

## **Simulation Games and Experiential Learning in Action, Volume 2, 1975**

One Experience with the V.K. Gadget Company  
An Introduction to Managerial Accounting

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During the past three years I have been teaching management accounting to MBA students at the Amos Tuck School of Business Administration, Dartmouth College, Hanover, New Hampshire; and at the School of Business Administration, the University of Western Ontario, London, Canada. At both institutions I have utilized an accounting game, developed by Ken Goosen, Associate Professor of Accounting Louisiana Tech University. The purpose of this paper is to briefly introduce the game to you; and then to describe how I have used this game to teach the complexities of the budgeting process, but more importantly, to show students how their behaviour can be directly influenced by the type of reports and information they are provided. Finally, the paper describes problems I encountered in installing this game, first on Dartmouth's Honeywell 635 and then on Western's IBM 1130. Hopefully these comments may aid other possible users in their consideration of this very useful learning tool.

### The V. K. Gadget Game

The V. K. Gadget game was developed to:

- 1) increase student's understanding of the importance of managerial accounting as an aid in decision making, and to
- 2) be an instructional device for increasing the student's ability to use managerial accounting techniques and concepts<sup>1</sup>

In order to meet these objectives the V. K. Gadget game places extensive emphasis on the abilities of participants to undertake the types of cost analysis typically included in an introductory management accounting course; cost-volume-profit analysis, contribution analysis; and to be concerned about the problems introduced in such courses: the problems of performance evaluation, planning and budgeting.

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<sup>1</sup> Goosen, Introduction to Managerial Accounting: A Business Game, General Learning Corporation, Morristown, N. J., 1973.

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Technically the V. K. Game is a non-interactive, deterministic model.<sup>2</sup> It is non-interactive in that the decisions of one team have no impact upon any other team, and it is essentially deterministic in that the ranges of the few stochastic parameters included in the computer model are clearly defined in the game manual.

This basic simplicity of the V. K. game substantially accounts for its usefulness as a tool for teaching management accounting. Its very nature requires the student to utilize the extensive forms supplied with the game manual to prepare detailed operating and cash flow budgets. The model's outputs (figures 1, 2, 3 and 4) directly relate to these budgets and provide specific feedback regarding the student's ability to interpret the game manual, and to forecast and plan. Because of the thoroughness of the V. K. Gadget budgeting experience (requiring detailed marketing, manufacturing and financial budgets), it is a powerful learning aid to developing an understanding of the complexities and importance of the budget and the budget process in industry today.

### Managing Student Behaviour

While the Gadget game was originally intended to provide practice with management accounting concepts, I have found it very useful to show students how their behaviour can be influenced by a management reporting system and to establish the difficulties inherent in creating acceptable measures of performance within such reporting systems.

To meet these objectives, I developed a performance measurement system and created an active role for the administrator, in the guise of the Corporate Executive Office. For both the 32 teams participating at Dartmouth, and the 40 teams playing at Western, the game was modified to generate performance parameters each period. These parameters formed the basis for period performance reports (illustrated by the February Performance Reports figures 5 and 6). In these figures the budget variance represents the absolute difference between each team's estimate of earnings and the actual reported earnings for the month. The remaining data was provided by the game. In figure 5 the teams' absolute performance on each parameter is reported, while in figure 6 relative performance is summarized by ranking all competing teams over the parameters reported. In addition to the performance reports, the Executive Office also issued monthly directives (figure 7), commenting on the performance reported.

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<sup>2</sup> The model, written in Fortran, requires about 32K words of memory for execution (although it can be overlayed to smaller systems)

FIGURE 1

DIVISION 1	PERIOD	4	EXHIBIT I
V. K. GADGET COMPANY BALANCE SHEET AS OF APRIL 30, 1975			
ASSETS			
CURRENT			
CASH	\$	0.	
ACCOUNTS RECEIVABLE	\$	111,802.3	
ALLOWANCE FOR BAD DEBTS		10,098.8	
MATERIALS		28,595.	
FINISHED GOODS		9,327.	
TOTAL CURRENT ASSETS			\$ 108,823.1
FIXED			
PRODUCTION EQUIPMENT AND TOOLS	\$	735,000.	
ACCUMULATED DEPRECIATION, P E + T		139,520.	
	\$	595,480.	
FURNITURE AND FIXTURES	\$	96,000.	
ACCUMULATED DEPRECIATION, F + F		28,000.	
	\$	68,000.	
BUILDING	\$	768,000.	
ACCUMULATED DEPRECIATION, BUILDING		44,800.	
TOTAL FIXED ASSETS			\$ 1,386,680.
INVESTMENTS			\$ 0.
INVESTMENTS IN U.S. GENERAL CO. STOCK			\$ 247,359.1
TOTAL ASSETS			\$ 2,473,591.1
LIABILITIES			
CURRENT			
ACCOUNTS PAYABLE	\$	89,790.	
NOTES PAYABLE		0.	
ACCUMULATED INCOME TAXES PAYABLE		183,156.	
TOTAL CURRENT LIABILITIES			\$ 272,954.
LONG TERM			
BONDS PAYABLE	\$	0.	
TOTAL LIABILITIES	\$		\$ 272,954.
STOCKHOLDERS' EQUITY			
COMMON STOCK (AUTHORIZED- 50,000., ISSUED- 4,000.)	\$	40,000.	
PREMIUM ON COMMON STOCK		12,000.	
RETAINED EARNINGS		165,063.6	
TOTAL STOCKHOLDERS' EQUITY			\$ 220,063.6
TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY,			\$ 247,359.1

