

Optimization of Financial Resources for IT Industry Through Goal Programming

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ABSTRACT

This chapter presents optimum solutions to the financial decisions of the INFOSYS, India, given the INFOSYS's basic financial constraints, legal obligations, and the long and short-run goals of the management.

KEYWORDS

Goal programming model, Goal constraints.

1. INTRODUCTION

In order to demonstrate the application of Goal Programming (GP) to top management level, financial planning data were obtained from INFOSYS. Infosys is the No.1 provider of integrated business, technology and process solutions on a global delivery platform. INFOSYS is a global services provider delivering technology-driven business solutions that meet the strategic objectives of our clients. INFOSYS has 40+ 'Centers of Excellence' that create solutions around specific needs of industries. INFOSYS delivers unmatched business value to customers through a combination of process excellence, quality frameworks and service delivery innovation. INFOSYS is the World's first CMMI Level 5 certified software services company from last 28 years. The total number of employees was 65,000 and 584 clients as of March 31, 2008.

The Relevant Information Is Given In The Following Table 1.

Table 1: Revenue and Expenditure Variables
Revenue 2008 in Rupees

	Constants or Variables	Assumed Value
Electricity Revenue	A_1X_1	–
Rate per KWH	X_1	–
Estimated Demand	A_1	Rs.42,356,417
Minimum or Maximum Desired Rate	A_{12}	5.02/KWH
Gas Revenue	A_2X_2	–
Rate per MCF	X_2	–
Estimated Demand (MCF)	A_2	6,11,698
Minimum or Maximum Desired Rate	A_{13}	21.32/MCF

Non-Operating Revenue	A ₃	Rs.6,215,698
Depreciation	A ₄	Rs.8,667,521
Amortization	A ₅	6.4
Construction Funds		
Bond Fund	X ₃	–
Assumed Upper Limit	A ₆	0.0
Improvement & Contingency Fund	X ₄	–
Ratio to Earned Revenue	A ₇	13.1%
Contribution From Customers	A ₈	Rs.2,167
Salvage	A ₉	596
Mutual Funds	A ₁₀	86.20
Antitrust	A ₁₁	88.69
Expenses 2007		
	Constants or Variables	Assumed Value
Bond Retirement	B ₁	Rs.54,213
Interest Payment	B ₂	9,215
Operating Expenses	B ₃	8,516,720
Payroll & Employee Benefits	B ₄	2,123,157
Technical Improvement	X ₅	–
Desired ratio to earned revenue	B ₅	0.007
Payments to the Stockholders – Preliminary	B ₆ C ₁	–
Ratio of Payments to Total Assets	B ₆	0.0210
Payments to the Stockholders – Final	X ₆	–
Ratio of Payments to Earned Revenue	B ₇	0.22
Construction	X ₇	–
Desired Construction	B ₈	Rs.9,456,672
Bond Reserve Fund	B ₉	4,123
Interest Reserve Fund	B ₁₀	3,245
Beginning and Ending Balances		
Total Assets at the Beginning of the Year	C ₁	Rs.68,964.12
Beginning Balance	C ₂	5670.76
Ratio of Surplus to Total Assets to Lower Rates	C ₃	0.31

2. GOAL PROGRAMMING MODEL

2.1 Priority Structure for Management Goals

P_1 = The first priority of the firm's top management, to avoid issuing any new bonds in 2007. The issued bonds in 2008, and there is no mood among the stockholders to consider new bonds. Therefore, P_1 is to be assigned to d_7^- and d_7^+ .

P_2 = The second goal of the management, to meet the current operating and payroll expenses, as well as payments of the bond principal, interest, and reserve fund expenses. However, management feels that the payment of operating and payroll expenses is twice as important as paying other expenses. Hence, $2P_2$ is assigned to d_1^- and P_2 is assigned to d_2^- .

P_3 = The third priority of the management, to provide the payments to the city. $2P_3$ is assigned to d_3^- (preliminary payments) and P_3 to d_5^+ (overachievement of the final payment to the city).

P_4 = The fourth priority factor, the avoidance of a shortage in the I & C fund. P_4 , therefore, is assigned to d_{11}^- .

P_5 = The fifth priority of the management, to secure desired funds for technological improvements of the firm's operation. Hence, P_5 is assigned to d_{10}^- .

P_6 = The sixth goal, to secure a desirable amount of funds for continuous construction projects. $2P_6$ is assigned to d_{12}^- to ensure that construction not going under the desired level, which is based on the bond and I & C funds. Then P_6 is assigned to d_{13}^- .

P_7 = The last goal of the management, at least to maintain the current electricity and gas service rates. Therefore, P_7 is assigned to d_8^- and d_9^- .

