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CONSUMPTION AS THE OBJECTIVE IN COMPUTER-SCORED TOTAL ENTERPRISE SIMULATIONS

Precha Thavikulwat, Towson State University

ABSTRACT

Computer-scored total enterprise business simulations have traditionally incorporated production-oriented scoring systems, which measure performance in the short term. A consumption-oriented scoring system that would quantitatively measure long-term performance is proposed. Mechanisms for effecting the system, problems it will create, and solutions to those problems are discussed. The possibilities that a consumption based system will substantially affect participants' experiences, that it will resolve the dilemma of assigning individual grades for group accomplishments, and that it will increase the Instructors flexibility are raised. The proposal is made that consumption oriented simulations should be called total economy simulations and that the subsequent evolution in simulations should be proliferation oriented, and called total ecology simulations.

INTRODUCTION

Money is not the objective; it is the medium of exchange. This is a truism, but it is a truism that has been ignored in traditional computer-scored total enterprise business simulations.

Total enterprise business simulations are those that "include all the main functions of business enterprise as its decision inputs--marketing, production, and finance (Keys, 1987: 225). As such, they are different from functional business simulations, which focus specifically on problems of decision making as seen in one particular functional area" (Cohen and Rhenman, 1961**:** 40).

The question of interest is whether a total enterprise simulation is merely a sum of functional simulations, or whether it might also be an entity that is distinct from its functional parts. Existing total enterprise simulations appear to be based on the former thinking. They track functional objectives, such as sales in marketing, costs in production, and profits in finance, and they may include a formula that gives an overall index of performance based on a weighted sum of functional objectives and related ratios. None of the objectives they track are different in kind from a functional objective.

Granted, tracking functional objectives and summing them does not necessarily imply that these objectives dominate the grades that students receive. Instructors often base grades on a variety of measures. Anderson and Lawton (1988b) have assessed 11 of these measures: exams on simulation rules and procedures, exams on reading simulation output, exams on conceptual issues, evaluation of written plans, ability to predict results, performance relative to implementation of the teams plan, identification of and recovery from mistakes, relative ranking on simulation results, analysis paper, oral presentation, and peer evaluations. Nevertheless, these measures are not intrinsic to the simulation. Although they may be recommended by the simulation's designer and discussed in the simulation manual, they are not part of the algorithm-- they do not determine the way the simulation works.

The need for a good intrinsic measure of performance in total enterprise simulations has been noted by Smith and Golden (1989b), who observed that traditional measures track short-term performance, not long-term performance. This is disturbing, because executives in charge of total enterprises should work for the long term. For functional managers, a short-term orientation might be acceptable; but for chief executives, it would not be acceptable. The problem centers on finding a long-term, yet quantitative, objective that would be embodied in the simulation itself, and would not be incidentally attached to the simulation by instructors who must then rely on their subjective judgments.

Because businesses earn profits so that their owners might enhance their consumption, consumption should be the long-term, quantitative objective that is sought. Consumption can be measured quantitatively, as production can. Thus, incorporating a consumption objective in computer-scored total enterprise simulations is feasible.

A consumption-oriented total enterprise simulation is not itself a new idea. BLOCKS & CHIPS (Thavikulwat, 1982) was a simulation that assigned grades to participants based on the number of 'chips' they bought, hence consumed. A chip was a certified construction of paper and glue that a company physically manufactured. BLOCK & CHIPS required participants to make chips with paper, scissors, and glue, and it required the instructor personally to count the chips. Because BLOCKS & CHIPS relied on physically real products, it could not be administered easily. BLOCKS & CHIPS was not a computer-scored simulation.

To be administratively facile, given today's technology, a simulation should be computer-scored. This paper shows how a computer-scored, consumption-oriented total enterprise simulation can be created. It points out the substantive and programmatic problems that accompany this approach. It suggests that a consumption-oriented simulation can be the foundation of a new class of business simulations--the total economy simulation.

IMPLEMENTATION

A consumption approach to scoring total enterprise simulations can be distinguished from a production approach. In a production approach, the scores that participants receive come directly from the success of their producing firms. This success is measured by sales, by costs, and, bottom-line, by profits. In a consumption approach, however, participants receive no scores until they consume the products their simulated firms produce. At that point, consumption converts to scores such that the more a participant consumes, the higher that participant scores.

Of course, simulated firms produce simulated products that have no intrinsic worth. In a computer simulation, the products are really labeled numbers. Moti

to consume, however, arises from the desire to score well. For the system to be complete, a mechanism must distribute the earnings of firms to participants, and a mechanism must allow participants, as consumers, to buy the products the firms produced.

In a computerized simulation, the enabling mechanisms would be programmed instructions that would distribute the earnings of firms to their owner-participants, and that would enable those same participants, as consumers, to buy selectively the products of competing firms. The consumers would be given a schedule relating products to points. A product bought would be a product consumed. As participants consumed, they would be credited with points. The computer program would execute the trade, and would assure that the selling firm receive the revenue, and the buying consumer, the points.

