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UCLA EXECUTIVE DECISION GAMES

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This report was prepared as the written portion of a paper on "Total Enterprise Games," to be presented by the author to the Symposium on Management Games, University of Kansas, December 12-13, 1958. It consists of a brief description of UCLA Executive Decision Game No. 2, and an even shorter preliminary description of the new Game No. 3. Several persons, including Tibor Fabian, J.L. McKenney, and K.R. Wright, have played important parts in the work on which this paper is based. It was written as part of the Management Sciences Research Project, UCLA, under support from the Logistics Branch, Office of Naval Research. The Western Data Processing Center and the Division of Research, both agencies of the Graduate School of Business Administration, UCLA, have also helped to make this work possible. Reproduction of this paper in whole or in part is permitted for any purpose of the United States Government.

UCLA EXECUTIVE DECISION GAMES

Three executive games have been developed at UCLA. Game No. 1 which was first played in the spring of 1957, has been superseded by the more refined Game No. 2. Game No. 3, utilizing the Western Data Processing Center's new IBM 709 computer, is now only to the test-run stage. Consequently, this note will focus on Game No. 2, which has been used by a number of universities other than UCLA and also by several business firms. A note at the end will briefly describe Game No. 3.

Game No. 2.

The bulk of the discussion is straightforward description of the game in the form of a condensed and slightly generalized version of the instructions given to the players.

As a preliminary to the formal instructions, players are told briefly about business games in general and their purposes. Questions are invited throughout the instruction period, but the administrator of the game reserves the right to give incomplete answers. As a substitute for more thorough instructions and the knowledge which would in a real business be inherited from past managements, a short, unscored practice period of play usually precedes the "main run" for a group.

This game simulates a multi-firm, one-product industry. There may be as few as two firms or as many as nine. Time is accelerated to a rate of approximately one year per hour or two of actual play. Six to seven years are simulated by one play of the game, sometimes in a single day, and sometimes in a series of one- or two-hour sessions.

A team of three to six players forms the top management of each firm, and guides it by making the following decisions quarterly:

Price of Product
Production Volume
Advertising and Selling Budget
Research and Development Budget
Investment in Plant and Equipment
Dividend

The decisions are filled into preprinted forms, which are designed to facilitate keeping track of past policies.

When decisions have been made, they are taken to a computing room and punched into cards which are fed, along with cards summarizing the state of the industry at the end of the preceding quarter, into an IBM 650 computer. This machine is programmed to simulate a quarter's operations and produce cards from which an IBM 407 tabulator prepares the following confidential reports for each firm:

Sales Volume
Percent Share of Industry Sales
Current Inventory Quantity

Production Capacity for the Next Quarter
Statement of Profit and Loss
Statement of Receipts and Disbursements
End-of-Quarter Statement of Financial Condition

A facsimile set of reports appears at the end of this paper. The "Operating Statements" covering a given quarter's operations are returned immediately after the decisions have been made which will guide operations during the following quarter.

In addition to these reports, the teams are notified of their competitors' prices immediately after each quarter's decisions are collected. They are also kept up-to-date on predicted and actual values of a general business index of special pertinence to the hypothetical industry of the game. Annual summaries of the operations of all firms are posted shortly after the end of each year. The game has usually been played in one large room, whose atmosphere, with these reports posted, has been compared to that of a wide-open bookmaking establishment. Espionage by eavesdropping is sometimes feasible.

It is usual to concentrate about half of the total time for a year's decision-making in the period when annual summaries are published. Overall plans for the year are then made, but may be modified at any time during the rest of the year. The time scale is firmly set by those who administer the game. Lunch-breaks are given, but intermediate breaks must be arranged within the teams much like "vacations" in real life. The schedule usually allows two or three hours for pregame discussion and the unscored practice period, as well as an hour or two for postgame analysis of results and the reasons therefor.

Management's job in this game is to balance the controllable factors in such a way as to make the most of available resources and potentialities. All firms start from the same position, with the same sales, inventories, prices, etc. The industry can raise itself up as a whole. At the same time, the firm whose management team learns most quickly what the essential problems of the game are, and how to cope with them, can pull far ahead of its competitors in the course of a few years of play.

Efforts to increase sales must be properly related to costs, both in terms of enlarged budgets for advertising and for research and development and reduced margins resulting from price cutting. Marketing efforts must be coordinated with plant capacity and production volume. Investment programs and dividend policies must be geared to available funds. All of these factors must be balanced in the face of continually changing competitive and general business conditions. The need for planning is emphasized by the fact that relatively stable policies are more effective, price for price, dollar for dollar budgeted, etc., than are policies involving much fluctuation.

Total industry market is affected both by business conditions and by the industry-wide constellation of prices and expenditures for advertising and research and development. Each firm's potential share of the total market is determined primarily by the relationship of its policies to those of its

competitors. The product's purchasers are fairly sensitive to price differentials, and in the short run to price changes as such. Market shares are also much influenced by advertising and by design improvements resulting from research and development expenditures. Advertising and research and development have effects which extend for several quarters. As might be expected, the impact of advertising is relatively intense but also relatively short-lived, compared with that of research and development.

Production at or below the "capacity" figure listed on the Operating Statements is accomplished at nearly fixed cost per unit, relatively small reductions being a consequence of vigorous research and development programs. Production over and above capacity can be called for, but at an approximately doubled direct cost per unit. Normally, the largest non-budgeted, indirect costs are those which are fixed and those, such as depreciation, which depend roughly upon plant size. (Exceptions occur if a firm expands its plant too rapidly, or if large cash deficits appear.) Advertising and research and development are costs as budgeted.

