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13. ABSTRACT

This document describes the 1971 - 1972 version of the Management Decisionmaking Exercise (MDE) used at the Industrial College of the Armed Forces (ICAF). The Participants' and Background documentation explains the play of the game from a participant's viewpoint. The Administrative documentation provides complete instructions for the faculty and computer operations personnel involved in conducting the MDE.

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MANAGEMENT DECISIONMAKING EXERCISE

INDUSTRIAL COLLEGE OF THE ARMED FORCES

Washington, D. C.

20315

1971

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FOREWORD

The ICAF Management Decisionmaking Exercise is based on a model widely used in various Executive Development Programs. The idea of using simulation to train business managers grew out of work by the American Management Association (AMA) in 1957. Noting that for years the military had used simulation in the form of war games to train its personnel, the AMA sought to extend this concept to the business world. This had become a practical possibility only with the growing success of Operations Research in designing mathematical models of business situations and the widespread availability of computers.

Since original development, management decisionmaking simulations have been used in the training of business executives at several management levels in a variety of companies. They have also been used extensively in both graduate and undergraduate education at numerous universities and colleges.

The model being used at ICAF was prepared for remote time sharing operations. The program, which consists of several hundred statements, is written in the BASIC programming language. The general model is quite flexible in that it allows for the creation of a wide variety of business situations through the adjustment of several parameters.

In 1968 the basic simulation was modified by faculty members of the Simulation and Computer Directorate at ICAF. A major change was the addition of a "what if" capability to enhance student learning of the economic principles inherent in the basic model. Subsequent changes have revised the output formats and adjusted the algorithms so that they more accurately reflect actual business conditions. These new manuals reflect the latest programming changes as well as including more detailed explanations where experience with past games has indicated these to be desirable.

Although this exercise is easy to learn to play, the model is sufficiently sophisticated to challenge your managerial and business acumen. We hope that you will find it both an enjoyable and profitable learning experience.

ALAN S. WILHITE
Captain, USN
Director
Simulation and Computer Directorate

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1.0 INTRODUCTION

The success of American business is, of course, vital to national security. Not only does it provide most of the facilities, equipment, and weapons used in the conduct of national security affairs, it also acts as the mainstay of our economy. Senior military officers and civil servants engage in frequent negotiations with managers of private enterprise, but rarely do they have the opportunity to gain much of an understanding or appreciation of the many interrelated factors which must be carefully considered and decided upon by management to conduct a successful business.

The ICAF Management Decisionmaking Exercise has been designed to demonstrate some of the major problems involved in running a business enterprise in an oligopolistic environment. It is hoped that the exercise will enhance your appreciation and understanding of the businessman's problems and provide some insights into the intricacies of competitive business decisionmaking.

During the ICAF Management Exercise, you, along with four fellow students, will be acting as executives making periodic high-level decisions for a business firm. The decisions you will make in five academic periods in seven calendar days will be similar in many ways to those which would be made in actual practice over a period of two to three years.

Although these decisions center on the allocation of funds within your company, you will be in competition with two other companies selling the same basic product. Thus, you will have to consider not only the internal needs of your company, but also the behavior of your competitors. How your

firm fares will depend upon the interaction of your decisions and those made by the two competing firms. Your firm is operating in an oligopolistic industry--an industry composed of few sellers. The steel and automotive industries are good examples of such an industry. Recent experiences in both of these industries indicate the risk involved when competitors do not follow the price policies set by the price leader.

The information given in this manual and during the initial orientation period, combined with the application of sound business principles, will enable you to operate effectively. As the exercise progresses, you will acquire a better feel for the generalized market in which you are competing, as well as an understanding of your competitors.

1.1 Purposes and Objectives

The primary purpose of the ICAF Management Decisionmaking Exercise is to provide you with a synthetic but realistic experience that will demonstrate the organization, planning, and analysis required for sound management in a dynamic business environment. This experience and the insights you derive from it should complement and supplement the content you will be receiving throughout Course 430.

A secondary purpose is to allow you to become more familiar with the use of computers, both as an aid in decisionmaking and as a tool in management training. Concomitantly, the exercise should serve to give you a better understanding of simulation methods, their value, limitations, and problems.

Briefly stated, the objectives for the exercise are:

(1) Be familiar with some of the problems involved in decision-making in a competitive business environment.

(2) Understand and be able to apply some of the major principles of sound business management.

(3) Appreciate the importance of setting specific company objectives, developing consistent policies for the implementation of these objectives, and establishing control measures to insure performance.

(4) Know the major criteria used to measure and evaluate management performance and appreciate the value and weaknesses of various performance measures.

(5) Be familiar with the computer as a tool in business decision-making and as an aid in management training.

(6) Be familiar with the use of simulation and appreciate the values, limitations, and problems of simulation model construction.

2.0 GENERAL STRUCTURE AND PROCEDURES

The ICAF Management Decisionmaking Exercise will consist of 12 simultaneous games, each game representing a distinct industry having no relationship to any other industry. Three firms compete within each industry, and no exchange of information is allowed between them, except through reports generated by the computer. Mergers and direct collusion are not allowed. All of the firms within an industry produce and market the same basic product. In order to keep the problem general, the product is not specifically defined. Thus, your decisions are to be based on general business principles, rather than on the technical peculiarities of producing and distributing a particular commodity.

The starting conditions (See Sec. 6.0, BACKGROUND INFORMATION) for all firms within an industry and across all 12 industries are identical. Therefore, you will be able to compare the success of your firm with that of other firms both within and outside of your industry. Industry Summaries will be posted after the end of each period in the Student Mail Room (Room 102).

At the beginning of the first period you will be given reports showing the financial condition of your company and the industry. At the end of the first period and all subsequent periods, each firm will submit its decisions (See Sec. 4.3) to the faculty member monitoring its industry. These decisions will be used as input to computers accessed through the College's remote consoles. These input data will then be processed in accordance with a mathematical model which has been programmed to simulate the business activity of each firm. The computer then prints out reports showing the results of the activity during the past 6 months. This cycle will be repeated five times during the exercise, thus allowing 30 months of simulated business activity and the associated decisionmaking experience to take place in a highly condensed amount of time.

