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USING A COMPUTERIZED MENU-DRIVEN DATA ENTRY AND "WHAT-IF" PROGRAM AS A PEDAGOGICAL ENHANCEMENT FOR MANAGEMENT SIMULATION

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ABSTRACT

Management simulations and games are extensively used in business curricula. However, there seem to be problems associated with their use which discourage, if not preclude, the use of this tool in many situations. Two issues that particularly seem relevant are: (a) difficulty in data entry by students and instructors; and (b) difficulty in using "what if" scenarios to test the ramifications of potential decisions. This article attempts to define the problem and suggest solutions through the use of a computerized parameter-driven data entry and "what if" program.

INTRODUCTION

Management simulations and games are now a standard part of most Business Schools' curricula. While the precise and exact pedagogical value of such simulations is still under study, (Wolfe, 1986; Butler, Markulis & Strang, 1985; 1986), most educators accept the fact that management simulations do contribute some benefit to student learning. In spite of the assumed benefits of simulations, a number of researchers have reported problems associated with the use of computerized simulations. A recent study by Keeffe and Cozan indicates that up to 25% of business instructors dropped or did not use simulations because of administration/logistics problems (1985). Two issues which seem particularly related to the reasons given by instructors for dropping simulations, are: (a) the difficulty of data entry (for both instructors and students); and (b) the difficulty students have had in using "what-if" scenarios to test the ramifications of potential decisions or the total absence of "what-if" analysis. This paper presents a solution to both of these problems through the use of a totally computerized menu-driven data entry program and scenario generating capability. This menu-driven program allows students to enter decisions in an error free manner and also enables students to test various decision scenarios, without them having to learn anything about a microcomputer except to turn it on. Since the program is automatic and menu-driven, the students (and best of all, the instructors) do not have to concern themselves with technical questions, such as how to use a spreadsheet, how are (my team's) decisions entered into the computer, etc.

Data Entry

The Problem.. Despite the proliferation of computers and computer-related courses in business schools, many students arrive at a course which uses a standard management simulation with a paucity of the mechanical skills required to enter their team's decisions into the computer simulation. This lack of computer skills is disruptive, if for no other reason, than because the instructor must devote time and effort to teaching students how to make and to enter decisions into the computer in order to play the simulation. Instructors and game administrators must constantly deal with a myriad of mechanical and quasi-technical problems which detract from efficient simulation utilization. This problem is not new. It was acknowledged as irksome as far back as 1982 by Dunikoski and Barton when they tried to suggest ways in which instructors can and should free themselves from the mundane, but necessary duties of simulation management, and concentrate on the learning benefits of the simulation experience (Dunikoski and Barton, 1982).

The History. A review of literature on computerized management simulations reveals that they have, indeed, become more sophisticated and while at the same time easy to use. In part, this is a result of the rapid development of microcomputers and standard computer software which has made computers easier to use, hence the term, "user-friendly." ABSEL has tracked much of this development. In 1980, for example, Fritzsche was applauding the advent of direct terminal entry of data (as opposed to punched cards) and proposed a general set of procedures for the development of a terminal entry system for computerized simulations (1980). For the creators of business simulations, Biggs and Smith suggested a set of guidelines, which included the use of microcomputers, which were then coming into common usage (1982). The call to write or adapt computerized simulations to microcomputers was made again in 1985 by Fritzsche and Cotter, wherein they suggested not only a rationale for doing so, but also gave a set of general procedures for creating such simulations, (1985). In general, ABSEL has been encouraging game and simulation developers to keep pace with changing technology. For example, Fritzsche, Jensen and Schou suggested that simulation developers adopt mainframe simulations to work entirely on microcomputers (1982). Other simulation developers have reported on the development of menu-driven input programs for specific business simulations, such as THE BUSINESS MANAGEMENT LABORATORY GAME and MANSYM IV, (Dickson and Kinney, 1982; Schellenberger and Masters, 1986).

The next step came in developing input or data entry programs for mainframes, whereby students could use a secret password to get into a data entry program, enter their decisions and then sign off. After all the teams had entered their decisions, the program would be run and students would retrieve their print-outs either from the instructor or pick them up at a specified location. Developers of computerized simulations then decided to put such data entry programs on microcomputers due to factors such as the proliferation of microcomputers in the business world and the availability of software programs (e.g., LOTUS 1-2-3)*. The next logical step in this process is (1) the direct link of microcomputers to mainframe or minicomputers and which will enable data entry programs to interface directly with mainframe computers or (2) the utilization of simulations in a totally microcomputer environment. Table 1 below

summarizes the major evolutionary steps in the history of data entry.

