A COMPUTER SIMULATION OF AN INTERNATIONAL MARKETING ENVIRONMENT

DISSERTATION

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By

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The purpose of this study is to develop a simulator which would bridge the gap between theory and reality for the student of international marketing. The simulator developed is a computerized business game entitled "The International Marketing Simulator."

The International Marketing Simulator contains a description of the model, player's manual, and scenario section. Incorporated in this section is information on how to input decisions into the computer game. There are 252 decisions to be made by each student team. Those decisions are punched on forty-two computer cards. There are pricing, promotion, distribution, product quality, country selection, market, and production decisions.

The International Marketing Simulator also contains information on the functioning of the International Marketing Simulator. Some of the functions discussed were the demand function, production function, and the promotion function. Extensive discussion was given to this segment. When the demand function was discussed it was noted that price and promotion were interrelated. It was noted, for

example, that a lowering of an existing price, all other things being equal, would increase the demand for the product in units. It was also noted that increasing the promotional expenditure from one period to the next, all other things being equal, would result in an increase in the demand for the product in units. Complicating this discussion would be to simultaneously lower the existing price and increase the promotional expenditure for the product. The net result is not a simple summation of both actions taken independently of each other but a separate function which indicates the interrelationship between price and promotion.

The last part of the International Marketing Simulator is a detailed story of each of six foreign countries which are used in the International Marketing Simulator. The six countries are Japan, Belgium, Canada, Portugal, Sweden, and Switzerland. This section is called the scenario section since each country has a story about it which "sets the stage" for the computer game.

There were four parts to the verification process of the International Marketing Simulator. The four parts were (1) making trial program runs on an IBM 360 computer, (2) verifying the logic of the model of the International Marketing Simulator, (3) students participating in making trial runs on the International Marketing Simulator, (4) conducting a before-after study with a control group.

The implication drawn concerning this thesis is as follows: there is a definite probability that a student's knowledge and analytical ability in the area of international marketing will be increased if the student participates in this Simulation of an International Marketing Environment.

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CHAPTER I

INTRODUCTION AND PURPOSE OF THE STUDY

> The growing internationalization of world business, coupled with intensive export expansion programs and pressures for the rapid development of emerging nations, has focused increasing attention on the subject of international marketing.[1]

The importance of international marketing in the present and near future is readily made apparent in Table I on the following page.

Table I illustrates the rapid growth rate of world trade. The total amount of world trade approximately doubles every twenty years. In the year period from 1963 to 1971, however, world trade has more than doubled. In 1963 world trade was $316.5 billion and in 1971 world trade was $710.0 billion. If this trend continues, world trade will be at the trillion-dollar amount in the latter 1970's and perhaps at the two-trillion-dollar amount by the 1980's.

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[1]David S. R. Leighton, International Marketing: Text and Cases (New York, 1966), p. vii.

TABLE I

GROWTH OF WORLD TRADE, EXPORTS AND IMPORTS, IN BILLION DOLLAR AMOUNTS FROM 1840 TO 1971*

Year	Amount
1840	2.8
1860	7.2
1880	14.8
1900	20.1
1913	40.4
1929	66.7
1938	48.9
1948	121.1
1953	167.1
1958	222.3
1963	316.5
1965	383.8
1966	419.9
1967	441.0
1968	490.8
1969	568.1
1970	639.1
1971	710.0

*Figures for total volume for 1840-1913 from U.S. Bureau of Foreign and Domestic Commerce, Statistical Abstract of the U.S., 1921 (1922), p. 923. The figures for 1929 are derived from U.S., Bureau of Foreign and Domestic Commerce, Commerce Yearbook, 1931 (1931), pp. 720-727. The figures for 1938-1971 are derived from the United Nations' Statistical Yearbook 1972 (1972), pp. 398-399.

Frederick B. Dent, Secretary of Commerce, notes the importance of international markets when he writes:

> The commerce department has a concise but important message for the American business community today: "Now, as never before, the time and conditions are ripe for American companies to sell more of their U.S. made products overseas."
>
> The currency realignments of 1971 and 1973 resulted in a significant increase in the

> purchasing power of most European currencies as well as the Japanese yen. In addition, booming business conditions in Japan, Canada and the Common Market create growing new markets for U.S. goods and services. These conditions are expected to continue.
>
> The market for U.S. exports is there. The United States Government is committed to maintaining an export environment that will enable exporters to capitalize on that market in the 1970's.[2]

With all this increased competition and attention directed toward world markets, it is economically important for American business to examine the various methods with which the international marketing executive utilizes to gain experience and understanding of the complex and dynamic nature of world marketing. It is suggested that the international marketing executive gains understanding of the world market from at least two sources. Two of these main sources are (1) theory and (2) reality. The executive gains understanding of the world market by attending theory classes given by institutions of higher learning and management seminars. The executive also gains understanding of the world market by the reality of international business experiences. The latter may be the better of the two instructional methods but does take precious productive years away from the international marketing executive and

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[2]The New York Times, September 30, 1973, Sec. 12, p. 3.

could be quite costly. The former method, theory, suffers from inaccurate abstraction from reality.

This dissertation is an attempt to bridge the gap between abstract theory and confusing reality by the development of a computerized simulated marketing environment. It is thought the computer business game by nature will be both theoretical and quasi-realistic. It is further thought that the business game will increase the international marketing executive's understanding of the complex and dynamic nature of the world market.

A discussion by Greene will be presented:

> . . . a business game is a simulation or model of part or all of a business organization. The game may be designed to represent something as narrow as an inventory control problem or as borad as a high-level capital budgeting situation.
>
> The vital elements of both military and business games are these: rules, structure, competition, feedback.
>
> The rules specify the types of decisions a player can make and the restrictions placed upon his decisions by the game designer. For example, in a sales-oriented game the number of calls a salesman can make on customers during a given period could be limited. This is similar to other familiar games, such as chess, where the rules include the ways that the pieces are allowed to move.
>
> The structure consists of the constants and variables and the relationships between

them. Statements can be made which indicate the effect of a price change on sales volume, which could then influence inventory. Inventory in turn could be related to manpower requirements in a warehouse. These relationships are frequently expressed mathematically, but this is not an absolute requirement in many cases. Usually these relationships are determined by examining historical data of the company's operation and/or by consultation with experienced businessmen either inside or outside of the company.

Competition is another important factor in gaming. If several teams participate in a single game, the decisions made by any one team will influence the positions of all other teams. In those games where a team competes solely against an environment, rivalry between teams may be created by comparing their final company results and their methods of attacking the problems. In a game, players contend with several interacting variables, some of which are not under their control. Competitors' actions, demand trends, and the like, must be considered, but cannot be known or manipulated with certainty.

Feedback adds a dynamic aspect to gaming; the decisions and results of one period influence future conditions. For example, if in the first month of operation too many dollars are spent on the building of new plant capacity, to the neglect of research and development, future sales and long-range profits may suffer. The classical business case study, in contrast is a static study of a changing environment.[3]

The business game to be developed in this dissertation will be oriented toward international marketing or more

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[3]Jay R. Greene, "Business Gaming for Marketing Decisions," The Journal of Marketing, XXV (July, 1960), 21.

specifically to a multinational corporation. A multinational corporation may be defined by the following explanation as presented in an article in Business Week.

> The multinational company is one that meets two tests:
>
> It has a manufacturing base or some other form of direct investment that gives it roots in at least one foreign country.
>
> It has a genuinely global perspective; its management makes fundamental decisions on marketing, production and research in terms of the alternatives that are available to it anywhere in the world . . . .
>
> A multinational company's management sees its enterprise as a global entity. It sees its foreign and domestic interests interwoven into a web of carefully integrated parts. It allocates its capital, manpower, and other resources on a global basis. For such a corporation, the U.S. is but one of many markets, one of many sites for production or research.[4]

Purpose of the Study

The primary purpose of this dissertation is to develop a computer game for use in the college classroom or management seminar as an aid for college students and business executives in bridging the gap between international marketing theory and international marketing reality. The computer game, by utilizing a mathematical model, will represent an international marketing environment.

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[4] "Special Report: Multinational Companies," Business Week, Number 1755 (April 20, 1963), 62.

The secondary purpose of this dissertation is to force the international business student into making decisions. It is thought that this forcing will develop and/or imporve the student's analytic ability to conceptualize international marketing problems.

Significance of the Study

The significance of this dissertation is that a computer simulation will be developed for use in the college classroom and the executive seminar as a teaching aid to improve the business student's as well as the executive's understanding of the real-world complexities in the international marketing environment.

Methodology

1. There was a literature review of game theory, models, simulation and the different types of operational games.

2. The International Marketing Environment Simulator was developed.

3. The International Marketing Environment Simulator was played and tested among business students and professionals for its ease of playing, authenticity of real world situations and validity of outputs. The results of testing the International Marketing Simulator were then analyzed, modified, and redesigned. This procedure was

continued until a satisfactory representation of an international marketing environment was developed.

4. The International Marketing Environment Simulator was developed in its final form.

Definitions

For this dissertation the following definitions have been used:

Object system is the system we want to study; it is the "object" or subject matter of an investigation or learning experience.[5]

Model is a representation or abstraction of an actual object or situation. It shows the relationships (direct and indirect) and the interrelationships of action and reaction in terms of cause and effect.[6]

Simulation is a quantitative technique used for evaluating alternative courses of action based upon facts and assumptions with a computerized mathematical model in order to represent actual decision making under conditions of uncertainty.[7]

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[5]Richard F. Barton, A Primer on Simulation and Gaming (Englewood Cliffs, New Jersey, 1970), pp. 4-5.

[6]Robert J. Thierauf and Richard A. Grosse, Decision Making Through Operations Research (New York, 1970), p. 14.

[7]Ibid., p. 14.

Operational gaming describes the modeling of a game around a realistic situation, where the participants actually make decisions (often in teams) and where the results of their interacting decisions are reported and become the data inputs for the next round of decisions.[8]

Business game is a simulation or model of part or all of a business organization. The game may be designed to represent something as narrow as an inventory control problem or as broad as a high-level capital budgeting situation.[9]

Limitations of the Study

1. The mathematical model developed for the simulation game cannot be designed to include all the complexities and interrelationships of the real world international marketing environment.

2. The mathematical model developed for the International Marketing Environmental Simulator cannot be designed to yield the exact outputs which would occur in the real world of international marketing.

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[8] J. F. McRaith and Charles R. Goeldner, "A Survey of Marketing Games," Journal of Marketing, XXV (July, 1962), 21.

[9] Jay R. Greene, "Business Gaming for Marketing Decisions," Journal of Marketing, XXV (July, 1960), 21.

3. The International Marketing Environment game should be simulated on a computer. Computer time is expensive and not all educational institutions have computer facilities which are needed to play this game.

CHAPTER II

AN HISTORICAL REVIEW OF THE DEVELOPMENT OF BUSINESS GAMING

This chapter will trace the origins of business games. The chapter will start by reviewing childrens games and game theory. After game theory, the development of models and simulation will be reviewed and examined. Finally, operational gaming and its subparts, war gaming and business games will be reviewed.

Game Theory

> The origin of games has been vaguely assigned to the inborn tendency of mankind to amuse itself. Games have no geographical boundaries and game playing is found in all parts of the world whether it be in the underdeveloped areas of Africa or in a plush New York apartment penthouse.
>
> Modern games have so nearly lost their original meaning that even in the light afforded by history it is practically impossible to trace their origin. Most of the games that are presently played in America have origins in China, Korea, Japan, Greece, Italy and Africa.
>
> Up until the invention of the electronic digital computer, game playing was primarily restricted to mere humans or special purpose machines. Today, mathematicians, programmers,

> scientists and game-playing novices are spending considerable amount of time programming general purpose digital computers to play games.[1]

It is thought that games and game theory were first brought to national and international attention with the publishing of Von Neumann and Morgenstern's Theory of Games and Economic Behavior.[2] "The term games," as Thierauf and Grosse write, ". . . related to conditions of business conflict over time. The participants are competitors who make use of mathematical techniques and logical thinking in order to arrive at the best possible strategy for beating their competitor(s)."[3]

The following payoff matrix is an example of two-person zero-sum game.

		PLAYER WHITE	
		Strategy A	Strategy B
PLAYER RED	Strategy C	2	-4
	Strategy D	-2	4

[1]Donald D. Spencer, Game Playing with Computers (New York, 1968), p. 3.

[2]J. Von Neumann and O. Morgenstern, Theory of Games and Economic Behavior, third edition (Princeton, New Jersey, 1953).

[3]Robert J. Thierauf and Richard A. Grosse, Decision Making Through Operations Research (New York, 1970), p. 377.

The game is interpreted in the following manner. Player white has two strategies. They are A and B. Player red also has two strategies. They are C and D. When player white selects strategy A and player red selects strategy C, player red receives a payoff of two from player white. Similarly when player white selects strategy B and player red selects strategy D, player white receives four from player red. It can be seen that this is a zero-sum game because the payoff receipt of one player exactly equals the disbursement from the other player. This is further clarified by Lipson when he writes,

> Game theory deals with competitive situations in which two or more rivals have a common goal, such as that of obtaining a larger share of the market, and also have various strategies with attendant rewards in terms of increased or decreased share of the market. By means of matrix algebra, an optimal strategy can be computed for each set of rivals. This optimal strategy has the unique property that it cannot be defeated even if it is known to the other contestant.[4]

Models

A model is a representation or abstraction of an actual object or situation. It shows the relationships (direct and indirect) and the interrelationships of action

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[4]Harry A. Lipson, "Formal Reasoning and Marketing Strategy," Journal of Marketing, XXVI (October, 1962), 1-5.

and reaction in terms of cause and effect.[5] Models are built in order to gain a better understanding of complex systems that are too difficult to conceptualize analytically. Generally speaking, a model builder desires to know the results of changing one or more variables in a system. It is often too costly and too time consuming to change variables in a real world system and then sit back and observe the results. Therefore, a model is built to represent the real world system.

Classifications of Models

The three types of models that are most generally used to represent reality are iconic, analogue and symbolic. Ackoff and Sasieni discuss the three types of models when they write:

> In iconic models the relevant properties of the real thing are represented by the properties themselves, usually with a change of scale. Hence iconic models generally look like what they represent but differ in size; they are like images. Some common examples are photographs, drawings, maps, and "model" airplanes, ships, and automobiles. Iconic models of the sun and its planets such as are usually housed in planetariums are scaled down, whereas models of the atom is scaled up. Iconic models are generally specific, concrete, and difficult to manipulate for experimental purposes.
>
> Analogues use one set of properties to represent another set of properties. Contour lines on a map, for example, are analogues of elevation. A hydraulic system can be used as

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[5]Thierauf and Grosse, op. cit., p. 14.

> an analogue of electrical, traffic, and economic systems. Graphs are analogues that use geometrical magnitudes and location to represent a wide variety of variables and the relationships between them. In general, analogues are less specific, less concrete, but easier to manipulate than are iconic models.
>
> Symbolic models use letters, numbers, and other types of symbols to represent variables and the relationships between them. Hence they are the most general and most abstract model. They are usually the easiest to manipulate experimentally. Symbolic models take the form of mathematical relationships (usually equations or "inequations") that reflect the structure of that which they represent.[6]

Models are often used when developing an operational game. An iconic type model is generally not the type of model utilized when developing an operational game since two purposes of an operational game are to simulate an object system, and to force students into a decision making environment. It would be difficult to develop an iconic model that could efficiently achieve these two purposes. The nature of an iconic model is the reason that this type of model is not utilized when developing an operational game. An iconic model's nature is concerned with images of an object system. An iconic model represents an object system by using physical properties of the real thing. An example would be a globe representing the earth. To develop

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[6]Russell L. Ackoff and Maurice W. Sasieni, Fundamentals of Operations Research (New York, 1968), pp. 60-61.

an iconic model for an operational game would be difficult because the object system, the decision making environment, does not lend itself to physically being imitated by a model.

Analog models are also not appropriate when developing an operational game. An operational game could perhaps be developed by using an analog type of model but the operational game would be difficult to develop and to administer. To develop an operational game by using analog type models is difficult because the model builder would have to represent complex object systems by innumerable amounts of graphs and charts. The operational game would also be difficult to administer because the administrator would have to interpret on each graph or chart the resulting output from changing the input variables in the representation of the object system. Graphs and charts are also mainly two-dimensional in nature and illustrate relationships between two variables. In many object systems, however, relationships exists between three or more input-output variables. Simply stated, analog models cannot adequately express relationships that exist in complex object systems or in representations of objects systems, operational games.

Symbolic type models are generally employed when developing a representation of an object system that is used for an operational game. Symbolic models adequately

represent object systems because of their use of equations and abstraction. The object system to be represented, however, must be able to be described and formulated by equations and various degrees of abstraction in order for the symbolic type of model to become an adequate representation of reality. This only indicates that operational games cannot be developed for all object systems, simply because at present there might be no model which adequately represents the complex relationships existing in the object system.

Models can be dimensioned to the functions they perform. Amstutz writes,

> Models may be described in terms of those functions which they are to serve, the occupations of the people who develop them, the context in which they are used, or the techniques through which they are implemented. The following dimensions are relevant in the present context:
>
> 1. Implicit -- explicit
> 2. Qualitative -- quantitative
> 3. Macro -- micro
> 4. Simple -- complex
> 5. Static -- dynamic
> 6. State change -- process
> 7. Deterministic -- probabilistic
> 8. Theoretical -- empirical
> 9. Correlation based -- behavioral
> 10. Descriptive -- predictive
> 11. Descriptive -- normative
> 12. Manual -- computerized
> 13. Operations research -- econometric.[7]

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[7]Arnold E. Amstutz, Computer Simulation of Competitive Market Response (Cambridge, Mass., 1967), pp. 91-92.