The results from each period will be available through the faculty monitor for the industry approx. 90 minutes after the conclusion of the period. To aid you in analysing the results and preparing your decisions for the succeeding period, you are encouraged to use the computer to interrogate the model and to make projections of a "what if?" variety. (See Sec. 5.3).

It should be emphasized that all decisions should be made on the basis of good business practice and the dollar values determined from an analysis of the reports. No unusual situations have been built into the model. The results of any particular set of decisions arise from the interaction among your decisions, those of your competitors, and the basic model. Note that your company has control over only one of three sets of interrelated factors which determine how you will fare. The situation is dynamic and effects may change with time. Thus, both the interests of your firm and the learning value of the exercise are likely to be ill served, if you attempt to play against the model.

In order to reduce a real life business situation to one of manageable proportions and one capable of being handled on a greatly accelerated time scale, a number of features have been abstracted and simplified in the model. An example of this is the requirement that each semi-annual operation must be financed from the cash on hand less $1000. Nonetheless, you should be able to adjust rather quickly to the specific frame of reference used in the exercise. Judging from the past, the business factors included in the model are sufficiently realistic to make your experience during the exercise an interesting and educational one.

3.0 COMPANY ORGANIZATION

In the ICAF exercise, there are 12 industries, each identified by two digit numbers, e.g., 01, 02, 03. Your industry number will be identical to your Industry Committee Number. Within each industry,

there are three numbered companies, 1, 2, and 3. Each company is made up of 5 students, who will be acting as the executives or managers of the company.

One person in each company will be designated as president by the student section's faculty adviser. Beyond this, the apportionment of executive tasks is at the discretion of the team members. A variety of organizational structures are possible. For example, the group may decide upon a committee structure for decisionmaking; or it might prefer to organize by function or by area. The group may rotate assignments or change its organization at any time it desires. However, the company president as designated by the faculty adviser will be held responsible throughout for submitting decision forms on time and for picking up the computer generated reports.

A written statement of organization and individual responsibilities should be maintained at all times and updated to show any changes in organization, along with a brief statement of the reasons for the changes.

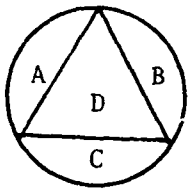
4.0 COMPANY DECISIONS

During each period, each company will make two sets of decisions. The first set, called "area decisions", relate to the unit selling price and marketing expenditures to be made in each of four geographical marketing areas. The second set, called "plant decisions", relate to plant improvement, production, and research. Except for the application of certain general principles and the use of standard projection techniques, there is no way to predict the best decisions for any firm

for any period. All decisions are interrelated, and their effectiveness depends, in part, on the decisions of other firms in your industry and the sensitivity of the market to particular policies. The decision-making philosophy of each firm is totally at the discretion of its management group.

4.1 Market Area Decisions

The market is geographically divided into four areas as shown in the following figure:



A firm may sell its product in any area. However, each company may be thought of as having its home office and manufacturing plant in a "home" geographic area (area A for firm 1, area B for firm 2, and area C for firm 3). The fourth area (D) is an open market.

Each firm has an advantage in its home area, in that there are no transportation costs applied to the units it sells there. There are, however, transportation costs associated with the units sold in a competitors' home market areas. There are also transportation charges for units sold in the open market (area D), but these charges are less than in any competitors' home area. It is, of course, up to each company to decide whether or not to pass this transportation charge on to the customer in the selling price. Regardless, the amount of these charges will be reflected in the unit delivered costs shown on the company reports.

For each period every company will make area decisions for each marketing area. These include the unit selling price that will be charged in each area and the amount to be spent on marketing in the area. These decisions will have a direct and immediate effect on the amount of business each firm will do in each area. All other things being equal, as the price is lowered, the potential market increases, along with the company's share of that market. Of course, unit prices in each area must be competitive. If your firm's prices are too high, you may not sell many units. If they are too low, you may have more orders than you can fill.

A company is free to set any selling price it wants (up to $99.) and to spend any part of its available funds for marketing in any area (up to $999,000). At the beginning of the exercise, all three companies of each industry are competing in all four market areas. A firm may withdraw from any area at any time. However, once a company has left a marketing area, it may not recommence selling in that area during the exercise.

The potential market (total orders) in each area will vary from its original value as a function of time, general level of business activity (as reflected by a business index), selling price, research funds (which affect attractiveness, style, and packaging) and the total marketing expenditure. The potential market and each company's share of that market are completely independent from one area to another.

The business economy is dynamic, not static. The volume of the potential market and the business index may vary up or down as they

would in normal periods of growth or recession. There are, however, no seasonal cycles built into the economy.

Increasing marketing expenditures serves to expand the market but at a diminishing rate due to a saturation effect. Initially, dollars spent for marketing should more than pay for themselves in profits, but if too much is spent, the company will find a diminishing return for the additional funds expended. Marketing expenditures have an effect for several periods in addition to the one in which the money is spent. This means that a large change made by one company will not necessarily produce a sudden and drastic effect on the market. It also means that a company will need to plan ahead for more than one period. Since this is a competitive economy, the marketing expenditures of one company relative to another is quite important in determining who gets what share of the market. In order to sell units in an area, a firm must have made a marketing expenditure in the area large enough to be 1% of the total of money spent by all firms for marketing in that area.

If a company cannot satisfy its potential market by production and inventory, sales in all areas are allocated by the same percentage, no one market area being favored. Unfilled orders do not carry over into subsequent periods nor are they redistributed to competitors. Thus, marketing expenditures which produce excess orders are simply wasted money.

4.2 Plant Decisions

For each period each firm must decide how much money to spend on plant improvement, production and research. Plant (and equipment) manufacturing capacity is figured at $20.00 plant value per unit of

capacity. Thus, if a firm has a plant valued at $5,200,000, that plant has a production capacity of 260,000 units. Each period, each firm's plant will depreciate in value (and thus in capacity) at a fixed rate. The rate has been set at 2% in the current model. This figure is closer to that generally used for depreciation of equipment than that for depreciation of a building; however, for simplicity both plant and equipment are lumped together in the model. To maintain its plant at a given capacity, a firm must allocate enough money to plant improvement to compensate for this 2% depreciation.