Fixed costs make large volume operation advantageous relative to total cost per unit. Costs depending upon plant size levy large penalties for overexpansion. Underproduction, relative to potential sales, results in loss of revenue through lost sales, rather than in added costs. Overproduction leads to excessive inventories and to correspondingly large carrying charges.

Plant and equipment deterioriate at a rate of 2.5 percent per quarter, and this deterioration is reflected immediately in reduced capacity. To maintain a given capacity, it is necessary to reinvest accordingly. Reduction in capacity is accomplished by allowing depreciation to take its course, without reinvestment. New capacity is purchased by allocating twenty dollars per unit of quarterly capacity desired to "Investment in Plant and Equipment," over and above the sum needed to hold ground against depreciation. There are "incidental expenses" associated with purchases of plant and equipment, which are small for moderate rates of expansion, become significant when as much as one million dollars is allocated to plant investment in a single quarter, and grow rapidly with larger investments. Plant and equipment whose purchase is budgeted at the beginning of one quarter is not available for production until the following quarter.

When net cash assets fall below zero, costs are incurred for loan negotiation, interest, factoring, etc. These costs become significant with a shortage of a few hundred thousand dollars, and grow rapidly with larger deficits. The administrators of the game may be willing to "buy into a firm" if its cash position becomes desperate, but will not pay more than about half the book-value of the equity purchased.

Like all such reports in real life, the Operating Statements used in the game are to some degree "conventional." For instance, inventory value is figured on a standard cost basis, and certain costs are arbitrarily allocated to the "ADMINISTRATION AND SELLING" detail item and others to "MISCELLANEOUS." These conventions and also some quantitative information concerning the factors governing various costs, which are discussed as part of the preparation of players, will not be taken up here.

The goals to be sought by participants in Game No. 2 are not spelled out in detail. Different teams may take different tacks. One may concentrate on expansion and increased sales, for instance, while another may focus more directly on the profit picture. Each team is required to keep track of its broad objectives and of its operating strategies during the course of the game. The game itself is followed by a discussion of the objectives and strategies of the teams. Each team subjectively evaluates its own work, and is also given an objective "score," based upon overall profitability, dividend policy, and the condition of its firm at the end of play. The discussion is facilitated by large-size charts summarizing the progress of the game. Such figures as the economic index, prices, marketing expenditures, production capacity, sales volume, and net profits are graphed.

The purpose of the post-mortem is less to reveal better strategies which might have been adopted than to show how better use could have been made of the available information. The point is that the critic attempts to dissect the players' performance in its relation to the information available to them, rather than in connection with his special knowledge of the details of the economic model underlying the game. It might be mentioned, for instance, that a certain team should have avoided going into a forecast recession period maintaining a high price level, in view of the already known unhappy effect of a similar policy on another firm during an earlier economic decline. It is believed that comments of this kind help to minimize the extent to which players may take home specific (and often no doubt incorrect) ideas about business obtained from the game, and to refocus attention on the process of play as an exercise in learning from experience.

Game No. 3.

The new game (which is coded in FORTRAN and hence can be easily adapted to either the IBM 704 or 709) differs from Game No. 2 mainly in that each firm may manufacture and sell up to three products, while the market is stratified in such a way that diversity in product lines is beneficial to the industry. The products are of "the same kind," but vary in their sort of appeal. The quarterly decisions are as follows:

For each firm: Purchase of Plant and Equipment
Purchase of Securities

For each product: Selling Price
Marketing Budget
Design and Styling Budget
Production Volume
Labor-and-materials Budget per unit produced

The following reports are prepared by the computing equipment:

For each firm: Consolidated Report of Profit and Loss
Cash Flow Report
Statement of Financial Condition
Report re Production Capacity

For each product: Report of Income and Expense
Report re Production, Sales, and Inventory

An industry-wide report is also repared "annually," giving past and forecast economic indices and summarizing the operations of all firms.

Because this game is just beginning its "shakedown" runs, further details will not be given here. Mimeographed publications and the FORTRAN program will be made available in due time.

OPERATING STATEMENTS

FIRM 3 PERIOD 14

SALES VOLUME	451,806
PERCENT SHARE OF INDUSTRY SALE	14
CURRENT INVENTORY QUANTITY	287,597
PRODUCTION CPY NEXT QUARTER	604,209

PROFIT AND LOSS

INCOME SALES REVENUE		$ 2,990,956
EXPENSE		
MANUFACTURING COSTS	$ 1,676,478	
REDUCTION IN INVENTORY VALUE	444,582-	
ADMINISTRATION	393,348	
ADVERTISING AND SELLING	200,000	
RESEARCH AND DEVELOPMENT	400,000	
DEPRECIATION	302,107	
MISCELLANEOUS	253,412	$ 2,780,763
PROFIT BEFORE INCOME TAX		$ 210,193
ADDITION TO INCOME TAX FUND		$ 109,300
NET PROFIT AFTER INCOME TAX		$ 100,893
DIVIDENDS PAID		$ 50,000
ADDITION TO OWNERS EQUITY		$ 50,893

RECEIPTS AND DISBURSEMENTS

RECEIPTS SALES REVENUE		$ 2,990,956
DISBURSEMENTS		
CASH EXPENSE	$ 2,923,238	
ADDITION TO INCOME TAX FUND	109,300	
DIVIDENDS PAID	50,000	
INVESTMENT IN PLANT	302,000	$ 3,384,538
ADDITION TO CASH ASSETS		$ 393,582-

FINANCIAL CONDITION

ASSETS	
NET CASH ASSETS	$ 758,889
INVENTORY VALUE	$ 862,791
PLANT NET BOOK VALUE	$12,084,180
OWNERS EQUITY	$13,705,860

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