Table 1. Steps of Historical Development of Data Entry

1. Manual Worksheets--Card Input
2. Manual Worksheets--Instructor Does Terminal Input
3. Manual Worksheets--Students Do Terminal Input
4. Computerized Worksheets--Students Do Terminal Input
5. Fully Menu-Driven Worksheets and Data Entry

Decision Support Systems and Scenario Development

The Problem.. There are many learning benefits attributed to computerized management simulations. Certainly, one of the great claims of the computerized simulation teaching genre is that students will be able to see the ramifications of their decisions by making use of "what-if" analysis or scenario building. Unfortunately, this claim frequently falls short of fulfillment when students actually use a computerized simulation. In part, it falls short because instructors have unrealistic expectations about the time, effort and skill students have in using a simulation, let us say, as part of a Business Policy course. For example, while software presently exists whereby students can make use of DSS techniques (e.g., LOTUS 1-2-3, VISI-CALC) students often do not make use of the software. Students are either unfamiliar with the software or do not make use of the software's full capabilities. This is particularly true given the high degree of sophistication of today's software (e.g., LOTUS 1-2-3, Release 2). Unfortunately, most instructors do not have time to teach the specifics of spreadsheets or other types of DSS programs in class, particularly when the computerized simulation has already been added to an existing course. While instructors hope that students will make use of a spreadsheet (either by learning one or applying one they are familiar with) this usually remains a "hope" and little more than that.

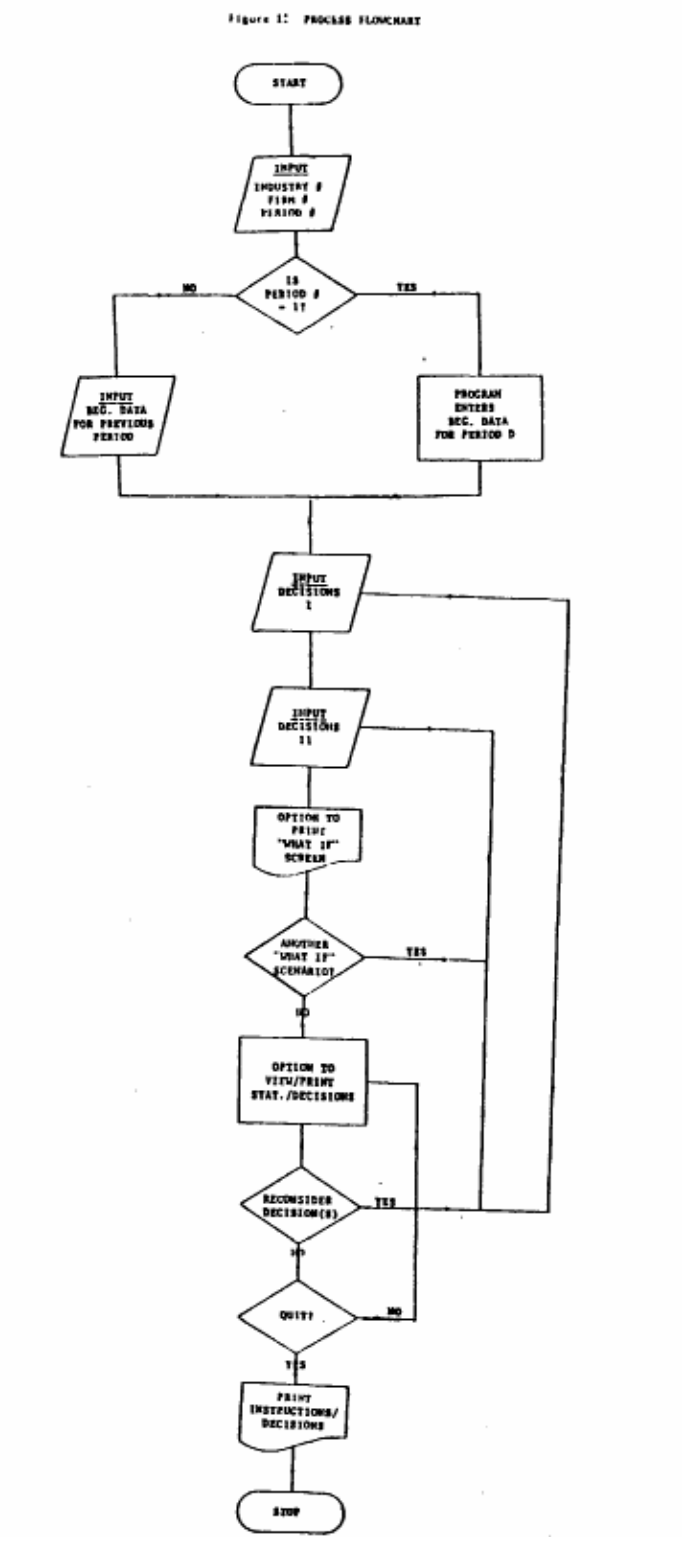
As with the data entry problem, this situation has been approached in various ways by the designers of computerized management simulations. For example, some management simulations presently on the market make no use of "what-if" facilities except to say that the student can design one, while other (like the DECIDE Simulation) make use of a LOTUS 1-2-3 (Release la) spreadsheet as part of the simulation. In the latter case, students must have some familiarity with a spreadsheet to manipulate the data in order to carry out rudimentary "what-if" analysis.

