## HOW TO MULTIPLY YOUR MANAGEMENT GAME

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## ABSTRACT

This paper describes a method for expanding the simulation flexibility inherent in some management games. This method allows multiple runs of the game, each run with different industry and market characteristics, yet all runs are combined into a single consolidated company report. Each separate run uses common production and financial resources.

## INTRODUCTION

Some simulation gaining situations may give rise to the desire or need to represent more than the one or two products contemplated by the game model. One such situation is the use of a management game in in-house executive development programs. It is often desired that the simulation give the appearance of the sponsoring company. For sponsoring companies with diverse divisions or subsidiaries, a single management game may not reflect the diverse structure and the rich variety of the decisions to be made. Where divisions or subsidiaries are foreign companies, the usual management game approach may not provide the best conceptual environment for bringing together executives from around the world. One value of executive development gaming programs that give the appearance of the employer company is the learning experience of executives as they play company roles other than their own, or as they play the roles of competitors. This paper describes a method for "multiplying," so to speak, a management game to represent diverse divisions, yet preserving a single company orientation.

### Simulation Design Alternatives

To accomplish the objective of diverse experience in a single company orientation using an existing management game, several strategies are available.

The game administrator could have participants play two or three different simulations one after the other with instructions to imagine each simulated company is a subsidiary paying dividends to a parent.

The administrator could have participants play different simulations concurrently and in separate computations sum up financial variable values to represent parent companies. Each player team in this design strategy would manage two or three companies in different industries and be evaluated not only on individual company performance but also on results achieved by the parent company.

A more elaborate strategy would be to create a whole new simulation for conglomerates. In this approach, existing simulations of industries would pass financial data to the conglomerate model, which in turn would create consolidated statements. The simulated conglomerate would be managed by a team of players, as would the individual companies held by the conglomerate. Conglomerate managers would make financial and resource allocation decisions and would also be capable of acquiring and divesting companies. This approach, which simulates conglomerate portfolio management, has been previously

### reported to ABSEL [2].

An approach that lies between the first "just imagine you are a subsidiary" approach and the latter rather elaborate conglomerate model approach is described in this paper. In this simulation design, separate divisions make and market diverse products (possibly in different geographical areas), but each division remains an integral part of a single company. These divisions do not make financial decisions at the corporate level. The design does not include acquisition or divestiture features, but does include new product startup.

#### **Illustrative Example**

To illustrate this method for multiplying a management game, an example game will be described. The multiplying method has been implemented for this game. The example game is THE IMAGINIT MANAGEMENT GAME [1]. A sample company report of this game is shown in Figure 1. Several popular management games follow similar formats. In Figure 1, the totals column is not the sum of the product columns because it includes values for divisions making and marketing products in addition to the product shown in Figure 1.

THE IMAGINIT MANAGEMENT GAME is a longestablished simulation game usually used in business policy teaching contexts. It is extremely flexible due to high external parametererization and data manipulation completely independent of the computer program. This flexibility enables IMAGINIT to simulate almost any manufacturing industry from small unit manufacture such as breakfast cereals to big unit large price products such as automobiles. This same flexibility also allows versions of IMAGINIT to be tat bred to resemble particular companies. Usually this implementation takes the form of two to five clones of the simulated company competing with each other, (called the equal start condition), although with IMAGINIT it is possible to establish unequal starts so that a competing company may resemble an actual competitor of a company sponsoring an executive development program.

The IMAGINIT markets contain one market of up to two products for each competing firm (Market A with Products A-i and A-2) and a second market of a single product for each firm (Market B with Product B-i). What Products A-i, A-2, and B-i represent depends on values set for the external parameters and data. Usually, a play of IMAGINIT begins with an existing Product A-i in Market A, and player managers may start up another product in Market A (Product A-2), which will compete with Product A-i, or they may bring out a Product B-i, which will compete only with competitors' Products B-i. Of course, all Products A-i and A-2 for all firms compete with each other. There is a maximum of five competing firms and hence a maximum of ten products in Market A and five in Market