figure 2

DIVISION 1

PERIOD 4

EXHIBIT II

V. K. GADGET COMPANY

INCOME STATEMENT - DIRECT COSTING BASIS

FOR THE MONTH ENDED APRIL 30 1975

	TERRITORY 1	TERRITORY 2	TERRITORY 3	TERRITORY 4	TOTALS
SALES	\$ 294120.	\$ 522424.	\$ 602528.	\$ 706040.	\$ 2125112.
COST OF GOODS SOLD	82409.	146377.	168921.	197824.	595432.
GROSS PROFIT	\$ 211711.	\$ 376047.	\$ 433706.	\$ 508216.	\$ 1529680.
EXPENSES:					
SELLING:					
SALESMEN SALARIES	\$ 35700.	\$ 63700.	\$ 73500.	\$ 86100.	\$ 259000.
SALESMEN COMMISSIONS	26471.	47019.	54223.	63541.	191254.
SALESMEN TRAVEL	17415.	17185.	15856.	46450.	96906.
SALESMEN TRAVEL	30000.	40000.	53000.	67000.	190000.
PACKAGING	3870.	6874.	7928.	9290.	27962.
BAD DEBTS	4412.	7835.	9038.	10591.	31876.
TERRITORY OFFICES	1000.	1000.	1000.	1500.	4500.
SALES OFFICE OPERATING EXPENSES	17000.	17000.	17000.	20000.	71000.
HOME OFFICE SALES EXPENSES	4498.	7990.	9215.	10793.	32500.
CREDIT DEPARTMENT EXPENSES	2317.	4115.	4747.	5563.	16743.
TOTAL SELLING	\$ 142683.	\$ 212720.	\$ 245507.	\$ 320833.	\$ 921743.
GENERAL AND ADMINISTRATIVE					
EXECUTIVE SALARIES	\$ 8304.	\$ 14750.	\$ 17012.	\$ 19934.	\$ 60000.
SECRETARIAL AND CLERICAL	484.	860.	992.	1163.	3500.
SUPPLIES	2627.	4666.	5382.	6106.	18931.
DEPRECIATION; BUILDING	144.	779.	91.	106.	320.
DEPRECIATION; FURNITURE AND FIXTURES	138.	245.	284.	332.	1000.
TRAVEL	9675.	6874.	5946.	25547.	48042.
TOTAL GENERAL AND ADMINISTRATIVE	\$ 21272.	\$ 27475.	\$ 29707.	\$ 53388.	\$ 131842.
TOTAL FIXED MANUFACTURING OVERHEAD	\$ 10447.	\$ 18556.	\$ 21401.	\$ 25078.	\$ 75482.
TOTAL EXPENSES	\$ 174402.	\$ 258751.	\$ 296615.	\$ 399299.	\$ 1129067.
NET OPERATING INCOME (LOSS)	\$ 37309.	\$ 117295.	\$ 137091.	\$ 108916.	\$ 400612.
OTHER INCOME:					
INCOME FROM OTHER SALES				\$ 57277.	\$ 57277.
DIVIDENDS FROM INVESTMENT				0.	0.
TOTAL OTHER INCOME				\$ 57277.	\$ 57277.
INTEREST EXPENSE				0.	0.
OTHER CHARGES				0.	0.
NET OTHER INCOME OR EXPENSES					\$ 57277.
NET INCOME BEFORE TAXES					\$ 457890.
INCOME TAXES					183156.
NET INCOME					\$ 274734.