It is seen that models are able to take on a multitude of different characteristics. Models can be explicit and denote meaning to the user, or they can be implicit and connote meaning to the user. It is thought that most models developed for operational gaming tend to be quantitative, complex, dynamic, state-change, probabilistic, empirical, and computerized. Models can be macro in nature, representing for example, aggregate spending as computed in Gross National Product. A model can also be micro in nature, rperesenting for example, the pricing of products in an individual company.

Advantages in the Use of Models

There are many advantages in developing a model to represent a real-world object system. Theirauf and Grosse present some of the advantages of model building when they write, "An important advantage of model building is that it provides a frame of reference for consideration of the problem, that is, the model may indicate gaps which are not apparent immediately."[8] Thierauf and Grosse continued by writing, "From a cost standpoint, a complex problem can be expressed in a mathematical model that will allow one to change parameters in an effort to see the results without undertaking actual construction of the project."[9] For

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[8]Thierauf and Grosse, op. cit., p. 22.

[9]Ibid., p. 22.

example, a queuing model can be developed to determine the optimal number of docks to be installed for a harbor.

Limitations in the Use of Models

There are also disadvantages when representing a real-world object system by the use of a model. Guetzkow, Kotler, and Schultz comment on some of the disadvantages of using a model when they write, "The disadvantages of modeling in general, including simulation, stem from the model's artificiality, abstraction or simplification, and idealization, and the consequent difficulties and dangers in making inferential leaps from a model to the real world."[10]

Simulation

Simulation is defined in many various ways. According to Emshoff and Sisson, "A simulation is a model of some situation in which the elements of the situation are represented by arithmetic and logical processes that can be executed on a computer to predict the dynamic properties of the situation."[11] Barton similarly stresses, "Simulation is simply the dynamic execution or manipulation of a model

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[10]Harold Guetzkow, Philip Kotler and Randall L. Schultz, Simulation in Social and Administrative Science, Overviews and Case-Examples (Englewood Cliffs, New Jersey, 1972), p. 6.

[11]James R. Emshoff and Roger L. Sisson, Design and Use of Computer Simulation Models (New York, 1970), p. 8.

of an object system for some purpose."[12] Another writer defines simulation as "dynamic representation achieved by buidling a model and moving it through time."[13] A more lengthly but comprehensive definition of simulation follows:

> Simulation. A general method of studying the behavior of a real system or phenomenon; the method usually involves the following features; (1) devising a model or set of mathematical and logical relations, which represents the essential features of the system; (2) carrying out step-by-step computations with these relations which imitate the manner in which the real system might perform in real time. Typically, the real system is subject to chance elements, and this leads to the inclusion of probabilistic characteristics in the model. In systems of complexity, a high-speed digital computer may be programmed to carry out the sequence of computations (also a simulation may involve both a computer and persons imitating certain human functions in a system). An important advantage of simulation is that the system can be studied under a wide variety of conditions which might be expensive or impossible to apply directly to the real system. Simulation is an important tool for a great variety of problems, particularly where ordinary mathematical solution is not possible, or where intangibles of human judgement are involved. . . . Examples include (1) the functioning of a business firm, (2) the diffusion of neutrons in a nuclear reactor, and (3) the problem-solving behavior of a human being.[14]

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[12]Richard F. Barton, A Primer on Simulation and Gaming (Englewood Cliffs, New Jersey, 1970), p. 6.

[13]William Arthur, "To Simulate or Not to Simulate: That is the Question," Educational Data Processing Newsletter, II (July, 1965), 9.

[14]William Karush, The Crescent Dictionary of Mahtematics (New York, 1962), pp. 243-244.

For purposes of this study the following definition of simulation will be used. "A quantitative technique used for evaluating alternative courses of action based upon facts and assumptions with a computerized mathematical model in order to represent actual decision making under conditions of uncertainty."[15] It is thought that Thierauf and Grosse's definition of simulation is a good definition because of the definition's comprehensiveness and briefness. It is also thought that this definition provides a good orientation or operational framework for computer simulated games. Figure 1 on page 22 illustrates a flow chart for a simulation procedure.

Meier, Newell, and Pazer present an introduction for simulation when they write,

> Simulation of business and economic systems has evolved as one of the most interesting and potentially powerful tools available for analyzing business and economic problems. Through simulation techniques the business analyst, operations researcher, or economist has the means for observation and experimentation which have long been the essence of the approach of the physical scientist. Building and running a simulation model permits observation of the dynamic behavior of a system under controlled conditions, and experiments may be run to test hypotheses about the system under study. In other words, simulation provides a laboratory for analysis of problems that often cannot be solved by other means.
>
> Early uses of the simulation technique usually involved experimentation with physical

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[15]Thierauf and Grosse, op. cit., p. 471.

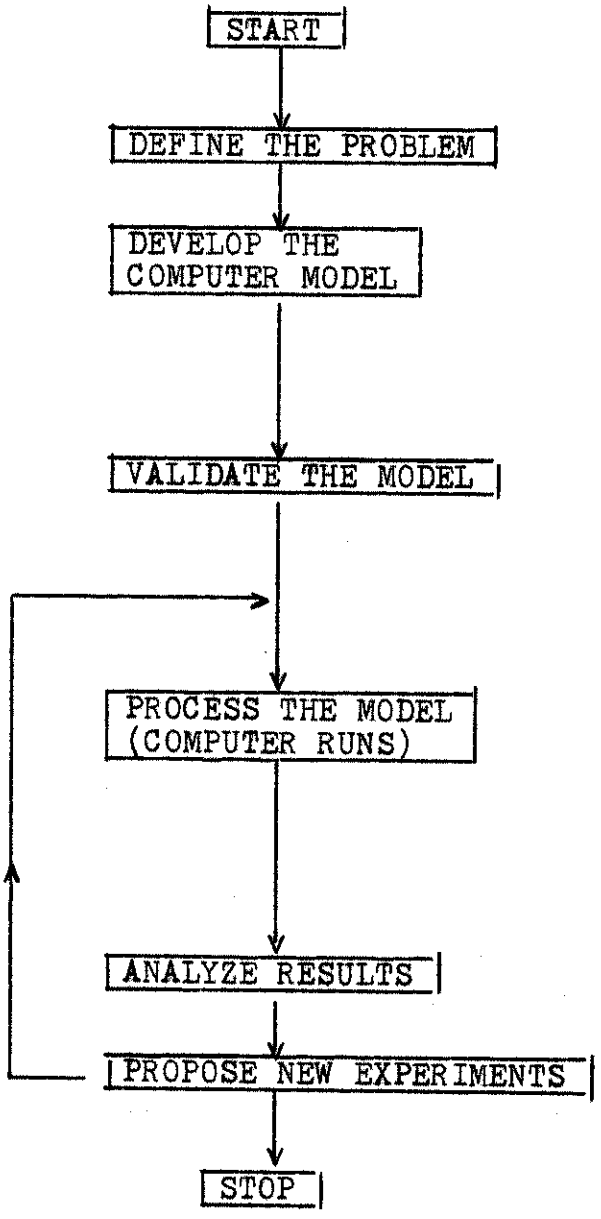

Fig. 1--Simulation procedure*

*Claude McMillan and Richard F. Gonzalez, Systems Analysis, A Computer Approach to Decision Models (Homewood, Illinois, 1968), p. 31.

> models representing the phenomena under investigation. As such, simulation was widely employed in engineering and scientific studies. Since administrative and economic processes are not easily represented by physical models, simulation by this method has been little used by social scientists and managers. However, simulation by means of digital computers has found wide acceptance in both engineering and scientific work and in the analysis of administrative and economic problems.[16]

Simulation, it is therefore seen, can be viewed as an aid for the researcher as well as the analyst. Simulation allows the researcher and the analyst to observe the dynamic interaction of inputs and their related outputs through time.

Classifications of Simulations

Simulation techniques can be classified into four distinct types. These four types are (1) analysis, (2) man-model simulation, (3) man-machine simulation, and (4) all-computer simulation.[17]

Analysis type simulation is simulation that examines each component part in the object system. The purpose of the examination is to determine how each part functions in the total system.

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[16]Robert C. Meier, William T. Newell and Harold L. Pazer, Simulation in Business and Economics (Englewood Cliffs, New Jersey, 1969), p. 1.

[17]Richard E. Barton, A Primer on Simulation and Gaming (Englewood Cliffs, New Jersey, 1970), p. 7.

Man-model simulation is another type of simulation which uses real live people. In this type of simulation it is assumed that the people taking part in the simulation are representative of the people that are being studied in the object system. It is also assumed that these people taking part in the simulation will behave (make decisions) in the artificial environment in the same way they would in the real-world object system. Man-model simulation, it is seen, is useful when the researcher is studying problems in psychology and sociology. This type of simulation is also beneficial when studying the decision-making process.

A third type of simulation is man-machine simulation. The object system can be represented and simulated by machine. One of the most widely known is a flight simulator. This is a machine in which potential pilots are trained. The machine simulates the same flying conditions one would experience in actual flying. Using a machine flight simulator is definitely safer than having a potential pilot making mistakes in the object system.

Physical machines are also utilized in many education programs when the object system is too dangerous to have a novice experimenting with it.

A type of man-machine simulation is man-computer simulation. A computer is classified as a machine and,

therefore, man-computer simulation is sub-part of man-machine simulation.

Three types of computers are digital, mechanical, and analog. A digital electronic computer represents symbols and numbers by digits.

> Bit is the name for the amount of information that is contained in a number which can only take the value 0 or 1. The word "bit" is a contraction of "binary digit," meaning a digit that can take one of the two values 0 or 1, just as a decimal digit can take one of the ten values 0,1,2, . . ., or 9. Although human beings commonly use decimal digits to represent numbers, machines commonly use binary digits because most physical devices used in machines can retain one of two states most reliably. (For example, on or off, positive or negative, north or south magnetization, etc.,).[18]

The second type of computer is mechanical, and is rather limited in its ability to perform a sequence of events.

The third type of computer is the analog computer. The analog computer is used when data is continuous in nature as opposed to discrete data.

> Numerous situations exist in which data are generated as continuous responses which are either directly expressable as voltages or may be electrically converted (transduced) to that form. Under certain

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[18] William C. Gear, Computer Organization and Programming (New York, 1969), p. 21.

> conditions it is possible to process these actual signals rather than some codified representation of them. When this is the case we refer to such signals as analog data, and the instrument used to process them is called an analog computer. We can gain some insight into what these conditions are by examining some of the basic properties and operating characteristics of analog information-processing systems.[19]

A sample flow chart of a man-computer simulation project is found in Figure 2, page twenty-seven. This flow chart illustrates the various procedures included in a man-computer simulation project as well as the logical scheduling of the sequence of events that is necessary to complete the project.

Figure 3 presents a flow chart of all-computer simulation. This flow chart also illustrates the necessary procedures and sequencing of a simulation project. Figure 3 may be found on page twenty-eight.

Advantages in the Use of Simulation

There are many advantages gained from using simulation when studying object systems. One of the major advantages in using simulation is that it enables the researcher to experiment with a system rather than with the actual object system. For example, a company might need a new distribution strategy. The investment needed for each

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[19] T. D. Sterling and S. V. Pollack, Computing and Computer Science (London, 1970), p. 351.

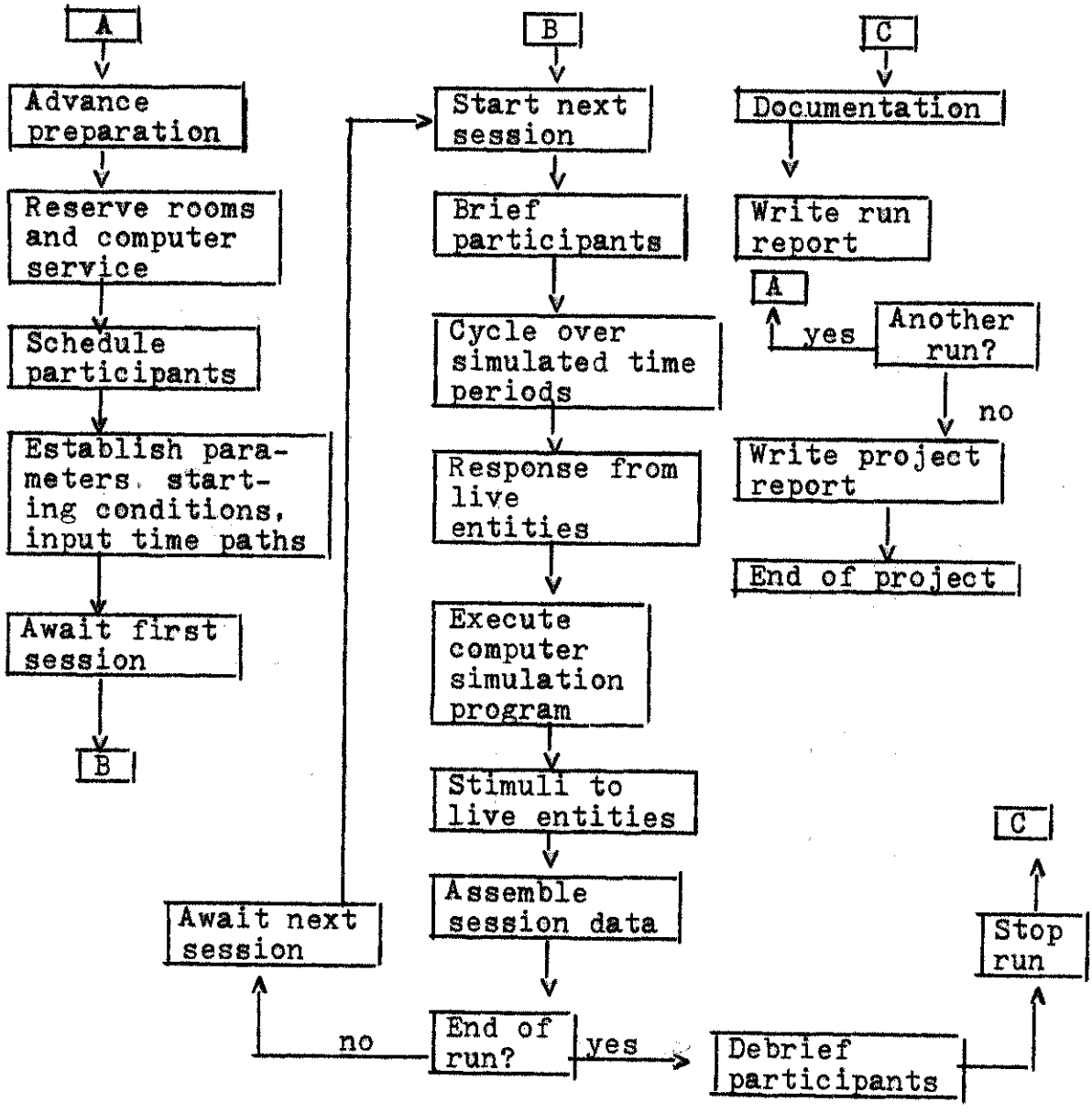

Fig. 2--Man-Computer Simulation*

*Richard E. Barton, A Primer on Simulation and Gaming (Englewood Cliffs, New Jersey, 1970), p. 87.

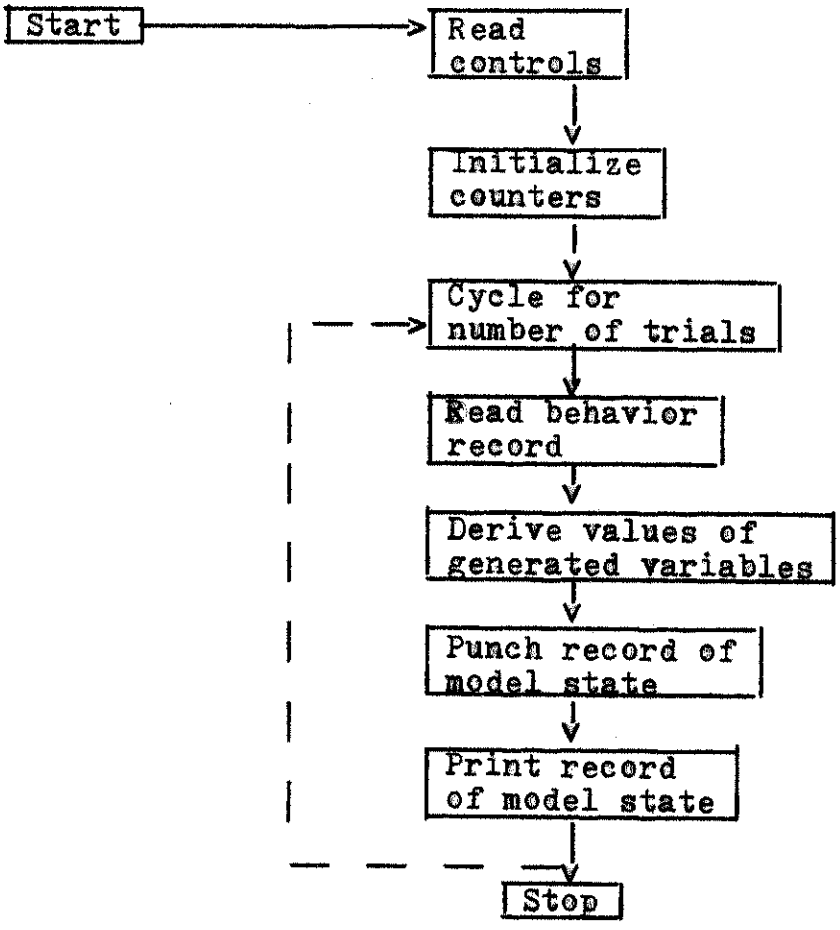

Fig. 3--All-Computer Simulation*

*Richard F. Barton, A Primer on Simulation and Gaming (Englewood Cliffs, New Jersey, 1970), p. 111.

proposed distribution strategy is costly and if the company makes a critical error in judgement the company could suffer financial ruin. The company could implement different distribution strategies and then observe their relative optimalities. This procedure, however, would be both risky and costly. Therefore, a simulation is developed to determine the best possible distribution strategy. Such a simulation was developed by Kotler and entitled the "Strategy Simulation Method."

