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SOME ISSUES IN GAME DESIGN

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ABSTRACT

Designers and developers of management simulation games come from many miscellaneous areas and most have learned about gaming largely through their own experience. As a result there tend to be differences of opinion about the goals of simulation and methods for achieving these goals.

This paper looks at some of these issues about which some differences of opinion exist and examines some of the reasons for there being different ideas as well as giving the author's opinion about the issue.

The specific issues discussed are:

    The Desirability of Realism
    On-Line versus Off-Line Umpiring
    Should There Be One Game or Many?
    The Desirability of Having Dominant Variables
    Methods of Determining the Winner of the Game
    Debriefing--A Lot or a Little?

INTRODUCTION

Many of those currently involved in the design and development of management simulation games found they were developing games almost by chance: because it looked like a game was needed in a particular area; because they were intrigued by a particular game and became involved in the gaming process; or because they were working in an area and in trying to find a good way to present it, found they had developed a game.

The first game I developed came about because I was concurrently teaching the 3 sigma action rule of quality control in one course and exponential smoothing in another course. In quality control, practice is to use the philosophy of overwhelming statistical evidence before taking action, because the assumptions are that the probability of a parameter change is very small and that it is expensive to make the error of assuming a parameter has changed when it has not. On the other hand, exponential smoothing, with its constantly changing estimate of a process parameter, is used where the probability of a parameter change is high and the cost of assuming a parameter has changed, when it has not, is very low. It appeared that these two circumstances represented opposite extremes of what should be a continuum of problems, and this led to speculation on the appropriateness of the stock market as a possible circumstance in which the probability of a significant parameter change (a change in the real worth of stock) was neither very high nor very low, and the cost of assuming a parameter had changed when it had not (buying or selling the stock) was neither very high nor inconsequential. An interest in on-line computer testing of ideas led me somewhat astray from the original problem and the game I call STOCK MARKET was born in its initial version almost before I knew that a game was what I was developing.

Although the circumstances that have led each of us into gaming probably vary widely, it is unusual for the route to gaming to follow the path of other disciplines where, as a student, one takes an introductory course, develops an interest, and decides to major in an area by taking more advanced courses in the area.

Because of this, we find that there are many more-or-less preconceived ideas about game design that are often used as rules of thumb without really questioning their merits. This often results in different ideas being held by different users, and has had the worthwhile result of promoting interesting discussions at ABSEL meetings. Despite this, the issues are often not clearly faced and we find that discussions do not lead to agreements because the unstated assumptions forming the basis of the arguments are different.

This paper endeavors to select several points on which there are differences of opinion, analyze the basis for the opinions and, to spark controversy, give the author's conclusions about which point of view should carry the day. It should be recognized that the conclusions reached are in themselves based on the author's biases without opportunity for rebuttal and should be evaluated in that light.

THE DESIRABILITY OF REALISM

Many game developers have assumed that realism is the goal they are working towards in their game design. A recent article makes the blunt statement, ''Ideally, all gaming techniques strive to obtain a 100% realistic copy of the object system being simulated.'' [2] This emphasis on realism probably stems from various attitudes, including (1) a feeling that gaming isn't quite respectable, (2) a view that games are just another way of using cases, with actual cases having wide-spread acceptance for legitimate reasons, (3) a goal of indoctrinating the participants in the use of a specified form or record-keeping technique, and (4) a desire to subject the student to the complexities of real-life decision making by requiring integrated decisions for a wide range of variables.

The problem with trying to achieve realism is that it is impossible because the variety of possible relationships is virtually infinite. In real life we see people endeavoring to solve problems using linear programming techniques where literally thousands of variables are used. The argument that having ten variables in a problem is better than having four because real life problems have a very great number is difficult to accept without documentation. Psychologists have long recognized the severe limitations on the number of variables a person can take into account at one time, and have dealt specifically with the issue of realism.

