Experiential Learning Enters the Eighties, Volume 7, 1980

NEW TECHNOLOGY FOR BUSINESS GAMES

Peter R. Sugges, Jr. Temple University

ABSTRACT

Since computerized business games greatly compress the time scale, they need to be supported by modules which provide staff support for the student teams and the faculty administrator. Examples of these are provided for one popular business game. Student and faculty acceptance of these modules suggest that they fill a gap in business gaming technology.

INTRODUCTION

Computerized business games seem to be here to stay. However there is still little consensus in what it is that business games teach. In order to try to explain why this might be so, I would like to describe some of the things that are being done at Temple University with The Executive Game.[11 What we have done stems from the thesis that the business game is a type of educational technology that needs to be supported by other technology if the business game is to reinforce the things that we are telling students in other courses which they have taken before they play the game which typically is done at the end of the students course of study.[1]

Business games only provide a milieu in which students can test the efficacy of their decision making tools and abilities. They do not provide any structure to the experience beyond that and that is where the difficulty lies in trying to determine the value of business games. If the students are left for the most part to their own devices in arriving at their decisions, one should not be surprised that they frequently make decisions without resort to any analytical tools. In part this approach derives from the fact that business games compress the time scale. At Temple, the student teams are required to submit one decision covering one-quarter's activities each week of the semester. While they have fewer decision variable values to submit to the computer program than they would have to decide upon if they were operating a real firm for a quarter, they still need to make many of the same calculations that they would make in a real firm the calculations themselves are just less complex. In addition a manager would, in a firm the size we are simulating, have staff support In doing much of his analysis. Typically this is not provided by the games that are on the market. So we have a team of 3 to 5 people trying to run a firm under a tight time schedule without any explicit staff support. No wonder we see students relying more on intuition, folklore passed to them by previous students, native intelligence, etc. in arriving at their decisions than we do on the methods and tools of analysis that we provided them in their other course work. In short, it is rather easy for students to approach the game as a crapshoot where they put down their bet (their decision) and then await the roll of the dice (the computer output). U they win, they try that bet again. If they lose they try something else. What is being taught by all this? Probably that whether or not you succeed in business is largely a matter of luck rather than that whether or not you succeed is largely a matter of how carefully you have done your analysis and whether you have used appropriate tools of analysis. Of course if one doesn't have the appropriate tools of analysis or has them but doesn't know how to use them, then your fate is indeed a matter of luck.

Taking the matter a step further, how does the game administrator counsel the players and evaluate their results? Does he use some simple measure of merit like who earned the greatest profit or who earned the greatest return on investment? All too frequently this is the case. And it is the case with good reason. How can an administrator do an adequate job of keeping abreast of the performance of 10 to 20 different firms again without a support staff? I doubt that it can be done except in the superficial manner in which I have suggested that it is being done. So the administrator usually doesn't use any of the sophisticated tools of analysis that are available to him either because of the time compression. The game designers then have created a monster by not providing the support needed to play the game rationally which is a major message that we are trying to get across in our courses -that is that much of what goes on in business is susceptible to rational analysis. If business isn't susceptible to rational analysis, or if we don't have the time or possibly the tools to perform a rational analysis, then business is indeed a crapshoot.

Therefore I am greatly disturbed by the fact that although most business schools now use a business game at the end of their program of study, this gaming experience fails to reinforce the message that we have been trying to provide in all of our courses up to this final laboratory experience. Students leave with an impression that little of what we have been giving them has any practical application. And how are they to get any other impression given the way business gaming is handled in most schools?

If business games aren't reinforcing our message, perhaps we would be better off without them. While that is an option, I believe that there are other ways out of this dilemma besides discarding business games. The option that I would suggest as being superior to simply discarding games, or that of continuing their use in the belief that they are worthwhile, is that game builders and users collaborate in developing ancillary software to provide staff assistance that a manager would ordinarily have in a real company. The staff assistance would consist of a package of programs which would provide the kinds of reports and decision making information that are required if the game players and the administrator are to function more rationally. Basically I see the need for two kinds of modules. One would be available to the students and the other would be available to the administrator. I would like to discuss each of these separately.

[1] At Temple, the business game is used as part of the Business Policy course at both the graduate and undergraduate level.