B. IMAGINIT will also simulate monopolies.

Decisions in THE IMAGINIT MANAGEMENT GAME are made both for products and for the company as a whole. The decisions to be made for each product are:

FIGUR COMPANY IMAG	E 1 INIT REPORT			-
THE IMAGINIT MANAGEMENT GAME The imaginit auto and computer industry	YEAR LOW	1 QUARTER PRICE L	0 UXURY	монтн о
COMPANY REPORT FOR FIRM 52	A-1	A-2	B-1	TOTALS
SHIPMENTS IN UNITS OF PRODUCT NET SALES REVENUE COST OF GOODS SOLD	7350000	<b>0:</b>	8:	25200000.
DIRECT LABOR (\$) DIRECT MATERIALS STORAGE	1800000. 3000000.	8:	8:	3453600. 12000000.
FACTORY DEPRECIATION OTHER FACTORY OVERHEAD COST TO MANUFACTURE				200000.
CHANGE IN FINISHED GOODS ON HAND (\$) COST OF GOODS SOLD GROSS PROFIT ON SALES	255000.	0.	٥.	255000.
SALESMEN (\$)	40000.	0.	o.	640000.
RESEARCH AND DEVELOPMENT	2100000.	ŏ:	ŏ:	510000.
EMPLOYEE FRINGE BENEFITS OPERATIONS RESEARCH	300000.	0.	0.	800000.
ADMINISTRATIVE OVERHEAD INTEREST PROFIT BEFORE INCOME TAX				444000.
INCOME TAX				2269824
DIVIDENDS PER SHARE 2.00 TO	TAL PAYOUT	200000	•	20040701
CHANGE IN STOCKHOLDERS EQUITY	JCEEDS		•	2464576.
BALAN	E SHEET			
ACCOUNTS RECEIVABLE 2016000.	AC	COUNTS PAYABLE ORT-TERM LOANS		2064000.
MATERIALS 190000.	BO	NDS		250000.
NET PLANT 2000000.	RE	ŢĂINED EARNING	S	2886446.
COMMON SHARES 100000.	10	BOOK VALUE		49.86
MARKET QUOTE	73.42			
CURRENT POLICY AND ENVIRONMENT Average industry prices this period Current total market demand (Units)	3	A 500.00 8400.	0.00 0.00	-
SHARE OF MARKET THIS PERIOD	A-1 0.250	A-2	-B-1	
POTENTIAL SHIPMENTS NEXT PERIOD PRICES	2205	0.00	0.00	
MATERIALS INPUTS PER UNIT (\$)	1500.00	ŏ:ŏŏ	ŏ:ŏŏ	1800000
HATERIALS ON ORDER (\$)	1000000:	š:	š:	1900000.
PRODUCTION LEVELS (UNITS)	2000.	0.0	°.°.	
NUMBER OF FINISHED UNITS ON HAND DISTRIBUTION CHANNEL INVENTORIES	175	0.	8:	
PURCHASE OR SALE OF FACTORY CAPACITY	PUNDE	TEQUED OF PEDE	EMED .	200000.
QUARTERS DIVIDENDS TOO LOW 0.	TOTAL	DIVIDENDS TO D	ATE	200000
FRINGE BENEFITS PER HOUR 1.00	PROBAD	LABOR HOURS	IKE	800000.
CURRENT NUMBER OF LABOR SHIFTS 3.	PERSON	S AVAILABLE PE	R SHIFT	T 160.

Price Materials inputs per unit Salesmen Advertising Product research and development Materials to be ordered Units to be produced

Decisions to be made for the company as whole are:

Employee fringe benefits per hour Dividends per share to be paid Operations research Short-term loans (borrow or repay) Bonds (issue or redeem) Shares of stock to be offered Factory capacity (purchase or sell)

The implementation of the approach described in this paper makes use of the full set of IMAGINIT decisions for managing the original, parent, or main company of the simulation. This company makes and markets in its own Markets A and B. Then for divisions that make and market diverse products in different markets, only the decisions for the product variables are used. There can be as many of these different divisions doing business in different Markets A and B as desired. Decisions dealing with finances, company-wide production capacity, and employee benefits are made only by the main company. This variation of the original game is called MULTIPLE IMAGINIT.

