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INTEGRATING DECISION SUPPORT SYSTEMS AND BUSINESS GAMES

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ABSTRACT

The types of decision support-business game configurations available are discussed followed by the various types of decision support systems currently in use. Attention is then turned to the design support required for the use of the systems, the uses they may be put to and finally what the administrator may expect from using them.

INTRODUCTION

Decision support systems have been around for a long time although they were generally clothed in another name, management information systems (Day, 1986). The image generally associated with management information systems was that of a marketing research or an operations management type hunched over computer equipment providing management with information when requested. The technician served as the link between the manager and the data.

Micro-based decision support systems (DSS) with their ready accessibility and relatively friendly software allow the manager to replace the technician thus eliminating the link. The removal of the link puts the decision maker much closer to the data base thus decreasing the time required to obtain information and encouraging more thorough analysis of the data. Developments in hardware and software have provided managers with tools which are both powerful in terms of data manipulation and relatively easy to use. Probably the greatest contribution to the development of DSS has been the introduction of spreadsheet programs for microcomputers.

TYPES OF SYSTEMS

There are generally four ways of integrating DSS with business simulations given that both DSS and games run on mainframe and microcomputers. First, there is the configuration where both the simulation and the DSS are run on a mainframe computer. This is more reminiscent of management information systems where the technicians had the expertise to operate somewhat complex systems. The advantage of this type of system is that the game can be designed or modified to output a data file stored on disk which is then directly accessible by the DSS. Examples of this type of system can be found in the pairing of The business Management Laboratory (Jensen and Cherrington, 1984) and SLIM (Courtney and Jensen, 1981) and the linking of IMAGINIT with IFPS (Muhs and Callen, 1984).

The second configuration consists of simulations run on mainframe computers with the DSS residing on micros. Among the advocates of this configuration, Sherrell et al. (1986) state that this is the most realistic arrangement in terms of emulating what the student is likely to find today in the business world with performance data being stored on mainframe and DSS software available on micro. With this type of system, data for the DSS may be placed on mainframe disk and later downloaded to the micro DSS. This, of course, requires some linkage between the mainframe and micro such as modem communication. Alternatively, but much less desirable, the data can be entered by hand off of printed output sheets. This type of configuration has also been reported by Anderson and Lawton (1986), Keys et al. (1986) and Markulis and Strang (1985).

With the third type of integration, both the simulation and the DSS are micro based. In this configuration, if the data for the DSS is to be output from the simulation and if the micro is networked with a hard disk, or for small classes the micro contains a hard disk, the system will work similarly to the second configuration above. If a hard disk is not available and data is to be made available in machine readable form from the game, the data will have to be stored on floppy disks which must then be made available to the teams. When the floppy disk option is chosen, a decision must be made whether to use one floppy disk and protect team data with individual passwords or to place the relevant data on individual team disks. The latter option would be the natural choice if using a micro-based simulation which places the individual team output on separate disks. However, if the simulation prints the team output directly, using individual disks would entail much disk swapping at the end of the simulation run.

The final configuration links a business game on a micro with a DSS on mainframe computer. This configuration is not likely to be used by many educators as DSS software is generally less costly for microcomputers and it is becoming more plentiful. If one already has micros, there would be little advantage to using the mainframe for DSS work. The only case when this configuration would likely be chosen is where micros are not available to students, the mainframe has DSS available and the simulation to be used only runs on a microcomputer. There may be situations, if the communications equipment is available, where the data output for the game run on a micro could be stored on mainframe disk for later downloading by students to their micro based DSS. This would form a quasi network with the mainframe serving as the hard disk.

TYPES OF DECISION SUPPORT SOFTWARE

Numerous types of DSS software are available on the market with new variations and modifications frequently released. Most of the newer packages are micro based. Many of the mainframe packages have been released in micro version. The microcomputer is at the heart of the development of DSS since it is inexpensive and possesses a great deal of power. Software designed for the micro has been relatively

easy to learn to use thus eliminating the need for a technician to operate the system. A manager can pick up the basics in a few hours and then learn more advanced applications on the job. This development has resulted in managers becoming much more closely connected with their information and has allowed them to examine their data in much more depth than would be feasible using a third party as the link between the data and the manager.

DSS software can generally be categorized as consisting of spreadsheets, modeling languages, statistical packages, management science model packages and custom designed programs.

Spreadsheets

Perhaps the most popular type of DSS in use at the present time is the spreadsheet. Spreadsheets began with the introduction of VisiCalc in 1979. Essentially an electronic worksheet consisting of cells organized into rows and columns, the spreadsheet has been used for all types of financial and accounting analysis as well as for other types of quantitative analysis requiring mathematical manipulation of data.