STUDENT MODULE

The module made available to the students should at the very least consist of a model which students could enter their proposed decision into to ascertain what the results of their decision would be if their forecast about what will happen does in fact happen. This model should provide information about profit, cashflow, inventories, account receivables, interest charges, payables, equity, etc. The exact nature of the output and the detail would need to be tailored to a particular game.[2] In most games that are available today, the student is left to his own devices in making such calculations, or is provided with a worksheet which he must fill out using manual calculation procedures. Of course it is possible for a student to develop his own programs so that the calculations can be automated thus shortening the time required to work out the results for a decision and usually greatly improving the accuracy thereof. But I have already observed that the compression of time in business games leaves the students short of this valuable commodity, so where are they going to get the time to do what many are not equipped to do (i.e., write computer programs)? The answer is that there just isn't time for students to do this on their own. There are available some modeling packages (i.e., we have one which is called Integrated Financial Planning System {IFPS}). but one encounters the same difficulties using these as standard programming languages, namely lack of both time and familiarity.

Since the students' knowledge about the future state is imperfect, the student module can be used to determine what their results would be if the future turned out better or worse than they expect. Probabilities can be assigned to these outcomes and one can use decision analysis to determine what one should do in the face of uncertainty. Since this functioning of the foregoing described model is dependent upon some forecast of how the state of the environment is expected to change, the student model should also include a forecasting model.[3] Depending upon the complexity of the game being used, other models such as a production scheduling model might also be necessary.

FACULTY ADMINISTRATOR NODULE

The faculty or administrator module should first of all present the game results in a summarized manner so that the administrator does not need to handle and examine separate statements for each firm that he is supervising. If this is not done, after a few quarters of play, the administrator becomes overloaded with game results which creates a major filing job and in any event leaves him with too much detail. Furthermore, at this point all he has is data, and the data needs to be worked over to extract the information about how well each firm is doing. Typically one would prefer to have a number of ratios to review to ascertain the strengths and weaknesses of each firm. Without a faculty analysis program, the administrator is left to his own devices to obtain this information. More often than not, the administrator has neither the time nor the assistance to get this information in a timely manner. Since it is important for the faculty member supervising the game to act as a counselor to the firms he is supervising, he cannot do as good a job in this capacity as he might if he had the information available. Thus as with the students, the administrator can't make the contribution of reinforcing the earlier classroom instruction through the use of the business game unless the game builders provide a program which will output a compact listing of input and output along with relevant analysis of the data.[4]

The required input for the faculty analysis program can be produced by the business game program which can be modified to do this. Basically the modification involves the creation of a punched output of the relevant data from each quarter. Each quarter's punched output is added to that of previous quarters and thus the faculty output produced is a complete analysis of the game play to date. The administrator is able to discard his previous report each time that he receives a new report as all of the information on the previous report is included in the new one. The foregoing has been implemented at Temple and it has been used by the faculty for the past year.

DISCUSSION

Because the two modules have only been implemented at Temple during the past year, it is not possible to offer more than an impression of the student and faculty response to them. The student module is available in an interactive mode. Great effort was made to make the module conversational so that there is little barrier to its use by non-computer types. Each team member is able to work with the module and they can then meet and have an informed discussion about their future decisions. They can use the output from each quarter as input for the next quarter's decision and thus develop an operating plan for the next year in about 10 to 15 minutes. This makes it possible for each member of a team to be a contributing member without making great demands on their time. This typically has been a stumbling block in the use of business games that don't have a student module. In this case, any student who has undertaken the task of performing extensive hand calculations has a tendency to take over the decision-making for the team. Others who haven't taken the time to do this work acquiesce and so while a team may have 3 to 5 members, frequently only one is really making the decisions for the team - or if none of them have taken the time to do their homework, then they simply muddle along in the crapshoot mode. Thus the student module functions as an equalizer and decision making seems to be closer to what administrators expect it to be.

The faculty module reduces the amount of preparation time required to carry on a discussion with the student teams. Without any need to resort to hand

[2] An introduction to the model used with The Executive Game at Temple is attached at the end of this paper.

[3] We have canned regression programs available for students to do their forecasting.

[4] An introduction to the faculty analysis program used with The Executive Game at Temple is attached at the end of this paper. Part 2 has been purposely omitted since this describes the mechanics of how to access the faculty analysis program on the computer used at Temple.

calculations, a faculty administrator can with S to 10 minutes of study of his report be ready to have in-depth discussions with each of the teams. Thus an administrator can meet with teams more frequently than is usually the case without such a report because he does not have to spend very much of his time preparing for such meetings.

What each of these modules has done in the case of The Executive Game is to allow both the students and the faculty to do more in less time. Given that time is a scarce resource for both, it is not surprising that each group has welcomed the provision of their respective modules. Each group is able to function more in the executive mode than was possible without the modules. Given that we are trying to train people to become executives and not computational experts, this is a happy state of affairs from both the student point of view and from the educational point of view.

