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FLEXIBILITY IN SIMULATION DESIGN FOR CONTINUAL STUDENT MOTIVATION

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The thrust of the paper is directed towards inventorying and examining some of the available procedures for expanding the possible levels of complexity, or versions of use, of a business game. The specific version chosen for use in a given situation will be dependent on the skills and sophistication of the given group of participants playing the game. Since a game that is easily adopted and employed by others also increases usefulness, the aim of the paper is also directed toward enabling the above while minimizing additional tasks in administering the game.

Inclusion of some fairly simple additional programming can extend the usefulness of a business simulation by substantially increasing the size of the possible groups of game users. The possible user base of a game is generally effected by:

1. the number and appropriateness of the business functions or areas controlled by the game participants; and
2. the nature and appropriateness of the participant controlled decisions in each of the functional areas.

Unfortunately for game developers, “appropriateness” is measured by those adopting the game. Thus, adoptions and game use are directly related to the ability of the game to satisfy a large number of possible users’ perceptions of what specific decisions should be available in the game. Procedures that enable prospective users to operate the game with their specific sets of decision variables avoids complaints and increases the use of the simulation by others.

First, the purpose for establishing multiple versions of use and the nature of the major types of use are presented. An actual business game is used to both demonstrate the implementation of multiple versions and to indicate how the utility of the game is enhanced by minimum additional programming. The procedure for implementing multiple versions is obtained by having:

1. a variable parameter set,
2. a variable set of participant controlled decisions,
3. the automatic generation within the program of a set of decision inputs that can replace the participants non controlled decisions, and
4. special “one shot” options.

One commonly finds (1) and (4) in many games today. Items (2) and (3) can be used to extend the use of a game over a much broader group of participants, as will be shown.

From the game developer’s point of view, the utility of a game is related to the amount of use of the game by others, the game’s ability

Simulations, Games and Experiential Learning Techniques, Volume 1, 1974

to increase student motivation and interest in course material, and its ability to improve the skills and knowledge of both the instructor and student participants. All of the above are enhanced if the game can be used at many different levels of complexity. The high degree of confusion and frustration that might exist if the participants are placed in a game situation requiring skills and abilities beyond their previous training are avoided. Likewise, the lack of both stimulation and additional learning resulting from participants' involvement in a too simple decision making setting are also circumvented.

VERSIONS OF USE

Both the number of participant controlled variables and the difficulty of the decision situation are changed to enable the adopters selection of a specific set of student controlled decisions. The purpose of each of the multiple versions, now to be described, can be used in either a general purpose or functional area business game.¹

Participants Do Not Enter Decisions

In its simplest version, the participants do not control any of the decision variables. This version is used to familiarize the new game player, before decision inputs are required, with the game environment, both the operating conditions and rules, and the games decision variables. The rather exasperating situation felt by many students forced to make decisions when fully immersed into a new uncertain situation is avoided. With this initial version, the rules for game play and necessary skills for proper decision making can be learned before decision entries are required. For example, with The Financial Management Decision Game, FINGAME¹, the students are assigned the tasks of preparing sets of pro-forma financial statements based on either the set of decisions entered by the administrator or automatically generated by the simulation. Variance reports explaining the differences between the pro-forma statement preparation requires the students to both learn how to prepare financial statements while also acquiring knowledge of the many rules and conditions affecting the firm's statements and performance. The variance reports force the students to locate errors in their original pro-forma statement preparation while also demonstrating the origin and size of the justified variances.

After a few iterations with this version, the students will have adequate exposure to the necessary skills and knowledge of the game rules to operate a simulation game. At this point, they are usually quite anxious to enter active game play.

¹ All of the versions that are to be described are used in [1] and more fully discussed in [2].

Simulations, Games and Experiential Learning Techniques, Volume 1, 1974

One Decision is Participant Controlled

Participants control one variable at a time with this version of use. All the other controllable decisions required to maintain the firm are made by the administrator, or internally generated within the game.

The single participant controlled decision version is used to acquaint the students with the rules governing the single decision area while also allowing them to see the ramifications of the single decisions on their company and environment. Participants also quickly recognize the interdependence of their decision with the restraints imposed by not having control over the other decisions.

The control of one variable at a time enables a systematic means of more slowly obtaining a knowledge of game play. With FINGAME, the students in an introductory finance course control the decision variable most closely matching the material they are studying. In this instance, the game fulfills the role of a problem or workbook text. An advantage exists with the game over the workbook text since the students both see how their single area decision is interrelated with the other company decisions and can see how their decision affects the firm's financial statements and performance.