> . . . this company faced several alternative distribution strategies and the company executives held diverse and not entirely disinterested views on the appropriate strategy. No proposal was backed up by any hard-headed profit calculation nor was there an agree-upon framework for comparing and ranking the alternative strategies. Our discussion showed that one framework is provided by the weighted factor score model and another by the hierarchical preference ordering method. These methods, while an improvement over simply listing advantages and disadvantages of each strategy, lack a profit calculation and suffer from other shortcomings. It was then proposed that computer simulation would be a better method in requiring the executives to think hard about sales, costs, marketing programs, and investment for each strategy. It would permit management to project the logical consequences of its estimates and readily test the effect of introducing new assumptions.[20]

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[20]Philip Kotler, Marketing Decision Making, A Model Building Approach (New York, 1971), pp. 297-298.

Maisel and Gnugnoli summarize advantages and disadvantages of computer simulation in tabular form when they write:

TABLE II

SUMMARY OF ADVANTAGES AND DISADVANTAGES OF COMPUTER SIMULATIONS*

Advantages	Disadvantages
Permits controlled experimentation with: (a) consideration of many factors; (b) manipulation of many individual units; (c) ability to consider alternative policies; (d) little or no disturbance of the actual system	Very costly
Effective training tool	Uses scarce and expensive resources
Provides operational insight	Requires fast, high capacity computers
May dispel operational myths	Takes a long time to develop
May make middle management more effective	May hide critical assumptions
	May require extensive field studies

*Herbert Maisel and Giuliano Gnugnoli, Simulation of Discrete Stochastic Systems (Chicago, Illinois, 1972), p. 5.

Simulation Testing

Simulation procedures, like model building and development, are also subject to testing. The testing is required to determine if the simulation is yielding adequate representational output from inputs into the simulated system.

VanHorn, concerning the testing of simulation and models, writes:

> . . . two important characteristics of the validation problem are:
>
> 1. The objective is to validate a specific set of insights not necessarily the mechanism that generated the insights.
>
> 2. There is no such thing as "the" appropriate validation procedure. Validation is problem-dependent.21

The testing procedure for the International Marketing Simulator will be presented in a later chapter in this paper.

Applications of Simulation

To illustrate the simulation process, two actual simulation problems will be reviewed. The first problem or illustration of simulation concerns the selection of advertising media from various alternatives. The problem is to select the media that would optimize a company's total dollar profits. The advertising media selected should, of course, reach an audience whose demographic characteristics are the same as the present purchasers of the company's products. Five different media are to be considered. These are (1) television, (2) radio, (3) newspaper, (4) newspaper supplements and (5) magazines. The

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[21]Richard VanHorn, Validation, p. 3, cited in Thomas Naylor, The Design of Computer Simulation Experiments (Durham, North Carolina, 1969), pp. 233-234.

following simulation model is designed to determine an estimation of the exposure value of a given media rather than to determine the best media.

> The . . . simulation model was designed by the Simulmatics Corporation. The model consists of a sample universe of 2944 make-believe users, representing a cross-section of the American population by sex, age, type of community, employment status, and education. Each individual's media choices are determined probabilistically as a function of his socioeconomic characteristics and location in one of ninety-eight American communities. A particular media schedule is exposed to all the persons in this hypothetical population, according to Figure 4 on page 33. As the simulation of the year's schedule progresses, the computer tabulates the number and types of people being exposed. Summary graphs and tables are automatically prepared at the end of the hypothetical year's run, and they supply a multidimensional picture of the schedule's probable impact. The advertiser examines these tabulations and decides whether the audience profile and the reach and frequency characteristics of the proposed media schedule are satisfactory.[22]

The second illustration of simulation concerns a coffee company which is interested in its market share, costs and profits. The problem and its possible solution approach are described by Kotler.

> Tuason simulation. Tuason carried out a simulation of the household coffee market in which he tested the competitive efficacy of a particular adaptive, diagnostic strategy. His model described a large coffee company which made decisions on price, deals, and product blend each week.

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[22]Kotler, op. cit., p. 458.

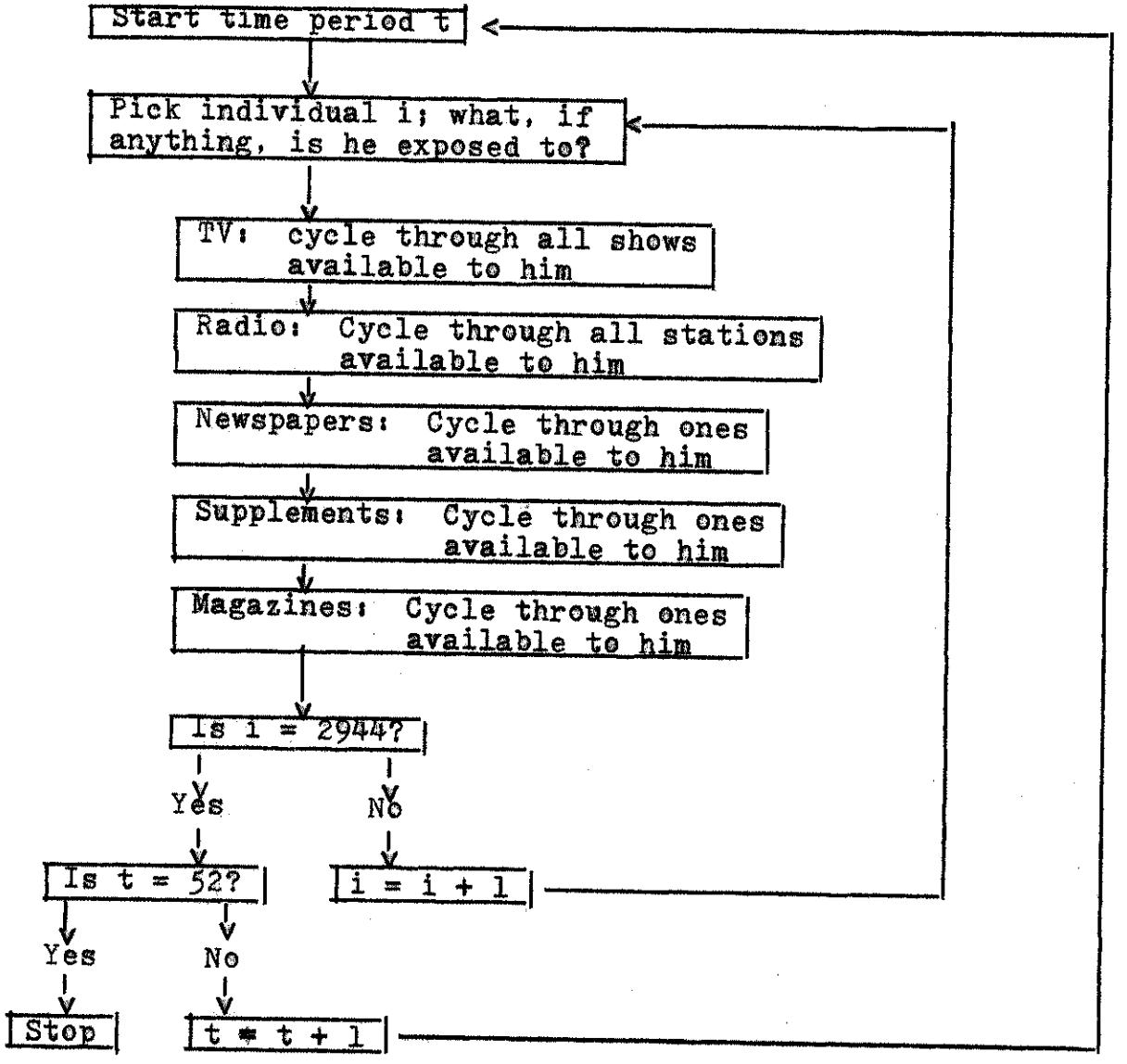

Fig. 4--Simulation Model, Simulmatics Corp.*

*"Simulmatics Media Mix: Technical Description," Simulmatics Corporation, (New York, October, 1962).

. . . . . .

> Essentially the coffee company considers whether the last period results satisfy its market share and profit goals. If not, the firm considers appropriate changes in its marketing program or product. These changes are guided by a diagnosis of any changes in the market program of competitors. The company evaluates the expected costs, sales, and profits from the contemplated marketing plan and, if these meet its goals, the plan is adopted.[23]

Operational Gaming

Gaming and operational gaming have been defined in many different ways. Buffa wrote, "Operational games are an application of the general simulation technique which offer considerable promise for education in the business field."[24] Buffa further notes, "Output from the model shows the effect of the decisions made and represents a feedback of the information which may influence future decisions by the players."[25] Meier, Newell, and Pazer write, "Games are a form of simulation in which human beings make decisions at various stages; thus games are distinguished by the idea of play."[26]

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[23] Ibid., p. 112.

[24] Elwood S. Buffa, Operations Management, Problems and Models, second edition (New York, 1968), p. 691.

[25] Ibid., p. 691.

[26] Meier, Newell and Pazer, op. cit., p. 179.

Gaming has many advantages.

Some of the more common claims are that gaming excels in:

1. Selling and teaching the solutions of games

2. Eliciting information from inarticulate experts.

3. Stimulating the imagination.

4. Incorporating intelligence interplay.

5. Solving non-factorable problems where context is important.

6. Pooling the knowledge of experts.

7. Determining balanced forces and estimating marginal utilities.

8. Testing sensitivity over a wide range.

9. Incorporating actual probability distributions into a game.[27]

There are, however, limitations when using gaming. The first caution concerning gaming is that participants often try to beat the game instead of acquiring the educational information contained in the game. "A second drawback may occur if the game is considered too easy -- if variables are not complex enough to actually represent real life

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[27]C. J. Thomas and Walter L. Deemer, "The Role of Operational Gaming in Operations Research," The Journal of the Operations Research Society of America, V (February, 1957), 22.

situations."[28] Carlson also writes that games might be too difficult and " . . . if calculations or relationships are so complex that the participant will merely guess rather than get involved in sincere analysis."[29] A third limitation or caution when using operational gaming, "is that the gaming situation does require a significant time commitment."[30] A student will have to read the rules, try to understand the rules, actually play the game and then finally there is generally a debriefing session after the game has been played.

War Games

Kibbee, Craft, and Nanus trace the origin of operational gaming when they write,

> The military, of course, have been playing war games for centuries. Chess was early used as a form of war game, and many varieties of "war chess" have been created, the game being adapted to changing military concepts. Helwig, Master of Pages at the court of the Duke of Brunswick, developed a form of war chess in the 18th century which used a board made up of 1,666 squares, and had pieces representing battalions of fusilers, squadrons of dragoons, batteries of siege guns, and so forth.
>
> War chess evolved, primarily as a result of the work begun by the Prussian Army in 1811, into the modern much used map maneuvers, where actual maps of terrain

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[28] John G. H. Carlson and Michael J. Misshauk, Introduction to Gaming: Management Decision Simulations (New York, 1972), p. 3.

[29] Ibid., p. 3.

[30] Ibid., p. 3.

> are used instead of a checkered board. The Germans made extensive use of war games and man maneuvers, in preparation for both World War I and World War II.[31]

Greenlaw, Herron, and Rawdon, concerning the use of game playing, simulation and military applications write, "Among the most well known of these (simulation) is the Link Trainer, in which a physical model is employed to simulate the problems of piloting an airplane under flight conditions."[32]

There have been many military games developed since the arrival of the digital electronic computer. Military like games, however, are not the only environmental situations represented by computer-assisted games and simulation. There are also games of peace.[33] These games have as their objective a peaceful world.

A very informative example of a military gaming operation is presented by Morse.

> During the war several antisubmarine air search tactics were worked out by this means. The rules of the submarine player

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[31]Joel M. Kibbee, Clifford J. Craft and Burt Nanus, Management Games, A New Technique for Executive Development (New York, 1961), p. 6.

[32]Paul S. Greenlaw, Lowell W. Herron and Richard H. Rawdon, Business Simulation in Industrial and University Education (Englewood Cliffs, New Jersey, 1962), p. 7.

[33]Lloyd Norman, "Games of Peace," Newsweek, LXIII (January, 1964), 56-57.

> allowed him so many hours submergence, during which he could not be seen by the air player and during which he could see the plane only a short distance away; when he was on the surface he could be seen by the plane, of course, and was attacked unless he submerged in time; and so on. We worked up a gadget with electrical contacts to conform to these rules of sighting, so that the submarine player and the air player could each chart his course unseen by the other. For several weeks the men in our groups played dozens of games on this device.[34]

The type of problem with which a military operational research worker is faced has been classified by Shephard when he writes as follows.

> (a) What is the best method of using the weapons and equipment at present in existence in order to achieve a given aim? Examples of this type of problem are:
>
> (i) How should anti-aircraft guns and guided weapons be sited?
> (ii) How should men be trained to give their best performance?
> (iii) What proportion of ammunition of different types should be supplied?
>
> (b) Given, in broad terms, the policy (or strategy) that is to be adopted, what weapons, equipment, men and material are required in order to carry it out in the best possible way? Examples include:
>
> (i) What is the best form of anti-tank defence?
> (ii) What force characteristics are most appropriate to nuclear war?

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[34]Philip M. Morse, "Trends in Operations Research," Journal of the Operations Research Society of America, I (September, 1953), 163-164.

(iii) What are the optimum types and mixes of weapon needed in a limited war?

It will of course be appreciated that economic factors play a considerable part in the solution of such problems.

(c) What is the best policy or strategy to adopt? For example:

(i) Should nuclear weapons be used? And, if so, how?
(ii) Should the Army be equipped so that it can fight anywhere in any type of specialist forces?[35]

Shephard has written that there are six methods of approach to solve military operational research problems. The methods of approach are (1) military exercises, (2) field experimentation, (3) research and development, (4) sand table and map exercises, (5) collecting historical data, and (6) military experience.[36]

Business Games

A type of an operational game is the business or management game. A definition of business games, as earlier noted in this paper, is presented by Greene when he writes, " . . . a business game is a simulation or model of part or all of a business organization. The game

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[35] R. W. Shephard, "War Gaming as a Technique in the Study of Operational Research Problems," Operations Research Quarterly, XIV (June, 1963), 120.

[36] Ibid., p. 121.

may be designed to represent something as narrow as an inventory control problem or as broad as a high-level capital budgeting situation."[37] Carlson and Misshauk take a slightly different view of business gaming. Their view is more oriented toward an educational objective. They write that "Business gaming is a teaching vehicle or technique that makes use of situations specifically designed to represent the actual environmental conditions in the business world."[38]

A brief description of a typical business game is presented by Kibbee, Craft, and Nanus.

> The game session begins with a briefing. At this time the instructor describes for the participants the type of company they are about to manage, the economic environment, the general nature of the products, and the competitive forces they will face. The scope of their authority, the functions to be filled, the decisions to be made, and the information they will receive are all discussed. In addition to the mechanics of play, the purpose of the exercise and the manner in which it relates to the entire educational program are covered.
>
> After the briefing the participants meet with the other members of their management team. In a typical game, involving perhaps forty to fifty executives, there might be six teams each with seven or eight

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[37]Jay R. Greene, "Business Gaming for Marketing Decisions," The Journal of Marketing, XXV (July, 1960), 221-222.

[38]Carlson and Misshauk, op. cit., pp. 3-4.

> members. The management teams determine their organization, set objectives, decide on the short- and long-range plans necessary to achieve these objectives, and introduce necessary controls and procedures. Typically organizational structures evolve, with presidents, vice-presidents, etc. In addition to the obvious desire to maximize net profit, other objectives will be set concerning share of market, stabilized production, inventory control and personnel policies.
>
> Games are played in periods, each period being a day, week, month, quarter, or year, depending on the particular game.
>
> . . . At the end of the game play, which may well simulate from six to sixteen months, a discussion session takes place. This "critique" session is held to focus attention on the lessons which were to be taught. The participants have the opportunity of reviewing their performance, discussing management principles with other members of the group and receiving feedback from the game administrator and observers.[39]

Business games have their origin traced back to 1957, when the American Management Association developed the game entitled, "Top Management Decision Simulation."[40] Greenlaw, Herron, and Rawdon write, "The first practical business game is generally considered to have been that developed by the American Management Association in 1957--the Top Management Decision Simulation."[41] Meier, Newell,

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[39]Kibbee, Craft and Nanus, op. cit., pp. 4-6.

[40]Franc M. Ricciardi and others, Top Management Decision Simulation: The AMA Approach (New York, 1957).

[41]Greenlaw, Herron and Rawdon, op. cit., p. 13.

and Pazer similarly write, "It is generally agreed that the earliest business management game was the Top Management Decision Simulation, developed by the American Management Association in 1956."[42]

Classifications of business games.--Burch has written that there are three types of business games. These three types of business games are (1) general management games, (2) functional games, and (3) industry games.[43] Burch, concerning general management games, writes, "All major functions of the business are included and decision making is at the top management level."[44] Burch, concerning functional games, writes, "There are many games aimed at the middle or lower levels of management which stress a particular management function such as marketing, production, inventory control and finance."[45] The third type, industry games, deals with particular problems for specific industries. Thorelli and Graves similarly write, "General management games incorporate a more or less well-balanced mix of the major functions of the business, such as marketing research

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[42]Meier, Newell and Pazer, op. cit., p. 181.