The amount of depreciation in plant value is determined at the end of a period and degrades the plant capacity available for production in the subsequent period. For example, suppose that a firm starts with a plant valued at $6,000,000; this would mean that the company has the capacity to produce 300,000 units for sale during the period. Assuming the firm allocated no money to plant improvement during the period, the plant would depreciate $120,000 at the end of the period, leaving a plant valued at $5,880,000 with a capacity of 294,000 units for production during the next period.

A firm may increase its plant capacity by allocating more money to plant improvement than is necessary to compensate for the normal depreciation. The capacity will be increased at a rate of 1,000 units for every $20,000 invested over the amount of depreciation. It is important to note, however, that the increased capacity resulting from plant investment in one period will not be available for use until the next period. Thus, if a firm has a plant valued at $5,200,000 and a capacity of 260,000 units in Period 1 and wants to

increase its capacity by 10,000 units, it must invest $304,000 in plant improvement during Period 1 (i.e., $104,000 to cover depreciation of the current plant and $200,000 to increase its capacity by 10,000 units). The firm will then have a plant valued at $5,400,000 with which to start Period 2. Operating at capacity, the company may then produce 270,000 units during Period 2.

The only way in which a firm can decrease its plant capacity is by allowing its plant value to degrade through normal depreciation. Therefore, to avoid idle plant capacity, a firm should undertake plant expansion only after thorough and careful planning.

Production dollars should be allocated on the basis of the available cost information. There is a penalty (higher unit costs) for operating a plant at less than full capacity. Unit costs decrease with increasing levels of production, as is the case in most businesses. The relationship between production quantity and unit cost is not linear, however. As production increases, the rate at which unit costs decrease becomes smaller. By the same token, as the level of production decreases, the rate of increase in unit costs becomes greater.

Research and development funds have an influence over several periods. Up to certain percentage of sales, R&D funds will yield a long-run return greater than their cost. This return is realized in two ways: (1) increasing the potential market and one's share of that market; and (2) by decreasing unit production costs (both directly through greater plant efficiency and indirectly through the increased

quantity of units produced). After R&D expenditures reach a reasonable level, they cease to have any further effect on unit production costs, although they continue to affect the size of the potential market and one's share of that market.

4.3 The Company's Semiannual Decision Form

At the end of each period, each company will submit its semiannual decision form to the faculty member monitoring its industry. A reproduction of this form is shown on the following page. This form should be filled out carefully and only after all decisions have been carefully considered. Once submitted the decisions contained on the form will be considered final, and you will have to live with any errors it may have contained.

In filling out the form, the following rules will be observed:

(1) Unit Price will be entered in whole dollars for each marketing area and will not exceed $99.00. If your firm has withdrawn from selling in a marketing area, enter zeroes.

(2) Marketing allocations for each area may not exceed $999,000 and should be entered in thousands of dollars. Again if your firm has withdrawn from a marketing area, enter zeroes.

(3) Allocations to production, research, and plant improvement should also be entered in units of one thousand dollars. Unallocated cash will be carried forward as cash.

(4) Total expenditures (i.e., marketing expenditures in all four areas plus allocations for production, research, and plant improvement) must be at least one thousand dollars less than the company's cash balance at the start of the period (i.e., cash may

ICAF MANAGEMENT DECISIONMAKING EXERCISE

DECISION FORM

FIRM _____ INDUSTRY _____

DECISIONS FOR PERIOD _____

AREA DECISIONS Unit Price (In Dollars)	Area A	Area B	Area C	Area D
Marketing (In THOUSAND Dollars)	Area A	Area B	Area C	Area D
PLANT DECISIONS (In THOUSAND Dollars)	Production	Research	Plant Improvement	

CASH (In THOUSAND Dollars)

NOTE: TOTAL EXPENDITURES (Marketing expenditures in areas A, B, C, and D; plus Production, Research and Plant Improvement expenditures) must not exceed CASH less $1,000. Should total expenditures exceed these limits, the faculty monitor will adjust by reducing the amount allocated to production.

TOTAL EXPENDITURES (In THOUSAND Dollars)

_____ DATE

_____ SIGNATURE

not be depleted below $1000). Both of these figures (viz., total expenditures and initial cash balance) should be entered in thousands of dollars in the designated blocks. If total expenditures should exceed your cash balance less $1000, the faculty moderator will adjust expenditures by reducing the amount allocated to production.

(5) When the form has been completely filled out, it should be dated and signed by the company president.

Thus, the form that is submitted by each firm will look like the completed sample on the next page. This information will then be fed into the computer by your faculty monitor and will serve as a partial basis for semiannual company and industry reports.

5.0 DECISIONMAKING CRITERIA

In making its decisions, each company will want to evaluate carefully its past performance, the behavior of its competitors, and the general state of the industry--all in terms of its policies and objectives. A variety of computer generated information will be available to aid you in this task.

5.1 Semiannual Reports

Shortly after the end of each period (approx. 90 minutes), an operating statement consisting of a Confidential Company Report and an Industry Summary will be available to each company through the Industry's faculty administrator. These reports are a composite of typical information needed by management for decisionmaking purposes and include reports on competitive prices, sales and net income, assets,

ICAF MANAGEMENT DECISIONMAKING EXERCISE

DECISION FORM

FIRM 1 INDUSTRY 14

DECISIONS FOR PERIOD 3

AREA DECISIONS Unit Price (In Dollars)	Area A 40	Area B 40	Area C 40	Area D 40
Marketing (In THOUSAND Dollars)	Area A 300	Area B 25	Area C 25	Area D 50
PLANT DECISIONS (In THOUSAND Dollars)	Production 7360	Research 100	Plant Improvement 300	

CASH (In THOUSAND Dollars)	TOTAL EXPENDITURES (In THOUSAND Dollars)
8116	8160

NOTE: TOTAL EXPENDITURES (Marketing expenditures in areas A, B, C, and D; plus Production, Research and Plant Improvement expenditures) must not exceed CASH less $1,000. Should total expenditures exceed these limits, the faculty monitor will adjust by reducing the amount allocated to production.

16 November 1971
DATE

Joe Jones
SIGNATURE

market information, production costs, sales analysis, inventory, and current operations.

5.1.1 Confidential Company Report

A company's confidential report contains the kind of information that is normally available to the executives of a company but which is not ordinarily made public. Each company report applies only to its own firm's business. A sample is shown on page 16a.