After covering a substantial set of decisions, one at a time, the students have the requisite understanding of the skills and game environment to control the entire set of available decisions. By employing this version, student confidence is increased, there is less likelihood of students establishing faulty or unsound decision procedures, and the transition to operating the entire set of company decisions is much easier.

Participants Sequentially Add Controlled Decisions

Students control an expanding set of decisions with this version. Very similar to the version just described, the game player gains control of an additional variable after he has acquired the necessary skills and knowledge of game rules to manage the new decision.

Reinforcement of previous learning is achieved by the requirement for repeating decisions in each of the controlled areas. Further, after several iterations, the student will have full operating management of available decisions.

Participant Control the Entire Decision Set

The entire set of available decisions are controlled with this type of use. Explanations for using a previous version to phase the student into a simulation game were covered. Arguments also exist for the full immersion approach. This approach more closely duplicates high stress decision environments the students might face in an actual situation. Additionally, the immediate control of the entire game's decision set provides an experiential situation not easily duplicated in other classroom activities.

Simulations, Games and Experiential Learning Techniques, Volume 1, 1974

An extended version of the fully controlled decision set can be used to provide the participants with further exposure to a game. By changing the game's environmental parameters, a new decision making structure can be implemented. For example, with FINGAME two packets of environment and company cards are provided with the source program. The first is for an established operating company while the second is for a newly formed company having only cash and common equity. With different environmental parameters on prices, costs, demand, and demand and price variability, the second packet requires the participant to first build and then efficiently operate his company in an environment quite different from that of the first packet.

Additional Special Options

Specific non-recurring decisions situations are included in a game to maintain student interest while also enabling them to develop additional decision skills. Student interest often declines after several interactions are played with the same set of controlled decisions. The learning obtainable from a game quickly declines as the students routinely determine decisions using pre-learned decision procedures. Special "one shot" options requiring additional decision making can be used to maintain continued learning and interest. For example, the administrator of FINGAME can initiate a labor strike, a large extraordinary gain (or loss), or a fire that burns out inventories and an administrator's specified percentage of machine capacity.

With the inclusion of the special options the students effort must be directed toward the range of possible effects of the available options on his company and pre-plan, or form a strategy, in anticipation of their possible occurrence. Additionally, when the option is initiated, further decisions are required to adjust the company to reflect the new event.

IMPLEMENTATION OF MULTIPLE VERSIONS

A variable parameter and participant controlled variable set together with special options and machine generated substitute decisions are used to expand the use of a game. Suggestions and recommendations on their incorporation into a game are now provided.

A Variable Parameter Set

A set of parameters affecting key environmental factors are controlled by the game administrator with most games. This enables the administrator to modify it:

1. for use at various levels of complexity;
2. to enable its reuse without exact duplication of previous results; and
3. to adjust the environment to the specific experiential situation desired by the administrator.

Simulations, Games and Experiential Learning Techniques, Volume 1, 1974

The control of the parameters is easily accomplished by using variable names on key coefficients used in the program. The variables are then read in on cards. The efficient utilization of "prime located" cards decrease administrator requirements in making changes. Thus, the first few and last few cards in a data deck are most accessible and best for enabling administrative changes.

Additionally, there is less likelihood of faulty deck sequencing when these cards are used for the most likely game changes. Clear documentation explaining how and why the variables can be changed is essential.

A Variable Set of Participant Controlled Decisions

A variable participant decision set is one of the two key items enabling the many versions of use described earlier. Figure 1 provides a flow chart of the programming required to implement both the variable decision set and the simulation generated decision set options. Referring to Figure 1, the control of the I th decision will be student controlled if $D(I) = 1$ on the A1 card. Further, if $D(I) \neq 1$, and $D(I) \neq 0$, the administrator will enter the decision with the variable $REP(I)$ on the A2 card. A maximum of $2N$ additional variable name will be required to implement the above procedure. Additionally, as can be seen, the programming requirements will be minimal.

Simulation Generated Decision Set

The automatic generation of a set of decision inputs, used in lieu of student and administrator entered decisions, increases the usefulness of the variable decision set option just reviewed. The simulation generated decision will be used when $D(I) = 0$ for decision item I , Figure 1. The automatic generation of decisions decrease the administrator's task in period to period decision making when participants do not control the entire set of N decisions. Without this option, the administrator would have to enter decisions that are not student controlled.