DSS and Scenario Development

The History. ABSEL has monitored the development of DSS over the years. Generally, there seems to have been two directions: (1) researchers and simulation designers suggesting that some kind of DSS or "what-if" tool should be used in the simulation process (Sherrel, Russ & Burns, 1986; Markulis & Strang, 1985; Collins & Shane, 1984) and, (2) simulation designers or researchers taking a specific simulation and creating a "what-if" tool specific for that simulation (Muhs & Callen, 1984; Schellenberger, 1983). In general, one could probably say that the lack of good "what-if" tools for simulations is due, in part, to the fact that most tools have just recently become available.

The Menu-Driven Data Entry Process and "What-If" Program

A Description. A totally menu-driven DSS and data entry program was developed to alleviate traditional problems associated with data entry for management simulations and to assist students in developing "what-if" scenarios for their decisions. A Process Flowchart (see Figure 1) illustrates how the program operates. The program itself is perhaps best explained by describing the way in which the program actually operates (and then describing the actual steps the student will take in running the program).



The menu-driven program is fully automatic. It was written using LOTUS 1-2-3 (Release 2). However, no knowledge of LOTUS 1-2-3 (or any spreadsheet for that matter), is required to successfully run the program since it was designed to be totally menu-drive. The program requires the use of two floppy disks: (1) a data-program disk, and (2) the LOTUS 1-2-3 system disk (microcomputers with hard disks can have LOTUS 1-2-3 already on the system and therefore, the student would only need the data-program disk). LOTUS 1-2-3 is loaded into the system and automatically loads the data file (students do not have to get into the LOTUS 1-2-3 menu or command system). All instructions are listed on the screen, which automatically and at every step instructs the students on what to do next. A screen that appears early in the process asks the student whether he/she is playing the first period of the simulation or another period. If the student is playing the first period, then certain historical values will automatically be entered by the computer (as these values assume an existing operation) and if the student is entering decisions for any other period, the computer explicitly tells the student that he/she must look at the computer print-out from the previous period in order to enter certain kinds of information from that print-out, as illustrated in Figure 2. The reason for this seemingly simple but important instruction is that students to not seem to know where to retrieve or how to use information from their print-outs.

The program then automatically prompts the student through the remaining decisions. The program prevents students from entering invalid data such as alphabetic characters, dollar signs, etc. An important feature of the program is that the student cannot enter decisions which are "technically" or "physically" impossible, for example, selling more goods than has been produced. If the student did enter such a decision, the screen would remind the student that this decision cannot be entered and that the student should reconsider his/her decision and reenter it. However, students can enter decisions that would perhaps be considered "poor" judgements, for example, scheduling more labor than in required.

Figure 2: Input Sheet

```
ENDING INVENTORY OF LEATHER FOR THE PREVIOUS PERIOD:

     A       B       C       D         E         F          G          H          I
661
662
663                 PREVIOUS PERIOD IS          1
664                 --------------
665
666       Please refer to your computer print-out (from the main-frame)
667  for the period indicated above. The values for the following items
668  should be entered at the prompts on the top of this screen.
669
670  ENDING INVEN/      MONTETARY         EXPENSES              WASTE
671  CAPACITY           ITEMS                                  ESTIMATES
672  ---------------    ---------         --------              ----------
673
674  FINISHED GOODS     MARKETABLE SEC    SUPERVISORY           LEATHER
675  LEATHER            LIABILITIES       DEPRECIATION          RUBBER
676  RUBBER             CASH              MISC. OPERATING       DOWNTIME
677  LABOR
678
679
680                                                 CMD
```

After the last decision in entered, the student sees a listing of all of his/her decisions and a partial listing of the ramifications of these decisions. Figure 3 illustrates this important screen. This is where the "what-if" potential of the program comes into play. At this juncture, the menu asks the student is she/he would like to alter any or all of the decisions just entered. With the same screen still visible, the student can elect to change a decision variable and automatically, the screen will show the results of that change and to print the scenario. The next menu asks the student if he/she wishes to view or print the entire Cash Flow Statement, the Income Statement, or a complete listing of all the decisions. Students can reiterate through the process as many times as they wish and can view or print the results at each juncture. On completion of the iterative process students are given three options: (1) RECONSIDER ANY OR ALL DECISIONS, (2) QUITE AFTER SAVING, (3) QUIT WITHOUT SAVING. When the student elects option 2 the program tells him/her that these decisions have been saved and that they are ready to be entered into the full simulation environment • *

An important feature of this menu-driven program is that it prevents accidental or intentional mutilation or tampering with the worksheet. This safe-guard is accomplished by "locking" the students into "command mode" during the execution of the macros.