As can be seen from the sample, each company report contains six sections: (1) a sales analysis by area, (2) a production report, (3) a profit and loss statement, (4) a cash flow statement, (5) a financial analysis, and (6) a statement of performance measures. All values on the report form are in thousands of units or in thousands dollars, except unit cost and unit delivered cost which are given in dollars and cents. The actual computations from which these values are derived are carried out to a high degree of accuracy, and the values are then rounded off for simpler reporting. Because of this rounding, there may be some apparent discrepancies in the results.

The items contained in the report are by section as follows:

SALES ANALYSIS BY AREA

ORDERS are the total number of orders received by your firm in each area during the period.

SALES are the total number of units sold by your firm in each area for the period covered. If this figure is less than ORDERS, your firm is under-producing and/or pricing too low, i.e. creating a higher demand than can be satisfied.

MARKETING is the total amount your firm decided to spend by area on marketing during the period.

SAMPLE

ICAF MANAGEMENT DECISIONMAKING EXERCISE

SEMIANNUAL CONFIDENTIAL COMPANY REPORT

FIRM 1 INDUSTRY 1 PERIOD 1

SALES ANALYSIS

AREA	A	B	C	D	TOTAL
ORDERS(1000 UNITS)	102.	22.	22.	106.	252.
SALES (1000 UNITS)	91.	20.	20.	94.	225.
MARKETING (1000 $)	250.	50.	50.	250.	600.
REVENUE (1000 $)	3813.	796.	796.	3771.	9177.
DLVRD UNIT COST($)	34.02	36.02	36.02	35.02	

PRODUCTION	10% LESS	CURRENT	10% MORE	PLNT CAP	INVNTRY
QUANTY(1000 UNITS)	202.	225.	247.	260.	0.
UNIT COST ($)	34.66	34.02	33.49	33.23	0.00
TOTAL COST(1000 $)	7016.	7650.	8284.	8640.	0.

PROFIT AND LOSS(1000 $)

SALES INCOME	9177.
COST OF GOODS SLD	7650.
TRANSPORTATION	174.
MARKETING	600.
MARKET SURVEYS	0.
INVENTORY STORAGE	0.
RESEARCH	150.
DEPRECIATION	104.
COST OF SALES	8678.
GROSS PROFIT	499.
TAXES	250.
NET PROFIT	250.

CASH FLOW(1000 $)

RECEIPTS	9177.
DISBURSEMENTS	8927.
NET FLOW	249.
NEW BALANCE	10538.

FINANCIAL ANALYSIS(1000 $)

CASH	10538.
INVENTORY	0.
PLANT VALUE	5200.
TOTAL ASSETS	15738.

*****PERFORMANCE MEASURES*****

UNDERPRODUCTION PENALTY($ PER UNIT)	0.79
CAPITAL TURNOVER(REVENUE/INVST)	0.59
PROFIT ON SALES (%)	2.72
RETURN ON MARKETING(SALES $/MKTG $)	15.29
COSTS OF SALES($ PER UNIT)	38.59
RETURN ON CAPITAL (%)	1.61

YOUR PLANT CAPACITY, IN 1000 UNITS, NEXT PERIOD WILL BE 260

REVENUE is the total amount of money your firm received from SALES in each of the indicated market areas, i.e., number of units sold in an area times the price you charged per unit in that area.

DELIVERED (DLVRD) UNIT COST is the unit cost of goods sold plus the cost of transporting these units to the areas in which they were sold. In computing the cost of units delivered, inventory is valued at its production cost and new production is valued at its own cost. Units from inventory will be sold first.

PRODUCTION Report

10% LESS heads the column which shows the QUANTITY, UNIT COST, and the TOTAL COST of production if you were to reduce CURRENT production by 10 percent.

CURRENT indicates the column which shows the QUANTITY of units actually produced during the period just ended, their UNIT COST, and their TOTAL COST.

10% MORE designates the column which reports the QUANTITY, UNIT COST, and the TOTAL COST if current production were to be increased by 10 percent.

PLANT CAPACITY (PLT CAP) denotes the column which shows the QUANTITY of units your plant could produce at full capacity, the UNIT COST at full capacity, and the TOTAL COST of full capacity production. The nearer to full capacity that your plant produces, the more efficient it will operate and the lower will be the UNIT COST of the units produced. To increase PLANT CAPACITY, you must invest in PLANT IMPROVEMENT. To decrease PLANT CAPACITY, you must allow your plant to depreciate without investing in PLANT IMPROVEMENT. Production levels higher than present plant capacity can be attained only through plant investment greater than the rate of depreciation.

INVENTORY (INVTRY) denotes the column which shows the QUANTITY, UNIT COST of production, and the TOTAL COST (or value) of the units remaining unsold during the last period(s). INVENTORY operates on the FIFO (First In, First Out) principle so that it is valued at its average production cost which is recomputed semiannually.

PROFIT AND LOSS Statement

SALES INCOME is the total amount of cash taken in from the sale of units during the period and is equal to the total REVENUE shown in the sales analysis section.

COST OF GOODS SOLD (SLD) is the production cost only of the units sold during the period. The cost of unsold units appears as INVENTORY in the balance sheet showing your FINANCIAL CONDITION.

TRANSPORTATION is the cost of transporting units sold. (See Sec. 6.2, BACKGROUND INFORMATION for details).

MARKETING is the total amount your firm decided to spend on marketing during the period.

MARKET SURVEYS are the cost charged after the first three free What-if's projections. It is assumed each firm's marketing staff is able to conduct three surveys in a period without recourse to outside contractual assistance. Costs for more than three what-if's in a period are charged at a rate of $25,000 per what-if.

INVENTORY STORAGE is the cost of warehousing for unsold inventory. The charge is computed at $1.25 per unit of goods.

RESEARCH is the amount your firm decided to spend on research during the period.

DEPRECIATION is the total amount of depreciation on plant value occurring during the period. It is computed as an expense before TAXES. (See Sec. 6.2, BACKGROUND INFORMATION for details).

COST OF SALES is equal to the sum of cost of goods, transportation, marketing, market surveys, inventory storage, research, and depreciation.

GROSS PROFIT is the difference between SALES INCOME and COST of SALES.