Additional programming is required to automatically internally generate the substitute decisions, $NEW(I)$ of Figure 1, used when $DCI) = 0$ for decision item I . To reward the students for control of additional decisions, $FINGAME$ is constructed to generate non optimal substitute decisions. If students properly manage their new decision, or decisions, the performance of the firm will improve. $FINGMIE$ requires less than $\frac{1}{2}N$ additional statements to determine values of the N substitute decisions. Thus, additional programming needed to establish the option were not substantial.

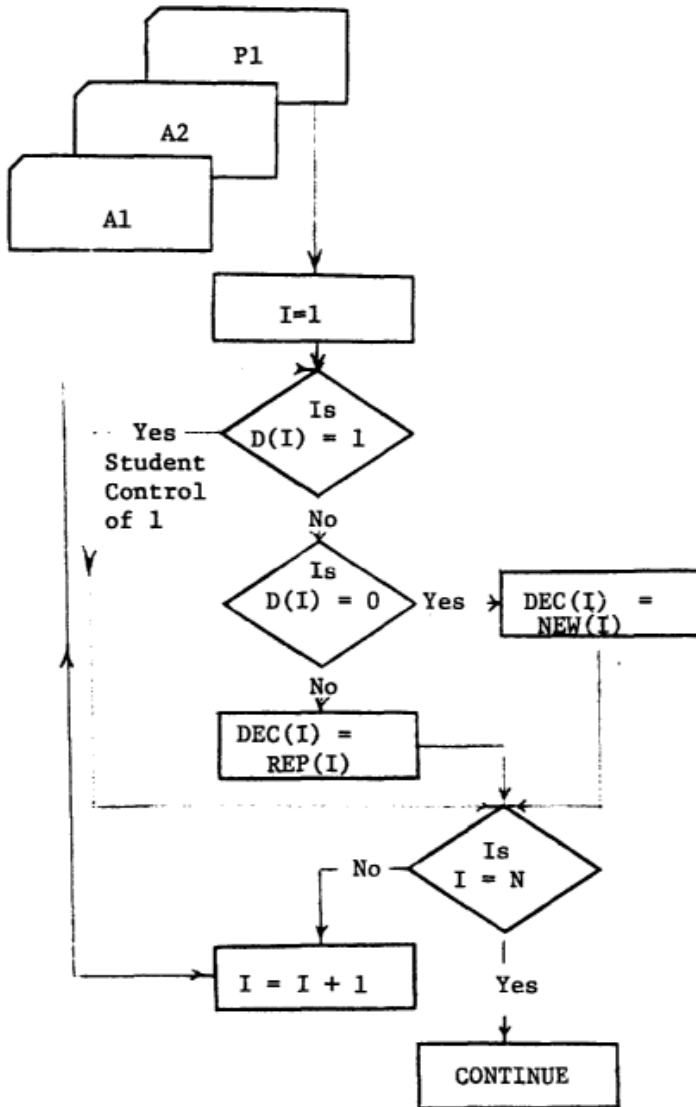
Special Non-Repeating Options

The nature of the non-repeating option determines the extent of additional programming required for implementation. For example, the extraordinary gain or loss option in $FINGAME$ required an additional two FORTRAN statements.

Simulations, Games and Experiential Learning Techniques, Volume 1, 1974

Alternatively, the strike option required twenty-two statements since it affected many other program variables. Thus, the programming changes required to implement several special options can easily become very complex and extensive

Figure I
Decision Control



Participants Company Decision Card
(Includes DEC(I), I=1,N)

Administrator's Company Decision Card
(Includes REP(I), I=1,N)

Administrator's Decision Control Card
Includes D(I), I=1, N where there are N
possible participant controlled decisions.

NEW (I) is the simulation generated
decision for the Ith decision item.

Simulations, Games and Experiential Learning Techniques, Volume 1, 1974

CONCLUSION

The implementation of multiple versions of game play with a single operating program is fairly easily obtained. The requirements are more easily obtained if the game is initially designed with an intended use of multiple versions.

The usefulness of the game to a given adopter is expanded and the likelihood of a greater number of adoptions is increased when multiple versions are available. Given the extent of the increased possible usefulness of the game, the required increase in planning, programming, and compile and execution time are minimal.

REFERENCES

1. Brooks, LeRoy D., The Financial Management Simulation Game, (Homewood, Illinois: Richard D. Irwin, Inc., Forthcoming).
2. _____, The Financial Management Simulation Game: Administrator's Manual, (Homewood, Illinois: Richard D. Irwin, Inc., Forthcoming).