Two microcomputer-based strategy simulations, CORPORATION (Smith & Golden, 1989a) and STRATEGY! (Priesmeyer, 1987), already allow for the trading of stock, which shows that trading programs can be implemented on microcomputers. Allowing the trading programs to encompass products also would therefore be an extension of a proven technology. Thus, implementing a consumption approach to scoring total enterprise simulations on microcomputers is feasible.

PROBLEMS

Although a consumption approach to scoring total enterprise simulations merely extends existing technology, it does bring with 1t new problems. Fundamentally, the trading of products would involve a volume of transactions greater by at least an order of magnitude than the trading of stock. Over a single academic term, for instance, each participant might reasonable purchase stock on two or three occasions, at the most, but if each participant purchased products at this frequency, the simulated firms would face an anemic market.

To allow participants to trade at high frequencies, three solutions are possible. These range from a labor intensive, lower technology solution, to a labor sparse, higher technology solution.

First, a clerical person could be trained to work with participants. This person would manage the program, would accept from participants their many purchasing requests, would enter those request, and would hand back to students printouts confirming their trades. This solution solves the problem by applying more labor to an existing technology.

Second, the processing of traces that is now centralized could be decentralized. That is, instead of a clerk running the computer program that accepts trading requests, the participants would run the program by themselves. Although some simulations already allow for partially decentralized processing (participants run a data-entry program to place decisions on a disk, which then goes to the clerk), the idea here is to eliminate the clerk altogether.

Eliminating the clerk implies that the decentralized program would have to access a central file. Maintaining the integrity of this central file would be a difficult problem. Because the central file would be on a diskette or on a hard disk that must be accessible to participants, who may decide to copy the file for clandestine analysis, the file must be encrypted. Tamper-checking algorithms must also be included in the processing program to prevent the programs acceptance of corrupted data. The program must also be immune to inadvertent errors that participants with little training would be inclined to make. Although these are difficult problems, they are programming problems that can be solved.

Third, decentralized processing could be carried one step further by placing the central file on a file server of a microcomputer network. The central file would then only be accessible through programs run on microcomputers that are part of the network. Direct access by participants would not be allowed, forestalling any possibility of tampering with the file. Administratively, this is the best solution. It does require a microcomputer network, and good computer programming.

To assure that the programming problems are solvable, a prototype, CAPSTONE, has been created. The prototype involves decentralized processing with a pair of encrypted and tamper-resistant central files that can either be located on a disk accessible to participants, or on a file server of a microcomputer network. The prototype imposes two trading restrictions: first, trading can occur only in one direction, and second, offers can go only one way. Thus, companies can sell to consumer, but consumers cannot sell to companies. Companies can state the prices they require, but consumers cannot state the prices they want. These two restrictions simplify the programming at an undetermined loss in the efficiency of the market**.**

DISCUSSION

Companies make profits so that their owners might enhance their consumption. This is the truism that has yet to be implemented in total enterprise simulations. A consumption-oriented simulation would implement this truism.

The implementation will require considerable efforts. These efforts may not be worthwhile if the resulting product does not substantially enhance experience, content, or feedback (Keys, 1977), or if it will not substantially ease the instructors administrative burden.

One might ask, for instance, how counting consumption units is any different from counting the profits that provide participants with income for their consumption. Actually, major differences can arise because the shares in a business may not be evenly distributed among the owners, because some owners may be more astute consumers than others, and because some companies may distribute their profits in a more timely fashion than others. Furthermore, the voluminous psychological literature on objectives, inspired by Lewin (1938), suggests that changing the objective changes the nature of the experience. Nevertheless, the effect of chancing the objective in this particular way has yet to be tested. Research will be of value here.

Administratively, a consumption-oriented simulation, because it scores individual performance rather than company performance, eases the instructor’s burden of assigning grades. Instructors of production-oriented simulations invariably are faced with the dilemma of assigning individual grades for group results. Many instructors resolve this dilemma by having group members rate their peers. As Anderson and Lawton (1988a) have pointed out, however, these necessarily subjective ratings are a frequent source of dissatisfaction and conflict.

Moreover, a consumption-oriented simulation provides instructors with the added flexibility of allowing firms to start from different states. Teach (1987, 1989) has noted that the profit measure underlying production-oriented simulations mandates the artificial requirement that all firms start from identical' states and are constrained by the same parameters. A consumption-oriented simulation replaces this requirement with the more palatable one that all participants start with the same cash balance which they are free to hoard or to invest in any of the businesses the simulation makes available.

Consumption closes the economic loop that production opens. For this reason, a consumption-oriented total enterprise simulation is a new kind of simulation that might be called a total economy simulation. This name was chosen because it properly suggests that business simulations might be expanded further to incorporate interdependent industries, intertwined in a complex of cooperative and competitive economic forces-just like the real. world.

Extending the 'logic that production leads to profit
and that profit leads to consumption, one might consider what would follow consumption. Taking the Darwinian position that consumption reads to the proliferation of the species, perhaps eventually, simulation designers will attempt to create proliferation-oriented simulations that would yet fall into yet another category that could be called a total ecology simulation. But that would be a project for the next decade.

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