2.2 The Goal Constraints are Developed as Follows:

G1: Operating Expenses and Payroll

[Electricity revenue + Gas revenue + Bond fund + Beginning balance + Non-operating revenue + Depreciation + Contribution from customers + Salvage + Mutual funds + Antitrust funds] – (Operating expenses + Payroll & Employee benefits) ≥ 0

$$[A_1X_1 + A_2X_2 + X_3 + C_2 + A_3 + A_4 + A_5 + A_8 + A_9 + A_{10} + A_{11} - B_3 + B_4] \geq 0$$

$$[42,356,417 X_1 + 507,894 X_2 + 0 X_3 + 5670.76 + 6,215,698 + 8,667,521 + 6.4 + 2,167 + 596 + 86.20 + 58.0] - [8,516,720 + 2,123,157] \geq 0, \text{ or}$$

$$42,356,417 X_1 + 507,894 X_2 + d_1^- - d_1^+ = 21,509.0$$

G2: Payment of Principal, Interest and Reserve Funds

[Electricity revenue + Gas revenue + Bond fund + Beginning balance + Non-operating revenue + Depreciation + Amortization + Contribution from customers + Salvage + Mutual funds + Antitrust funds] – [Bond retirement + Interest payment + Operating expenses + Payroll and Employee benefits + Bond reserve fund + Interest reserve fund] ≥ 0

$$[A_1X_1 + A_2X_2 + X_3 + C_2 + A_3 + A_4 + A_5 + A_8 + A_9 + A_{10} + A_{11}] - [B_1 + B_2 + B_3 + B_4 + B_9 + B_{10}] \geq 0$$

$$[\$42,356,417 X_1 + 507,894 X_2 + 0 X_3 + 5670.76 + 5252357 + 7599478 + 6.4 + 1616.26 + 596 + 86.20 + 58.0] - [49169 + 5767 + 7537920 + 1179855 + 4,123 + 3,245] \geq 0, \text{ or}$$

$$42,356,417 X_1 + 507,894 X_2 + d_2^- - d_2^+ = 27,240.2$$

G3: Preliminary Payment to I & C Fund

[Electricity revenue + Gas revenue + Bond fund + Beginning balance + Non-operating revenue + Depreciation + Amortization + Contribution from customers + Salvage + Mutual funds + Antitrust funds] – [Bond retirement + Interest payment + Operating expenses + Payroll and Employee benefits + Bond reserve fund + Interest revenue fund + Preliminary payments to the stockholders] ≥ 0

$$[A_1X_1 + A_2X_2 + X_3 + C_2 + A_3 + A_4 + A_5 + A_8 + A_9 + A_{10} + A_{11}] - [B_1 + B_2 + B_3 + B_4 + B_9 + B_{10} + B_6C_1] \geq 0,$$

$$[42,356,417 X_1 + 507,894 X_2 + 0 X_3 + 5670.76 + 5252357 + 7599478 + 6.4 + 1616.26 + 596 + 86.20 + 58.0] - [49169 + 5767 + 7537920 + 1179855 + 4,123 + 3,245 + 0.0210 (72075.11)] \geq 0, \text{ or}$$

$$42,356,417 X_1 + 507,894 X_2 + d_3^- - d_3^+ = 34,231.5$$

G4: Preliminary Payments to The Stockholders

[Electricity revenue + Gas revenue + Non-operating revenue] – [Bond retirement + Interest payment + Operating expenses + Payroll and Employee benefits + Bond reserve fund + Interest reserve fund + Preliminary payments to the stockholders + Ratio of I & C fund to earned revenue [Electricity revenue + Gas revenue + Non-operating revenue]] \geq 0

$$[A_1X_1 + A_2X_2 + A_3] - [B_1 + B_2 + B_3 + B_4 + B_9 + B_{10} + B_6C_1 + A_7 [[A_1X_1 + A_2X_2 + A_3]]] \geq 0,$$

$$[42,356,417 X_1 + 507,894 X_2 + 5252357] - [49169 + 5767 + 7537920 + 1179855 + 4,123 + 3,245 + 0.0210 [72075.11] + 0.125 [42,356,417 X_1 + 507,894 X_2 + 5252357]] \geq 0, \text{ or}$$

$$39710872.575 X_1 + 571380.75 X_2 + d_4^- - d_4^+ = 51,375.1$$

G5: Final Payments to the Stockholders

[Final payments to the stockholders + Preliminary payments to the stockholders] \geq [Ratio of stockholders payments to earned revenue]

$$X_6 + B_6C_1 \geq [A_1X_1 + A_2X_2 + A_3]$$

$$X_6 + 0.0210 [72075.11] \geq 0.22 [42,356,417 X_1 + 507,894 X_2 + 5252357], \text{ or}$$

$$494797.42 X_1 + 71105.16 X_2 - X_6 + d_5^- - d_5^+ = 6,672.8$$

G6: Breakeven Constraint

[Electricity revenue + Gas revenue + Bond fund + Non-operating revenue + Depreciation + Amortization + Contribution from customers + Salvage + Mutual fund + Antitrust fund] – [Technical improvement + Final payments to stockholders + Construction + Bond retirement + Interest payment + Operating expenses + Payroll and employee benefits + Bond reserve fund + Interest reserve fund + Preliminary payments to the stockholders] = 0