TAXES are figured at 50 percent of the difference between sales and total expenses. There are no taxes on a loss. There is no carry-over of a loss for tax purposes. (See 6.2, BACKGROUND INFORMATION for further details).

NET PROFIT is the GROSS PROFIT less TAXES.

CASH FLOW Statement

RECEIPTS is the total amount of cash taken in from the sale of units during the period and, thus, is equal to the SALES INCOME, which is equal to the total REVENUE.

DISBURSEMENTS is the total of the expenditures actually made during the period. This total includes the total cost of production for units produced during the period (sold and unsold), marketing expenditures, research expenditures, transportation expenses, plant improvement expenditures, taxes, inventory storage charges, and charges for extra market surveys, (what-if's).

NET FLOW is equal to RECEIPTS less DISBURSEMENTS.

NEW BALANCE is the amount of cash your firm now has with which to conduct business during the next period. It is computed by adding the Net Flow (with its proper sign) of the <u>current</u> report period to the CASH (or NEW BALANCE) of the <u>Previous</u> period's report.

FINANCIAL ANALYSIS Balance Sheet

CASH is the new cash balance as computed in the CASH FLOW statement (shown as the NEW BALANCE).

INVENTORY is the total value of the units remaining unsold at the end of the period.

PLANT VALUE is the value of your plant at the end of the period and the value at which your plant will be operating during the next period. PLANT VALUE is determined by subtracting the amount of depreciation from the previous PLANT VALUE (given in the Company Report for the previous period) and adding the amount invested in Plant Improvement during the period. To determine plant capacity for the coming period, divide the PLANT VALUE by $20.00.

TOTAL ASSETS is the total value of all your assets (i.e., cash, inventory, and plant).

PERFORMANCE MEASURES by Firm

This section contains several fairly common measures of management performance.

PRODUCTION PENALTY is equal to the unit cost of production at capacity minus the current unit cost of production. It is expressed in dollars and cents and represents the "penalty" incurred for producing under capacity.

CAPITAL TURNOVER is equal to the revenue or sales income for a period divided by the firm's total assets at the start of that period. This measure shows management's diligence and effectiveness in working the total capital of the business to generate sales volume.

%PROFIT ON SALES, sometimes called margin percentage of profit on sales, is equal to 100 times the ratio of net profit for a period to sales revenue for that period. This measurement shows the spread between revenue and expenses of the period, and without a margin of profit a company has nothing.

RETURN ON MARKETING is the ratio of total revenue from sales to total marketing expenditures. It is a measurement of the average amount of cash taken in per dollar of marketing expenditure.

COSTS OF SALES is equal to a firm's total expense for a period divided by the number of units sold during the period. Thus, it is the average per unit cost of conducting business during the period.

RETURN ON CAPITAL, sometimes called return on investment, is computed by multiplying 100 times the ratio of the net profit for a period to the total assets at the start of that period. Equivalently, it is the percentage profit on sales times the turnover of capital. Return on capital, the profit earned on the capital employed, is widely accepted by management as a tool for measuring performance.

5.1.2 Industry Summary

The Industry Summary contains information of the type usually published by business firms and is available to the entire industry. Each firm's Industry Summary is identical and includes a market survey of orders, sales, and marketing expenses by area but not by company. As can be seen from the sample (p.20) it also contains information on the prices charged by each company in each area; and the total income, total expenses, and net assets of each company.

SAMPLE

SEMIANNUAL INDUSTRY SUMMARY

INDUSTRY 1 PERIOD 6

BUSINESS INDEX = .98

AREA TOTALS ALL FIRMS

AREA	1	2	3	4	TOTAL
ORDERS(1000 UNITS)	174.	162.	179.	390.	905.
SALES (1000 UNITS)	153.	156.	173.	360.	843.
MARKETING (1000 $)	410.	235.	225.	810.	1680.

PRICES

PRICES, FIRM 1 ($)	44.00	46.00	44.00	42.00
PRICES, FIRM 2 ($)	47.00	47.00	46.00	47.00
PRICES, FIRM 3 ($)	43.00	43.00	43.00	43.00

PROFIT AND LOSS
(1000 $)

FIRM	1	2	3
SALES INCOME	13853.	9348.	13877.
COST OF SALES	12471.	8061.	12217.
GROSS PROFIT	1382.	1287.	1660.
NET PROFIT	691.	643.	830.

FINANCIAL CONDITION
(1000 $)

CASH AVAIL	13982.	9127.	14383.
INV VALUE	0.	3842.	0.
PLANT VALUE	7889.	7165.	6968.
TOT ASSETS	21871.	20134.	21351.

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The Industry Summary is divided into three main sections: 1) a total Market Survey by area for all firms, 2) a Profit and Loss Statement by firm, and 3) a balance sheet showing the Financial Condition of each firm. In addition, the Industry Summary reports the current Business Index.

The BUSINESS INDEX is an indicator of the overall trend of the economy. If it is greater than 1.00, it has a multiplier effect on the potential orders. If it is less than 1.00, there is a contracting effect on the potential orders. If the BUSINESS INDEX is equal to 1.00, it has no effect on the potential orders. However, even if the index is 1.00 or less, you may increase your share of the market by employing more effective management than your competitors. Conversely, if the index is greater than 1.00, your share of the market may decrease as a result of poor management.

AREA TOTALS FOR ALL FIRMS

ORDERS is the total of all orders received by all firms doing business in the areas indicated.

SALES is the total of all orders filled in each area. If there are fewer sales than orders in any area, some firm is not producing enough to fill the orders received or has set the price too low.

MARKETING is the total amount of money spent for marketing in the area indicated by all firms doing business in that area.

PRICES, FIRM N are the prices charged by Firm N (where N=1, 2, or 3) for each area in which it does business.

PROFIT AND LOSS STATEMENT

SALES INCOME is the amount of cash taken in by each firm from the sale of units during the period.

COST OF SALES is the total cost to each firm of conducting business during the period. It includes the cost of goods, transportation, marketing, research, depreciation, inventory storage, and extra market surveys.

GROSS PROFIT is the difference between each firm's SALES INCOME and its TOTAL EXPENSE.

NET PROFIT is the GROSS PROFIT less taxes.

FINANCIAL CONDITION Balance Sheet

CASH AVAILABLE (AVAIL) is the total amount of money each firm has on hand at the completion of the period covered.