The early VisiCalc spreadsheet was rather spartan compared with the current spreadsheets in use such as Lotus 1-2-3, Supercalc and Multiplan. These spreadsheets contain numerous functions such as square root, standard deviation, cosine, logarithms, net present value and logical operators. Varying graphics capabilities are also present.

The strength of the spreadsheets is their provision for entering formulas Into individual cells with the results of the formula being displayed in the cell. The formulas often reference values previously placed in other cells of the spreadsheet. These values may themselves be the result of the calculations of a formula using numbers provided in still other cells. When a new number is placed in a given cell, all of the cells whose numerical values depend upon the given cell are updated automatically. This feature enables the user to engage in the now famous "what if" activity. The applications of spreadsheets in business gaming is limited only by the ingenuity of students and professor.

Modeling Languages

While modeling languages will generally perform the same functions as spreadsheets, they differ from spreadsheets in that modeling languages store formulas and data separately. Thus they can handle much more extensive models as the program loads only the data and variables that the user references (Horwitt, 1985). They also contain analytical tools that will generate sophisticated equations which would have to be user written when using spreadsheets. Many also include statistical procedures such as multiple regression analysis.

The most popular modeling language appears to be a program known as Interactive Financial Planning System (IFPS). IFPS's English syntax, non-procedural language is touted as being easy to use. It is dynamic--accommodating diverse levels of proficiency (Muhs and Callen, 1984). IFPS is especially useful for the model builder who wishes to incorporate goal-seeking adjustments of chosen variables to achieve optimum levels of performance. It extends the normal spreadsheet "what if" capability to "what's best?" (Plane, 1986).

Other modeling languages include Horizon 370, MicroSIM and PC Analect. In general, there is always a price to pay for using more sophisticated tools. Modeling languages are, as a group, more difficult to learn and require more time to achieve proficiency in than spreadsheets.

Statistical Packages

Statistical packages have been with us for some time, but they have only recently been available for microcomputers in a form comparable to those found on mainframes. In fact, the major mainframe packages, BMDP, SAS and SPSS are now all available on micros. In addition, there are some additional packages designed for micro only use which are worth considering such as Systat (For a review of micro-based statistical packages see Fridlund, 1986).

The micro-based statistical packages generally contain the normal range of standard statistical procedures found on mainframes with some containing most of the newer sophisticated routines. Each package has its own special language and each statistical procedure is based upon specific assumptions. Thus they are not easy for students to use unless the students have had some experience with the package previously. However, the packages are very powerful and should be considered wherever statistical manipulation of data is appropriate.

Management Science Models

Numerous packages have been developed for microcomputers which employ various management science models. These include critical path methods, linear and nonlinear programming, optimization models and queuing models. The quality of the packages vary from excellent to barely usable. Where they are appropriate, the models breathe life into management science by demonstrating the usefulness of quantitative techniques in the business environment.

Custom Designed Systems

Some faculty have designed and written separate programs to provide decision support for business games. For example, Shane and Bailes (1986) have written a program to support teams in forecasting their available capital funds. Such programs provide an advantage in that they can be designed to stress issues which the administrator desires to emphasize during the academic period. The disadvantage is that the programs take a long time to develop and test. In many cases exiting software can be adapted to meets the administrator's needs at a significantly lower time cost.

DESIGN SUPPORT

With all of the above types of DSS software, some design support must be provided prior to using the DSS for game analysis. The design may take the form of templates for spreadsheet use, command code sequences for modeling languages and for statistical packages, setup specifications for management science models and computer code for custom designed systems.

The choice of who provides the design support depends upon the type of DSS used and the level of knowledge possessed by the students in the class.

For a class with no experience using spreadsheets, the administrator may initially wish to provide templates and possibly spend time later working with the class on spreadsheet design. For a class that has had experience using spreadsheets, the administrator may simply indicate the type of spreadsheets which are useful leaving the design and testing to the students. The same type of approach should work for modeling languages and management science models. Custom designed packages are likely to be created by the administrator unless student assistance from some unusually competent students is available.

This approach to design support is similar to the experience found in the business world. Many spreadsheet templates are on the market. New users are likely to buy a set of templates when the spreadsheet program is purchased to get them started. This is especially true if the manager has had little computer experience. Alternatively, if there is an individual in the firm who may be considered a resident expert on the software, the templates may be designed by the expert. In either case once the templates are developed, the manager works directly with the data instead of receiving information via a technician link.