[43]John G. Burch, Jr., "Business Games and Simulation Techniques," Management Accounting, LI (December 1969), 49-50.

[44]Ibid., p. 49.

[45]Ibid., p. 50.

and development, finance, and production."[46] Concerning functional games, Thorelli and Graves write, "Functional games, of which marketing games are perhaps most typical, are confined largely to problems within a relatively narrow area."[47]

Another type of business game is the in-basket exercise. The in-basket type of game is described by Lopez when he writes,

> The IN-BASKET EXERCISE takes its name from the in-basket or tray usually found on a manager's desk, used to keep incoming correspondence in order, to provide a place to deposit incoming documents for his attention and action, and to provide a location for the pick-up of his outgoing papers. Many of the problems a manager or administrator faces on his job come to him through the in-basket.
>
> An in-basket test simulates the problems of a specific management role and requires the examinee to handle these simulated problems as if he were actually on the job. Normally, he is instructed that his predecessor has suddenly left the job, either temporarily or permanently, and that he must now deal with what is left in the in-basket on the basis of his own judgment, tempered by what is usually a long and detailed set of background material.
>
> The particular documents which fill the in-basket constitute the test items, and the actions taken by the participants in handling them constitute the test. The participants

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[46] Hans B. Thorelli and Robert L. Graves, International Operations Simulation (London, 1964), p. 9.

[47] Ibid., p. 9.

> respond to the items as though they were actually on the job and whatever they produce represents their answers to the test problems.[48]

Characteristics of business games.--There are many different characteristics of business games. Kibbee writes, "What is far more important in most management games is verisimilitude: The degree to which the players feel that the simulated situation is real."[49] Business games can have the characteristic of interaction. Burch writes, "Games that attempt to reproduce the competitive business world, or that deal with marketing problems are usually interactive, which means that the actions taken by one side affect its opponents' results as well as its own."[50] Business games can also be non-interactive, as Thorelli and Graves write, "Games about scheduling problems or specific administrative techniques often are non-interactive; that is, the players vie for the best score independently of each other as in bowling."[51] Carson writes, "The more complex games are played with electronic computers. The decision parameters

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[48]Felix M. Lopez, "The In-Basket Exercise," Simulation/Gaming/News, March, 1973, p. 1.

[49]American Management Association, Inc., Simulation and Gaming: A Symposium, AMA Management Report No. 55

[50]Burch, op. cit., p. 49.

[51]Thorelli and Graves, op. cit., p. 49.

of the game are programmed into the computer, and it analyzes the decisions made and feeds back results."[52] Carson further writes, "Many of the more simple games can be scored by hand. Many that can be scored by hand are still scored by computer where one is available because of the speed with which it produces results, less chance for errors, and neater reports."[53] One of the most comprehensive lists of business game characteristics is presented in Duke's Metropolis game when he writes,

> Business games hold certain characteristics:
>
> 1. They tend primarily to utilize a man-machine combination, with considerable variation between rigid (machine) versions and free (umpire-goverened) versions.
>
> 2. They are used primarly for training purposes; they are used less often to study the system under consideration and in some cases to demonstrate proposed changes in this system.
>
> 3. They are used for testing alternative courses of action.
>
> 4. They may operate in real time but for the most part compress time and expedite play.
>
> 5. They inevitably employ a simulated environment, which attempts to represent

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[52]John R. Carson, "Business Games: A Technique for Teaching Decision-Making," Management Accounting, XLIX (October, 1967), 32.

[53]Ibid., p. 32.

> the "real world" as it is relevant to the problem, within the perception of the designers.
>
> 6. They progress as a series of plays or cycles, each representing some real-life period, and progress over a sufficient number of cycles to insure the programmed objective (continuous play techniques are being explored in some instances).
>
> 7. They require that the players "act out the role," specifically be requiring appropriate decisions.
>
> 8. They are all simple, relative to the situation they are abstracting from.
>
> 9. Finally, they involve the concept of competition between players or teams.[54]

Advantages in the use of business games.--There are many advantages in the use of business games. McKenney writes, "The prime appeal of gaming as a teaching tactic is that it generates a sustained, high level of student involvement."[55] Tait stresses that games are entertaining as well as being profitable. He writes that, "One of the major advantages of business games as an education tool is their ability to confront managers with the consequences of their decisions."[56] Nanus lists six conservative claims for the use of management games.

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[54]Richard D. Duke, Gaming-Simulation in Urban Research (Michigan, 1964), p. 9.

[55]James L. McKenney, Simulation Gaming for Management Development (Boston, 1967), p. 3.

[56]Richard Tait, "Business Games are More than Fun," International Management, XXV (October, 1970), 36.

1. A good management game can provide a degree of involvement of participants in the learning situation which exceeds that usually attained by other teaching techniques in the field of business management and this, according to current learning theory concepts, is desirable.

2. Games can be used to demonstrate principles of management relating to the interaction of decision areas over time better than static techniques such as lecture or case study.

3. Games provide an effective means for demonstrating some of the decision making problems associated with a specific functional area (for example, marketing).

4. Properly designed and administered games can provide extremely effective demonstrations of the application of certain time related management tools such as budgets, forecasts or mathematical inventory control models and the capabilities of electronic computers in rapid data analysis and report preparation.

5. Games are useful as simulated task situations for certain types of organizational research relating to communications, leadership, group structure, decision making and related concepts.

6. The process of building a game often provides useful insights into the relationships existing in the business being simulated.[57]

Babb, Leslie and VanSlyke add, "Business gaming seems well suited to the study of market structure, psychological attributes, and other variables affecting conduct or

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[57]Burt Nanus, "Management Games: An Answer to Critics," The Journal of Industrial Engineering, XXVII (November-December, 1962), 35-36.

behavior of firms."[58] Finally, Wollaston, concerning the advantages of management games writes, "The primary one is the opportunity to learn from experience without paying the price that could be expected for wrong decisions in real life."[59]

Limitations in the use of business games.--There are limitations when using business games. Tait stresses that business games ignore the areas of personnel management, motivation, and job enrichment. Eliminating these less quantifiable areas leaves no room for personal ambition among the participants. Finally, Thorelli and Graves write,

> Management simulations never give a perfect portrait of reality. No matter how intricate the computer equipment used, the picture is always impressionistic, both as regards the traits of reality incorporated and their relative emphasis. In effect, simulations tend to reflect the biases of their designers.[60]

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[58]E. M. Babb, M. A. Leslie and M. D. VanSlyke, "The Potential of Business-Gaming Methods in Research," Journal of Business, XXXVIV (October, 1966), 468.

[59]Justin G. F. Wollaston, "The Name of the Game is Gaming," Systems and Procedures Journal, XVIV (January-February, 1968), 24.

[60]Hans B. Thorelli and Robert L. Graves, International Operations Simulation (London, 1964), p. 13.

Examples of management games.--One of the first management games, as previously noted, was the American Management Association's "Top Management Decision Simulation."[61] This game is explained by Kibbee, Craft and Nanus when they write,

> In this first AMA game, five teams or "companies" were considered to be manufacturing a single identical product for sale in the same market. Each company started in the same financial postiion and with the same choices available to it. In each round of play (or "quarter" of a business year) each company allocated its financial resources among a group of alternative expenditures--production, marketing effort, research and development, and additional plant investment--and set the price of its product. Players could also purchase market probe which would inform them of the demand they would have obtained had they set a different price or advertising expenditure. They would sell off a plant at a loss to raise funds, but they were not permitted to borrow; quarterly expenditures could not exceed cash on hand.[62]

Another example of a business game and a special version of that game is presented by Kotler when he writes,

> One of the first and most fully developed business games is the Carnegie Tech Management Game, created by faculty members at Carnegie-Mellon University Graduate

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[61] Franc M. Ricciardi and others, Top Management Decision Simulation: The AMA Approach (New York, 1957).

[62] Joel M. Kibbee, Clifford J. Craft and Burt Nanus, Management Games, A New Technique for Executive Development (New York, 1961), pp. 165-166.

> School of Industrial Administration. A special version called MATE (Marketing Analysis Training Exercise,) developed by Kuehn and Weiss, shows the marketing operation in much detail, while simplifying the production and financial aspects of the original game. MATE revolves around three firms in the packaged detergent industry, operating in four geographical regions. Each month the firm may establish or alter price, advertising expenditures, and retail allowance. The firm may also purchase market survey reports containing estimates of total retail sales and market shares, retail distribution and stockouts, and competitive advertising expenditures. These estimates are subject to an amount of error varrying with the funds appropriated for each survey and chance factors. Furthermore, the firm can invest in product research to find new and better products or to imitate competitors' products, with the results also dependent on how much it invests and chance factors.[63]

One of the best known of the management games is also presented by Kotler when he writes,

> The M.I.T. Marketing Game models a complex and realistic marketing environment. Developed around electric floor polishers for household use, this game requires the players to determine product quality, price, dealer margins, channels of distribution (including number and type of dealers), market area, advertising expenditures, advertising media and appeals, and the number and disposition of salesmen and promotion within the retail store.[64]

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[63]Philip Kotler, Marketing Decision Making, A Model Building Approach (New York, 1971), p. 660.

[64]Ibid., p. 661.

The last example to be examined is Hans B. Thorelli's INTOP, or University of Chicago International Operations Simulator.[65] This game is one of the best games to be developed in the area of international business training games. The game is of the functional type, dealing in one area, international business. The game is also computer scored and there is interaction or competition among the rival teams. INTOP can be played by four to twenty-five company teams. Each team can consist of three to seven executives. Each team can compete in three areas. These areas are Brazil, the European Economic Community, and the United States. Each team can market either or both of two products. The products are medium-priced electrical appliances. Each team makes decisions concerning the expenditure levels on products and improvements, scheduling of plant and production, price, advertising, marketing information, channels of distribution, short-term bank loans, patent licenses, and inter-company and intra-company transactions.

Also in INTOP there is a basis for inter-team comparison. At the start of play each team prepares a written report on the goals it wishes to obtain. These goals at the end period are then used as criteria of performance for each team.

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[65]Hans B. Thorelli, INTOP, International Operations Simulation, Player's Manual (Glencoe, Illinois, 1963).

One final word about INTOP would be that INTOP is an international business simulator and not an international marketing simulator. A business simulator has decision inputs from all areas of business while a marketing simulator emphasizes the marketing inputs. For example, a business simulator or game has one input for advertising. A marketing simulator has inputs for the elements of the promotional mix. These are (1) personal selling, (2) advertising, and (3) sales promotion. These elements are further broken down into sub-parts. For example, the advertising elements can be broken down into the type of media to be used. These could be (1) radio, (2) television, (3) magazines, and (4) newspapers. If the marketing game was even more complex and realistic, the television input could be broken down according to the time of day the message is scheduled. This could be morning, afternoon or evening broadcasts. It is, therefore, indicated that there is a difference between the international business game and the international marketing game.[66]

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[66] More examples of management games are presented by J. F. McRaith and Charles R. Goeldner, "A Survey of Marketing Games," The Journal of Marketing, XXVI (July, 1962), 61-68. An even more detailed description of management games is found in Robert G. Graham and Clifford F. Gray, Business Games Handbook (American Management Association, Inc., 1969).

CHAPTER III

THE INTERNATIONAL MARKETING SIMULATOR

Description of the Model

The Determination of Demand for the Model

The determination of the level of demand for each student team for each grade of product in every country is a complex function of interrelated elements. One of these elements is the product's life cycle. For purposes of the simulation, the product being marketed is at the end of the introduction stage in its product life cycle and entering its growth stage during the first period of the simulation.[1] The model's suggested length of simulation is twelve periods. Each period represents three months. The game can easily be lengthened by simply simulating past the twelfth period. It is suggested, however, that somewhere around the fifteenth period a modification should be made to limit the amount of demand. This would reflect the saturation stage of the product's life cycle. About the eighteenth period it is suggested that the demand is decreased since the product should be in the decline stage in its life cycle. These

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[1]Thomas A. Staudt and Donald A. Taylor, A Management Introduction to Marketing (Englewood Cliffs, New Jersey, 1965), Chapter 8.

manipulations of demand can be made by simply changing the growth control card. Such a change could be 4 per cent to 3 per cent to 1 per cent to -1 per cent to -3 per cent. The time period is also changeable on the control card. This is especially noteworthy because the time period is the exponent of the growth function, (1.00+growth) to the power of the time period. The growth function is illustrated in Table III on page fifty-five. The 2556 units figure is the demand for the product over twenty time periods or five years.

An important question to be asked at this time is, of course, what is the amount of the demand to be multiplied by the growth element? The demand for the product in each country was calculated in the following manner. The example will be for the first time period. Constructed into the model is the fact that the first period's percentage share of the twenty time periods is 4 per cent. Therefore, demand in the first time period will be 4 per cent of the total demand for five years. Five years is the life cycle of this product before it becomes obsolete because of a superior product which will be introduced in four to five years. The total demand for the product for the five years is calculated by multiplying the number of households by one. It is thought that the product is similar to a refrigerator. Demand for the first time period then becomes 4 per cent of the number of households for each country.

TABLE III

GROWTH FUNCTION

Period	Growth	Hypothetical Demand of 100 Units
1	1.04	104
2	1.08	108
3	1.12	112
4	1.16	116
5	1.21	121
6	1.26	126
7	1.31	131
8	1.36	136
9	1.42	142
10	1.48	148
11	1.53	153
12	1.60	160
13	1.66	166
14	1.73	173
15	1.80	180
16	1.00	100
17	1.00	100
18	1.00	100
19	.92	92
20	.88	88
		2556 Units
	(Numbers are truncated at 2 decimal points)	

The demand for the first period is really the total industry demand for the product. There are twenty corporations in the industry. This means a student team could have a very profitable demand of 5 per cent of the industry's total demand. There are other profitable per cents of the industry's total demand both above and below the 5 per cent figure which a team could have of the

industry's demand. At a certain point, however, a team starts to lose money. This is because the team's price is too high.

It is apparent that a student team's potential demand for a product in the first time period then becomes 5 per cent of the 4 per cent of the number of households in a country.

If, for example, this country is Japan, potential demand would be 55706 units for the first time period, (27853000) (.002). These 55706 units have to be divided among the three grades of products. In Japan the low grade product demands approximately 60 per cent of this total. Demand, therefore, is close to 33000 units.

The model used to represent the marketing of the low grade product in Japan for the first time period is presented below in lines #1-13.

```
Line #1 Profit = ((((-2750)*(PJL)+60500)*((1.0+G)**(T))+
Line #2    ((X+AJNL)/PJL)+((X1*AJSL)/PJL)+((X2+AJRL)/PJL)
Line #3    +((X3*AJML)/PJL)+((X4*AJDL)/PJL)+((X5*AJTL)/PJL)
Line #4    *(PJL)
Line #5    -(((((-2750)*(PJL))+60500)*((1.0+G)**(T))+
Line #6    ((X+AJNL)/PJL)+((X1*AJSL)/PJL+((X2+AJRL)/PJL)
Line #7    +((X3*AJML)/PJL)+((X4*AJDL)/PJL)+((X5*AJTL)/PJL))
Line #8    *(((90000/FJL)+7)+
Line #9    (2)+(1))
```

```
Line #10  +AJDL+AJML+AJNL+AJRL+AJSL+AJTL
Line #11  +JWiL+JCiiL
Line #12  +BiJL*1.1+CiJL*.90+P/JL*1.+SiJL*1.15+WiJL*1.2
Line #13  +BiJL+CiJL+PiJL+SiJL+WiJL)*(1.8))
```

The code and sample values for these symbols are listed below.

PJL+	Price in Japan Low Grade Product=$18.00
G=	Growth=.04
T=	Time period=1
X=	Effectiveness of Newspaper Advertising=7.0
AJNL=	Newspaper Adv. in Japan Low Grade Product=$20000.
X1=	Effectiveness of Sales Promotion=6.0
AJSL=	Sales Promotion in Japan Low Grade Product=$8000
X2=	Effectiveness of Radio Advertising=5.0
AJRL=	Radio Advertising in Japan Low Grade Product=$5000.
X3=	Effectiveness of Magazine Advertising=4.1
AJML=	Magazine Adv. in Japan Low Grade Product=$41254.
X4=	Effectiveness of Direct (Mail) Advertising=4.0
AJDL=	Mail Adv. in Japan Low Grade Product=$10000.
X5=	Effectiveness of Television Advertising=2.0
AJTL=	Television Adv. in Japan Low Grade Product=$2000.
FSL=	Production in Units=31000
JWiL=	Inventory Cost for Manufacturer=$10000.
JCiiL=	Inventory Cost for the Wholesaler=0.
BiJL=	Units from Belgium to Japan=0.

CiJL= Units from Canada to Japan=0.

PiJL= Units from Portugal to Japan=0.

SiTL= Units from Sweden to Japan=0.

WiJL= Units from Switzerland to Japan=0.

JiJL= Units from Japan Mfg. to Japan Whlslr.=21000.

Profit in Japan for the low grade product is determined by the equation presented in Lines #1-13. Demand in units is determined by Lines #1-3. Sales revenue is determined by multiplying demand in units (Lines 1-3) by Line #4 which is the price of the product. Lines #5-13 determine total costs and are subtracted from Lines #1-4. This results in profit. Lines #5-7 determine demand in units and when multiplied by Line #8, average cost per unit, yield the cost of production. Lines #5-7 are also multiplied by line #9, which is the retailer's cost of $2 per unit sold and the wholesaler's cost of $1 per unit. Line #10 is the amount of the expenditure on promotion. Line #11 is the cost of the manufacturer's and wholesaler's inventory. Line #12 determines the shipping cost. Finally, Line #13 is the importer's cost.