INVENTORY (INV) VALUE is the total value of the units each firm has remaining on hand at the completion of the period covered. The value of this inventory depends on the cost of producing the units included in it.

PLANT VALUE is the value of each firm's plant at the completion of the period covered.

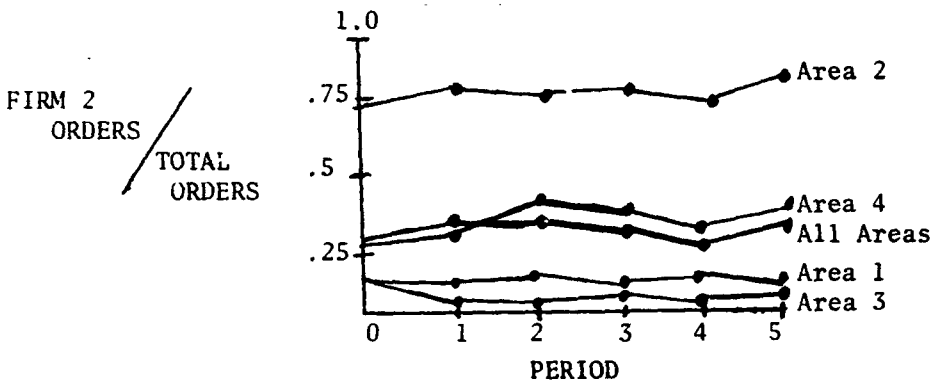
TOTAL (TOT) ASSETS is the sum of CASH AVAILABLE, INVENTORY VALUE, and PLANT VALUE.

5.2 Performance Records and Analysis

In addition to the computer generated reports, each company will want to maintain graphs, charts, and tables to aid in its decision-making. For example, you will probably want to keep charts showing the relative allocations and performance of other firms in comparison to your own. Such charts will be very useful in projecting trends and anticipating the behavior of your competitors. You will probably also want to make forecasts of your operations to include sales, cash flow, and return on investment. Thus, you will want to keep records and charts on such things as expected and actual sales, prices, share of the market, cash flow and total assets. The type of charts and records you keep is a decision that each firm must make for itself and, of course, will depend upon the kind of analysis which a firm wants to draw upon in making its decision.

The charts and records need not be especially elaborate. However, as a minimum you should maintain performance records of the variety illustrated by the chart below.

SHARE OF THE MARKET-FIRM 2



5.2.1 Measuring Performance

To evaluate past performance and to provide guidelines for future courses of action, it is necessary to have some way of judging the success or failure of a business. Thus, the question of how to measure performance is of paramount importance to a private enterprise.

The type of measurements to be used will, of course, depend upon the interests and objectives of the company and the nature of the enterprise itself. To aid you in your analysis and planning during the exercise, some of the most commonly used measures are discussed below:

Percentage Margin of Profit on Sales

Profit on sales, expressed as the ratio of net profit to net sales for a period, is probably the most widely used measure of performance. It is computed as follows:

$$\% \text{ Profit on Sales} = \frac{\text{Net Profit for a Period}}{\text{Sales Income for a Period}} \times 100$$

Even though the margin percentage of profit is regarded by many as the key measurement of management performance, it can be deceptive. It does indicate the spread between revenue and expenses of a period but disregards the amount of capital employed by a company to produce and market the goods sold. Owing to this inadequacy, the top management of many companies has come to feel that managerial performance and effectiveness should be measured by the profit earned on the capital employed.

Return on Capital

Thus, the total of all assets available for use during a period has recently been widely accepted by management as a valid and more broadly meaningful base for measuring performance. The measurement computed on this basis is called return on capital or return on investment. It is computed as follows:

$$\text{Return on Capital} = \frac{\text{Net Profit for a Period}}{\text{Total Assets at the start of the Period}} \times 100$$

Note that total assets employed in the calculation refer to those assets that were available at the beginning of the period and not at the end. Thus, in calculating this measure, you will want to

divide your net profit for a period by the total assets at the end of the previous period.

Capital Turnover

The rate of return of capital is dependent upon two factors: (1) the percentage profit on sales, which was discussed above, and (2) capital turnover. Capital turnover is determined as follows:

$$\text{Capital Turnover} = \frac{\text{Sales Income for a Period}}{\text{Total Assets at the start of the Period}}$$

The turnover of capital is an indication of management's effectiveness in using its capital to generate sales income.

Although return on capital may be computed directly by dividing net profit by total assets, it may also be determined by multiplying the percentage profit on sales and the rate of capital turnover.

Return on Capital = % Profit on Sales x Capital Turnover

You will probably find this latter procedure for calculating return on capital to be the most desirable, since you will probably want to calculate the two factors upon which it depends anyway.

5.3 Computer Aided Projections and Analysis

To further aid you in your decisionmaking tasks, you are encouraged to make projections, conduct analyses, and ask "what-if" questions using the computer. The computer may be accessed using the teletype console in your section's seminar room. By following the procedures described below, you may explore the consequences that would flow from alternative sets of decisions by entering hypothetical data for your firm and for your competitors. It should be noted, however,

that this projection procedure is not a substitute for deliberation and carefully reasoned decisionmaking. There are millions of possible outcomes, just as there are millions of possible decision combinations. It would be literally impossible to explore all possibilities, even with the aid of the computer. Therefore, you will want to make use of the computer only after reducing through analysis the number of decision alternatives you wish to explore. You should attempt to restrict your computer aided analysis to three sets of decision inputs for each decision period because of limited time for your analysis. Each set of decisions will produce a projection in the form of a Projected Confidential Company Report for your firm and an Industry Summary almost identical in format with those discussed earlier. A charge of $25,000 will be made for each projection after the third as outlined in section 5.1.1.

5.3.1 Procedures for Making Computer Projections

The program which you will use in making projections based on a set of hypothetical decisions is stored on a computer system located in the Washington area. In using this system, you will find that the procedures are very similar to those described in the ICAF Computer Time Sharing: User's Manual. You will, of course, use the teletype console in your seminar room.

The program which you will call is named *INDUST. To make use of this program, the following steps are required:

1. Check the setting of the Duplex switch (mounted either on the rear right side of the teletype or on the face just above the telephone dial). The switch should be set on HALF DUPLEX.

