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AUTHOR Tweddale, R. Bruce
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ABSTRACT

Presented is a budgetary decision model developed to aid the executive officers in arriving at tentative decisions on enrollment, tuition rates, increased compensation, and level of staffing as they affect the total institutional budget. The model utilizes a desk-top programmable calculator (in this case, a Burroughs Model C 3660). The model allows the executive officers to meet together and test inputs to the budget and receive immediate feedback on the size and nature of the resulting institutional budget. The outputs allow the decisionmakers to discuss immediately the effects of their decisions on inputs as they relate to outputs. The use of a calculator has certain advantages in terms of expense, ease of programming, and portability. (Author)

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Difficult Budgetary Decisions: A Desk-Top Calculator Model to Facilitate Executive Decisions

R. Bruce Tweddale, Assistant Director
Office of Institutional Research
Grand Valley State Colleges
Allendale, Michigan 49401
(616) 895-6611

During the Summer of 1975, the Planning Office at Grand Valley State Colleges began preliminary discussions on the 1976-77 institutional budget. Like many other public institutions, Grand Valley found itself in a situation involving soaring costs brought about by inflationary pressures at the very time that the level of state appropriations to higher education were falling off.

It was quickly evident that the combination of inflation and a drop-off in state support meant that some very difficult budgetary decisions had to be faced in the planning of the institutional budget for 1976-77. At this point the normal process of building a budget from the individual operating budget level and aggregating by level to a total institutional budget was examined in light of the current situation. If we were facing a year in which it was obvious that the budget would be severely restricted, it didn't seem to make much sense to use the normal process which would probably result in a bottom line entirely out of line with practical reality.

After some thought, it was decided that the first order of approach to the 1976-77 budget building process should be "broad brush" and educational. Both the executive officers who would be making the final budgetary decisions and the operational budgetary unit heads had to be made aware of the nature of the problem and the consequences of various major decisions on the total institutional budget.

In order to accomplish this task we needed a tool that would facilitate, in a workshop type setting, demonstration of the nature of the problem and the consequences of various solutions. Ideally, the methodology would allow

the participants to suggest alternative solutions to the budgetary problems and immediately see what effect these solutions produced. Similar types of meetings had been held in the past, but the turn-around time for staff work on the proposed solutions necessitated a whole series of meetings where the results of the last proposal were reviewed and then another solution proposed.

This situation was ready-made for a machine processed model that would allow a whole series of budgetary proposals and results to be discussed at one meeting. The resultant discussion along with the give and take in making new proposals in one session would be much more likely to produce the desired concensus on methods of dealing with the budgetary problem.

Normally, modeling is thought of as a difficult and time consuming task involving the use of computers. However, this method has certain draw-backs in terms of expense, ease of programming, and portability. In addition, some people have an inherant distrust of computers or are overly awed by the process. We felt that this might be a detraction from the primary task of education and concensus seeking. In reality, fairly sophisticated and utilitarian models can be developed using desk-top programmable calculators. In this case, we used a Burroughs model C3660 which allowed for 144 individual programming steps.

Since we were interested in the broad implications of the current budgetary problem on the total institutional budget, we identified those elements of income and expenditure that had broad effects.

Income variables then became:

A. State appropriation

B. Tuition Income

The expenditure variables which were chosen were:

A. Staffing ratios by employment category

B. Average compensation increase

This combination of income and expenditure variables then produces total income and total compensation to be paid. The difference between the two (assuming that the variables input to the model create more total income than total compensation) are then left for other operational expenses (Supplies, equipment, utilities, etc.)

Broken down into its components, the design of our particular model looks as follows:

I. Inputs to Model

A. Estimated student credit hours (in fiscal year equated students)

B. Desired student-faculty ratio

C. Desired ratio of students to Executive, Administrative, and Professional personnel

D. Desired ratio of students to clerical, office, technical, trade, and maintenance personnel

E. Compensation desired expressed as a ratio of the base year (1975-76) compensation average

F. Proposed undergraduate tuition rate expressed in $/credit

G. Estimate of the State of Michigan appropriation in dollars

II. Calculations & Assumptions

A. Divide fiscal year equated student input by the employee group ratio inputs to obtain numbers of staff required (in full time equivalent numbers)

B. For each employee group, multiply the average compensation for the base year by the inputed compensation increase ratio. These new calculated average compensation ratios are than multiplied by the calculated number of staff required in each category.

C. The weighted tuition rate for the base year is $676/(fiscal year equated student), with an undergraduate tuition rate of $14/credit. The ratio of the proposed undergraduate tuition rate minus $14, divided by $14, is multiplied by $676 and the result is added to $676 to obtain the new weighted tuition rate per fiscal year equated student. The new weighted rate is multiplied by the inputed value of fiscal year equated students to obtain projected tuition income. This process assumes the same mix of in-state/out-state and graduate/undergraduate credits for the projected year as for the base

year. It also assumes that any tuition increases over the base year would be applied proportionally to all of the categories of tuition.

D. The tuition income derived in II C. is added to the appropriation estimate from I G. This sum is increased by a fixed estimate of $265,000 for "other income" to arrive at a total projected revenue.