Figure 3

IVISION 1	PERIOD	EXHIBIT III
V. K. GADGET COMPANY		
COST OF GOODS MANUFACTURED		
FOR THE MONTH ENDED APRIL 30 1975		
MATERIALS (BI)		
MATERIAL PURCHASES	\$ 11358.	
FREIGHT IN	473244.	
MATERIALS (EI)	26595.	
MATERIALS USED		\$ 458006.
VARIABLE DIRECT LABOR		
CUTTING DEPARTMENT	\$ 31785.	
ASSEMBLY DEPARTMENT	62532.	
FINISHING DEPARTMENT	28441.	
TOTAL DIRECT LABOR COST		\$ 122759.
VARIABLE MANUFACTURING OVERHEAD		
UTILITIES	\$ 3555.	
REPAIRS AND MAINTENANCE	10666.	
SUPPLIES	10666.	
TOTAL VARIABLE MANUFACTURING OVERHEAD		\$ 24807.
TOTAL COST OF GOODS MANUFACTURED		\$ 605653.
NUMBER OF UNITS MANUFACTURED		14220.
MANUFACTURING COST PER UNIT		\$ 42.589
FIXED MANUFACTURING OVERHEAD		
FIXED DIRECT LABOR	\$ 25000.	
UTILITIES	500.	
PRODUCTION PLANNING AND CONTROL	2300.	
PURCHASING AND RECEIVING COSTS	39677.	
FACTORY INSURANCE	100.	
DEPRECIATION, PRODUCTION EQUIPMENT AND TOOLS	6125.	
DEPRECIATION, BUILDING	1280.	
FACTORY SUPPLIES	500.	
TOTAL FIXED MANUFACTURING COSTS		\$ 75482.

figure 4

Figure 4

DIVISION	1	SUMMARY OF ACTUAL RESULTS				PERIOD	4
		MARKETING					
		TERRITORY	TERRITORY	TERRITORY	TERRITORY	TERRITORY	TERRITORY
		1	2	3	4	5	6
-----							
1: CUSTOMERS REQUESTING DEMONSTRATION							
2: ACTUAL CALLS BY SALESMEN							
3: SALES ORDERS							
4: SALES (UNITS)							
5: UNDELIVERED SALES - CURRENT PERIOD(DOLLARS)							
6: UNDELIVERED SALES - CURRENT PERIOD(UNITS)							
7: SALESMEN END OF PERIOD							
8: SALESMEN QUITTING							
9: ADDITIONAL VOLUME OF SALES							
-----							
PRODUCTION		CUTTING		ASSEMBLING		-----	
		-----		-----			
1: PRODUCTION EQUIPMENT - UNITS		10.		25.			
2: PRODUCTION EQUIPMENT - MACHINES(PER 8 HR. SHIFT)		888.		9020.			
3: PRODUCTION POTENTIAL - LABOR(PER 8 HR. SHIFT)		14220.		14432.			
4: LABOR HIRED		80.		160.			
5: LABOR REQUIRED FOR MACHINE CAPACITY(8 HR. SHIFT)		50.		100.			
6: EXCESS LABOR HIRED(BASED ON PLANNED PROD.)		0.		0.			
-----							
MATERIAL		-----					
1: ENDING INVENTORY		1460.					
2: MATERIAL X (UNITS)		2032.					
3: MATERIAL Y (UNITS)		219.					
4: FINISHED GOODS (UNITS)		14585.					
5: PRODUCTION POTENTIAL - MATERIAL X		15237.					
6: PRODUCTION POTENTIAL - MATERIAL Y		6200.					
7: MATERIAL RETURNED							
-----							
FINANCING		-----					
1: BONDS ISSUED - CURRENT PERIOD		0.					
2: BOND PROCEEDS		0.					
3: COMMON STOCK ISSUED - CURRENT PERIOD		0.					
4: COMMON STOCK ISSUED - PROCEEDS		0.					
5: MARKET VALUE OF STOCK (PER SHARE) LAST PERIOD		515.					
6: BANK LOAN PROCEEDS		0.					
7: CREDIT TERMS		3.					
-----							
RATIOS		-----					
1: RETURN ON INVESTMENT (ASSETS)		0.11					
2: EARNINGS PER SHARE		68.683					
3: CURRENT RATIO		3.98					
4: RATIO OF BONDS PAYABLE TO STOCKHOLDERS' EQUITY		0.00					