2. Depress the ORIG button (just below the telephone dial) to obtain a dial tone. The volume of this tone may be adjusted using the control knob on the right side of the front panel.

3. Dial XXX-XXXX to establish contact with the appropriate Computer System. The system should respond with a high-pitched beep. If, however, you receive a busy signal, hang up by depressing the CLR button (just below the telephone dial), wait, and call again. (NOTE: The appropriate telephone numbers will be given to you by your faculty adviser prior to the start of the exercise).

4. Immediately after contact is established, the computer will cause the time, date, line number, and a greeting/identification to be printed. It will then request your user number and password. You should respond to this request by typing:

XXXXXX,ICAF

(NOTE: The 6 digits of your user number (XXXXXX) will be given to you prior to the start of the first decision period).

5. After you have returned the carriage, the system will check the validity of the user number and password you have entered. Finding them in order, it will respond with the word READY. If you fail to gain access to the system, check to see that you have entered the right information; then try again. If you continue to fail, consult your faculty adviser for assistance.

6. Enter the command RUN *INDUST and return the carriage. This will cause the program to begin execution.

7. After printing an appropriate heading, the system will ask you to enter your industry number, your firm number, and your company's passkey. This passkey is designed to help you protect confidential company information by preventing other companies from gaining access to your files.

8. If the credentials you have entered are valid, the program will immediately ask for a set of hypothetical decisions for Firm 1. If your credentials are not in order, the program will print out a diagnostic informing you of your error.

9. After you have entered a complete set of decisions for Firm 1 and returned the carriage, the program will ask for a set of decisions for Firm 2. After this set is entered and the carriage returned, the program will call for decisions for Firm 3. Once these have been

entered and the carriage returned, the program will automatically cause a company report and industry summary to be printed out based on the hypothetical decisions you have entered. (NOTE: You should use the Computer Data Worksheet to facilitate the entering of these hypothetical or assumed decisions).

10. When the program has completed the printing of the reports, the system will print the time used in executing the program and await your next command. You should enter the command OFF and return the carriage. This will terminate your transmission and cause the console to shut off.

An example of the entry procedures and system's responses is shown on the following page. Those items which you must enter are underscored.

If in using the computer you make a mistake, you may correct it in one of two ways provided that you have not returned the carriage. If your error involves only one or two of the immediately preceding characters, you may correct them by using the backspace arrow (shift and "O" keys). While the printing head does not literally backspace, the printing of the backspace arrow indicates to the machine that you want the character(s) or space(s) immediately preceding the arrow(s) "erased". If you make a mistake such that you need to retype an entire line, this may be accomplished by depressing the CONTROL (CTRL) key and striking the "X" key. This causes the entire line upon which you have been working to be deleted. The computer indicates this by printing the word DELETED and advancing the paper one line. You may then retype the line from scratch.

If for some reason you wish to stop the program once it has begun execution, depress the BREAK key. The system will stop the execution, print the word STOP, advance the paper, and print the word READY. At this point, you may restart the program by (1) depressing the BREAK

RELEASE (BRK RLS) button (it will be the lighted button on the upper right hand side of the face of the teletype), and then (2) entering the command RUN. If you wish to terminate transmission, depress the BRK RLS button and type OFF.

```
ON AT 11:10    10/13/71   TUESDAY    LEA LINE 10
RESPONSE/360 ---- FOR ASSISTANCE NUMBERS, RUN **ASSIST
USER NUMBER,PASSWORD--XXXXXX,ICAF
READY

RUN *INDUST

INDUST      11:11    10/13/71   TUESDAY    LEA

            MDE/ICAF/1971-1972

ENTER IND NO., FIRM NO., & PASSKEY: XX,X,XXX.XX? 01,1,XXX.XX

FOR FIRM 1, ENTER 4 PRICES, 4 MARKT AMTS, PROD, RES, PLT IMP
? 42,40,40,40,250,50,50,250,7650,150,104

FOR FIRM 2, ENTER 4 PRICES, 4 MARKT AMTS, PROD, RES, PLT IMP
? 40,42,40,40,50,250,50,250,7650,150,104

FOR FIRM 3, ENTER 4 PRICES, 4 MARKT AMTS, PROD, RES, PLT IMP
? 40,40,42,40,50,50,250,250,7650,150,104

ARE ALL INPUTS CORRECT (YES OR NO)?? YES
```

(Program is executed and reports printed).

```
THIS COMPLETES YOUR 'WHAT IF' PROJECTION.  PLEASE TERMINATE
YOUR TRANSMISSION BY ENTERING THE COMMAND 'OFF'.

TIME    0 MINS.   8 SECS.

OFF
OFF AT 10:37
PROC. TIME...    8 SEC.
TERM. TIME...   11 MIN.
```

5.3.2 Entering Hypothetical Decision Data

After the program begins execution (i.e., after you have entered the command RUN *INDUST), it will ask that you enter your Industry Number (IND NO.), your Firm Number (FIRM NO.), and your firm's PASSKEY in accordance with the following format: XX,X,XXX.XX. It is essential that this format be followed exactly. The Passkey you will be using will be unique to your firm and will be known only to members of your firm. Your faculty monitor will inform you of your passkey at the start of the exercise; and from then on, you should share it with no one.

After you have entered your industry number, firm number, and passkey, return the carriage. The program will then check this information to make sure that it is valid. Finding your entry information in order, the program will ask for the set of hypothetical decisions for Firm 1. All of the information for Firm 1 should be entered on a single line, each item separated by a comma and with no blank spaces. The information should be entered in the following order: the prices to be charged in dollars in each of the four marketing areas, area A first, area B second, and so on; the amount being spent on marketing in thousands of dollars in each of the four areas, area A first, area B second, etc.; the amount being spent for production in thousands of dollars; the amount being spent on research in thousands of dollars; and finally, the amount being spent for plant improvement in thousand of dollars. After entering this information, check to see that your entries are correct and then return the carriage (if you've made a mistake, delete the line using the CTRL and "X" keys and retype it).

The program will then ask you to repeat the process for Firms 2 and 3. After the Firm entries are made, the computer will ask if all the entries are correct if they are type YES and return the carriage. After this entry has been made, the program will automatically cause a Projected Company Report and an Industry Summary to be printed out, based on the hypothetical data you have entered.