Using the sample values given in the code, profit can be determined. Substituting the sample values into lines #1-3 results in demand being over 35000 units. Potential demand in this case is over the amount of units on hand to be sold. The model does not allow demand to be more than

the units on hand available to be sold. Therefore, in this case, demand is equal to the units on hand, 21000. Sales revenue thus becomes $378000. Production cost incurred this period is $207967. Retailer's cost is $42000 and wholesaler's cost is $21000. Promotional costs are $86254. Inventory cost for the manufacturer is $10000. Shipping and importer's costs are zero. Total cost then becomes $367221. Profit equals $10774.

Promotion

Promotion is another element in the model which influences the demand in units for a product. Simply stated, when promotion is increased, demand will increase. This relationship holds true, however, only up to a certain amount. This is the saturation level. Above this level promotion is actually annoying potential customers and sales decrease. In the model this is mathematically done by the insertion of an IF statement. For example, if the promotional expenditure is above the saturation level, then sales decrease. This saturation level can also be modified by the user of the program.

The model also determines the effectiveness of the six different promotional vehicles for each of the three products in the six countries. Using a hypothetical example, $100 spent on radio advertising in a country would increase sales by 700 units. Mathematically the relationship

is (7)(amount of expenditure). Carrying the example further, $100 spent on newspaper advertising results in a sales increase of 300 units, (3)(100). Also $100 spent on television results in a sales increase of zero units, (0)(100). Why are the effectiveness of the three promotional levels respectively seven, three, zero? The answers are (1) in this country out of 1000 households there are 800 radios, (2) the literacy rate of the country is only 10 per cent, and (3) television advertising is illegal. It is seen that the effectiveness of each promotional vehicle is determined by the information supplied in the scenario section in the chapter entitled "The International Marketing Simulator."

There are eighteen different demand curves and six promotional vehicles affecting each curve. Therefore there are 108 relationships. Each of these relationships can be modified by the user of the program. It is strongly suggested that the relative effectiveness of each individual promotional vehicle, the 108 relationships, be not altered. A student team makes decisions on the information supplied to them from the scenarios. The effectiveness, however, may be altered if the information in the scenarios is changed. The information in the scenarios is factual and should only be updated when changes occur.

Distribution Costs Determination

One element of the distribution cost is the shipping cost. Shipping costs per unit do not vary with the quantity being shipped. For example, one unit shipped from Japan to Canada cost $.90 per unit. One hundred units shipped from Japan to Canada cost $90. The way the model computes the cost is by simply multiplying the units shipped from one country to another by the cost per unit for shipping.

The determination of the shipping cost was done on a distance basis. The farther one country is from another, the higher the distribution cost. For example, the distance from Belgium to Sweden is approximately 300 miles. The shipping cost is $.10. The distance from Sweden to Switzerland is approximately 600 miles and the shipping cost is $.50. The distance from Japan to Canada is approximately 5,000 miles and the shipping cost is $.90.

It should be noted that the distribution costs are the same regardless of direction between two countries. Using the Japan to Canada example, the shipping cost incurred was $.90 per unit. The shipping cost from the other direction, Canada to Japan, is also $.90 per unit. The model computes these costs as being equal regardless of the direction East to West or West to East because it is assumed that a student team may manufacture products in any or all of the six countries if they so desire. The shipping costs in the

real world situation are not the same; they vary with the direction being shipped. This is because more trade goes one way than the other, which results in empty ships returning to the home port. For purposes of this model, it was desired that the student team be not influenced by traditional manufacturing countries and traditional market countries for products. With the shipping costs being equal, a student team may make the decision to manufacture and market its products in any or in all of the six countries.

Another element in distribution cost is the wholesalers' cost. Wholesalers' cost varies in the model because of several factors. One of these factors is the density of the population; generally speaking, the denser the country in terms of population, the less the wholesalers' cost per unit. Another element which influences the cost is the amounts of highways in miles per thousand households. For example, when a country increases its highways in miles per thousand households, the country simultaneously lowers its wholesalers' cost per unit. Finally, the greater the per capital income for a country, the cheaper are its wholesalers' costs. This is because the higher-income countries will have more modern equipment plus advanced technology.

In the model these distribution costs are computed by multiplying each respective distribution cost by the demand in units for the product.

Importers' Cost Determination

The importers' cost in this game has been made simpler than it really is in the world of international trading. For example, a low grade product exported from Switzerland to Portugal incurs an importers' cost of $2.20. A low grade product exported from Belgium to Portugal also incurs an importers' cost of $2.20. In reality these two costs would be different. For the purpose of this game, it was decided to simplify this area of the model and make these two costs the same. The reason for this decision is that a student team already has to decide upon 252 values that must be input each time period. So that a student team would not think they were in a never-ending maze, the importers' cost determination was developed into its simpler form.

Hypothetical Nature of Demand and Cost Determination

For the purpose of this study it was decided to market a hypothetical product in this simulation. The costs and demand functions are also hypothetically determined. Since the purpose of this study is to bridge the gap between theory and reality for the student of international marketing, emphasis is being placed on students' learning techniques and procedures in international marketing. Emphasis is not being placed on the learning of a specific product marketed in international marketing. Therefore, a

hypothetical product and its cost and demand functions were developed for use in this model of an International Marketing Environment.

Player's Manual for the International Marketing Simulator

Introduction

International marketing is becoming one of the most important areas of business. One reason for the rise in importance of international marketing is that the volume of world trade is increasing at such a fantastic rate. World trade has risen from $48.9 billion in 1938 to $710.0 billion in 1971.[2] This is an increase of over 1000 per cent.

With the increase in importance of international marketing also arises an associative increase in the importance of training executives to be employed in international marketing. One of the methods used to train potential future international marketing executives is the computer business game. One computer game developed for the purpose of training international marketing executives is the International Marketing Simulator.

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[2]The figures for 1938-1971 are derived from the United Nations' Statistical Yearbook 1972 (1972), pp. 398-399.

Background of the International Marketing Simulator

This is a computer game designed to increase the players' knowledge of the international marketing environment. The object of the game for the players is simple. It is to make money. It is hoped that each team will make money and learn simultaneously.

A team makes money by selling products in one, or some, or all of the six countries. The six countries selected are Japan, Belgium, Canada, Portugal, Sweden, and Switzerland. The countries were selected for their particular characteristics. The United States was purposely excluded. It was thought that the inclusion of the United States in the International Marketing Simulator would bias the actions of the team players.

The game is played by teams. Three to six members constitute a team. The team can be organized in any way it wishes. One example of an organizational structure would be to assign a specific country or countries to each of the team players. Each player would then be responsible for the inputs associated with his country. Another organizational structure would be to assign specific functions to each team player. One player could be responsible for the pricing decision, one for production, one for promotion, one for distribution, one for allocating money, and one for determining market profitability. Another organization structure

could be one where team members act as a committee with no specific responsibility allocated to any individual team member. The team makes decisions by majority vote or some other decision-making criterion. There are many other types of organizational structures which can be adopted by each team. The responsibility for deciding organizational structure is decided upon by each team.

A consumer product is sold in this game. There are three grades of the product which can be sold. These are grade one, grade two, and grade three.

Demand for each product is measured in units. Each grade of product has its own individual demand curve. Therefore, there are eighteen demand curves. This is computed by eighteen equals three grades of products multiplied by the six countries. The slopes of the eighteen demand curves are of different values. Marketing research has determined that potential demand is calculated by multiplying the number of households in a particular country times twenty-five ten-thousandths. This calculation yields the demand in units for period one for the three grades of products. Demand in units for each grade of product for a particular country is a percentage of this calculation. For example, in country X there are 10,000 households. Multiplying by twenty-five ten-thousandths results in twenty-five. The grade one product might have

40 per cent of this amount, or ten units. Grade two's percentage might be 20 per cent, which would result in five units. Finally, grade three's percentage might be 40 per cent. This results in ten units. The actual percentage for each grade of product is determined by the relative amount per household income for each country. The higher the per household income, the greater the percentage becomes for the higher grade quality product. The lower-income countries, therefore, demand more lower grades than the higher grade of products.

Each team has many decisions to make. One concerns pricing. In this game it is possible for each team to determine the final price of the product at the retail level. Sales revenues generated during the period are not received till the end of the period. This means that a team has the option to take out a loan by simply spending more money than it had at the beginning of the period. It is assumed that all teams made the decision to collect marketing research information. This information is found in the Scenarios for each country. Other decisions to be made concern the areas of promotion, product planning, and distribution.

Inputs

Examples given in this section are hypothetical and do not represent any functional relationships as presented in the game.

Price

The price input is perhaps one of the most crucial inputs to the game. If the price is too low, demand in units will be great, but each unit sold may lose money. If the price is high, there could be a large profit on each unit sold, but the price might be too high and no units would be demanded. The quantity demanded in units, therefore, varies directly to the price of each product. There is a normal demand curve for all the products in all the countries. That is, when price is increased, fewer units will be demanded than previously, and when price is lowered, more units are demanded than when price was high. The parameters for price are (1) the lowest amount which can be input for price is $1.00; (2) the highest price can be set is at $99,999.99; and (3) every grade of product in every country must have a price, even if the team does not intend to market a particular product in every country. This means that each team must input eighteen prices in each game period (player's turn). There are eighteen prices because of the six countries and three grades of products, or 18=(6)(3).

This game does not consider "psychological" pricing. Psychological pricing is pricing in odd amounts such as $99.99. For example, without a psychological pricing function, demand could be 200 units when price is at $100.00 and 201 units when price is at $99.99. With a psychological

pricing function demand could hypothetically be 200 units when price is at $100.00 and 300 units when price is at $99.99.[3]

Information concerning how to input price decisions on computer cards is found in Appendix A, "Input Cards for Price and Production Decisions."

It should also be noted that price is not the only determinant of demand. Price is only one input. The other inputs which affect demand are the six promotional inputs.

Production

Production is in units. To produce one thousand units, 1000 is punched in the proper field on the correct production input card. More information is found in Appendix A, "Input Cards for Price and Production Decisions." The production input is similar in nature to the other marketing inputs. That is, each country in the game has its special characteristics. For example, one country may have a high labor supply and should be capable of attracting an adequate supply of labor. Another country with a limited labor market, however, might have to rely on a large expenditure for capital equipment to have economies of scale. All of these qualitative factors, however, are developed into precise quantitative relationships in the

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[3]David M. Gedrgoff, "Price Illusion and the Effect of Odd-Even Retail Pricing," Southern Journal of Business, XIV (April, 1969), 95-103.

game and are exhibited in Appendix B, which is entitled, "Production Functions for all Grades of Products in all Countries."

Production cost consists of two parts. They are fixed cost and variable cost per unit. Total fixed cost does not increase as production increases. Examples of fixed costs are rent and property tax. Variable cost is the cost of making one unit of the product. Total variable cost increases as more and more units are produced. Variable cost per unit remains constant as production increases. Examples of variable costs are direct labor and materials. The relationships described above for fixed cost and variable cost remain accurate as long as increases in production do not exceed the capacity limitations of the plant. When the capacity limitations of the plant are exceeded a new plant must be built, which means an increase in fixed costs. When plant capacity is exceeded in this game, variable cost per unit also increases, because the personnel department would hire workers who were only semi-skilled workers. Hiring of semi-skilled workers would increase the variable cost per unit since these new workers would be less productive.

Another factor which could increase the variable cost is the paying of overtime, time and a half, to employees working over forty hours a week. An example will now be

given showing production function for two levels of plant capacity. A production function may be given as follows: if production is less than or equal to 100 units, then fixed cost equals $35 and variable cost equals $3 a unit. If you produce over 100 units and exceed plant capacity, fixed cost equals $100 and variable cost equals $4.50 a unit. When a student team produces at a level of 100 units, total cost equals $335 and average total cost per unit equals $3.35. When a team produces at a level of 200 units, total cost equals $1000 and average total cost per unit equals $5.00.

In every period a student team can produce a maximum of 9999999 units for every grade of product in every country. Therefore, it is possible to have in one period, production equal to 179999982 units, or (18)(9999999)= 179999982. It is also possible to have a minimum production level of 0.

Promotion

Six different types of promotion are available for use by each team for every grade of product in every country. The types of promotion are (1) the direct method, which is mail advertising; (2) magazine advertising; (3) newspaper advertising; (4) radio advertising; (5) sales promotion; and (6) television advertising.

Generally speaking, promotion is a profitable expense. That is, the more a team spends on promotion, the more sales

increase. Sales in this game do not continue to increase at the same rate for every dollar spent for promotion. For example, if a team decides to spend $100 on magazine advertising, sales might increase by $700. (This does not mean that total sales are $700. It does mean that there was a previous level of sales and this level was increased by $700. This explanation will hold true for all following examples.) With the situation the same, a team decides to spend $200 on magazine advertising. The result is that sales are increased by $1000. The first example yielded a ratio of 7:1. The second example yielded a ratio of only 5:1. In this international marketing game it is seen that diseconomies of scale exist for marginal increases of promotion. It is also mentioned that level of promotion expenditure at which the ratio decreases is not at the same amount for all types of promotion. The ratio similarly changes for different grades of the product as well as for the different countries in which the product is being marketed. For example, when $100 is spent on magazine advertising in Japan for the low grade product, the sales increase ratio could be 7:1. When $101 is spent, the ratio decreases to 5:1. Compare this to newspaper advertising, when a $200 expenditure results in a ratio of 7:1 and an expenditure of $201 results in a 5:1 ratio. This example is expanded to show another hypothetical promotional limit where the ratio again decreases. This time $100 is spent

on magazine advertising in Belgium for the low grade product. The ratio in this example is 7:1. The ratio is still 7:1 at $200, $300, $400, $800, and at $1600. However, when $1601 is spent, the ratio decreases to 5:1.

Each type of promotion yields different ratios of performance. For comparison purposes the above example of a $100 expenditure will be utilized. The sales increases resulting from a $100 expenditure for the six types of promotion could be (1) $700 for magazine advertising, (2) $840 for mail advertising, (3) $340 for television advertising, (4) $0 for radio advertising, (5) $540 for sales promotion, and (6) $440 for newspaper advertising.

Promotional efforts are also affected by the quality grade of the product. Again, the $100 promotional expenditure will be illustrated. The sales increases resulting from a $100 expenditure on magazine advertising for the three grades of products could be $700 for the low grade product, $550 for the medium grade product, and $850 for the high grade product.

Promotional efforts are further influenced by the country in which they are being spent. For example, $100 spent on magazine advertising for the low grade product in Japan could increase sales by $700. The same $100 spent on magazine advertising in the five countries for the low grade product could result in sales increases of $510

for Belgium, $310 for Canada, $210 for Portugal, $610 for Sweden, and $710 for Switzerland.

Price influences the effectiveness of promotion. Promotion becomes more effective when price is lowered. The reverse is also true: when price is increased promotion becomes less effective. For example, when price equals $10, $100 spent on promotion yields a $700 increase in sales. If price were raised to $15, perhaps promotion would yield an increase of only $385. Lowering price to $5 results in a higher sales increase of $1,000. (It should be remembered that the magnitudes of all of these ratios are only hypothetical and are being used for illustrative purposes. They are not the ratios used in the international game.) The increases and decreases in the ratio of promotion to sales are due to promotion, not price. Although the price did change, it was not responsible for the increase or decrease of the ratio. The change in the ratio was due to effectiveness of the promotion. When price was increased, promotion became less effective, and when price was decreased, promotion became more effective. An example of the total effect of the price promotion relationship given in the form of a table might be more illustrative. Table IV on the following page shows total sales resulting from changes in price and promotion.

The parameters for promotion are (1) the highest amount which can be spent on a promotional type for a

particular grade of product in a country is $9,999,999, (2) the lowest amount which can be spent on a promotional type is $0, (3) there are 108 decisions to be made concerning promotion, since there are six countries, three grades of products, and six promotional types. 108=(6)(3)(6). Information as how to input promotion is found in Appendix C, entitled, "Input Cards Promotion."

The effectiveness of promotion is ascertained by each team from reading the scenarios of each country which are presented later in this chapter.

TABLE IV

TOTAL SALES RESULTING FROM CHANGES IN PRICE AND PROMOTION

Price	Promotion	
	0.	$100
$ 5	$7000	$8000
10	5000	5700
$15	$3000	$3385

Shipping

Once the product is made by the manufacturer, it is either shipped or held as inventory for the manufacturer. If the product is shipped, there are six destinations to which the manufacturer can ship. The manufacturer can send

the product directly to wholesalers in the same country as the manufactuere and/or to the remaining five foreign countries. For example, if a team decides to manufacture the product in Japan, they have the option to send units to the wholesaler in Japan and/or to importers in foreign countries. When the product is shipped from one country to a foreign country there is a shipping expense. This expense is summarized in Table V below.

TABLE V

TRANSPORTATION COST IN DOLLARS PER UNIT FROM MANUFACTURER TO FOREIGN IMPORTER

From	To					
	Japan	Canada	Sweden	Portugal	Belgium	Switzer-land
Japan	. . .	.90	1.15	1.00	1.10	1.20
Canada	.90	. . .	.95	.80	.90	1.05
Sweden	1.15	.95	. . .	.30	.10	.50
Portugal	1.00	.80	.30	. . .	.20	.30
Belgium	1.10	.90	.10	.20	. . .	.35
Switzer-land	1.20	1.05	.50	.30	.35	. . .

When units are not shipped to a foreign country there is no shipping cost and no importer's cost. This situation occurs when the manufacturer sends units to the wholesaler

in his home country. An example taken from the table would be the $0 per unit it costs to ship a product from Sweden to Sweden.