Input from the faculty and students has been used to revise both of the modules to do what they want them **10** do that the designer of them had not included in the original versions of each. This in itself is a sign that the modules are being used by both groups. Of course in this iterative process, one needs to be careful to not take over the decision making from either group for if this happens, then we have one computer program trying to outwit another computer program. We are no where near that point at present, but it is an ever present danger and it would be as bad to err in the direction of doing too much for students and faculty as it has been to err in the direction of doing too little for them.

Marshall McLuhan [2] has reminded us that the medium is the message. If the kinds of technological innovations suggested in this paper are not used in conjunction with business games, it seems that the message is not one that reinforces the message that is being delivered elsewhere in our business school curricula. The inclusion of these modules serves to reinforce the message that it is more profitable for a businessman to deal with his reality in an analytical manner than it is to trust to luck.

CONCLUSION

The compression of the time scale in computerized business games poses a problem for both students and faculty administrators as games are used at present. Neither has sufficient time to do all of the analysis that should be done **10** reap the benefits which have been claimed for business games. Thus new technology is required if games are to reinforce the message that is being delivered elsewhere in the business school curriculum. This required technology takes the form of computerized modules which can function as staff assistants to both the students and the faculty administrators. Two modules have been developed at Temple University; one to assist the students and the other to assist the faculty administrator. These modules were developed for The Executive Game. Their use has enabled the gaming experience to move to the executive level for both students and administrators. The response of both classes of users to these modules has been favorable and it is highly recommended that game builders include such modules in any new games that are developed and that such modules be added to existing games so that others may gain the same improvements in the game experience that we have gained at Temple through the use of these modules.

APPENDIX I

Introduction to MODEL 1.9

MODEL 1.9 (hereafter referred to simply as MODEL) is a terminal-based, business planning model designed to be used in conjunction with The Executive Game by Richard D. Henshaw, Jr. and James R. Jackson (Homewood, Ill.: Richard D. Irwin, Inc., 1978). MODEL enables the user to plan the operations of his firm by providing him with an estimate of the results that he would obtain for a set of decision values. If the forecasted level of sales is exactly the level achieved in The Executive Game, the financial results should compare very closely with those predicted by MODEL.

MODEL is programmed to provide for all of the options designed into The Executive Game except as noted in the last paragraph of these instructions. The administrator can charge for the use of MODEL. If the administrator does not want to make a charge for the use of MODEL, no modifications are necessary. In order to include a charge for the use of MODEL in The Executive Game, the administrator can operationalize the CS(J) variable as described on page 122 of The Executive Game manual. This allows the administrator the flexibility of charging only those who use MODEL. If the administrator does this, he should take steps to prevent the unauthorized use of MODEL by those who have not contracted for its use. To simplify things on our system, I require that a firm contract for the use of MODEL for the duration of the game once they choose to use MODEL.

The use of MODEL is explained to the user through instructions included in the MODEL program. After the user has input the 21 variables called for in lines 171-298, the program asks the user to identify any special government policies that are in effect such as:

1. Accelerated depreciation
2. Investment tax credit
3. Surtax

MODEL then checks to see if various conditions exist which will cause problems for the user if he is not aware of them. These checks include:

1. Does planned production exceed 3 times first shift plant capacity?
2. Are insufficient raw materials on hand to produce the planned volume?
3. Does expected sales exceed the sum of the planned production and finished goods inventory?
4. Is the correct amount being spent for maintenance?
5. Is overtime required to produce the planned volume?
6. Is a shift change involved?
7. Can the desired dividend be paid?

If any of these problem conditions exist, an appropriate message is printed.

The output from MODEL Includes:

1. Breakeven sales volume
2. Profit before tax
3. Profit after tax
4. Annualized return on shareholders' book equity
5. Addition to cash assets
6. Ending finished goods inventory
7. Plant capacity next period
8. Shareholder equity at the end of the planning period
9. Asset portion of balance sheet

10. If a cash deficit is encountered, the finance charge and annual rate of interest on the loan are printed
11. A listing of the values of the 21 variables for this decision

MODEL then allows the user to exit from the program, enter a completely new set of decision variables, change only selected variable values for the current decision variable set, or to investigate the effect of different government policies. The manner in which these options are exercised is explained to the user through the program.

MODEL is designed for use with Model 2 of The Executive Game. If Model 1 is being used, MODEL should be modified to reflect this lower maximum production level. This modification was not included in MODEL because it is assumed that most administrators choose to use Model 2.