Figure 3: Side By Side Decision Sheet

```
MARKETING MIX  1  2  3  4  5  PRINT  END
WAITING FOR YOUR RESPONSE
     A       B      C      D        E        F          G          H          I
861      You will now have the opportunity to reconsider your decisions and
862 try several "what if" situations until you are fully satisfied with
863 all of the decisions you have made.       ALL FIGURES ARE IN DOLLARS
864 UNLESS OTHERWISE STATED. YOUR DECISIONS AND THEIR IMPACT ON SELECTED
865 ITEMS ARE WITHOUT REGARD TO COMPETITORS' DECISIONS.
866
867 DECISION                    PRESS          PROJECTED
868 --------                    -----          ---------
869                                                          $
870 UNIT PRICE          $90.00    M                          -
871 SALES (UNITS)      400000    1     GROSS PROFIT         29041324
872 PROMOTION          100000    M     NET OPER. INCOME     27257412
873 R & D              100000    M     TAXABLE INCOME       27265212
874 MAINTENANCE        400000    2     INCOME TAXES         13087302
875 SEC BOUGHT/(SOLD)       0    3     INCOME AFTER TAXES   14177910
876 DIVIDENDS              20    4     NET CASH FLOW        17905096
877 INVESTMENT         250000    5     CASH BALANCE         20905096
878
879              TO PRINT        P
880              TO QUIT         E
                                        CMD
```

The Macros

What makes the data entry and "what-if" facility possible are the enhanced macro commands available with LOTUS 1-2-3 Release 2. The macros are small programs which drive the menus and provide for the "what-if" process. They can be viewed as a series of modules which reside on the same spreadsheet as the data entry program, but are unavailable (protected and hidden) to the student. Macros allow one to write with a few lines of code, let us say about 10-15, what might take a number of lines of COBOL or FORTRAN code to do. Figure 4 shows some of the macros (left side) and gives their explanation (right side).

CONCLUSION

This article presents a computerized menu-driven data entry and what-if program. While this program was developed for use with the DECIDE simulation it can be easily adapted for use with other simulations.

This program solves the problems of (a) the difficulty of data entry (for both instructors and students, and (b) the difficulty students have had in using "what-if" scenarios to test the ramifications of potential decisions or the total absence of "what-if" analysis.

The enhanced capabilities of LOTUS 1-2-3 (Release 2) make possible the features incorporated in the macros of this program.

Figure 4: Macro Examples

RANGE NAME	PURPOSE	CODE
ESTIMATE	Prompts the user to input estimates for raw material waste and for downtime for a given period. The data entered is then stored in a specified location for further processing.	{GETNUMBER "WHAT IS YOUR ESTIMATE OF LEATHER WASTE: ",B15} {GETNUMBER "WHAT IS YOUR ESTIMATE OF RUBBER WASTE: ",B16} {GETNUMBER "WHAT IS YOUR ESTIMATE OF DOWNTIME: ",B17} {GOTO}BA21~ {MENUBRANCH B_ESTMEN}
B_ESTMEN	This Menubranch gives the user an opportunity to change any of the values entered through the routine ESTIMATE.	YES NO DO YOU WANT TO CHANGE THESE VALUES? {BRANCH ESTIMATE} {BRANCH PROD}
PROD	Prompts the user to input desired production. If the user desires production in excess of constrained maximum, the program sounds a "beep" and executes Menubranch PROD_ERR.	{GOTO}F42~0~{GOTO}A25~{GETNUMBER "WHAT IS YOUR DESIRED PRODUCTION: ",F42} {IF F42>F41}{BEEP 2}{BEEP 1}{BEEP 2}{BEEP 1}{GOTO}BA41~{MENUBRANCH PROD_ERR} {CALC} {BRANCH SCH}
PROD_ERR	The user is now given an option to either accept constrained maximum production as the desired production, or re-enter desired production.	1 2 WAITING FOR YOUR RESPONSE {BRANCH PROD} {GOTO}F42~+F41~ {GOTO}A25~ {BRANCH SCH}

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