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A HYBRID METHOD OF EXECUTING A MANAGEMENT SIMULATION: COMBINING THE BEST OF MAINFRAMES AND MICROCOMPUTERS

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ABSTRACT

Over the Last thirty years, the use of business games has evolved through a number of different stages. The present phase of simulation game development seems to be almost totally microcomputer driven. This infatuation with the microcomputer and demise of the mainframe game may be premature. The present paper attempts to compare and contrast the advantages and disadvantages of both the microcomputer and mainframe simulation games. In this evaluation neither of the two types of computer games had a significant and all encompassing advantage over the other. The findings of the paper suggest that the most efficient manner of running a computer simulation may be to develop a hybrid system which combines the strengths of both the mainframe and microcomputer versions of a particular simulation game.

INTRODUCTION

In a relatively short period of time, the use of business games has evolved through a number of different stages. According to Wolf and Teach (1987) fur such periods ire discernible. The first phase (1957-1963) introduced proprietary games which were used fur both teaching and training. These games made use of either hand scoring or machine scoring methods. The simulations of the American Management Association (Ricciardi, 1957) were examples of this genus. The second phase of business gaming was ushered in between 1962 and 1968 when various proprietary games were commercially published for use in business schools. Examples of this eras contribution to gaining would include the modification of the UCLA game into Henshaw and Jackson's The Executive Game (1966) and R.D. Irwin's publication of the Carnegie Tech Management Game (Cohen, Dill, Kuehn & Winter, 1964). Phase ILL (1966-1985) of this evolutionary process introduced game users to simulations which comprised more complex algorithms and enhanced coverage of the business functional areas. This epoch also offered the diversification of handscored games or short term exercises into specialized areas such as personal development and group dynamics. The final period of game expansion started in 1985 and continues into the present. The identifying characteristic of this era is its embrace of the "microcomputer."

The present phase of simulation game development seems to be almost totally microcomputer driven. Authors of popular simulations originally designed for mainframes are busily writing code to down-load their packages for microcomputer usage [Wolfe & Teah, 19871. It appears, however, that contemporary games developed for microcomputers are not being up-loaded mainframes. In a recent analysis of ten popular total enterprise games, Keys [1987] reported that three of the simulations did not have mainframe versions though all ten had microcomputer versions.

The reasons for the migration to microcomputers by simulation game users are many. Wolfe and Teach [1987] and Fritzsche [1987] present excellent summaries comparing microcomputers with mainframes. Benefits of using 3 micro-based simulation include:

1. Ease of Administration. There is no need to deal with computer center personnel and the game can be run at the instructor's convenience. Also, PC type machines are readily available at home or at the office.

2. Student Familiarity. The present emphasis on computer literacy (particularly as applied to microcomputers) tends to guarantee that students will be familiar with the micro environment. The incorporation of simulation decision aids such as spreadsheet analysis is much easier with microcomputers than With mainframes.

In all fairness it must be pointed out that there are also some problems which can be associated with the use of PC based simulations. The three main problems

1. Incompatibility. Different micros may use different operating systems.

2. Speed of Execution. Micro CPUs and disk drives execute programs it a slower speed than do their mainframe counterparts.

3. Print Speed. Dot matrix printers cannot compare with high speed mainframe printers in producing complex simulation team results.

Does this present emphasis on microcomputer gaming portend the demise or the mainframe simulation? The authors of this paper would suggest that the answer to this question should be no. Administrators need to carefully evaluate how to best utilize the resources available to them before rushing to abandon mainframe simulations. When traveling to London, what counts is time [rum your doorstep to your hotel, not just the air travel time. So it is with a simulation. What counts is the total time spent in setup and administration, not just the time spent On one step in the process. By using a combination of micro and mainframe components, this study describes the use of the strung points of micro simulations with the best of mainframe versions to adopt a popular simulation to specific operating conditions.