If a manager stares at a computer screen long enough, a question of control is raised. Is it you or me? With time made available for exploratory use, managers can quickly become familiar with the use of quality software tools. As the manager becomes more familiar with using the program, he/she may begin to design some templates. Later, most of the templates used may be designed by the manager.

DSS USAGE

The uses which can be made of a DSS linked to a business game are many and varied. The level of usage actually made by student teams will depend upon at least three factors: accessibility, familiarity and emphasis. Experience indicates that there is a direct relationship between the convenience of access and the level of use of microcomputers. Ideally, students would have access to micros in their rooms. The next best location would be in their residence followed by a location in their college. The least preferred location would be in a laboratory removed from their normal travel patterns.

Second the use of DSS will also depend upon the familiarity of the student with the DSS and with computers in general. Students who are comfortable with using the DSS system are likely to look for alternative applications. Students who are apprehensive about using the system will generally complete only the minimum requirements and stop. Fortunately, success tends to breed confidence (or positive reinforcement leads to increased likelihood of response) and some students who previously were somewhat apprehensive toward the computer can be sheparded along to become devout proponents of DSS.

The third factor to affect usage is the emphasis the administrator places upon using the DSS. The more emphasis the greater the usage. Of course the emphasis placed will depend upon the course being taught as well as the attitude of the administrator toward DSS. Certainly a management science course could justify much more emphasis than a business policy course.

In terms of the types of uses made of DSS in business gaming, the simplest form might be character-ized as a spreadsheet used to calculate financial and operating ratios for each period of play. If the template is supplied by the administrator, the effort on the part of the student is minimal. The team will have access to information which most simulation teams do not bother to calculate but which can be very useful for spotting trends. The input to the spreadsheet can consist of data entered directly from each period's output.

Somewhat more complex and probably more valuable uses of DSS revolve around worksheets created to forecast sales, schedule production, evaluate investment proposals, and determine capital and cash budget requirements. These worksheets can be created and evaluated using either spreadsheets or modeling languages. By creating worksheets electronically, the student teams can start to test different alternative strategies by playing the "what if" and/or the "what's best" game. They can begin to evaluate trade of fs in budget elements and in investment proposals. If they go on to develop pro forma income statements and balance sheets, the teams can estimate the results of a specific tactical decision prior to its being made. They can evaluate how sensitive net income is to price changes, changes in sales force size, etc. This type of use, while very valuable in terms of deepening the learning experience, is not likely to happen unless a microcomputer is very convenient for the team members to use. Getting started with this level of DSS is time consuming.

Another somewhat different use of DSS involves the use of statistical packages for forecasting. These packages require a rather substantial amount of game history. Many times statistical analysis is hampered by the lack of sufficient data to satisfy the requirements of a particular procedure. This is especially true if a time series trend analysis is going to be used.

Statistical packages also generally require a somewhat sophisticated understanding of statistical techniques. This can be detrimental to their use unless one of the objectives of the course is to acquire this understanding.

Possibly the most complex use of DSS involves the use of management science models. While some simulations do not lend themselves to this type of support, others provide an excellent opportunity. One would expect that production simulations would be well suited for critical path, queuing and mathematical programming models. Actually a policy simulation might be able to support a critical path technique if the activities not related directly to the computer are included. Models might be created to emulate the simulated business activity,. Models might also be developed to predict customer response. As cited above, the particular applications may be greatly influenced by the type of course being taught and the objectives of the course.

This enumeration of uses by no means covers all of the applications which can be made of DSS in business gaming. The actual uses are limited only by the ingenuity of the students and their professor.

EXPECTATIONS

What can one expect to accomplish by pairing DSS with business educational simulations? The answer to this question is likely to depend upon the objectives of the individual administrator using the DSS. However, there appear to be several types of benefits which may be considered. First, the student will gain additional experience using the computer, hopefully with success. All positive contact with computers enhances confidence and moves the student toward the position of viewing the computer as another problem solving piece of equipment available at his/her disposal.

Second, the student will become familiar with DSS which are currently being used in the business world. His/her analytical tool box will contain one or more additional tools which can be applied to management problems. This should enhance the student's perception of the institution's academic program. It should also increase the student's value to potential employers.

Third, the use of DSS should result in a greater depth of understanding of simulation activity with a resulting increase in planning (Keys et al., 1986). The analysis should reveal patterns and trends which are normally not visible to the student team. The teams can evaluate the effects of their decisions prior to actually making them. This will likely lead to higher quality decisions and thus to more rigorous competition. Finally, DSS can be used to deepen the understanding of quantitative techniques when the student can actually see the results of their applications. It will also sensitize future managers to weaknesses in the techniques and provide experience in capitalizing upon their strengths.

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