figure 5

## FEBRUARY PERFORMANCE REPORT

Divisions	Budget Variance	Working Capital Variance	Sales/Sales- man	Net Income/ Sales	Earnings per Share	Sales
1	\$57795.07	4.281	2117.74	0.07	\$39.63	2198224.00
2	\$96579.04	2.004	3157.95	0.11	51.43	21229515.00
3	145552.52	3.075	4555.52	0.12	55.43	227622144.00
4	234542.52	3.475	3552.13	0.14	101.12	22700303.00
5	234542.52	3.475	4265.95	0.14	70.31	2150040.00
6	123357.79	2.004	4265.95	0.15	71.12	21713302.00
7	110145.13	0.002	4552.52	0.15	124.45	23327170.00
8	110145.13	0.002	4552.52	0.15	124.45	23327170.00
9	110145.13	0.002	4552.52	0.15	124.45	23327170.00
10	110145.13	0.002	4552.52	0.15	124.45	23327170.00
11	110145.13	0.002	4552.52	0.15	124.45	23327170.00
12	110145.13	0.002	4552.52	0.15	124.45	23327170.00
13	110145.13	0.002	4552.52	0.15	124.45	23327170.00
14	110145.13	0.002	4552.52	0.15	124.45	23327170.00
15	110145.13	0.002	4552.52	0.15	124.45	23327170.00
16	110145.13	0.002	4552.52	0.15	124.45	23327170.00
17	110145.13	0.002	4552.52	0.15	124.45	23327170.00
18	110145.13	0.002	4552.52	0.15	124.45	23327170.00
19	110145.13	0.002	4552.52	0.15	124.45	23327170.00
20	110145.13	0.002	4552.52	0.15	124.45	23327170.00
21	110145.13	0.002	4552.52	0.15	124.45	23327170.00
22	110145.13	0.002	4552.52	0.15	124.45	23327170.00
23	110145.13	0.002	4552.52	0.15	124.45	23327170.00
24	110145.13	0.002	4552.52	0.15	124.45	23327170.00
25	110145.13	0.002	4552.52	0.15	124.45	23327170.00
26	110145.13	0.002	4552.52	0.15	124.45	23327170.00
27	110145.13	0.002	4552.52	0.15	124.45	23327170.00
28	110145.13	0.002	4552.52	0.15	124.45	23327170.00
29	110145.13	0.002	4552.52	0.15	124.45	23327170.00
30	110145.13	0.002	4552.52	0.15	124.45	23327170.00
31	110145.13	0.002	4552.52	0.15	124.45	23327170.00
32	110145.13	0.002	4552.52	0.15	124.45	23327170.00
33	110145.13	0.002	4552.52	0.15	124.45	23327170.00
34	110145.13	0.002	4552.52	0.15	124.45	23327170.00
35	110145.13	0.002	4552.52	0.15	124.45	23327170.00
36	110145.13	0.002	4552.52	0.15	124.45	23327170.00
37	110145.13	0.002	4552.52	0.15	124.45	23327170.00
38	110145.13	0.002	4552.52	0.15	124.45	23327170.00
39	110145.13	0.002	4552.52	0.15	124.45	23327170.00
40	110145.13	0.002	4552.52	0.15	124.45	23327170.00
41	110145.13	0.002	4552.52	0.15	124.45	23327170.00
42	110145.13	0.002	4552.52	0.15	124.45	23327170.00
43	110145.13	0.002	4552.52	0.15	124.45	23327170.00
44	110145.13	0.002	4552.52	0.15	124.45	23327170.00

Absolute difference between forecast and actual

Absolute difference between Current ratio and Executive guideline

figure 6

## FEBRUARY PERFORMANCE REPORT

	Budget Variance	Working Capital Management	Sales/Salesman	Income/Sales	Earnings per Share	Sales
TEAM						
1	19	37	38	33	34	34
2	25	31	24	17	23	32
3	30	2	5	13	12	12
4	11	59	19	5	7	20
5	9	24	7	6	16	35
6	25	29	23	21	19	17
7	4	19	5	4	2	3
8	27	15	10	14	10	6
9	35	40	2	29	31	38
10	5	14	9	19	6	1
11	22	21	37	29	38	33
12	2	30	31	25	27	25
13	32	13	3	3	4	24
14	3	24	20	20	18	21
17	40	25	40	40	40	40
18	10	4	28	32	30	19
19	13	7	29	24	28	31
20	3	22	14	35	32	4
21	39	35	35	37	27	37
22	21	17	11	30	29	27
23	15	25	35	22	20	22
24	55	27	15	7	5	7
25	23	3	13	13	21	29
26	28	5	33	35	35	5
27	15	38	25	34	33	30
28	5	10	21	9	8	10
29	18	13	25	15	15	9
30	33	32	1	2	3	8
33	1	25	15	5	9	14
34	17	5	22	10	17	28
35	31	15	30	25	25	15
36	33	20	39	39	39	39
37	34	11	4	1	1	2
38	37	12	3	31	35	35
39	14	9	27	27	24	12
40	7	33	12	11	14	26
41	12	35	17	15	13	15
42	24	5	34	25	25	23
43	29	1	15	12	11	11
44	20	23	32	23	22	18



Figure 7

## V. K. G ADGET COMPANY

### Executive Offices

TO: All Divisions  
SUBJECT: February Performance Reports

Appended to this notice are your performance reports for February. While significant improvements in profitability have been apparent during February your Executive Officers are substantially concerned about the following apparent problems:

- 1) Your apparent difficulty in accurately forecasting Divisional performance (as reflected in the rather significant differences between your budgeted profits and your actual results). Clearly, if our resource allocation decisions are to best meet our Corporate plans, improvements must be made in our ability to forecast.
- 2) It is painfully obvious that many Divisions have paid little regard to the guidelines provided concerning working capital management. In these times of rapid inflation it remains absolutely critical that working capital not substantially exceed the 2.5 ratio of which you have been advised.
- 3) Your Executive Officers are concerned about the apparent inefficiency with which our salesforce is being managed. While it appears reasonable to expect sales in the neighborhood of \$8000 to \$10000 per man, most divisions are operating far below this level.
- 4) Return on Sales: It is our continued expectation that each division will ensure that its net return on sales exceed 10%.