Aronson has pointed out, ''. .a frequent criticism of laboratory experiments is that they are artificial and contrived imitations of the world, that they aren't 'real'....an experiment can be realistic in two separate ways: if an experiment has impact on a subject, forces him to take the matter seriously, and involves him in the procedures, we can call this <u>experimental realism</u>. Quite apart from this is the question of how similar the laboratory experiment is to the events that frequently happen to people in the outside world. This can be termed <u>mundane realism</u>. Often a confusion between experimental realism and mundane realism is re-

sponsible for the criticism that experiments are artificial and worthless because they don't reflect the real world.'' [I]

My own experience indicates that a game has more impact, is taken more seriously, and involves the student more if the number of interrelated variables are kept to a manageable number. The ability to comprehend the general nature of the effect of changing a variable is necessary if the decision making process is to be a live experience. At the opposite extreme of particular concern are games that endeavor to indoctrinate the participant into believing that the decisions leading to success in a game modeled after Industry X will actually be the decisions that should be made in Industry X. This will seldom be true in the short run, and even where sufficient research has been done to make it true in the short run, will certainly have the long run result of solving yesterday's problems rather than today's.

Another problem with real life situations is that the payoff for a good decision is seldom explicit. This means that even when excellent decisions are made, they ma~ not secure good results either because the expected payoff was not there or because pure luck in the thing of the decision mitigated against a good result. Even though luck may be of major importance in a real life situation, a game in which luck plays a major part will not be looked upon by the students as a meaningful learning experience.

I believe that the best advice one can give to the fledgling game designer is to take a realistic situation and simplify it greatly to make the situation amenable to meaningful analysis by whatever level of student the game is designed for. This will result in good analysis and a meaningful decision-making experience for the students, rather than merely subjecting them to a mass of data about which they can only guess at good answers.

ON-LINE OR OFF-LINE

Assuming that a computer is to be used to umpire the games, the overwhelming pedagogical value of quick feedback of results of decisions would appear to suggest that virtually all games would be umpired on-line. Waiting an hour or a day or a week to find out f a decision has turned out well is almost surely going to lessen the learning value that would have been secured through immediate feedback. Nevertheless, the vast majority of games being used are umpired on off-line batch systems.

There appear to be three main reasons why the preponderance of games are being umpired off-line.

(1) No on-line computer system is available.

(2) The terminal facilities tied n to an available on-line system do not readily permit the volume of output desired.

(3) Popular games were originally developed for batch systems and people are hesitant to change.

Considering that an excellent self-contained micro-computer, complete with 300 baud hard-copy terminal and completely adequate for most gaming applications, can be secured for under $400o, it is difficult to passively accept the constraints inched by the first two reasons. For the accounting oriented game, where the voluminous output may mean that a 30 character per second output rate is insufficient, even a line printer, while somewhat more

expensive, is considerably less costly than the equipment other colleges at the university routinely acquire for their laboratories.

If the facilities problem is mostly illusionary and immediate reinforcement through quick feedback of results is truly pedagogically sound, it is certainly to be hoped that, in a field as new, as dynamic, and as educationally exciting as simulation gaming, resistance to change will not carry the day.

ONE GAME OR MANY

The desire for realism with the attendant thrust towards bigger and bigger games, coupled with the predominance of off-line batch computer umpiring have led to playing just one game as part of a course, with one or two quarters of play (decision-making periods) a week. There are several disadvantages to playing only one game that can be successfully eliminated if the same amount of time is given to playing several games umpired on an on-line computer system.

One of the disadvantages is the indoctrination effect. Playing a game in which the winning strategy, for example, calls for relatively high price, high inventories, little advertising, many salesmen, and low quality should have the effect of acquainting the students with the need for the sort of analysis of the problem that would lead one to use these strategies. Unfortunately, the message received is often that these learned relationships are inherently correct and that high price, high inventories, etc., are the way to success in the real world. Playing other games where low price, low inventory, heavy advertising, few salesmen, and high quality are right is an effective way to put the emphasis on analysis of the situation rather than on empirical reasoning.

Another disadvantage of playing just one game lies in the inter-personal relationships that develop on a team. At the beginning of a game a leadership struggle will take place as various members of a team endeavor to have their point of view adopted by the team. Leaders will emerge as the team decides on a course of action and those espousing other viewpoints will be relegated to lesser roles. Playing more than one game, especially with different make-up of the teams, permits having several Opportunities to become a leader, and demonstrates the value of documented preparation, such as computer output, in having one's point of view being given serious consideration by the team.

A related variable is the total amount of decision-making experience that can be acquired through multiple games. Playing several games in an on-line atmosphere implies that time pressure--in itself a valuable and realistic experience-- will be applied with the result that far more decisions will be made in the same amount of time, with considerable learning taking place from both good and bad decisions.