Goods which are shipped from a manufacturer to a foreign importer also incur an importer's costs. These costs are the importer's margin, tariff, and duty. These costs are summarized in Table VI presented below.

TABLE VI

IMPORTERS' COST IN DOLLARS PER UNIT

Country	Grades of Product		
	One	Two	Three
Japan	1.80	2.10	2.25
Belgium	1.00	1.35	1.70
Canada	1.40	2.25	4.50
Portugal	2.20	3.50	4.50
Sweden	1.10	1.75	2.50
Switzerland	.50	.75	1.00

There is a restriction as to the amount of goods to be shipped. This restriction is a physical one. It is that a team cannot ship more than the goods that are available to be shipped. Goods available to be shipped for this period are determined by the amount of production for a particular grade of product in a particular country plus any inventory

remaining with the manufacturer from last period. There is also a priority as to who receives the goods if a team tries to ship more than they have available to be shipped. The priority is to fill Japan's order first, then Belgium's, Canada is third, Portugal is fourth, Sweden is fifth, and Switzerland is last.

The parameters for shipping are (1) the most that can be shipped of a particular grade of product to a single foreign importer or to a single home wholesaler from a single manufacturer is 9999999 units. (2) The least amount that can be shipped is 0 units. (3) There are 108 shipping decisions because there are six countries in which a team can manufacture, three grades of products, five foreign importers, and the manufacturer's home wholesaler. This is shown by 108=(6)(3)(5+1). Information on how to input shipping decisions is found in Appendix D, which is entitled, "Input Cards Distribution."

Product Input

Each team has a decision to make in regard to the product variable. There are three types of products which can be produced. These types of products are grade one, grade two, and grade three. A team may decide to produce and market only one of these product grades, or a combination of two of them, or all three product grades.

A team does not have to manufacture the product in the same country where the team markets the product. That is, for example, a team might want to sell the grade three product in Belgium and manufacture the product in Switzerland. The team might also decide to manufacture in Switzerland, Canada, and Japan and then ship the products to Belgium and other countries. Finally, the team might manufacture in Belgium and send all it produces to foreign countries, or keep all of the production in Belgium, or follow some combination of the two.

The three product grades are really three types of products. The grade one product is a product which appeals to the lower-income classes of people. The grade one product is not low in quality but simply just a basic product. The product is not very stylish and does not have as many product features as the two other products. In other words, the grade one product is a cheap product that just barely gets the job done. The grade two product appeals to a higher-income type of customer than the grade one product. Grade two is the middle-of-the-line product and appeals to people in the middle-income class. The grade three product is the higher-quality model. The product appeals to the people in the higher-income class. An analogy can be made between the three grades of the product and types of refrigerators. The grade three product is the refrigerator

with the ice-maker, ice-crusher, and water dispenser on the outside of the door. The grade two type of product is just a nice refrigerator which appeals to the middle-class. The grade one type refrigerator is more like an ice-box. It barely does the job.

Output

Examples given in this section are also hypothetical and do not represent the functional relationships present in the game.

Beginning Inventory Statement

This statement indicates the amount in units at the beginning of the period for the three grades of products in each of the six countries. This statement is further broken down into manufacturers' beginning inventory and wholesalers' beginning inventory. The beginning inventory is in reality the ending inventory from the previous period.

The beginning inventory of the manufacturer will be the amount of goods not distributed in the last period. In most periods there will probably be some amount of inventory except in the first period. In the first period, beginning inventory equals zero, since there were no previous periods. Thus it is assumed that each team is initiating a new product which has not previously been marketed or manufactured.

The beginning inventory for the wholesalers is the ending inventory for that wholesaler in the previous period. Ending inventory for the wholesaler accumulates when the wholesaler does not sell all of his inventory from the previous period. This can be seen in Table VII below.

TABLE VII

BEGINNING INVENTORY IN UNITS FOR ALL GRADES OF PRODUCTS IN ALL COUNTRIES FOR WHOLESALERS AND MANUFACTURERS

Country	Wholesalers			Manufacturers		
	One	Two	Three	One	Two	Three
Japan	5.	0.	0.	0.	0.	0.
Belgium	0.	0.	0.	0.	0.	0.
Canada	0.	0.	0.	0.	47.	0.
Portugal	0.	0.	0.	0.	0.	0.
Sweden	0.	0.	68.	0.	0.	0.
Switzerland	0.	0.	0.	0.	0.	0.

A sample beginning inventory statement is exhibited in Table VII above. In this example the wholesaler in Japan has a beginning inventory for the grade one product of five units. Sweden's wholesaler for the grade three product has sixty-eight units in beginning inventory. Finally, the manufacturer in Canada has a beginning inventory for his grade two product of forty-seven units.

Shipping Statement

The shipping statement indicates the units shipped from the manufacturer to the foreign importer, and in special situations, the units shipped from the manufacturer to the wholesaler in the same country.

A sample statement exhibiting units shipped from country to country is shown in Table VIII. Some of the units shipped were not from one country to another country. For example, nine units were sent from a Japanese manufacturer to a Japanese wholesaler. The product shipped was grade one. Table VIII also shows that seventy-six units of grade two product manufactured in Belgium was shipped to an importer in Canada. Finally, Table VIII shows that the manufacturer in Switzerland shipped fifty-nine units of the grade three product to the importer in Sweden.

Summary Statement

Each team participating in the International Marketing Simulation is presented with a summary statement for the three grades of products in the six countries. Hence, there are eighteen summary statements, (3)(6)=18. A Sample "Summary Statement" is exhibited in Table IX on page eighty-four.

TABLE VIII

UNITS SHIPPED FROM COUNTRY TO COUNTRY

From	To					
	Japan	Belgium	Canada	Portugal	Sweden	Switzer-land
Japan	9.	0.	0.	0.	0.	0.
One	0.	0.	0.	0.	0.	0.
Two	0.	0.	0.	0.	0.	0.
Three	0.	0.	0.	0.	0.	0.
Belgium						
One	0.	0.	0.	0.	0.	0.
Two	0.	0.	76.	0.	0.	0.
Three	0.	0.	0.	0.	0.	0.
Canada						
One	0.	0.	0.	0.	0.	0.
Two	0.	0.	0.	0.	0.	0.
Three	0.	0.	0.	0.	0.	0.
Portugal						
One	0.	0.	0.	0.	0.	0.
Two	0.	0.	0.	0.	0.	0.
Three	0.	0.	0.	0.	0.	0.
Sweden						
One	0.	0.	0.	0.	0.	0.
Two	0.	0.	0.	0.	0.	0.
Three	0.	0.	0.	0.	0.	0.
Switz-erland						
One	0.	0.	0.	0.	0.	0.
Two	0.	0.	0.	0.	0.	0.
Three	0.	0.	0.	0.	59.	0.

Table IX is a hypothetical statement. The dollar values of items in the statement have no relationship to the international marketing game. The values in the table are only for instructional purposes.

TABLE IX

SUMMARY STATEMENT FOR GRADE ONE PRODUCT IN BELGIUM

Sales revenue		$ 40,050.
Expenses:		
Production cost	$120,252.	
Direct mail	10,000.	
Mag. adv.	11,254.	
News. adv.	20,000.	
Radio adv.	5,000.	
TV adv.	2,000.	
Sales prom.	8,000.	
Inventory cost mfg.	500.	
Inventory cost whlslr.	600.	
Retlrs. cost	900.	
Whlslr. cost	450.	
Transportation cost	222.	
Importer cost + duty	600.	
Net profit		-$139,728.

The summary statement is for the grade one product in Belgium with price equalled to $89.00 in period number one. Sales revenue equalled $40,050. This means that there were 450 units sold at a price of $89. Production costs equalled $120,252. Fixed costs equalled $50,000. Variable costs equalled $70,252. Direct mail advertising equalled $10,000.

Magazine advertising equalled $11,254. Newspaper advertising equalled $20,000. Radio advertising equalled $5,000. Television advertising equalled $2,000. Finally, sales promotion equalled $8,000.

The next expense in Table IX is the inventory cost for the manufacturer. This cost equalled $500. The ending manufacturer's inventory for period one equalled 500 units. Each unit remaining in the manufacturer's inventory is charged at a rate of $1 per game period. There is no difference in the inventory expense for the three grades of products nor is there a difference in the inventory expense for the six different countries. Manufacturers accumulate inventory when they do not ship all of their units.

Inventory cost for the wholesaler equalled $600. The wholesaler had 300 units remaining at the end of period one which were not sold. The cost of wholesaler's inventory is $2 per unit per game period. According to Table IX the retailer's cost for selling grade one products in Belgium during period one equalled $900. The retailer sold 450 units. The retailer's cost for selling each unit is $2.

Retailers' costs are summarized in Table X. According to Table X the retailer's cost for selling one unit of the low grade product in Belgium is equalled to $2.

TABLE X

RETAILER'S COSTS IN DOLLARS PER UNIT FOR EVERY GRADE OF PRODUCT IN EVERY COUNTRY

Country	Grades		
	One	Two	Three
Japan	2	4	6
Belgium	2	2	3
Canada	2	3	4
Portugal	3	4	6
Sweden	2	4	5
Switzerland	3	5	5

The wholesaler's cost of selling 450 units of grade one product in Belgium, according to Table IX, was equalled to $450. Wholesalers' costs are summarized in Table XI. According to Table XI, the wholesaler's cost of selling the grade one product in Belgium is equalled to $1 per unit.

TABLE XI

WHOLESALER'S COSTS IN DOLLARS PER UNIT FOR EVERY GRADE OF PRODUCT IN EVERY COUNTRY

Country	Grades		
	One	Two	Three
Japan	1	2	3
Belgium	1	1	2
Canada	1	2	3
Portugal	2	3	4
Sweden	1	2	3
Switzerland	1	2	3

The next expense in Table IX is the Transportation cost. The transportation cost was the expense of shipping units from foreign manufacturers of grade one product to the importer in Belgium. The transportation cost for period one was $222. There were 650 units of grade one product shipped to Belgium. The breakdown of the 650 units is fifty units were sent from the Belgium manufacturer, 100 units from the manufacturer in Japan were shipped to the importer in Belgium and then moved to the wholesaler in Belgium, ten units were shipped from Canada, forty units were shipped from Portugal, 250 units were shipped from Sweden, and 200 units were shipped from Switzerland. The transportation cost was determined by multiplying the units shipped from other countries to Belgium times the shipping cost per unit. The shipping cost per unit for each country is found in Table V.

The next item in the summary statement is the importer cost and duty expense. The amount of goods Belgium imported was 600 units. According to Table IX the importer's expense was $600. Table XII shows the importer's cost to be $1 per unit.

The last item in Table IX is the net profit figure. The net profit in Belgium for the grade one product in period one was $-139,728. This amount was determined by subtracting the expenses from the sales revenue. In Table

IX the sales revenue was $40,050 and the total amount of the expenses were $179,778.

TABLE XII

IMPORTER'S COST IN DOLLARS PER UNIT

Country	Grades		
	One	Two	Three
Japan	1.80	2.10	2.25
Belgium	1.00	1.35	1.70
Canada	1.40	2.25	4.50
Portugal	2.20	3.50	4.50
Sweden	1.10	1.75	2.50
Switzerland	.50	.75	1.00

Ending Inventory

The next output statement is the one entitled, "Ending Inventory for All Grades of Products in All Countries for Both Wholesalers and Manufacturers." An example of an ending inventory statement is Table XIII on the next page.

Table XIII indicates that ending inventory for the manufacturer in Portugal for the grade one product was fifty-six units. In Table XIII Switzerland's ending inventory for the wholesaler of grade two product was equal to seventy-nine units. The last example taken from the table

is the amount of ending inventory for the Japanese manufacturer of the grade one product. This amount was equaled to sixty-nine units.

TABLE XIII

ENDING INVENTORY IN UNITS FOR ALL GRADES OF PRODUCTS IN ALL COUNTRIES FOR WHOLESALERS AND MANUFACTURERS

Country	Wholesalers			Manufacturers		
	One	Two	Three	One	Two	Three
Japan	0.	0.	0.	69.	0.	0.
Belgium	0.	0.	0.	0.	0.	0.
Canada	0.	0.	0.	0.	0.	0.
Portugal	0.	0.	0.	56.	0.	0.
Sweden	0.	0.	0.	0.	0.	0.
Switzerland	0.	79.	0.	0.	0.	0.

Ending inventory for the manufacturer is simply the amount of goods available to be shipped less the actual amount shipped. Ending inventory for the wholesaler is the amount of goods in inventory from the beginning of the period, plus any goods shipped to the wholesaler from the five foreign manufacturers through the importer, plus the amount of products sent to the wholesaler from the manufacturer located in the same home country, less the amount of units sold during the period.

Totals Statement

The last statement which a team receives as a computer output for the period is entitled, "Totals for All Grades of Products in All Countries." This final statement is exhibited as Table XIV.

TABLE XIV

TOTAL FOR ALL GRADES OF PRODUCTS
IN ALL COUNTRIES

Total sales revenue			$ 2703596.
Total cost			3194890.
Total gross profit			- 491295.
Minus loan	$298723.		
Total net profit			$- 790017.
Beginning cash		$2000000.	
Ending cash		$1209984.	

Table XIV illustrates the totals for three grades of products in the six countries. The first item in the statement is total sales revenues. In Table XIV this amount was $2703596. This figure was determined by summing the sales revenue for the eighteen summary statements. The next item in Table XIV is the total cost figure. The amount was $3194890. Total gross profit is the next item. It is calculated by subtracting the total cost figure from the total sales revenue figure. Total gross profit was $-491295.

In Table XIV interest on a loan was $298723. This interest is the amount of money which had to be paid for the use of borrowed money. Beginning cash for the period was $2000000. This particular team spent $3194890. Therefore, the team needed to borrow $1194890 for the period. A rate of interest of 25 per cent must be paid for borrowing this money. The loan interest is subtracted from the total gross profit to obtain the total net profit. The total net profit figure was $-790017. The ending cash item is the last item in Table XIV. The ending cash amount is calculated by adding the total net profit amount to the beginning cash figure.

Scenarios

Japan

Statistics.--In 1970 Japan had a national income of $156,833 million, a land area of 370,073 square kilometers, and a population of 103 million people.[4] In 1970 Japan had twenty-seven million households and a population density of 280 people per square kilometer.[5]

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[4]Europa Publications Limited, The Europa Year Book, 1972, A World Survey, II (London, 1972), 759-763.

[5]A. C. Nielsen Company, Nielsen International Marketing Research (Chicago, 1973), p. 134.

Economic affairs.--Since World War II Japan has experienced a very high rate of growth. Gross National Product (GNP) grew at an average annual rate of 11.1 per cent between 1961 and 1970 and in 1970 Japan's GNP became the second largest in the world. International trading has also risen very rapidly.[6]

Transport.--The Japanese transportation industry is one of the best in the world. In 1970 Japan's road network equalled 1,013,558 kilometers in length.[7]

The press.--Japan has freedom of the press and the total circulation of its dailies is third highest in the world. The Japanese press utilizes the most modern equipment.[8]

Radio and television.--In 1970 the Japanese people owned twenty-three million radios and 22.3 million televisions.[9]

Advertising.--Expenditures on advertising in Japan registered annual increases of 15.8 per cent in 1968, 18.9 per cent in 1969, and 19.5 per cent in 1970. Advertising expenditures in 1961 totalled $586 million. In 1970 the

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[6]Europa Publications Limited, The Europa Year Book, 1972, A World Survey, II (London, 1972), 757.

[7]Ibid., p. 758. [8]Ibid., p. 777. [9]Ibid., p. 783.

> figure was $2,100 million. It had increased 3.6 times in the space of ten years.
>
> Advertising expenditure in Japan has grown at approximately the same rate as the gross national product of the country for the past ten years. The ratio of advertising expenditure to GNP in 1961 was 1.10. In 1963 this ratio peaked at 1.22 and decreased to 1.07 in 1970. The annual average ratio for the past ten years (1961-1970) was 1.00.[10]

Belgium

Statistics.--In 1970 Belgium had a national income of $25.1 billion, a land area of 30,513 kilometers, and a population of nine million people.[11] In 1970 Belgium had 3.23 million households and a population density of 318 people per square kilometer.[12]

Economic affairs.--Belgium is one of the most successful importers and exporters in the world. Belgium exports about 40 per cent of its GNP.[13]

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[10]A. C. Nielsen Company, Nielsen International Marketing Research (Chicago, 1973), pp. 136-137.

[11]Europa Publications Limited, The Europa Year Book, 1972, A World Survey, I (London, 1972), 545-548.

[12]A. C. Nielsen Company, op. cit., p. 10.

[13]Europa Publications Limited, The Europa Year Book, 1972, A World Survey, I (London, 1972), 544.

Transport.--In 1970 Belgium's transportation network consisted of 4,165 kilometers of main line railway, 25,000 kilometers of main roads, and 1,768 kilometers of navigable inland waterways.[14]

The press.--Belgium has freedom of the press. There are forty-three daily papers, twenty-seven are in French, fifteen in Flemish, and one in German.[15]

Radio and television.--Although no radio and television advertising is allowed by the Belgium government, a 66 per cent television coverage can be obtained by boradcasting from the Netherlands, Germany, Luxemburg, and France. Radio Luxemburg can reach all of Belgium.[16]

> Promotion and merchandising.--Under the influence of an increasingly organized retail trade determined by the development of department stores, promotional activity is increasing strongly. Wholesalers and retailers as well as producers apply every form of promotional activity and merchandising-couponing, premiums, free samples, trading stamps and house-to-house sampling. Even shops not affiliated are taking part in this development. Trading

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[14]Europa Publications Limited, The Europa Year Book, 1972, A World Survey, I (London, 1972), 544.