APPENDIX II

FACULTY ANALYSIS PROGRAM FOR THE EXECUTIVE GAME

This description is divided into two sections. Section one describes the output of the faculty analysis program; and section two describes the preparation of the input for the program and the manner in which it is accessed.

Section 1: Description of Output

The Faculty Analysis Program summarizes and analyzes the team results from The Executive Game by Richard C. Henshaw, Jr. and James R. Jackson (Homewood, Ill. Richard D. Irwin, Inc., 1978). The program has 3 basic parts.

Part 1 lists 6 of the 8 decision values (it does not list investment in plant or purchase of materials) and certain key results for each team by quarter. The variables shown in this part are:

1. Net profit after tax ($)
2. Book equity at the end of the quarter ($)
3. Dividends paid ($)
4. Cash balance at the end of the quarter ($)
5. Selling price ($/unit)
6. Market potential (units)
7. Sales volume (units)
8. Production capacity during current period (units)
9. Production volume this period (units)
10. Standard labor cost ($/unit)
11. Standard material cost ($/unit)
12. Marketing budget ($)
13. Research & development budget ($)
14. Maintenance budget ($)
15. Finished goods inventory at the end of the quarter (units)

Part 2 has two sections. In the first section various performance measures are calculated for each team by quarter. It shows:

1. Payout ratio (current dividend/last quarter's profit)
2. Market share (team sales volume/total industry sales volume)
3. Lost sales (market potential sales volume)
4. Number of shifts (production volume/plant capacity
5. Profit margin (net profit/sales revenue)
6. Capital turnover (equity/sales revenue)
7. Product standard cost (labor cost + material cost)
8. Standard cost/price ratio (Product standard cost/selling price)
9. Marketing/revenue ratio (marketing budget/ sales revenue)
10. R&D/revenue ratio (R&D budget/sales revenue)
11. Maintenance/Production ratio (Maintenance budget/production volume
12. Price index (described on pp. 125 & 150 of manual
13. Cash/revenue ratio (ending cash balance/sales revenue)
14. Finished goods inventory/sales volume ratio
15. Gross operating margin = Price product standard cost - (marketing + R&D + maintenance)/sales volume

In the second section total industry statistics are calculated for each quarter. It shows:

1. Actual total industry sales (units)
2. Total industry sales adjusted for the seasonal index
3. Total industry sales adjusted for both the seasonal and economic indexes
4. The average industry selling price
5. The harmonic mean of the individual firms' price indexes
6. Industry market potential multiplier
$$\frac{(FFM+100{,}000)\ (FR+\ 50{,}000)}{(FFM+300{,}000)\ (FR+150{,}000)}$$
7. Average firm's adjusted sales (item 3/no. of firms)
8. Average firm's actual sales (item 1/no. of firms)

Part 3 calculates the annualized ROE (return on book equity not economic equity') for each firm for each quarter, the overall average annualized ROE for each firm, the overall average annualized ROE for the Industry, a stock market price for each firm, and an internal rate of return for each firm. The stock market price starts at $10 in quarter zero. The stock market algorithm is:

$$STMKT(J) = [3*ROE(t) + 2*ROE(t-1) + ROE(t-2) + ROE(t-3) + ROE(t-4)J*10.*.125/RROE$$

where; t= most recent quarter
t-1 quarter before more recent quarter, etc.
RROE = overall average annualized ROE for the industry. If RROE<6, then RROE=6.
STMIKT(J) = stock market price for firm J. If STMKT(J)<O, then STMKT(J)=O.

I print one copy of part 3 for each team and distribute it in class. This is an option which an individual faculty member may choose not to use - however he should still find part 3 useful for ranking the various teams by use of the stockmarket price.

The IRR (internal rate of return) is basically the same calculation as is described on pp. 21-3 in the student manual. However I use owners' book equity rather than "owners' economic equity." I therefore tell the students to ignore the Rate of Return and Rank presented in the XRATE report. The reason for parting ways with the authors is that they give a firm credit for investing in new plant regardless of whether the plant is utilized or not. The manner in which this takes place is that inflation supposedly makes a plant worth more by increasing its replacement value.

Thus a firm can go through a whole series of decisions and never earn a profit, but invest heavily in plant. The firm will show a positive, and frequently a double- digit, IRR. In fact the higher the rate of inflation introduced into the game environment, the more likely is this result to be attained.

REFERENCES

[1] Henshaw, Jr., Richard C. and James R. Jackson, The Executive Game (Homewood, Ill.: Richard D. Irwin, Inc., 1978).

[2] McLuhan, Marshall, Understanding Media: The Extensions of Man (New York: McGraw-Hill Book Company, 1965), p.[7].