$$[A_1X_1 + A_2X_2 + X_3 + A_3 + A_4 + A_5 + A_8 + A_9 + A_{10} + A_{11}] - [X_5 + X_6 + X_7 + B_1 + B_2 + B_3 + B_4 + B_9 + B_{10} + B_6C_1] = 0,$$

$$[42,356,417 X_1 + 507,894 X_2 + X_3 + 5252357 + 7599478 + 6.4 + 1616.26 + 596 + 86.20 + 58.0] - [X_5 + X_6 + X_7 + 49169 + 5767 + 7537920 + 1179855 + 4,123 + 3,245 + 0.0210 [72075.11]] = 0, \text{ or}$$

$$42,356,417 X_1 + 507,894 X_2 + X_3 + X_4 - X_5 - X_6 - X_7 - X_8 + d_6^- - d_6^+ = 40,052.5$$

G7: New Bonds

Bond funds \leq Assumed bond upper limit

$$X_3 \leq A_6$$

$$X_3 \leq 0.0 \text{ or } X_3 + d_7^- - d_7^+ = 0.0$$

G8: Minimum Electricity Rate

Electricity rate/KWH \geq Desired rate

$$X_1 \geq A_{12}$$

$$X_1 \geq 5.02/\text{KWH}, \text{ or } X_1 + d_8^- - d_8^+ = 5.02$$

G9: Minimum Gas Rate

Gas rate/MCF \geq Desired rate

$$X_2 \geq a_{13}$$

$$X_2 \geq 21.32/\text{MCF}, \text{ or } X_2 + d_9^- - d_9^+ = 21.32$$

G10: Technological Improvement

Technological improvement fund \geq Desired ratio of technological improvement to earned revenue
[Electricity revenue + Gas revenue + Non-operating revenue]

$$X_5 \geq B_5 (A_1X_1 + A_2X_2 + A_3),$$

$$X_5 \geq 0.007 [42,356,417 X_1 + 507,894 X_2 + 5252357], \text{ or}$$

$$X_5 - 176492.767 X_1 - 2539.47X_2 + d_{10}^- - d_{10}^+ = 11.4$$

G11: Final Payment to I & C Fund

I & C fund \geq I & C ratio to earned income (electricity revenue + gas revenue + non operating revenue)
+ (depreciation + amortization + contribution from customers + salvage + mutual funds + antitrust funds)

$$X_4 \geq A_7 [A_1X_1 + A_2X_2 + A_3] + [A_4 + A_5 + A_8 + A_9 + A_{10} + A_{11}]$$

$$X_4 \geq 0.125[42,356,417 X_1 + 507,894 X_2 + 5252357 + [7599478 + 6.4 + 1616.26 + 596 + 86.20 + 58.0]], \text{ or}$$

$$X_4 - 4412319.175 X_1 - 63486.75 X_2 + d_{11}^- - d_{11}^+ = 11,409.4$$

G12: Construction

Construction \geq Desired construction

$$X_7 \geq B_8$$

$$X_7 \geq 5945721, \text{ or } X_7 + d_{12}^- - d_{12}^+ = 5945721$$

The construction fund must be derived from the bond fund and I & C fund. However, there should be at least 5 million in the I & C fund for contingencies.

$$X_7 = X_3 [X_4 - 5,000.0] \text{ or } X_3 + X_4 - X_7 + d_{13}^- = 5,000.0$$

G13: Objective Function

$$\text{Min } Z = P_1 [d_7^- + d_7^+] + 2P_2 d_1^- + P_2 d_2^+ + 2P_3 d_3^- + P_3 d_5^+ + P_4 d_{11}^- + P_5 d_{10}^- + P_6 d_{13}^- + P_7 [d_8^- + d_9^-].$$

3. RESULT AND DISCUSSION

The solution will be obtained by using QSB⁺ computer software, the breakeven goal is treated as the lowest priority goal in order to identify the revenue requirements. The electricity rate (X_1) is increased to 0.04 per KWH. This situation occurred because of low priority that was assigned to maintaining the electricity rate. The gas rate (X_2) of 0.89 per MCF was achieved even though it was of a low priority goal. The result is due to the fact that we have not assigned any differential weights to the maintenance of existing rates between electricity and gas. The breakeven objective and construction fund goals were fully achieved. The goals to achieve the required payments to the operating and payroll expense and to principal, interest and reserve account were fully achieved. Therefore, it is important that management recognize the financial consequences of not raising the rates in order to weigh the utility of going to the council for an increase and to present a valid justification for any increase.

Table 2

$X_1 = 0.04$	$d_c^- = 0$
$X_2 = 0.89$	$d_c^+ = 0$
$X_3, \dots, X_8 = 0$	

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