[15]Ibid., p. 558.

[16]A. C. Nielsen Company, Nielsen International Marketing Research (Chicago, 1973), p. 18.

> stamps are the most wide-spread form of promotional activity--eight households out of ten give preference to shops giving discount or premium stamps and in fact three-quarters of the food retail trade (department stores excluded) distribute such stamps.[17]

Canada

Statistics.--In 1970 Canada had a national income of $55,387 million, a land area of 5.6 million square kilometers, and a population of twenty-one million people.[18] In 1970 Canada had 5.7 million households and a population density of 3.7 people per square kilometer.[19]

Economic affairs.--There is heavy foreign investment in Canada. Estimates indicate that 50 per cent of Canada's largest corporations are foreign controlled.[20]

The press.--The Canadian press has freedom of government intervention. Its 120 dailies have a circulation close to 4,572,000 copies.[21]

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[17] A. C. Nielsen Company, Nielsen International Marketing Research (Chicago, 1973), p. 18.

[18] Europa Publications Limited, The Europa Year Book, 1972, A World Survey, II (London, 1972), 251.

[19] A. C. Nielsen Company, op. cit., p. 120.

[20] Europa Publications Limited, The Europa Year Book, 1972, A World Survey, II (London, 1972), 249.

[21] Ibid., p. 274.

Advertising.--Net advertising revenues for all media for 1970 totalled $1,106 million, with press accounting for $515 million, television $130 million and radio $120 million.[22]

Portugal

Statistics.--In 1970 Portugal had a national income of $6,761 million, a land area of 88,941 square kilometers, and a population of 8.1 million people.[23] In 1970 Portugal had 2.2 million households and a population density of ninety-two people per square kilometer.[24]

Transport.--There were 30,000 kilometers of roads and 3,592 kilometers of railroads in Portugal during 1970.[25]

The press, radio and television.--Newspapers and magazines are censored by the government. In 1970 the Portuguese owned 612 radios and 173 televisions per thousand households.[26]

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[22]A. C. Nielsen Company, Nielsen International Marketing Research (Chicago, 1973), p. 128.

[23]Europa Publications Limited, The Europa Year Book, 1972, A World Survey, I (London, 1972), 1061-1065.

[24]A. C. Nielsen Company, op. cit., p. 77.

[25]Europa Publications Limited, The Europa Year Book, 1972, A World Survey, I (London, 1972), 1061.

[26]A. C. Nielsen Company, op. cit., p. 77.

Geographic features.--A very peculiar characteristic of Portugal is that nearly 60 per cent of the total population is living in communities of less than 5,000 inhabitants.[27]

Sweden

Statistics.--In 1970 Sweden had a national income of $29.5 billion, a land area of 449,750 square kilometers, and a population of 8.0 million people.[28] In 1970 Sweden had 2.7 million households and a population density of 18 people per square kilometer.[29]

Transport.--Sweden's transportation network in 1970 consisted of 11,512 kilometers of railways and 173,963 kilometers of roads.[30]

Advertising.--There is no commercial radio or television in Sweden. The Government, which has full control over broadcasting, has so far not allowed advertising, and it is not likely that this will change.[31]

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[27]A. C. Nielsen Company, Nielsen International Marketing Research (Chicago, 1973), pp. 79-80.

[28]Europa Publications Limited, The Europa Year Book, 1972, A World Survey, I (London, 1972), 1150-1154.

[29]A. C. Nielsen Company, op. cit., p. 94.

[30]Europa Publications Limited, The Europa Year Book, 1972, A World Survey, I (London, 1972), 1149.

[31]A. C. Nielsen Company, op. cit., p. 97.

Switzerland

Statistics.--In 1970 Switzerland had a national income of $18,734 million, a land area of 41,288 square kilometers, and a population of 6.2 million people.[32] In 1970 Switzerland had 2.0 million households and a density of 152 people per square kilometer.[33]

Transport.--Switzerland's transportation network in 1970 consisted of 2,839 kilometers of railways and 17,850 kilometers of highways.[34]

> Advertising.--There are no daily newspapers with nation-wide circulation because of the four different languages--German, French, Italian and Romantsch.[35]

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[32]Europa Publications Limited, The Europa Year Book, 1972, A World Survey, I (London, 1972), 1177-1180.

[33]A. C. Nielsen Company, Nielsen International Marketing Research (Chicago, 1973), p. 101.

[34]Europa Publications Limited, The Europa Year Book, 1972, A World Survey, I (London, 1972), 1176.

[35]A. C. Nielsen Company, op. cit., p. 104.

CHAPTER IV

DOCUMENTATION

Specifications

The International Marketing Simulator is a computer program written in FORTRAN IV. The program is written in FORTRAN IV to enable institutions to easily adopt the simulator into their system.

The program's execution time on a Burroughs 3500 computer for one team is twelve seconds. The execution time for two teams is twenty-one seconds. The length of the program on Burroughs 3500 equipment is 76,860 bytes. The limitations and parameters of the program have already been presented in the previous chapter, "The International Marketing Simulator."

User Guide

Concerning the input for the first period, the user of the simulator must submit computer cards according to a specific procedure. The program's user has to input three control cards. The first control card contains input information about the rate of growth, the time period, and the number of teams participating in the simulation. The second control card contains the names of the six countries utilized in the simulator. The third card contains the names of the

three grades of products. The input format is in FORTRAN IV. For the three cards the format is (F4.2,F3.0,I2), (18A4), and (4A4). These three cards are initially punched by the instructor for the first period. After the first period the computer automatically outputs punched cards for all of the remaining simulation periods.

The instructor has to make decisions concerning the first card. The growth rate is given by the formula (1.0+g) to the T^{th} time period. For example, if the growth rate is 0.03 and the game is in the third time period, the rate of growth is 1.092727. The recommended time period in which to begin the simulation is one. The names of the countries on the second card are Japan, Belgium, Canada, Portugal, Sweden, and Switzerland. The three grades of products on the third card are one, two, and three.

Team card decks follow the three control cards. Each team will submit a deck containing forty-two cards. On top of the team deck goes seven cards. Each student team needs one identification card which becomes the first card in the student deck of now forty-nine cards. The FORTRAN IV format is (A12,F10.0). The first field contains the name of the team. The second field contains the amount of money a team begins with for the period. The recommended amount is $2000000. The next six cards are beginning inventory amounts. It is recommended that these cards are blank which

would indicate that each team starts with zero beginning inventory. If a deviation from the zero level is desired the FORTRAN IV format is (6F8.0). The input sequence for these beginning inventory cards is the same as the sequence in which the beginning inventory amounts are output.

It should be remembered that the instructor, or program user, has to have cards punched only for the initial period. After this period the computer punches the cards. For example, the computer will give the instructor seventeen punched output cards for the first period when two teams are participating in the simulation. This means the instructor now has the punched output plus the original submitted decks for the period. The original decks have no further value since the student teams do not need them to input cards for the second period. The teams can prepare an input for the second period by examining their printed computer output from the first period. The seventeen cards which the computer punched are three control cards and seven cards for each team. The instructor has to place the seven output cards on top of each student's forty-two card input deck for the second period computer simulation. The instructor then places the three control cards on the top of the two completed student decks and submits the final cards for period two to the computer operator.

The above order of cards is illustrated in Figure 5, "Sample Input Deck." Figure 5 may be found on the next page.

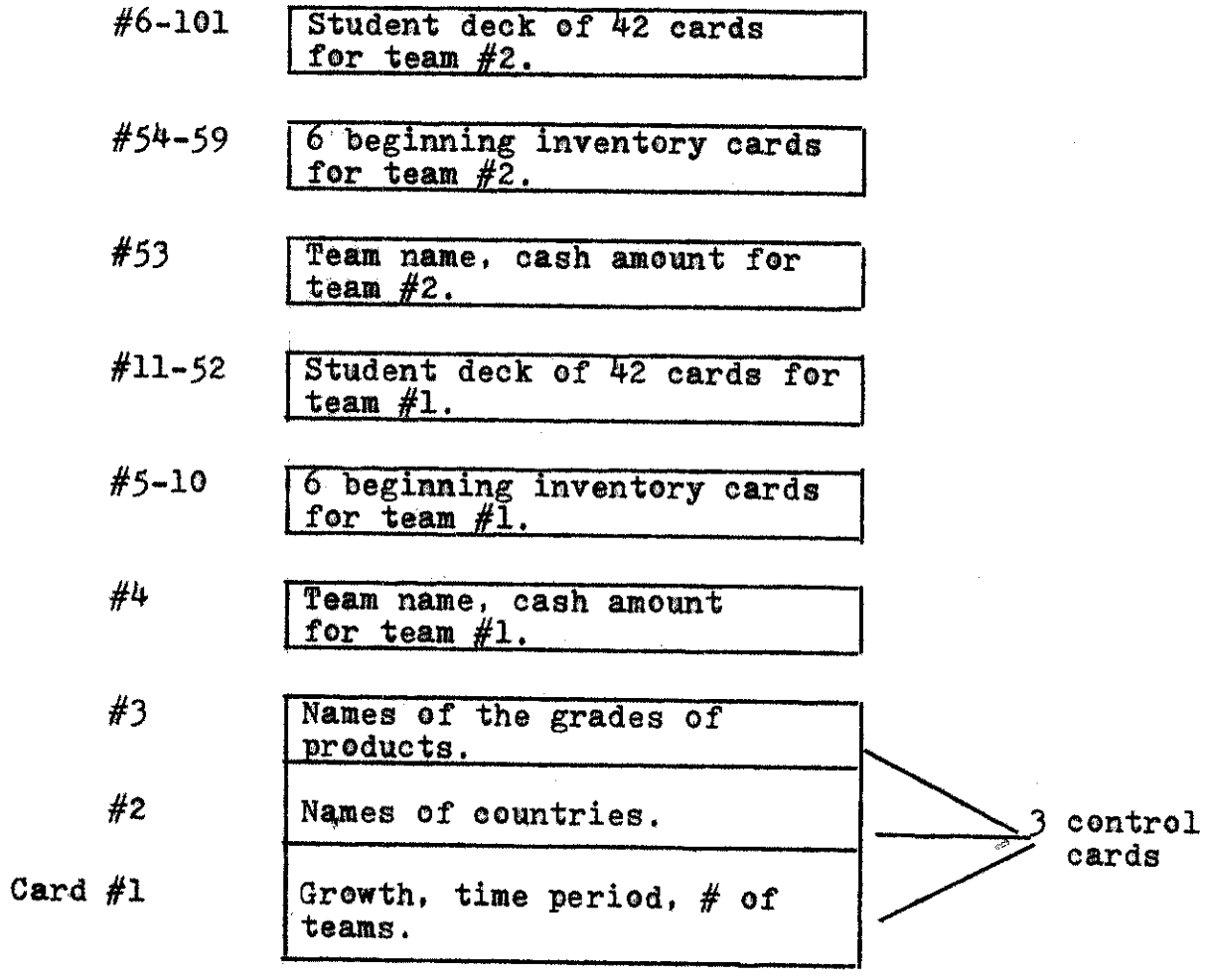

Fig. 5--Sample input deck

W2 is the name of a subroutine in the program. W2's purpose is to print in table form the beginning or ending inventory amounts for wholesalers' and manufactuers' inventory in the six countries for each student team.

C1 is the name of a subroutine which checks the amounts available to be shipped to home and foreign countries. C1's purpose is to disallow a team from sending non existent units to a shipping destination. There is a priority as to what

country is the first in line for a manufactuer's goods. The priority is Japan, Belgium, Canada, Portugal, Sweden, and Switzerland.

Output shipping data is a segment inside the body of the program designed to output shipping data in tabular form.

According to Figure 6 the next step in the program is to begin the simulator for each country. In this program each country's demand, costs, and profit amounts are determined individually. Even the different grades of the products are determined separately. For example, first all the units are produced in the six countries and sent to their predetermined shipping destinations. Then it is determined mathematically the amount demanded in Japan for the low grade product. The production, transportation, inventory, wholesalers, retailers, promotion, and importing costs are summed and subtracted from the sales revenue amount. The result is net profit.

The above procedure is then continued for the grade two product in Japan. The grade three product in Japan is last. This same procedure is continued for Belgium, Canada, Portugal, Sweden, and Switzerland.

W1 is a subroutine designed to print the summary statements for the three grades of products in each of the six countries.

The next step in Figure 6 is the determination of the ending totals for each student team. Included in the totals statement is the summation of all the sales revenue amounts, the total cost amounts, and the final gross and net profit amounts. These answers are then printed.

After printing the totals, the computer punches output which will become input for the next period. The punched output is information concerning the ending cash amounts for each team and the inventory amounts for manufacturers and wholesalers in each country.

The final step in Figure 6 is to determine if there is another team that has not yet played the simulator. This is accomplished by the computer comparing the number of teams which were input on control card #1 to the number of teams which the computer has actually read. When the two numbers are equal the program terminates.

Verification

The intended action of the computer program is to function as an international marketing environment. The purpose of the verification was to determine if the computer program adequately simulates the international environment.

There were four parts to the verification process. The first part of the verification process for the international marketing simulator was to make trial runs on an IBM 360

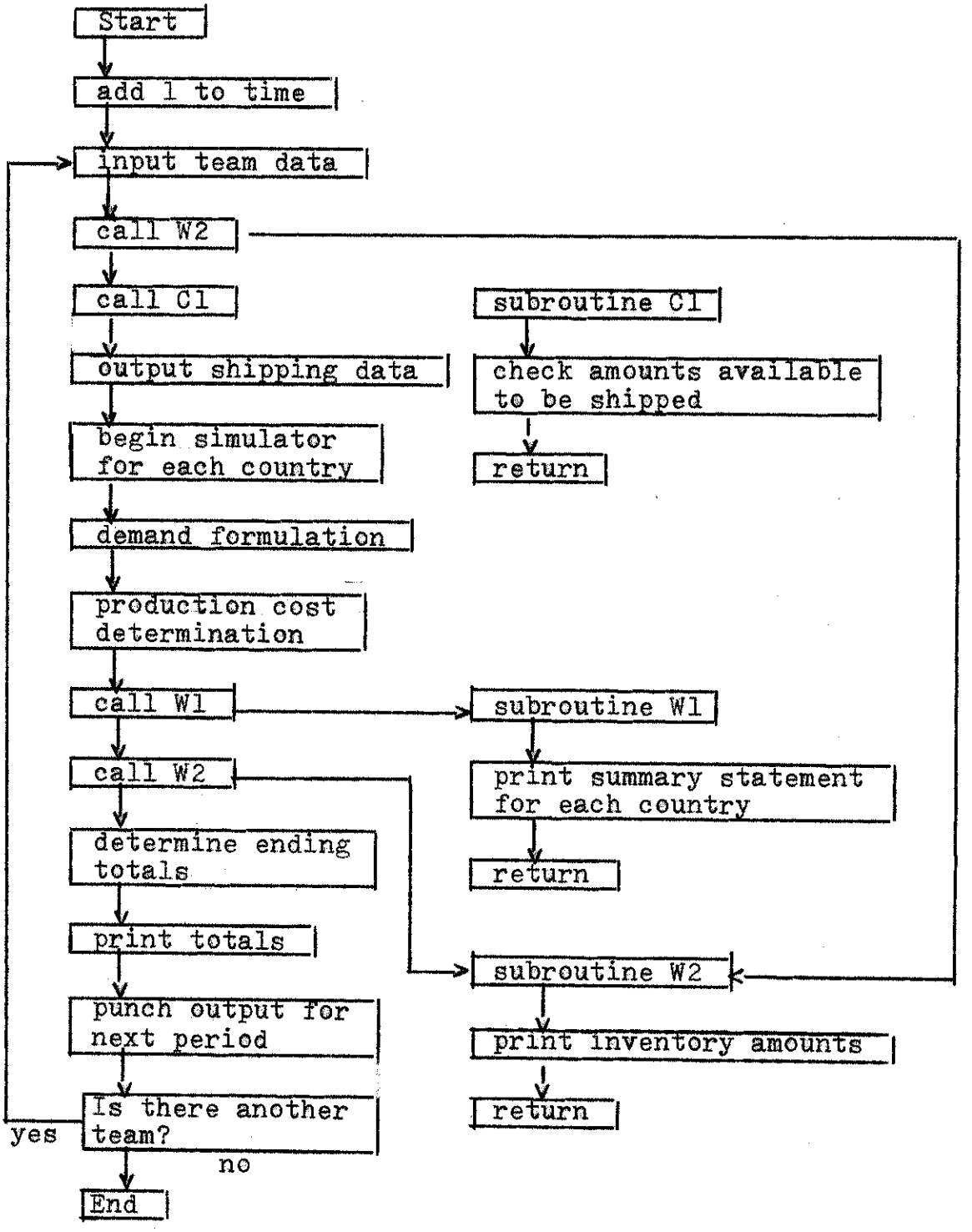

Fig. 6--Flowchart of the program

computer. Numerous test runs were conducted. Each trial run tested a specific program segment for errors. There were errors. These errors were corrected. The program was then retested and no errors were present.

The next part was to verify the logic of the International Marketing Simulator. The procedure was to input data into the simulator and analyze the data output. For example, if a price input into the simulator were increased from one period to another, all other things being equal, the sales output measured in units should decrease. After repeated inputs of different magnitudes it was determined that the logic was correct.

The third part of the verification process was conducted on a Burroughs 3500 computer. This part of verifying the simulator utilized actual students making trial-runs on the International Marketing Simulator. The students in one class of Business Administration at the State University of New York at Oswego participated in the testing. The purpose of this part in the verification process was to determine if students were able to input decisions into the simulator and obtain output. The students were able to input decisions.