DOMINANT VARIABLES

Most game designers prefer not to have dominant variables in their games because they do not want one team to be a runaway winner merely because they picked one variable (say advertising, as an example) and pushed the bulk of their resources into it. If this happens, other teams tend to lose interest if they are obvious losers half-way through the game and it is especially critical if the game is to continue for another month. Thus most variables are designed to be relatively close

decisions such that a bad decision on one variable will not automatically cause a team to do poorly if their decisions on other variables are adequate.

The other side of the question lies in the power of the indoctrination effect previously mentioned. One of our most successful alumni called me recently to express his pleasure with the quality of the education he had received, and said that the most important ingredient was learning to look for the key variables in a problem. I believe that there are dominant variables in most real-life decision analyses, and feel it is necessary to have at least some games where there are dominant variables so that students will get in the habit of looking for them. One advantage here of on-line umpiring is that the chagrin felt at having already lost is certainly tempered if one knows the game will only last for another hour rather than another month.

DETERMINING A WINNER

One of the difficulties in assessing the quality of decision making in real-life situations lies in the fact that luck plays an important role in the real world and the payoff for good decision making is quite uncertain. Thus professional decision analysts will be heard to maintain that we should reward good decision making rather than good results. This uncertainty of payoff detracts from rather than adding to the learning experience of making decisions and attempting to duplicate it in simulation gaming has little merit.

One method of determining a winner is to use a combination of many measures, comparing them with actual ratios currently in vogue in major corporations. This approach combines the problems of indoctrination and realism because students will be led to believe that certain relationships are inherently correct rather than analyzing to see why or if they are, and can be quite misleading if in truth the relationships of the game do not fully meet the conditions that led to the ratio being what it is.

I strongly advocate the use of one simple, clear-cut goal such as maximizing profits, minimizing cost, maximizing rate of return, etc., in deciding the order of finish of the teams. The certainty of payoff and the focusing of attention on a simple goal provide the framework for exciting discussion of strategy that will be dissipated if many goals of uncertain weight are used. If more than one goal is to be used, then the exact weightings should be known so the students themselves can calculate the order of finish rather than waiting for the analysis of the professor.

A related problem comes in the ending of the game, where special action may be taken in late quarters that would improve profits but leave a team in a poor position to carry on into later quarters. One solution to this dilemma is to judge which team is in the best position to carry on and declare it to be the winner. Once again, this introduces a subjective decision by the professor in charge. Another solution is to try to keep hidden when the game is going to end, usually quite unsuccessfully as students tend to be well-versed in the game of figuring out what the professor is going to do.

My recommendation here is to tell the students exactly when the game is going to end and to encourage them to do whatever they can to maximize the decision variable by the end of the game. I have never had any difficulty with students accepting this as a rule of the game, and it brings about a new element of excitement and discussion because a change in strategy towards the end of the game is often called for.

DEBRIEFING

Nearly everyone who writes on simulation gaming cites the necessity for extensive debriefing. While some debriefing is certainly necessary, I question whether the detail usually recommended is desirable. In questioning students on how they felt about the debriefing I do, it is not uncommon to get comments such as, 'After you lose you know you've lost and you usually know why you've lost and you don't need somebody rubbing your nose in ft.''

One of the greatest teachers I have known taught me beginning calculus. In his first class he asked, '%/hat is zero divided by zero?'' After receiving many varied answers he announced it was six. He then proceeded to

show that $(X^2 - 9)$ divided by $(x - 3)$ was equal to $X + 3$. When X was equal to three then zero divided by zero was six. He then said, 'Thank you, ladies and gentlemen, that's all for today,'' and walked out.

The whole class was abuzz with talking about what he had done and complaining that he could have made it anything he wanted just by choosing different relationships. I am convinced the concept of an indeterminant was far more effectively driven home that if he had lectured extensively about what he had done, as I am sure most of our debriefers would have.

To me an important objective is to have the students talking about the game as they are leaving after the game is over. While some debriefing is necessary, we should always keep in mind that there are many things that students can work out for themselves and in so doing understand them far better than if we tell them what they are supposed to have 'earned.

REFERENCES

[I] Aronson, Eliot. The Social Animal (San Francisco: W. H Freeman & Co., 1972), p. 280.

[2] Chiesel, Newell E. 'The Dynamic Aspects of Interactive Gaming Puts the Realism into Gaming,'' Insights into Experiential Pedagogy, Proceedings, Sixth ABSEL Conference, New Orleans, 1979, pp. 271-276.