Games other than IMAGINIT that contain flexibility in setting parameters and data are also suitable for this method of "multiplying your management game."

### MULTIPLE IMAGINIT

MULTIPLE IMAGINIT is an extension of THE IMAGINIT MANAGEMENT GAME to more than two markets and three products. The additional products are manufactured and sold using company-wide production and financial resources yet separate marketing decisions. These products have separate direct revenues, costs, and inventories, which are added into the totals column and the balance sheet of an otherwise regular IMAGINIT run. Any number of additional Market A's with their Products A-i and A-2 and Market B's with their

Products B-i may be simulated. Each of the additional markets may be made as similar or as different from each other as desired giving consideration to their use of company-wide production and financial resources. The additional products may have distinct names and if conceived of as produced and sold by different divisions, the divisions may have distinct names.

MULTIPLE IMAGINIT is accomplished by running special IMAGINIT runs for the additional products. The model that simulates the separate products is called Product IMAGINIT. Each Product IMAGINIT run can simulate one Market A and one Market B, each with distinct characteristics. For more than one Product IMAGINIT run, the appropriate variable values are summed and these totals are passed to a special run of IMAGINIT that not only simulates its own markets but also incorporates the product activity of all separate Product IMAGINIT runs. Thus the revenues and costs in the totals column, the inventories in the balance sheet, the standard labor hours used in production, the profit figures, book value, and market quote all include the effects of the separate product runs as well as of the products of this special run. This special program is called Company IMAGINIT. Company IMAGINIT looks like Original IMAGINIT, but includes much more in its totals and its simulation of production and financial details. Hence, MULTIPLE IMAGINIT is the combined use of Product IMAGINIT and Company IMAGINIT.

#### Use of MULTIPLE IMAGINIT

The MULTIPLE IMAGINIT Model is contained in an adaptation of the Original IMAGINIT computer model. The computer model called MULTIPLE IMAGINIT executes all three: Original IMAGINIT, Company IMAGINIT, and Product IMAGINIT. In the FORTRAN program, the control variable that does this magic is called PASSC. PASSC uses a field in a record that was not otherwise used by Original IMAGINIT.

If PASSC is set to zero, Original IMAGINIT is run and

nothing different happens. If PASSC is set negative, Product IMAGINIT is run. If PASSC is set positive, Company IMAGINIT is run. For negative or positive PASSC, the absolute value of PASSC is very important. This value gives the identification of the file external to these runs that receives the product data or from which the product data is read. The FORTRAN f lie name written by Product IMAGINIT is FORONN where NN is the absolute value of PASSC. The file read by Company IMAGINIT will be FORONN as well, but NN does not have to be the same for the read as for the write although It may be convenient to use equal NN's. Similarly, NN's do not have to be the same from period to period.

If only one Product IMAGINIT is run, Company IMAGINIT should read the FORONN file written by Product IMAGINIT. If more than one Product IMAGINIT is run, then the FORONN files should have different NN's or the same FORONN file will be written over again and again. In addition, a program external to IMAGINIT must be run that sums these separate files into a single FORONN file that will be read by Company IMAGINIT with NN set to correspond to the summation file. A foreign currency translation may easily be incorporated in this summarizing program so that separate product runs may be in different currencies.

Each Product IMAGINIT run is a full-blown IMAGINIT run requiring all the usual input data and creating the usual carryover file to which are appended the next period decisions. Of course, only the product related output is passed to Company IMAGINIT. The output report for Product IMAGINIT prints only those values pertinent to product management. An example product report is shown in Figure 2. It is this product run that is added into the totals column in Figure 1. Note the difference in product type and names and in the name of the division.

