a TE competing group are characterized by N or T dominance. This is what is cited in the fifth column of Table 1 as the NT% effect.

Hypotheses

As shown clearly in that table, the NT% effect is

quite different for somewhat larger teams of full-time employed MBAs than it is for somewhat smaller teams of full-time student BBAs. This was the case for both the MICROMATIC (Scott & Strickland, 1 985) and the Multinational Management Game (Edge, Keys, & Remus, 1 985) TE simulations but not for CORPORATION (Smith & Golden, 1989). A later study (Patz & Milliman, 1992) indicated a different personality bias effect for CORPORATION, team confidence, a point that will be important in the discussion of results.

For now, the purpose of this study is to compare the NT% effect on teams of full-time employed BBAs and comparable teams of full-time student BBAs. As will be noted in Table 3, team sizes are somewhat larger, actually 4 to 7, due to scheduling conditions in a large, metropolitan area. However, this allows a direct contrast with the MBA results, and the results for somewhat smaller BBA teams are already known--Table 1.

Furthermore, the hypotheses are clear for the full-time employed BBA teams.

H1: Final performance of competing, full-time employed BBA teams in a TE simulation will show a positive relationship with the degree of N and T dominance among team members.

H2: Dominant N and T, full-time employed BBA teams will establish an early lead in a TE competition.

H3: Once full-time employed, dominant N and T, BBA teams establish a competitive lead, the lead will be maintained.

As far as full-time student BBA teams are concerned, hypotheses are unnecessary. According to Table 1, nothing significant is expected. NT percentages and performance trends, however, are examined closely.

Method

A TE simulation was conducted in two sections of an undergraduate, capstone policy course. Each section formed an independent industry, and a total of 75 students participated. All students were seniors majoring in the various fields of business administration.
However, these was one key difference between the two sections. The second section was an evening class composed almost entirely of full-time employed

students. The six of 40 participants in that section who were full-time students formed one team, a point that will be important in the analysis of results.

The Multinational Management Game (Keys, Edge, & Wells, 1991) was used in both sections, and each section had seven teams. All teams were self-selected, so it was not surprising that the six full-time students selected each other as teammates. All other teams in the evening section, of course, were composed 1 00% of full-time employed students.

Simulation Procedures

After one class session devoted to the clarification of simulation rules, evaluation procedures, and decision-making mechanics, a one-year 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 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 directed at three specific conditions. First, the actual ending period of the simulation would remain unknown. (Each period is a year in the Multinational Management 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, they were processed by the simulation model, and the results were available to the participating teams within a few hours. This allowed 7 days before the next set of decisions, required on a weekly basis.

The participants were privy to the algorithm that determines cumulative scores in this simulation. These scores depend on the number of teams participating in the competition (N) as well as each team's market share, return on sales, total assets turnover, inventory turnover, returns on assets, debt to total assets, and return on equity. On each of these latter seven dimensions, for each year and cumulative game-to-date, each team is ranked for I =

1 N where I = 1 is first place. Each team's yearly score on any particular dimension is then $1O(N - + 1)$, and the cumulative score is obtained by summing over the game-to-date values for each of the seven dimensions.

MBTI Testing Procedures

No mention whatsoever was made regarding the MBTI instrument or any of the relationships shown in Table 1 until the end of the competition--the eighth year. Then the MBTI and its importance in recent TE research was explained, and both sections were asked if they would agree to an administration of the instrument.

There were no objections. In fact, a great deal of interest was expressed by the participants, and the basic data were collected. Each individual's results, of course, were confidential. Only team NT% scores were reported. However, every participant received an explanation of their results using Myers (1987).

Results

TABLE 3
INDUSTRY PERFORMANCE RESULTS

Full-Time Status	Team Size	Dom N	Dom T	NT%	Final Score
Student	5	1	2	60	3350
	4	1	0	25	3290
	5	2	2	80	2890
	7	1	4	71	2820
	5	2	1	60	2590
	4	0	1	25	2330
	5	0	2	40	2010
					$\underline{t} = .225$
Employed[a]	7	4	2	88	3240
	5	0	4	80	3210
	6	2	2	87	3020
	5	0	3	60	2440
	4	1	1	50	2410
	7	0	5	71	2300
					$\underline{t} = .747^*$

Employed Comparisons	NT% $\underline{t} = 2.1^*$
First Three vs. Last Three[b]	Final Score $\underline{t} = 9.6^{**}$

[a] As noted in the discussion, one team was eliminated due to its outlier status.
[b] In accordance with hypothesis #1, these comparisons use one-tail t-tests.
$^*\underline{p} < .05$, $^{**}\underline{p} < .001$

Table 3 along with Figures 1 and 2 display the key results of this study. Other exhibits have been excluded for purposes of brevity, but relevant findings are noted.