The fourth phase of the verification process was a before-after study with a control group. The purpose of this phase was to determine if the simulator increases the student's knowledge of international marketing.

The test group averaged 24.7 hours of Business Administration courses per student. The control group averaged 22.1 hours of Business Administration courses per student. During the first week of the semester an examination was administered to both groups to determine the student's knowledge in the field of international marketing. The examination is found in Appendix E, "International Marketing Examination." The average grade on the examination for the test group before playing the simulator was a grade of 65 per cent correct. The average grade on the first examination for the control group was a grade of 69.3 per cent correct.

The simulator was then played by the test group for twelve periods, or a total of three simulated years. Each decision period is equivalent to three months. The examination was then re-administered to both the test group and the control group. The average grade on the examination for the test group after playing the simulator was 84.6 per cent correct. The average grade on the examination for the control group without any playing of the simulator was 67.5 per cent correct.

Net profit figures for the six participating teams are found in Table XV, "Twelve Periods, Students Net Profit Figures."

Ending cash figures for the six participating teams are found in Table XVI, "Twelve Periods, Students Ending Cash Figures."

TABLE XV

TWELVE PERIODS, STUDENTS NET PROFIT FIGURES

Team	Net Profit			
	1	2	3	4
Curtraychars	-189,053	94,655	-330,723	353,015
Farmingdales	-603,925	-651,925	399,744	15,016
Scottimbarry	- 22,326	130,518	-483,212	-1,074,450
Deepthroatco	-319,227	51,136	333,482	252,013
Quickbucking	-255,933	331,966	189,413	423,878
Dennisjoetwo	-643,524	117,343	-120,192	73,619
Team	5	6	7	8
Curtraychars	279,714	390,199	384,713	435,482
Farmingdales	27,181	221,622	-476,926	315,510
Scottimbarry	272,831	968,713	-416,268	922,936
Deepthroatco	225,806	-521,942	554,698	654,352
Quickbucking	293,929	563,043	219,949	845,532
Dennisjoetwo	553,272	-187,092	489,778	- 96,049
Team	9	10	11	12
Curtraychars	460,040	- 84,004	1,107,799	504,636
Farmingdales	-321,463	-341,028	723,695	- 84,002
Scottimbarry	533,246	494,828	742,536	899,637
Deepthroatco	806 973	931,390	1,112,621	1,173,513
Quickbucking	826,287	327,326	767,359	928,276
Dennisjoetwo	-483,649	557,495	- 270,413	1,532,728

TABLE XVI

TWELVE PERIODS, STUDENTS ENDING CASH FIGURES

Team	Net Profit			
	1	2	3	4
Curtraychars	1,810,948	1,905,603	1,574,880	1,927,895
Farmingdales	1,396,656	744,731	1,144,475	1,159,491
Scottimbarry	1,977,674	2,108,192	1,624,980	550,530
Deepthroatco	1,680,733	1,731,909	2,065,391	2,317,404
Quickbucking	1,744,067	2,076,033	2,265,446	2,688,324
Dennisjoetwo	1,356,476	1,473,819	1,353,627	1,377,246
Team	**5**	**6**	**7**	**8**
Curtraychars	2,207,609	2,597,808	2,982,521	3,418,003
Farmingdales	1,186,672	1,408,244	931,368	1,246,878
Scottimbarry	823,361	1,792,074	1,375,806	2,298,742
Deepthroatco	2,543,210	1,980,447	2,535,145	3,178,497
Quickbucking	2,983,254	3,546,297	3,766,246	4,611,778
Dennisjoetwo	1,830,518	1,643,426	2,133,204	2,037,156
Team	**9**	**10**	**11**	**12**
Curtraychars	3,878,043	3,794,039	4,901,838	5,406,474
Farmingdales	925,415	584,387	1,308,082	1,224,081
Scottimbarry	2,831,988	3,326,816	4,069,352	4,968,989
Deepthroatco	3,985,470	4,916,860	6,029,481	7,202,994
Quickbucking	5,438,065	5,765,391	6,532,750	7,461,026
Dennisjoetwo	1,553,507	2,111,002	1,840,589	3,373,317

CHAPTER V

IMPLICATIONS AND SUMMARY

Implication

The implication to be made concerning this thesis is that a student's knowledge and analytical ability in the area of international marketing will be increased if the student participates in "The Simulation of an International Marketing Environment."

This implication was made when the student's results of the second part of the before-after study with control group were tabulated. Referring to Chapter IV, it was noted the students were administered an examination to determine their knowledge on the subject of international marketing. The exam was administered before and after the test group of students participated in the International Marketing Simulator and twice to students in a control group. The results of the examinations are summarized in Table XVII on page 111. From the examination results it is inferred that a student's participation in playing the International Simulator increases his knowledge of international marketing.

TABLE XVII

EXAMINATION RESULTS

Group	Beginning of Semester	End of Semester
Test group	65.0%	84.6%
Control group	69.2%	67.5%

The above evidence is by no means conclusive. A detailed study would have to be conducted to determine if the International Simulator is in fact a learning device for most people participating in the simulator. Two reasons why such a study is beyond the scope of this thesis are time and money. To be completely accurate, a random sample would have to be conducted for all persons who have played this International Marketing Simulator to determine if they are more or less successful in their occupations as international marketing managers. The sample of managers would also have to be compared with international managers who have not played the simulator. The comparison would measure the effectiveness of the manager in the field of international marketing. To be valid the study would have to be conducted somewhere between five and ten years after the person has used the simulator.

Therefore, it was concluded that only an implication would be made concerning this thesis. This implication in

effect indicates that this thesis does bridge the gap between theory and reality for the student of international marketing.

Summary

The purpose of this study is to develop a simulator which would bridge the gap between theory and reality for the student of international marketing. The simulator developed is a computerized business game entitled, "The International Marketing Simulator."

Chapter II is a literature review on the history of simulation. The history of simulation begins with a review of game theory. It then discusses model construction and simulation techniques and procedures. Operational gaming was the next topic of discussion. Included under operational gaming is the history of War games, games used in the social sciences, and Business games. Included under the subject of Business games is a review of the Massachusettes Institute of Technology and Carnegie Tech Computer Business games. One of the most important of the International Marketing games, Hans B. Thorelli's INTOP, is also presented for discussion.

After the literature review is Chapter III, "The International Marketing Simulator." This section contains a description of the model, player's manual, and scenario section. Incorporated in this chapter is information on how

to input decisions into the computer game. There are 252 decisions to be made by each student team. Those decisions are punched on forty-two computer cards. There are pricing, promotion, distribution, product quality, country selection, market, and production decisions.

Chapter III also contains information on the functioning of the International Marketing Simulator. Some of the functions discussed were the demand function, production function, and the promotion function. Extensive discussion was given to this segment. When the demand function was discussed it was noted that price and promotion were interrelated It was noted, for example, that a lowering of an existing price, all other things being equal, would increase the demand for the product in units. It was also noted that by increasing the promotional expenditure from one period to the next, all other things being equal, would result in an increase in the demand of the product in units. Complicating this discussion would be to simultaneously lower the existing price and increase the promotional expenditure for the product. The net result is not a simple summation of both actions taken independently of each other but a separate function which indicates the interrelationship between price and promotion.

The last part of Chapter III is a detailed story of each of six foreign countries which are used in the

International Marketing Simulator. The six countries are Japan, Belgium, Canada, Portugal, Sweden, and Switzerland. This section is called the scenario section since each country has a story about it which "sets the stage" for the computer game.

Chapter IV is titled, "Documentation." Included in this section are the (1) specifications of the program, (2) a user's guide, which would help an instructor initiate the game among his students, (3) the description of the computer program, and (4) the verification section which describes the various types of testing procedures used in evaluating the adequacy of the International Simulator.

Chapter V contains a summary of the thesis and a section on implications. The implication made is there is a definite probability that a student's knowledge and analytical ability in the area of international marketing will be increased if the student participates in the Simulation of an International Marketing Environment.

APPENDIX A

INPUT CARDS FOR PRICE AND PRODUCTION DECISIONS

P=Price
F=Production
L=Low
M=Medium
H=High

Card #1 Contents Price Japan Low grade product; Price Japan Medium; Price Japan High; Production Japan Low grade product; Production Japan Medium grade product; Production Japan High grade product

OR:

PJL; PJM; PJH; FJL; FJM; FJH

Format (3F8.2, 3F8.0) cards #1-6

Example:

#1 bbbb1.50bbb99.99bbbb2.00bbl0000.bl00000.bbbbbbbb

Small b stands for a blank space, not punched.

Card #1 contains the values 1.50, 99.99, 2.00, 1000, 100000, 0

which means,

Price Japan's Low grade product = 1.50 = PJL

PJM = 99.99

PJH = 2.

Production in units, Japan for Low=10000.=FJL

FJM = 100000.

FJH = 0.

J=Japan; B=Belgium; C=Canada; P=Portugal; S=Sweden; W=Switzerland

Card #2 PBL; PBM; PBH; FBL; FBM; FBH

#3 PCL; PCM; PCH; FCL; FCM; FCH

#4 PPL; PPM; PPH; FPL; FPM; FPH

#5 PSL; PSM; PSH; FSL; FSM; FSH

#6 PWL; PWM; PWH; FWL; FWM; FWH

Decimal points for Cards #1 - 6 are punched in Columns 6, 14, 22, 32, 40, 48

APPENDIX B

PRODUCTION FUNCTIONS FOR ALL GRADES OF PRODUCTS IN ALL COUNTRIES

Japan - grade low product

≤50,000 units produced	FC = 90,000	VC = 7
>50,000 units produced	FC = 150,000	VC = 9
>100,000 units produced	FC = 210,000	VC = 12

Japan - medium grade

≤30,000 units produced	FC = 18,000	VC = 10
>30,000 units produced	FC = 290,000	VC = 10
>40,000 units produced	FC = 380,000	VC = 14

Japan - high grade

≤40,000 units produced	FC = 300,000	VC = 16
>40,000 units produced	FC = 400,000	VC = 20

Belgium - low grade

≤ 5,000 units produced	FC = 10,000	VC = 10
≥ 5,000 units produced	FC = 50,000	VC = 14

FC = Fixed cost per unit
VC = Variable cost per unit
All figures are in dollars

Belgium - medium grade		
FC = 150,000		VC = 16
Belgium - high grade		
FC = 180,000		VC = 20
Canada - low grade		
≤ 60,000	FC = 120,000	VC = 10
> 60,000	FC = 200,000	VC = 14
Canada - medium grade		
≤ 20,000	FC = 120,000	VC = 15
> 20,000	FC = 200,000	VC = 20
Canada - high grade		
≤ 30,000	FC = 100,000	VC = 15
> 30,000	FC = 200,000	VC = 23
Portugal - low grade		
≤ 10,000	FC = 50,000	VC = 6
> 10,000	FC = 100,000	VC = 12
Portugal - medium grade		
≤ 20,000	FC = 100,000	VC = 18
> 20,000	FC = 200,000	VC = 20
Portugal - high grade		
FC = 100,000		VC = 30

Sweden - low grade		
≤ 50,000	FC = 180,000	VC = 8
> 50,000	FC = 200,000	VC = 13
Sweden - medium grade		
≤ 50,000	FC = 50,000	VC = 11
> 50,000	FC = 120,000	VC = 15
Sweden - high grade		
≤ 10,000	FC = 100,000	VC = 15
> 10,000	FC = 200,000	VC = 25
Switzerland - low grade		
≤ 10,000	FC = 30,000	VC = 10
> 10,000	FC = 50,000	VC = 13
Switzerland - medium grade		
≤ 10,000	FC = 50,000	VC = 13
> 10,000	FC = 60,000	VC = 15
Switzerland - high grade		
≤ 10,000	FC = 50,000	VC = 25
> 10,000	FC = 75,000	VC = 30

APPENDIX C

INPUT CARDS PROMOTION

Decimal points for values inputed on cards #7 - 24 are in columns 8, 16, 24, 32, 40, 48.

Format (2F8.0) for cards #25 - 30

Decimal points for values inputed on cards #25 - 30 are in columns 8, 16.

J = Japan, B = Belgium, C = Canada, P = Portugal, S = Sweden, W = Switzerland

Code: D = Direct (mail)
M = Magazine
N = Newspaper
R = Radio
S = Sales promotion
T = Television

L = Low
M = Medium
H = High

Card #25 JDL; JML
JDL = Japan Direct Low grade product
JML = Japan Magazine Low grade product

#26 BDL; BML

#27 CDL; CML

#28 PDL; PML

#29 SDL; SML

#30 WDL; WML

Format (10F8.0) for cards #31 - 36

Decimal points for values inputed on cards #31 - 36 are in columns 8, 16, 24, 32, 40, 48, 56, 64, 72, 80

Card #31 JNL; JRL; JSL; JTL; JDM; JMM; JNM; JRM; JSM; JTM

#32 BNL; BRL; BSL; BTL; BDM; BMM; BNM; BRM; BSM; BTM

#33 CNL; CRL; CSL; CTL; CDM; CMM; CNM; CRM; CSM; CTM

#34 PNL; PRL; PSL; PTL; PDM; PMM; PNM; PRM; PSM; PTM

#35 SNL; SRL; SSL; STL; SDM; SMM; SNM; SRM; SSM; STM

#36 WNL; WRL; WSL; WTL; WDM; WMM; WNM; WRM; WSM; WTM

Format (6F8.0) for cards #37 - 42

Decimal points for values inputed on cards #37 - 42 are in columns 8, 16, 24, 32, 40, 48

Card #37 JDH; JMH; JNH; JRH; JSH; JTH

#38 BDH; BMH; BNH; BRH; BSH; BTH

#39 CDH; CMH; CNH; CRH; CSH; CTH

#40 PDH; PMH; PNH; PRH; PSH; PTH

#41 SDH; SMH; SNH; SRH; SSH; STH

#42 WDH; WMH; WNH; WRH; WSH; WTH

APPENDIX D

INPUT CARDS DISTRIBUTION

Format (6F8.0) for cards #7 - 24

Card #7 JJL; JBL; JCL; JPL; JSL; JWL

JJL means units sent from Japan to Japan wholesaler low grade product

JBL = Japan to Belgium importer
JCL = Japan to Canada importer
JPL = Japan to Portugal importer
JSL = Japan to Sweden importer
JWL = Japan to Switzerland importer

(Remember, in order to send units from the manufacturer, you must have units available to be sent. These units become available when they are produced in the beginning of the period and from any units not shipped from the manufacturers last period - beginning inventory.)

Example:

Card #7 bbbb100.bbb1000.bbbbbbbbbbbbb55.bbbbbbbbbbbbbbbbbb

JJL = 100

JBL = 1000

JCL = 0

JPL = 55

JSL = JWL = 0

#8 JJM; JBM; JCM; JPM; JSM; JWM

Card #9 JJH; JBH; JCH; JPH; JSH; JWH

#10 Belgium to Japan or BJL

#10 BJL; BBL; BCL; BPL; BSL; BWL

#11 BJM; BBM; BCM; BPM; BSM; BWM

#12 BJH; BBH; BCH; BPH; BSH; BWH

#13 CJL; CBL; CCL; CPL; CSL; CWL

#14 CJM; CBM; CCM; CPM; CSM; CWM

#15 CJH; CBH; CCH; CPH; CSH; CWH

#16 PJL; PBL; PCL; PPL; PSL; PWL

#17 PJM; PBM; PCM; PPM; PSM; PWM

#18 PJH; PBH; PCH; PPH; PSH; PWH

#19 SJL; SBL; SCL; SPL; SSL; SWL

#20 SJM; SBM; SCM; SPM; SSM; SWM

#21 SJH; SBH; SCH; SPH; SSH; SWH

#22 WJL; WBL; WCL; WPL; WSL; WWL

#23 WJM; WBM; WCM; WPM; WSM; WWM

#24 WSH; WBH; WCH; WPH; WSH; WWH

APPENDIX E

INTERNATIONAL MARKETING EXAMINATION

1. Generally speaking for most countries, profits will increase with a lowering of the existing price of the product in that country because more units will be demanded.
2. The television media is one of the most effective promotional tools that is used in foreign countries.
3. The demand curve for different quality grades of products marketed in foreign countries have approximately the same slope.
4. Distribution costs for wholesalers are approximately the same for all countries.
5. Distribution costs for retailers can vary as much as 100% between one country and another.
6. Tariff and importing costs are usually not more than 50% of the total cost of the product.
7. The same quality grade of a product is most often sold at the same price in all countries.
8. Per household income can vary as much as 500% between one country and another country.

9. Unsold units that are in a foreign wholesaler's inventory do not incur an expense for the manufacturer.
10. One of the simplest methods of determing market potential for a country is by comparing its (1) number of households, (2) average size of the household, and (3) per household income to another country having the approximate characteristics and a known market demand.
11. The newspaper media, in terms of dollars spent, is one of the most utilized advertising methods in foreign countries.
12. Laws concerning the regulation of advertising media in foreign countries can be drastically different from the regulation in the United States.
13. The cost of production in one country can be different from the cost of production in another country for the same quality grade of a product.
14. Sales promotion gimmicks, such as a free key-chain with the purchase of a product, never produce the same degree of effectiveness in all countries.
15. A country with the lowest cost of production of all countries for a certain grade of product also usually has the lowest production costs for different quality grades of the same type of a product.
16. The literacy rate of the population is approximately the same for all countries.

17. Shipping costs are uniform or postage stamp rated for international trading.
18. Inventory costs for the international manufacturer are cheaper than inventory costs for the international wholesaler.
19. When determining a price for your product in a foreign market, it is suggested that you first determine your cost of the product.
20. The culture of the people influences the marketing of a product in a country.

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