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The administrator's ability to modify the students' decisions is demonstrated in the February and March Performance Reports (figures 5 and 8). In the February report teams were measured (among other things) on their ability to manage working capital. The statistic reported measured the absolute difference between the team's working capital ratio and a ratio of 2.5 to 1 desired by the Executive Office. As figure 5 suggests, prior to making this objective explicit in the Executive memo, the teams were paying little attention to the management of their working capital. After drawing their attention to it, however, the March Performance Reports shows a significant improvement in the management of working capital (which continued throughout the remainder of the game). This student response to the February Executive memo appears to clearly demonstrate the administrator's ability to manage the student's behaviour.

A quick comparison of figures 5 and 8 will disclose that the performance parameters reported change from period to period. The purpose of these changes is to force students to develop their own strategy and objectives, rather than merely following the Executive's directives. In fact, I have gone so far as to provide meaningless or misleading directives to force the students to develop their own plans.

### The Impact of Instructor Attention

In addition to reporting monthly performance the reporting system also served as the basis for establishing the "winners" in our V. K. Gadget world. For this purpose the number of variables across which performance was ranked were considerably expanded (figure 9). To declare a winner each team's performance on each parameter reported in figure 9 was ranked and then the sum of these ranks (across all parameters) were ranked.

This year, at Western, the game was played simultaneously by three different MBA 1 classes. The relative performance of the forty teams drawn from these three Sections is summarized in Table 1. From an administrative perspective it was very interesting that the performance of these three sections was clearly distinguishable. To determine overall section scores, the overall ranks for the teams included in the three groups were summed (yielding an aggregate score for class 4 of 331, for class 2 of 303 and for class 1 of 186). These scores were not comparable, however, because classes 2 and 4 consisted of 14 teams while class 1 had only 12 teams. To adjust for this difference we removed the worst two teams from the aggregate scores of both class 2 and class 4. The resulting aggregate scores still indicated the substantially better performance of class 1 relative to the other two classes (Table 2).

figure 8

V. K. GADGET COMPANY PERFORMANCE REPORT March 1975						
Division	Net Income	Return On Assets	Working Capital Management	Sales	Net On Sales	Manufacturing Unit Cost
1	\$255673.34	0.12%	0.65	\$2343840.00	0.11%	\$42.72
2	392505.51	0.08	0.41	3710140.00	0.07	42.71
3	387388.51	0.12	0.65	2431848.00	0.15	42.64
4	314221.59	0.09	2.07	2219112.00	0.14	43.91
5	3174482.23	0.01	1.20	1103232.00	0.02	43.27
6	204555.03	0.10	1.91	1133944.00	0.12	43.82
7	30522.83	0.05	0.73	2270100.00	0.09	42.33
8	151337.30	0.07	0.22	2161278.00	0.14	45.07
9	303310.76	0.06	0.62	2209016.00	0.07	43.63
10	3332232.65	0.11	0.49	22814282.00	0.10	42.75
11	3332232.65	0.08	0.97	2715936.00	0.13	48.42
12	3332232.65	0.07	0.05	2333333.00	0.14	42.30
13	3332232.65	0.05	0.07	3333333.00	0.09	42.12
14	3332232.65	0.03	1.24	6493344.00	0.25	44.82
15	3332232.65	0.33	1.16	3817024.00	0.31	44.33
16	3332232.65	0.11	0.81	2271897.00	0.14	43.52
17	3332232.65	0.15	0.82	3059847.00	0.19	42.52
18	3332232.65	0.24	0.25	3912024.00	0.13	47.13
19	3332232.65	0.10	0.21	2456415.00	0.04	43.37
20	3332232.65	0.13	0.95	1774920.00	0.16	42.59
21	3332232.65	0.10	0.00	2504978.00	0.14	42.23
22	3332232.65	0.14	0.69	2320126.00	0.17	47.43
23	3332232.65	0.23	0.70	2478512.00	0.20	45.20
24	3332232.65	0.05	0.59	3639356.00	0.10	43.12
25	3332232.65	0.07	1.17	1273256.00	0.10	43.87
26	3332232.65	0.07	1.72	1813350.00	0.10	42.70
27	3332232.65	0.05	1.03	22795128.00	0.08	42.31
28	3332232.65	0.14	1.37	2795128.00	0.15	42.35
29	3332232.65	0.12	0.46	2382330.00	0.13	43.75
30	3332232.65	0.15	0.47	2509042.00	0.13	45.89
31	3332232.65	0.16	0.49	2888502.00	0.14	42.88
32	3332232.65	0.11	0.49	3150720.00	0.11	43.90
33	3332232.65	0.05	0.53	1977980.00	0.19	45.79
34	3332232.65	0.03	1.96	2526606.00	0.12	42.43
35	3332232.65	0.11	0.51	3201831.00	0.10	43.53
36	3332232.65	0.15	0.04	3090576.00	0.16	42.79
37	3332232.65	0.05	0.59	1738030.00	0.06	43.02
38	3332232.65	0.05	0.59	1738030.00	0.06	43.02

// Dup

Figure 9<sup>3</sup>

## V. K. GADGET COMPANY

## Executive Offices

MAY 11, 1975.