NT% and Performance

First, regarding the performance relationship of full-time student teams with their group NT%'s, the upper portion of Table 3 indicates no significance, r = .225. This is the expected result given the previous BBA reports noted in Table 1.

However, the lower portion of this table, and Figure 1, indicate a strong relationship of full-time employed team performance with group NT%'s C! = .747, < .05). This confirms H1. Moreover, when comparing the teams finishing in the first three positions with those in the last three, the average NT% score is significantly higher Ct = 2.1, < .05) as is the average difference in their final scores (t = 9.6, <.001).

Figure 1
Full-Time Employed Performance
r = .747
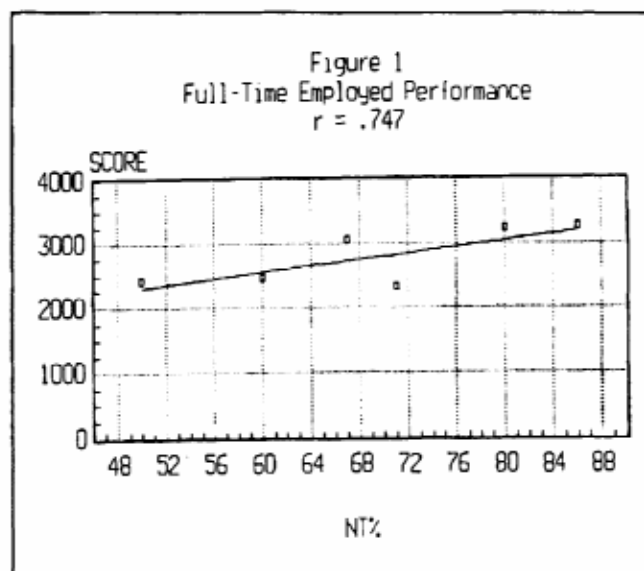
As noted in Table 3, these results were obtained after eliminating one team in the full-time employed section, i.e., the one group composed of full-time students. The exclusion of this team met the two standard tests for an outlier (Dillon & Goldstein, 1984, pp. 252-254). First, their inclusion in the correlation determination reverses the significance of the finding (r = -.009, t = .9839). Second, and more important, the <u>change</u> in the regression slope coefficient, when eliminating this team and dividing by the slope's standard error, is far greater than 2. In fact, the ratio is 5.42 (t < .005).

This finding, more than anything else, underscores the difference between full-time employed and full-time student BBA teams in a TE competition. The former is predictable; the latter, apparently, may not be.

Performance Patterns

There is, however, a key exception as shown in Figure 2. The relationship depicted in this exhibit pertains to the full-time employed teams, including the one full-time student group. Nevertheless, the pattern is exactly the same for the section of full-time student teams and the pooled results of both sections.

The plot in Figure 2 confirms both H2 and H3. High performing full-time employed, high NT% teams gained an early lead, H2, and maintained it throughout the competition, H3. A repeated measure analysis of variance indicated that the first three teams outperformed the last four overall ($F = 9.42$, $= .022$), and the lead grew as the competition continued $CF = 8.71$, $< .0001$).

Figure 2
Full-Time Employed
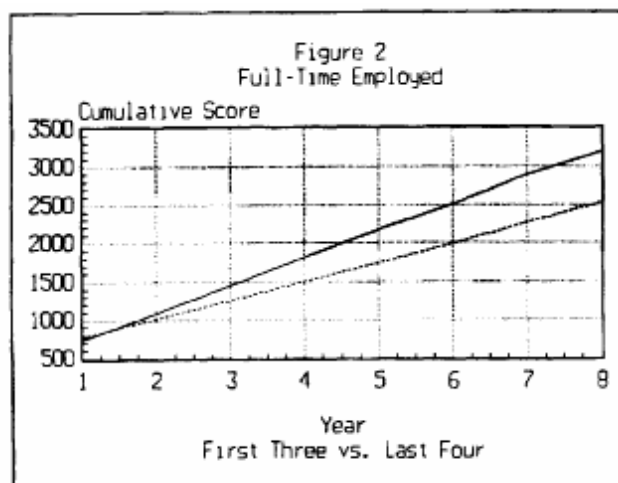
Interestingly, the same phenomenon held for the full-time student teams even though the NT% effect was not observed. Another repeated measure analysis of variance indicated that overall the first three teams outperformed the last four ($f = 1 2.36$, $= .01 26$), and once again the lead grew as the competition continued ($F = 8.42$, $< .0001$).