E. Subtract total calculated compensation from total calculated income to arrive at total dollars for operation.

III. Outputs of the Model

A. Faculty positions required

B. Executive, administrative, and professional positions required

C. Clerical, office, technical positions required

D. Total compensation dollars required

E. Total revenue

F. Total dollars available for operational expenses other than salaries

G. Total dollars available for non-salary expenses expressed as a percentage of total revenue

In order to facilitate the use of the model and obtain the involvement of our audience, a worksheet was created. This worksheet listed the actual values of the variables for the base year. It also provided cells for the users to enter their assumptions for the seven inputs to the model for the budget year

under consideration. These numbers are then entered via the calculator keyboard in sequence and the resultant seven outputs are displayed in sequence on the display panel of the calculator.

In actual practice, we also provided for the users several sheets of back-up data showing historical student/employee ratios, spread of expenditure between salaries and non-salary operational expenditure, and state appropriations. These were provided in order to give the user the necessary background to make realistic assumptions for input to the model. Samples of the worksheet and back-up data sheets with hypothetical values are attached as appendices A-D.

The time to produce the program for the model was very minimal, probably four hours including de-bugging. For those interested, the actual program written for the Burrough's C3660 calculator is attached as Appendix E.

Our first use of this model was with our top executive officers. We reviewed the background data with them and then asked them to use the worksheets to propose assumptions for the 1976-77 budget. By use of this model, we were able to achieve an amazing amount of concensus with regard to the problems of the 1976-77 budget and possible approaches to their solution.

In fact, the top executive officers felt that the model would provide an excellent educational tool to be used with operational unit heads and representative employee groups. We therefore used the model with several of these groups with interesting results.

When employee groups entered a 8% or 9% compensation increase factor, it quickly became evident that this would result in less money available for operation--hardly a viable solution with inflation and spiraling utility costs. Those that opted for increased productivity by means of increasing student/employee ratios had to face the prospect of having fewer employees and the prospect of layoffs. Those that tried to vary enrollment quickly saw in very concrete terms the resultant effect on staffing and total revenue. Although this model does not deal with the issue, those that would drastically increase tuition rates had to face the question of the effect this might have on enrollment.

Our experience has been that a simple, desk-top calculator model can be a very effective tool to quickly focus the attention of interested audiences on specific problems and the net effect of possible solutions. Because feedback to possible solutions is very rapid, it can also be a very valuable aid in achieving a sense of group concensus.

The use of a desk-top calculator model as opposed to a computer model has advantages in ease of programming and being able to easily transport the calculator into many different kinds of physical locations.

Regardless of whether one uses a calculator or a computer for the modeling vehicle, simple and utilitarian models can provide an efficient method in aid of the human decision making process. If one is striving for concensus of opinion on solutions to quantifiable problems, simple models tend to minimize the possibility of debate over the model itself and allows attention to remain on the problems and possible solutions.

Appendix A

BUDGET MODEL WORKSHEET

Data Element	Base Year (1975-76)	Function	Run #1	Run #2	Run #3	Run #4
FYES	6,510	Assumption →				
S/F Ratio	20.6	Assumption →				
S/EAP Ratio	62.2	Assumption →				
S/COT Ratio	34.6	Assumption →				
Comp. Increase (1.XXX)	1.085	Assumption →				
Tuition Rate	14.00	Assumption →				
Appropriation	9,211,900	Assumption →				
Av. Fac. Comp. Av. EAP Comp. Av. COT Comp.	18,117 22,320 10,307					
FYE Faculty	315.20	Result →				
FTE EAP	104.65	Result →				
FTE COT	187.99	Result →				
Total Comp.	9,983,890	Result →				
Total Revenue	13,804,505	Result →				
Total CSSM, Eq., & Stud. Wages	3,820,615	Result →				
Above Line As % of Total Rev.	27.7%	Result →				

Notes:

Appendix B

GENERAL FUND DATA

	1970-71	1971-72	1972-73	1973-74	1974-75
Faculty FYE	153.6	170.4	219.8	265.5	287.6
E.A.P. FYE	51.0	65.2	80.3	79.4	85.6
C.O.T. & Maintenance Service FYE	120.2	143.9	152.8	169.9	172.3
	324.8	379.5	452.9	514.8	545.5

STUDENT/EMPLOYEE GROUP RATIO

	1970-71	1971-72	1972-73	1973-74	1974-75
FYES/Faculty	20.7	23.2	21.7	20.0	20.4
FYES/E.A.P.	62.2	60.6	59.3	66.7	68.7
FYES/C.O.T. - M-S	26.4	27.4	31.2	31.2	34.1
FYES	3,172	3,948	4,765	5,299	5,879