## TO ALL DIVISIONS:

AFTER SUBSTANTIAL ANALYSIS, DISCUSSION AND DATA PROCESSING THE BOARD OF DIRECTORS HAS THE DIVISIONAL RATINGS FOR OUR NEW EXECUTIVE BONUS PLAN.

YOU HAVE BEEN JUDGED ON MEASURES OF YOUR RETURN TO INVESTORS AND UPON YOUR FINANCIAL, OPERATING, MARKETING AND MANAGERIAL EFFECTIVENESS.

## RETURN TO SHAREHOLDERS

1. RETURN TO SHAREHOLDERS. THIS MEASURE REFLECTS THE RETURN TO AN INVESTOR IN YOUR STOCK DURING THE PAST FOUR MONTHS. IT INCLUDES THE INCREASE IN THE MARKET PRICE OF YOUR STOCK UNDER YOUR MANAGEMENT PLUS DIVIDENDS RECEIVED BY THE INVESTOR DURING YOUR REGIME.

MEAN	RANGE
\$1.147	\$183 - \$4,798

## FINANCIAL EFFECTIVENESS

MEAN	RANGE
\$984.192	\$489,306 - \$1,559,732

2. 1) TOTAL INCOME

MEAN	RANGE
.08	.04 - .12

3. 11) AVERAGE RETURN ON ASSETS

4. 111) WORKING CAPITAL MANAGEMENT EFFECTIVENESS

MEAN	RANGE
1.69	0.0 - 6.93

5. (IV) CLOSING MARKET PRICE FOR YOUR DIVISION'S SHARES

MEAN	RANGE
\$1.116	\$185 - \$4,497

EACH OF THEIR MEASURES SHOULD BE SELF EXPLANATORY -- GREATER EARNINGS; A HIGHER RETURN ON ASSETS, AND A HIGHER MARKET PRICE IS GOOD FOR U.K. GADGET AND FOR EACH OF ITS DIVISIONS. IN ADDITION, HOWEVER TO MORE GROWTH, STABILITY OF EARNINGS AND MARKET PRICE IS ALSO IMPORTANT. OUR COMPANY IS IN THE BUSINESS OF MANUFACTURING AND SELLING GADGETS -- WE ARE NOT HERE TO SPECULATE IN THE MARKET. THE RISKINESS OF YOUR DIVISION'S OPERATIONS WAS EVALUATED BASED ON THE

6. VARIABILITY IN INCOME

MEAN	RANGE
\$175.809	\$56,482 - \$629,588

7. VARIABILITY IN RETURN ON ASSETS

MEAN	RANGE
.05	.01 - .18

8. VARIABILITY IN EARNINGS PER SHARE

MEAN	RANGE
\$21.28	\$14.12 - \$105.75

3. IN PREPARING FIGURE 9, THE PARAMETERS REPORTED WERE EITHER PROVIDED BY THE GAME OR REPORTED AS FOLLOWS:	Manufacturing		MEASURED BY THE DELTA OF A REGRESSION LINE THROUGH THE FIRM'S MANUFACTURING UNIT COSTS FOR ALL PERIODS	
	Cost Trend	Budget Variances	Estimated and Reported Results	Measured by the standard deviation of the specified parameter over the periods played
RETURN TO SHAREHOLDERS		CLOSING-OPENING MARKET PRICE PLUS ALL DIVIDENDS PAID THROUGHOUT THE GAME		
WORKING CAPITAL EFFECTIVENESS		ABSOLUTE DIFFERENCE BETWEEN TEAM WORKING CAPITAL RATIO AND DESIRED RATION OF 2.5 TO 1		

## PRODUCTION AND OPERATING EFFECTIVENESS

9. NET INCOME/SALES

THE EXECUTIVE COMMITTEE IS CONCERNED NOT ONLY WITH SALES, BUT WITH THE INCOME DERIVED FROM THOSE SALES. OVERALL OPERATING MANAGEMENT WAS ASSESSED THROUGH:

PERCENT OF SALES AVAILABLE AS INCOME AFTER ALL OPERATING AND NON-OPERATING EXPENSES.