THE PRESENT STUDY

Both authors use the Business Management Laboratory (BML) by Jensen and Cherrington (1984). BML is a moderately complex (Wolfe, 1978) simulation of the stainless steel flatware industry. Participants playing this simulation can make maximum of 60 decisions per round. BML comes written for mainframes (FORTRAN, minicomputers (VAX), and microcomputers (MS-DOS). The mainframe version came first and the BASIC code for the microcomputer version of the game is a straight forward translation of the FORTRAN used

in the mainframe version (Wolfe, 1987).

The operating environment faced by the authors as they attempted to implement the BML simulation is described below:

I. Both authors were experienced at running simulation games in their Business POLICY classes and both were familiar with BML.

2. Students at the authors' university learn Lotus 1-2-3 and use spreadsheets in several classes prior to taking Business Policy.

3. Microcomputers (IBM PCs) are available in the College of Business Administration building and accessible by students seven days per week.

4. Mainframe terminals are in short supply. Only two are available in the College of Business building. The high speed printer attached to the mainframe is located in the Computer Center.

5. There is limited mainframe capacity (A Burroughs A9 using the CANDE system).

6. Use of the on-campus VAX microcomputer is controlled by the College of Engineering and business professors need no~ apply.'

7. There is good rapport with systems analyst and programmers at the Computer Center.

Upon arrival in 1984, each author took a different approach to the implementation of the BML simulation. The first author put the FORTRAN IV version of BML on the mainframe and ducked the problem of the lack of mainframe terminals by having students submit their decisions in writing. A graduate assistant then punched in each team's decision – a long, tiresome task.

The second author ordered the micro version of BML. In this version, each student team had a floppy diskette. They entered their decisions on their diskette and turned it in to a graduate assistant. The graduate assistant then compiled the student decisions. After the decisions were computed, the assistant ran the simulation and printed the team reports - a long, tiresome task.

SET UP

Each author had to fight his own devils inn getting BML up find running.

Mainframe Computer Version

The mainframe version of the BML is available on magnetic tape. Included along with the magnetic tape are an Administrator's Manual and a separate manual which provides information on installing the game. The ape itself includes the simulation program which is written to comply with ANSI standard FORTRAN IV (1966) as well as a number of support programs which can which can be used to test the installation of the program and provide decision support to the game players. The use of the 1966 FORTRAN standard was purposely done to facilitatecompiling on a large variety of mainframe computers. The usefulness or ease of using the decision support material was not evaluated in this study.

In general the two major tasks that the necessary to get the simulation into running order are to copy the game program from the tape to your mainframe computer files and then to edit the program to specify the logical file allocation numbers used by your computer system for input and output. Once these two tasks are completed, the BML simulation is ready to be compiled and test run. Neither of the two tasks mentioned above is particularly difficult, but it is usually necessary to get assistance from local computer center personnel to either help with or any out the required tasks. In this particular study it took approximately three days from the time the tape was taken to the computer services department to the time the game was available for testing on the authors' instructional account. Once the program had been loaded, the authors had no difficulty compiling the program. Subsequent testing showed the program to execute correctly and all Output from test runs matched the expected test results provided by the game's authors. In summary, the actual set-up of the game is not difficult but can be time consuming. The ease of this step is out of the control of the faculty member running the simulation and depends on the expertise and helpfulness of the local computer center personnel. In this case, cooperation was excellent.

Micro Computer Version

The microcomputer version of BML comes with an Administrator's Manual that includes instructions for installing the simulation. The game program and accompanying test data types and decision support programs come on three LOOK floppy disks and well execute on IBM PCs and compatibles running PC-DOS or MS DOS version 2.0 or later. The simulation program is writ ten in BASIC and will run under both IBM'S BASICA or Microsoft's GW-BASIC. In order to be able to run the program, the administrator needs access to a two disk drive machine with a minimum of 128K bytes of memory. Instructions for using The program on a hard disk are also included. Since the game assumes that students will be entering their own decisions, the student game players need to have access to a PC with at least one floppy disk drive.