A third repeated measure analysis of variance indicated that there were no differences between the performance patterns in the two sections ($E = .043$, $p = .8391$). Therefore, their results were pooled for a performance pattern test comparing the first seven teams with the last seven, independent of

section. Once again, the first seven teams outperformed the last seven overall ($F = 20.76$, $= .0007$), and the lead grew throughout the competition ($F = 27.59$, $< .0001$).

Discussion

In short, the Anderson & Lawton (1993) and Washbush (1992) findings are not at all general. Once high performing teams establish a competitive lead, they maintain it. In addition, when examining the performance of full-time employed BBAs, just like full-time employed MBAs, the NT% effect on performance holds.

Moreover, a result not of this study but overlooked in the data that Anderson & Lawton (1993) report, is that half of their results agree entirely with those reported by Patz (1992). That is, teams with a high percentage of individuals who favor feeling decision making--those with a leading F in the second column of Table 2--always finish last.

This finding was emphasized in the Patz (1992) study, but Anderson & Lawton (1993) make no mention of it in theirs. Similar to the contrasts shown in Table 1--where none of the studies replicated the samples reported by Patz (1992)--the failure to look at all the results and consider their practical significance misses entirely the most important points.

Reconsidering

The first one is that the Anderson & Lawton (1991, 1993) and Washbush (1992) samples are drawn from entirely different student populations than the one sampled by Patz C1990, 1992). BBA, MBA, and full-time status distinctions are clear. However, the participants are from entirely different regions of the USA. University locations given for the authors in the published articles establish this.

Second, critics of the Patz C1990, 1992) studies fail to notice that the size of the reported performance correlations with NT% scores are very close. Previous ones are .627, .707, and .787. The one reported in this study of other full-time employed students is .747.

This sort of consistency is difficult to dismiss. The average correlation is .717 meaning that 51 .4% of the performance variation in full-time employed BBA or MBA student TE teams is explained by their group

personality composition based upon the simplest of measures, the NT%.

Third, the nature of TE personality bias has been established for all TE simulations tested, including team confidence for CORPORATION and NT% for MICROMATIC and the Multinational Management Game. One way or another, significant findings can be found relating performance results in these simulations to the composition of competing teams. A reasonable guess is that most, if not all, TE simulations can be diagnosed in a related fashion, depending upon how they are written.

Opportunities Not Problems

As noted before (Patz, 1 992), this is an opportunity not a problem for pedagogical and basic research. These biases happen under certain circumstances, and different biases probably occur in others.

The issue is to determine why they happen or do not. In an era where TE simulations are having more and more difficulty proving their worth in college classrooms (perhaps related to the computer literacy of faculty who would implement them), a major opportunity is presented to those researchers who would explicate the underlying principles.

Simply stated, among the foremost purposes of future simulation research endeavors are at least the following ideas:

1. Determine why different groups from different populations respond differentially to different TE business challenges based upon their group composition.
2. Design TE simulations that go beyond the traditional utilitarian ethics presented in our economics and finance texts to understand how and why participants react to them.
3. Extend the ABSEL promotion limitations beyond business simulation and experiential learning to other realms of practical and intellectual endeavors such as health care and public administration.
4. Develop methods for introducing and evaluating the new computer technologies in all sorts of classrooms.

All that needs to be done is reach for these opportunities and promote them.

Some Final Words

Of course, several of the statements in the preceding subsection are non-sequiturs and not related to the scientific purposes of this paper. They are concerned with the use and value of ABSEL scientific research.

The point is that if an ABSEL-related phenomenon can be demonstrated again and again, its usefulness for both scientific and practical purposes deserves considerable attention. Other well intended, limited efforts miss the point.

TE personality biases fall into this category. They are repeatable and an opportunity for ABSEL's continued success--not a criticism of past accomplishments.

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