Appendix C

DATA ON EXPENDITURES

Fiscal Year	Salaries	Non-Salary Operational Expenditures		
		CSSM	Equipment	Total
1963-64	62.2%	31.5	6.3%	100.0%
1964-65	60.8	29.2	10.0	100.0
1965-66	64.9	28.9	6.2	100.0
1966-67	68.8	28.0	3.2	100.0
1967-68	73.5	23.7	2.8	100.0
1968-69	71.0	26.4	2.6	100.0
1969-70	72.9	23.6	3.5	100.0
1970-71	73.0	25.3	1.7	100.0
1971-72	72.9	25.6	1.5	100.0
1972-73	72.8	25.4	1.8	100.0
1973-74	67.1	29.3	3.6	100.0
1974-75	70.2	28.9	0.9	100.0
1975-76	73.6	26.0	0.4	100.0

Appendix D

GENERAL FUND

STATE APPROPRIATIONS PER F.Y.E. STUDENTS

	Year	State Appropriation	Actual F.Y.E. Students	$ Per Student
	1963-64	588,372	198	2,972
	1964-65	1,097,270	459	2,391
	1965-66	1,698,303	1,030	1,649
	1966-67	2,137,981	1,298	1,647
	1967-68	1,985,000	1,604	1,238
	1968-69	2,449,068	2,066	1,185
	1969-70	3,058,992	2,498	1,225
	1970-71	3,682,195	3,172	1,161
	1971-72	4,582,760	3,948	1,161
	1972-73	6,641,000	4,765	1,394
	1973-74	7,832,600	5,299	1,478
	1974-75	8,483,313	5,879	1,443
Budgeted	1975-76	9,211,900	6,360 (Budgeted)	1,448

PROGRAM INSTRUCTIONS

MODE SELE

STEP	INSTR.	DESCRIPTION	STEP	INSTR.	DESCRIPTION
1	M+	Enter fiscal year equated student enrollment	37	M+	
2	9		38	6	Store base year EAP compensation
3	÷		39	◇	
4	H	enter S/F ratio	40	3	recall # COT positions
5	M+		41	×	
6	1	store # fac. positions	42	1	base year average COT compensation
7	◇		43	0	
8	9	recall enrollment	44	3	
9	÷		45	0	
10	H	enter S/EAP ratio	46	7	
11	M+		47	M+	
12	2	store # EAP positions	48	6	store base year COT compensation
13	◇		49	C	clear display
14	9	recall enrollment	50	H	enter compensation increase ratio (1.XXX)
15	÷		51	M+	
16	H	enter S/COT ratio	52	4	store compensation increase ratio
17	M+		53	×	
18	3	store # COT positions	54	*	
19	◇		55	6	recall total base year compensation
20	1	recall # fac. positions	56	M+	
21	×		57	6	store new total compensation
22	1	average base year faculty salary	58	C	clear display
23	8		59	H	enter new tuition rate
24	1		60	+=	
25	1		61	1	
26	7		62	4	
27	M+		63	.	
28	6	store base year faculty compensation	64	0	
29	◇		65	0	
30	2	recall # EAP positions	66	—	
31	×		67	÷	
32	2	base year average EAP compensation	68	1	
33	2		69	4	
34	3		70	.	
35	2		71	0	
36	0		72	0	

(Continued)

TOR: LRN

TEP	INSTR.	DESCRIPTION	STEP	INSTR.	DESCRIPTION
73	+=		109	—	
74	×		110	M+	
75	6		111	8	Store operational funds
76	7		112	◇	
77	6		113	1	
78	M+		114	H	Display # faculty positions required
79	5	Store new tuition rate per FYES (increase)	115	◇	
80	6		116	2	
81	7		117	H	Display # EAP positions required
82	6		118	◇	
83	M+		119	3	
84	5	add present tuition rate per FYES	120	H	Display # COT positions required
85	◇		121	◇	
86	5	recall total new tuition rate/FYES	122	6	Display total compensation
87	×		123	H	
88	◇		124	◇	
89	9	recall total FYES	125	7	
90	M+		126	H	Display total income
91	7	store total tuition revenue	127	◇	
92	2		128	8	
93	6	"other	129	H	Display total operational funds
94	5	income"	130	÷	
95	0		131	◇	
96	0		132	7	recall total income
97	0		133	+=	
98	M+		134	H	Display operational funds as % of total
99	7	add 'other income'	135	*	
00	H	enter anticipated state appropriation	136	•	Clear all memory units
01	M+		137	EP	End program
02	7	add appropriation to total income	138		
03	C	clear display	139		
04	◇		140		
05	7	recall total income	141		
06	+=		142		
07	◇		143		
08	6	recall total compensation	144		

STORAGE MEMORIES	
0	
1	# faculty positions
2.	# EAP positions
3	# COT positions
4	compensation rate increase
5	New tuition rate in $/FYES
6	total compensation
7	total income
8	total operational funds available
9	enrollment in FYES

CONDITIONAL JUMPS

1	2	3	4	5	6	7	HLT

UNCONDITIONAL JUMPS

8	9	0	•	CHG SGN	C		

PROGRAM RECORDING

AFTER LAST END PGM INSTRUCTION IS ENTERED

1. INSERT CARD
2. DEPRESS RECORD
3. DEPRESS VERIFY
4. REMOVE CARD AND IDENTIFY

BUDGET MODEL