Data Passed from Product IMAGINIT to Company IMAGINIT

Product data passed to Company IMAGINIT are added to

#### FIGURE 2 PRODUCT IMAGINIT REPORT

THE IMAGINIT MANAGEMENT GAME THE IMAGINIT PERSONAL COMPUTER DIVISION	YEAR 1 PERS	QUARTE	BUSINESS	10NTH 0
COMPANY REPORT FOR FIRM 54	A-1	A-2	B-1	TOTALS
SHIPMENTS IN UNITS OF PRODUCT NET SALES REVENUE	21000. 17850000.	0:	0: 0:	17850000.
DIRECT LABOR (\$) DIRECT MATERIALS	1500000. 9000000.	8:	8:	1500000. 9000000. 75000.
STORR FACTORY OVERHEAD SALESMEN (\$) ADVERTISING RESEARCH AND DEVELOPMENT EMPLOYEE FRINGE BENEFITS	500000 300000 250000	00	00.000	1330000 300000 250000
MATERIALS 1500000. FINISHED GOODS 0.	ACTUAL L	ABOR HOURS		500000.
CURRENT POLICY AND ENVIRONMENT Average industry prices this period Current total Market Demand (UNITS)	85 84	A	0.00 0.00	-
SHARE OF MARKET THIS PERIOD POTENTIAL SHIPMENTS NEXT PERIOD PRICES MATERIALS INPUTS PER UNIT (\$) MATERIALS ON HAND (\$) MATERIALS ON ORDER (\$) MONTHS UNTIL MATERIALS ARRIVE PRODUCTION LEVELS (UNITS) NUMBER OF FINISHED UNITS ON HAND DISTRIBUTION CHANNEL INVENTORIES	22472, 850.00 450.00 1500000, 20000, 20000, 2300,	0.000	0.000	1500000.

the corresponding product data generated by the Company IMAGINIT run before production and financial details are simulated and the income statement and balance sheet are computed. Hence, the Company IMAGINIT report reflects performance of the total firm including all additional products. For example, total labor hours on the company report is for the total firm while on the product reports, it is only for the products on these reports.

Simulated variations, if turned on, operate separately in each product or company run. Interestingly, it is possible to set parameters so separate labor strikes may occur in the product runs, or parameters may be set so that strikes occur only in the company runs.

Data is passed via a matrix PASS(I, J) that contains 14 variables for each product division. They are written in FORONN in two records of seven each for each firm in a product run. The variables are:

Game number of the run

Firm number

Total net sales revenue Total direct labor Total direct materials Storage Total salesmen (\$) Total advertising

Total R & D

Materials ordering costs Materials (balance sheet) Finished goods (balance sheet) Actual labor hours Total materials received

### Participant Organization

Of course, one team of players manages the main or original company including its up to three products. This team also records the company-wide decisions regarding fringe benefits, finances, and production capacity.

With one additional division making and marketing products in up to two entirely different markets, the main or original team may also manage these products. Another possibility is two teams each managing separate product simulations but becoming a single group to make the company-wide decisions. With two or more additional divisions, such a company-wide group becomes too large so that companywide decisions are made by a subgroup of the total number of participants. Beyond this point, numerous combinations of product-market management teams are possible.

## IMPLEMENTATION

As of this writing, MULTIPLE IMAGINIT has been implemented in batch mode on VAX supermini computers in the FORTRAN source language using standard FORTRAN file numbering conventions. A future implementation step at this computer site is to replace Original IMAGINIT now servicing policy-type courses in an interactive environment with MULTIPLE IMAGINIT.

### A NOTE

Should a game administrator wish to represent divisions that manage their own production capacity but not their financing, a MULTIPLE IMAGINIT type model could easily be programmed by modifying division decision variables to include factory capacity and operations research and output variables to include plant size, shifts, and overtime, and adding appropriate variables to the matrix that passes data from product to original runs. Should the administrator wish to represent divisions or subsidiaries that manage both production and local financing, the conglomerate portfolio model described in [2] would be more appropriate.

#### REFERENCES

- [1] Barton, Richard F., <u>THE IMAGINIT</u> <u>MANAGEMENT GAME</u> (Lubbock, Texas: <u>Active</u> <u>Learning, 1978)</u>.
- [2] , "A Simulation Game Model for Conglomerates," <u>Proceedings of the Eleventh Annual</u> <u>Conference of the Association for Business Simulation</u> <u>and Experiential Learning</u>, Honolulu, January, 1984, pp. 189-193.