MEAN	RANGE
.09	.05 - .14

IN ADDITION TO GENERATING INCOME, THE EXECUTIVE COMMITTEE IS CONCERNED ABOUT OUR ABILITY TO MEET CONTINUED MARKET DEMAND FOR GADGETS, (WHICH WILL INCREASE SUBSTANTIALLY IN THE FUTURE). FOR THIS REASON, AVAILABLE PRODUCTION CAPACITY IS OF GREAT CONCERN, BUT AVAILABILITY IS NOT OUR ONLY CONCERN. WE ARE ALSO CONCERNED WITH YOUR CAPITAL PLANNING. IT MAKES LITTLE SENSE TO HAVE UNBALANCED THROUGHPUT CAPABILITY BETWEEN DEPARTMENTS SINCE EXCESS FACILITIES SUGGEST AN UNREQUIRED CAPITAL INVESTMENT. YOU WERE MEASURED ON:

10. MINIMUM THROUGHPUT CAPACITY

MEAN	RANGE
\$11,198	\$5,491 - \$13,376

11. BALANCE CUTTING AND ASSEMBLY MACHINES

MEAN	RANGE
.05	.00 - .10

12. BALANCE CUTTING AND ASSEMBLY WORKERS

MEAN	RANGE
.04	.00 - .10

MANUFACTURING COST CONTROL WILL REMAIN AN IMPORTANT ELEMENT IN YOUR OPERATIONS. YOU WERE MEASURED ON:

13. MANUFACTURING COST PER UNIT

MEAN	RANGE
\$43.78	\$42.24 - \$47.67

14. MANUFACTURING COST TREND

MEAN	RANGE
-2.995	-1.70 TO - 4.724

## SALES EFFECTIVENESS

OUR SALESFORCE IS A VALUABLE ASSET. FOR THIS REASON, AND DUE TO THE HIGH COST OF TRAINING, SALESFORCE TURNOVER IS NOT DESIRABLE. YOU'VE BEEN MEASURED ON:

15. TOTAL SALES

MEAN	RANGE
\$9,826,981	\$7,120,744 - \$12,522,450

16. CHANGE IN WORKFORCE DURING APRIL

MEAN	RANGE
177	0 - 627

17. SALESFORCE TURNOVER

MEAN	RANGE
192	60 - 236

## MANAGERIAL SKILLS

18. BUDGET SALES VARIANCE

MEAN	RANGE
.11	.01 - .40

19. BUDGET INCOME VARIANCE

MEAN	RANGE
.27	.00 - 1.96

TABLE 1  
V. K. GADGET OVERALL RANKINGS

DIVISION	OVERALL RANK	GROUP 2	DIVISION	OVERALL RANK	GROUP 1	DIVISION	OVERALL RANK
GROUP 4							
1	30		17	31		33	1
2	12		18	20		34	13
3	9		19	8		35	25
4	26		20	6		36	34
5	35		21	39		37	3
6	36		22	23		38	28
7	18		23	19		39	14
8	22		24	11		40	17
9	33		25	29		41	15
10	21		26	27		42	10
11	38		27	37		43	2
12	7		28	16		44	24
13	4		29	5			
14	40		30	32			
	<u>331</u>			<u>303</u>			<u>186</u>

Table 2

Adjusted Aggregate Section Performance

Western MBA Sections		Group Aggregate Score
1		186
2	303 - (37,39)	227
4	331 - (38,40)	253

The important difference between the three groups appears to be the extent to which instructors were involved with the game. Section 4's instructor played a very passive role in the game -- he basically was not involved in its administration. In contrast, the instructors of Sections 1 and 2 actively participated in the game. For example, we personally delivered the first Executive memo, with appropriate derogatory comments, where performance differed from "management's desires". Finally, because the instructor of group 1 physically administered the game, his students could perceive his extensive involvement in it. We believe it is this differential attention and instructor involvement which basically accounts for the differences in the performances of the three Sections.

Installing the V. K. Gadget Game

A friend of mine, a manager of a data processing department in a large manufacturing company, swears he never again will buy a canned computer package because it is just too difficult to learn to use someone else's software, and because the chances of errors and software bugs are just too great. I must admit, that following my experience with V. K. Gadget, I can fully appreciate my friend's sentiments. I might again consider a "foreign" game because purchased software can save tremendous amounts of developmental and programming time, but I would be much more concerned about the many set-up and conversion hours which such a choice may require. At this stage of my paper, I shall briefly share my experiences in guiding the V. K. Gadget Model through the two conversions, at Dartmouth and then at Western, in order to explain my ambivalence about purchasing games and to suggest possible problems you may face in installing a game like V. K. Gadget.

Conversion 1 - Using a Large Computer System

Last year I installed the V. K. Gadget game on Dartmouth's Honeywell 635. In retrospect, this conversion was relatively painless. The first problem we had with this game was in obtaining a complete copy of the source problem. The publisher of the V. K. game manual, General Learning Press, is responsible for providing this deck. Unfortunately, when we received a copy of the program from General Learning Press, it was incomplete. We had received two front halves of the deck, but nary a copy of the second half of the program. Fortunately, a "panic-stricken" call to Louisiana provided a complete version of the program.