The initial set up of the microcomputer version of the BML is not difficult but does require the administrator to do a lot or disk copying and does have a good supply of blank disks. The game authors suggest that the first step to be taken is to make copies of the distribution disks. After this initial copying is completed, it is necessary to prepare both student disks and administrator disks. A student disk programming a decision entry routine and any student usable decision support programs is prepared for each team. (As mentioned in the mainframe, decision support software was not used. Therefore student disks contained only the necessary programs for decision entry.) Two administrator disks also need to be created. The first of these is used to control the BML program execution and to hold data files. The second disk is for the BML program itself. Programs and files for these two disks are copied from the distribution disks to the administrator disks, It is also necessary to copy your local version of BASIC to these disks. Once the administrator disks are set up, the program can be tested through the use of sample data which is provided by the game's authors. Initial tests of the program ran correctly and the system performed as expected on the first attempt. In summary, the disk swapping and file copying necessary to get the program ready to run was somewhat tedious. However, the entire installation and testing process required

only about two hours and can be completely handled by the individual instructor without the need for outside advice.

RUNNING THE GAME

Mainframe Computer Version

In order to run the BML simulation, three data files and the compiled simulation program itself are needed. The three files include: (1) a decision file which contains all of the participating teams resolutions; (2) a history file which is a "turnaround file produced by each run of the simulation and carries information about each firm from one period to the next; and (3) a parameter file which is a semi-permanent file which contains different entries which define the general nature of the simulation, (Most of the entries in the parameter file can be changed to provide a different acting industry from the semester to the next. However, this file ~s considered semi-permanent because it would not generally be changed during the course of a semester simulation.) During the course of running the simulation, two new files are produced by the program. The first of These files is a new history file (mentioned above). The other file which is created as a results file which contains the industry and individual team accomplishments for the quarter being simulated.

Due to the lack of mainframe terminals, student teams submitted their decisions in writing. Then a graduate assistant entered individual team decisions into a decision file on one mainframe. This step was the most time consuming spent of the manager procedure. Each team's decision consisted of the equivalent of ten rows by eighty columns of information and there were between ten and twelve teams per section. This massive amount of data transcription had the potential for entry errors and on a number of occasions was the cause behind a rerun of a decision.

After entering the decisions, two other housekeeping items needed to be taken care of before the simulation could actually be initiated. First, the parameter file had one line in it which was a quarterly data line. The entries on this line had to be changed to reflect the values for the quarter that was being simulated. Secondly, the history data from the most recent run on the simulation had to be redefined as the entry history for the decision.

After preparing the three needed files, execution of the program was very fast. Runs usually took less than one minute even when there was heavy use of the computer. Printed output of all reports created by the simulation program for all students was easily obtained by dumping output files to the high speed printer attached to the computer system. The actual hard copy printouts were usually available for pickup within one half hour of sending the file to the printer.

Microcomputer Version

The general approach to running the BML program on the microcomputer is very similar to its mainframe counterpart. The same input files are needed to carry out a run and the same output files are also created. There is a difference, however, on hw the student decisions file is created. in the PC version on the game, each student team makes their decision on a separate floppy disks which is turned into the game administrator. The administrator then uses a BASIC program supplied with the simulation to gather all of the separate team entries into a single decision file. This particular procedure requires a fair amount o~ disk swapping, but does not really take much time. Once the decision file is produced, the quarterly data line in the parameter file must be updated and the previous quarters output history file must be renamed for entry into the simulation run.

The actual running time of a decision on the microcomputer a relatively long when compared to the mainframe version. The major time factor was the number of disk accesses made to a floppy disk drives. To run an eight-team industry took about 10 minutes of processing before printing. Newer versions o~ the microcomputer version of BML use compiled BASIC which speeds up processing time considerably.

The real limitation of the microcomputer implementation of the BML shows up in the printing process. Even relatively last dot matrix printers are no match for the high speed printers of the mainframe environment. Even a printing only one copy of each team report it took about 20 minutes to print the results for an eight-team industry. The second author often teaches three sections of Business Policy with two BML industries per section. The process and print Lime sometimes approached three hours, an unacceptable use of time and a printer.