To aid you in entering your hypothetical decisions, you are encouraged to use a Computer Data Worksheet, like that shown on the following page. You will be given a supply of these worksheets by your faculty monitor at the start of the exercise.

5.4 Company Objectives, Policies, Plans and Control

Your analysis, no matter how elaborate, will be largely meaningless, unless it is conducted in the context of clearly defined objectives. Thus, the first task of every firm will be to establish explicit and specific immediate objectives for the company. Objectives may be defined in a variety of ways; e.g., a given rate of growth, a certain rate of return on investment, a specific share of the market, or some combination of these. They should, however, be quite specific. Vague, general objectives such as making a profit or maintaining a "fair" share of the market will be of little value to you in providing action guidelines. Once defined, your company's objectives should be recorded and a copy given to your faculty monitor. These objectives should be reviewed at the beginning of each period. If you find that you will want to revise and refine your objectives, you should record the reasons for the change, along with the considerations that gave rise to your revised objectives.

ICAF MANAGEMENT DECISIONMAKING EXERCISE

COMPUTER DATA WORKSHEET

CALL XXX-XXXX to establish contact with the appropriate 360 system.

USER NUMBER, PASSWORD -- XXXXXX,ICAF

RUN *INDUST

ENTER INDUSTRY NO., FIRM NO., AND PASSKEY: XX,X,XXX.XX? __,__,__.__ (Note period)

FOR FIRM 1, ENTER 4 PRICES, 4 MARKETING AMOUNTS, PRODUCTION, RESEARCH, AND PLANT IMPROVEMENT

Price Area A	Price Area B	Price Area C	Price Area D	Market Area A	Market Area B	Market Area C	Market Area D	Production	Research	Plant Improvement
? ,	,	,	,	,	,	,	,	,	,	,
$	$	$	$	1000 $	1000 $	1000 $	1000 $	1000 $	1000 $	1000 $

FOR FIRM 2, ENTER 4 PRICES, 4 MARKETING AMOUNTS, PRODUCTION, RESEARCH, AND PLANT IMPROVEMENT

Price Area A	Price Area B	Price Area C	Price Area D	Market Area A	Market Area B	Market Area C	Market Area D	Production	Research	Plant Improvement
? ,	,	,	,	,	,	,	,	,	,	,

FOR FIRM 3, ENTER 4 PRICES, 4 MARKETING AMOUNTS, PRODUCTION, RESEARCH, AND PLANT IMPROVEMENT

Price Area A	Price Area B	Price Area C	Price Area D	Market Area A	Market Area B	Market Area C	Market Area D	Production	Research	Plant Improvement
? ,	,	,	,	,	,	,	,	,	,	,

ARE ALL INPUTS CORRECT (YES OR NO)?? __

OFF

After defining its immediate objectives, each firm should outline a set of policies designed to meet these objectives; e.g., maintain a set price structure while increasing orders through marketing expenditures, and/or minimize direct costs by concentrating 80% of the firm's marketing effort in "home" and "open" market.

In addition, each firm will want to develop a set of long-range plans that take into consideration as many contingencies as possible, e.g., a slowing of the economy (as indicated by the business index) or cut-throat pricing by your competitors.

Finally, to insure that policies are carried out and objectives met, each firm will want to set up some control measures. These measures will include the assignment of pre-decision analytical tasks, the monitoring of performance, and the review of completed decision forms.

Each firm should maintain a written record of its objectives, policies, plans, and controls and should update this record as necessary. A brief explanation should be given in the record for any changes that are made. This information will be useful both in the conduct of your firm's operations and in analyzing and reviewing the exercise during the post-game discussion period.

6.0 BACKGROUND INFORMATION

The five students assigned to each firm may assume that they have been called to take over the management of a company that has fine possibilities, but which is in a somewhat marginal performance position at the moment. The company's return on investment is small, but its

sales price has produced a small margin of profit in all of the geographical areas in which it is involved. The ultimate goal is to put the company in a good financial position, increase the assets, make a good return on the initial investment, and be operating under good, long-range plans.

6.1 Relative Financial Position and Share of the Market

At the beginning of the exercise, all three companies in each industry are competing in all four market areas. The three companies start out with an equal financial position and with an equal share of the market.

The potential market in each company's "home" area is identical in size with that of each of its competitors. The potential market in area D, the open market area, is roughly twice as large as any home market.

6.2 Current Transportation Costs, Rates of Depreciation, and Rates of Taxation

For units sold in a company's home market, there is no transportation cost. For area D, the open market, there is a transportation charge of $1.00 per unit. For units sold in a competitor's "home" area, the cost of transportation is $2.00 per unit.

Plant capacity is depreciated automatically each period. The rate of depreciation will be 2% per period.

The tax each company must pay each period is computed at the rate of 50 percent of gross profits for the period. There are no taxes on a loss and there is no carry-over of a loss for tax purposes.

6.3 General State of the Economy

At the start of the exercise, the overall trend of the economy (as indicated by a business index of .98) is slightly contractive. The contraction rate is, however, small; and for most purposes the economy may be considered stable.

6.4 General Considerations

In making business decisions overall economic trends (up or down), costs of transportation, tax changes, and depreciation must all be considered as factors which can vary and consequently these possible variations are continually considered by prudent managers. The model used in this exercise has provisions for changing all these factors; however, they have remained as constants during the last three years. In the event any one or all were to be changed, adequate and timely notification would be provided to participants.

APPENDIX I

SCHEDULE FOR THE ICAF

MANAGEMENT DECISIONMAKING EXERCISE/ICAF/1971

DATE	TIME	ACTIVITY	PLACE
8 Nov	0830	Orientation	Auditorium
12 Nov	0830	Decision Period No. 1	Team Rooms
15 Nov	0830	Decision Period No. 2	Team Rooms
16 Nov	0830	Decision Period No. 3	Team Rooms
17 Nov	1030	Decision Period No. 4	Team Rooms
18 Nov	0830	Decision Period No. 5	Team Rooms
22 Nov	0830	Analysis and Evaluation of Decisions (IndCom 1 -6)	Seminar Rooms
22 Nov	1030	Analysis and Evaluation of Decisions (IndCom 7-12)	Seminar Rooms