## **Simulation Games and Experiential Learning in Action, Volume 2, 1975**

I am pleased to report that within 48 hours of receiving the complete source deck the V. K. Gadget Company was “alive and well”, in Hanover, New Hampshire, in spite of some incompatibilities between IBM and Honeywell hardware, and a near fatal problem with the available Dartmouth Fortran. Our conversion problems began with incompatibilities between the character *sets* of the IBM 370/135 and Dartmouth 635. The Dartmouth system, for example, read IBM’s “=” character as *fl>fl*• Fortunately, this problem was fairly easily overcome by means of the powerful text editor on the Dartmouth system.

A further conversion problem arose because, as many of you are I am sure aware, THE COMPUTER LANGUAGE at Dartmouth is BASIC (for it is at Dartmouth this language originated). For this reason the development of a Fortran compiler for the Dartmouth computer system had received low priority, and while a Fortran compiler was available it lacked one essential feature required by the Gadget program -- an EQUIVALENCE statement. We were able to overcome this problem by writing a subroutine to perform the equivalence task, but this problem is indicative of the totally unexpected non-routine conversion problems one might face.

BASIC led to one major adaptation of the Gadget game. Because BASIC is intended as an interactive time-sharing language, the Dartmouth computer is oriented to supporting terminals, and Dartmouth students are oriented to using terminals, not punched cards. Rather than trying to introduce “cardbatch” logistics, we converted the game input requirements of the original version to a time-sharing disk-data flow. A program was written to interrogate students regarding their play decisions which were then written to a disk file. The main game then run off the data in this file. While the primary reason for undertaking this adaptation was to alleviate the necessity of having students “punch” cards, it also allowed us the ability to “edit” student inputs. This ability turned out to be perhaps the most important advantage of the adaptation, for it allowed us to detect and correct problems in data input before the game was even run.

A final problem with the V. K. Gadget company related to one parameter of this game which was supposed to allow teams to factor their accounts receivable. Unfortunately, during trial runs, the factoring logic did not appear to execute properly. Because there was insufficient time to “debug” this problem the “government” declared factoring to be illegal and the game was played without this feature (without any significant apparent impact on the student’s experience).

### Conversion 2 - The Gadget Company on a Small Computer System

Having successfully utilized the V. K. Gadget game with my Dartmouth MBA classes, I looked forward to using it at Western and so set out last fall to bring the game up on the Business School’s IBM 1130. I was encouraged in these efforts by Professor Goosen’s provision of a



## **Simulation Games and Experiential Learning in Action, Volume 2, 1975**

“1130 version” of the game. Unfortunately, setting-up this version of the V. K. Gadget game required much more effort than expected. Specific problems encountered included: language problems, format problems, assignment problems, numerical problems and problems with misplaced statements.

The Fortran computer available on our 1130 represents a limited extension of Fortran II. A recent discussion with Ken Goosen confirmed that his “1130 version” had been developed with a much more sophisticated compiler. As a result we were faced with replacing BOOLEAN IF statements with ARITHMETIC IF statements. The lack of BOOLEAN logic also required a restructuring of computed GO TO logic throughout the game.

The original V. K. Gadget game output takes full advantage of the 132 print positions of the standard printer. Unfortunately our printer has only 120 position print characters. This problem required reformatting of most output statements in the game.

Perhaps the biggest (and most difficult problem to deal with) occurred due to the limited size of the 1130. The largest integer value the 1130 will handle is  $2^{15}$  or 32768. Any integer larger than this is set to 215. This proved a serious problem because the original Gadget game utilized a convention of integerizing the results of many real calculations. On the 1130, when these calculations exceeded 32768 the model “simply blew up”. This problem was only identified by obtaining a complete trace of a run of the model, and was only over-come by redefining several integer variables as real and by modifying the rounding logic utilized within the program.

Finally, unexplainable errors in the runs of test data were finally traced to the misplacement and transposition of source cards in the 1130 deck. (These problems were only finally found through line by line comparisons of the 1130 program, with the large system program I had used the previous year).

When finally, the Canadian Division of the V. K. Gadget Company began full operations, my research assistant and I had spent at least two man months establishing this version on our 1130. One thing this experience confirmed is there can be no more difficult task than attempting to debug someone else’s software and logic. A great deal of time spent on this conversion was spent in merely attempting to decipher the variables included in the game and the logic effecting these variables. (This effort was not all wasted, however, for during subsequent administration of the game it became much easier to deal with student questions and problems due to my improved understanding of its “workings”.)

Comparing my two experiences with setting up the V. K. Gadget game it appears that adopters face two possible sets of problems: incompatibilities between the development and host computer systems and inadequacies in the source programs provided and their documentation. Either of these problems may require many hours of frustrating programming, testing and experimenting to overcome.