COMBINING THE MAINFRAME AND MICROCOMPUTER

Developing a system that combines the best of the mainframe version of BML with the best of the microcomputer version proved surprisingly easy. First, the authors sat down and figured just what had to be done. Then, after learning as much about each BML versions is they would, they approached a friendly computer center Systems analyst for assistance.

The result was five phase system using both microcomputers and the mainframe.

Phase One: Students enter their decision on their own diskette, using the ENTER routine provided with the microcomputer version of BML. They then turn t~ the diskette in a manila envelope to the administrator.

Phase Two: The administrator (or his assistant) combines the student decision into one file using a modified version o~ the GATHER routine from the microcomputer version of BML.

Phase Three: The administrator gets on the main frame and prepares the files for the BML run. The history, parameter, and decision files are so named that all preparation actions automatically "update" all active industries. An ALGOL program prompts the administrator for the proper quarter and year, then updated the parameter files with the proper quarterly information. A system program removed and renames appropriate fires for all industries to run the new quarter.

Phase Four: The student decisions are uploaded from the microcomputer Co the mainframe. Using a modem and locally adapted software (KERMIT) the student decision files, one for each industry, are uploaded to the mainframe. The mainframe FORTRAN program had to be changed to accept the student decision files in free format.

Phase 5: Each industry is run separately, using the mainframe FORTRAN BML program. Then the results for all industries are disposed to the high speed printer. Running the programs takes about two minutes per industry. The results are available from the printer in about 30 minutes, depending upon other traffic.

It takes about 20 minutes of terminal time fur an administrator to process six industries including "feeding" each team diskette into the microcomputer. For total time, all results are normally available for distribution in one hour from the time all diskettes are turned in.

DISCUSSION

Should other users consider adopting this hybrid method of combining mainframe and microcomputers? Our answer is yes. The only system that is faster, in our view, is a system that allows students to input their data directly into the mainframe. The hybrid system offers a major advantage here also. B using individual team diskettes, the administrator has complete control over correcting technical errors that students invariable enter from time to time. Instead of the agony of reading a complete student file on the mainframe searching for errors,, the administrator can edit the student file using the conveniences offered by the microcomputer

The hybrid system offers the advantage of printing speed over a microcomputer only version of a simulation. The generally slow running speed of the PC CPU and disk drives can probably be overcome by using a combination of hard disk drives with "Turbo" PCs, ATs, and 80386 machines. But the problem of output remains. It is likely that in the foreseeable future, simulation administrators will have access only to dot matrix printers that are Very slow in producing the large quantities of printed material generated by any simulation. Even one copy of each of the required reports, can keep one tied to the printer for hours if a number of industries are being simulated. Photocopying results is a possible answer, but it takes more time and is an additional cost.

There are two keys to successfully adapting this hybrid system to any environment.

1. Administrators need to be thoroughly familiar with the simulation. When requesting assistance in customizing programs, it is necessary to be able to explain to system analysts in plain English just how the simulation operates..
2. Good cooperation is needed from computer center systems analysts and/or programmers who know about the local mainframe. Both present authors find that it is becoming easier and easier to deal with computer center personnel. Unlike the situation 10-15 years ago, users are more knowledgeable about computers and systems analysts are more knowledgeable about users. In addition to better mutual understanding between the users and providers of mainframe services, mainframe programmers have better tools to use (ALOGL and PLI) to assist in customizing pre-packaged programs such as simulations. No longer do they have to spend hours grunting out code to accommodate user desires. Times have changed. Simulation administrators should not assume that computer center personnel will be uncooperative in developing a system that integrates microcomputers into a mainframe system.

In short, we have found this hybrid system to be worth the developmental time and effort. It has been our experience that this methodology is both easier and more efficient than using either the microcomputer or mainframe versions by themselves. We would suggest this approach as the best which we have encountered over a number of years of experimentation and reel that the general idea of combining the best features of mainframe simulations with advantages of the microcomputer versions can be adapted to practically any situation.

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