

A Goal Programming Model For Public Accounting Firms

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ABSTRACT

The purpose of this paper is to indicate the usefulness of a management science tool to the problem of planning in public accounting firms. Specifically, an attempt will be made to relate goal programming to a planning problem of a public accounting firms.

KEY WORDS Public Accounting, Goal Programming

INTRODUCTION

Public accountants have, for years, encouraged clients to implement formal planning programs as an aid in the development of the business. However, until the past decade few accountants had implemented formal planning programs for their own practices. Because of this deficiency, witnessed the promulgation of written material in the area of planning for public accounting firms by the Institute of Certified Public Accountants and by individual accounting practitioners. [9]. Even though most of these publications emphasize the necessity for formal planning by public accounting firms, many firms still have not seriously considered such programs. The professional firm simply cannot continue to ignore planning since it empowers a firm to capacity more effectively and efficiently, to render better services to its clients, and to meet the challenge of a dynamic future [10]. Once a firm accepts the concept of planning in future growth deliberations, the footnote-cited publications offer useful guidance to the practitioner concerned with development of an approach to the planning process. For example, Robert Ellyson[10] recommends the following four-step approach to the planning process:

- (i) Determine the tentative general goals
- (ii) Study the past and present situations and, based on these, project what the future will be, assuming the trend continues

- (iii) De fine specific goals and tools for implementation and
- (iv) Design a reporting system and updating procedures

Although the need for formal planning is important to all accounting firms, it is critical in the larger firms. Planning in large accounting firms has become an extremely complex task, just as it has in industrial firms. Company management which public accountants serve increasingly have turned to modern management techniques, especially management science tools, as aids in planning and efficiently administering their limited resources. The purpose of this paper is to indicate the usefulness of a management science tool to the problem of planning in public accounting firms. Specifically, an attempt will be made to relate goal programming to a planning problem of a public accounting firm. Specifically, an attempt will be made to relate goal programming to a problem of a public accounting firm. With this goal in mind, a discussion of the goal programming technique was presented.

Goal programming, representing an extraordinary augmentation of direct programming, was discovered initially by A. Charnes and W. W. Cooper in their research of direct programming. These authors first introduced goal programming in their highly successful book, Administration Models and Industrial Applications of Linear Programming as a means of considering unsolvable linear programming problems. [4]. Ijiri Y. published a book on the goal programming technique in which he refined and reinforced the general notion of goal programming. [7] As a result of these efforts, goal programming has become an operational mathematical programming model.

As a practical technique, the goal programming approach first was applied by Charnes and others to advertising media planning. [7] This initial application was followed by those in the areas of manpower planning and aggregate production planning More recently, others have explored the application of goal programming to the areas of portfolio management,

municipal planning, and hospital administration[2]. Indeed goal programming is a relatively new technique, and its true potential has yet to be realized. The rather recent development of effective computer programs for the goal programming solution, the lack of which had hindered the technique's application in the past, has opened the avenues for possible application of this quantitative method to the more complicated management problems.

Multi objective criteria for processing capital structure decisions is identified and justified based on the findings of the past researches and the empirical survey conducted as a part of this study. In the empirical survey, CFOs as respondents are investigated for their goals, priorities, motivations, constraints and practices for capital structure decision making [6].

DATA OF THE PROBLEM

This study was carried out to designing an objective programming arranging model for a open bookkeeping firm in Bangalore. The model to be outlined is constrained to the arranging skyline of one year, although once a model for one year is developed, it could subsequently be expanded for a longer planning horizon. In addition to the limited planning horizon, certain other simplifications have been made. For example, the model is services functions could be added; the goals of the firm are not necessarily indicative of the goals any specific public accounting firm might have (and are not necessarily in the most desirable order for every firm); and possibly other factors which do not lend themselves easily to quantification, but which must be considered by firms n their planning processes, are absent from the model. Despite these obvious limitations, the model presented here should illustrate how the general goal programming approach may be applied to assist public accounting firms in their planning. Tables 1, 2, and 3 outline the information pertaining to the accounting firm needed for the model design.

TABLE-1 AUDIT PERSONNEL, WORKING HOURS, BILLING RATES AND GROSS AUDIT FEES

Position	Number Employed	Working Hr per Individual Per Year	Total Hr/ position year (50 weeks)	Chargeable Hrs per Individual Per Year	chargeable Hr/Posi- tion Year	Noncharge- able Hr/ Individual /year	Noncharge- able Hr/ Position Year	Billing Rates/Hr
Partner	3	2500	7,500	2000	6,000	500	1500	Rs40
Manager	6	2250	13,500	2000	12,000	250	1500	Rs30
Senior	12	2250	27,000	2100	25,000	150	1800	Rs20
Staff	30	2000	60,000	1900	57,000	100	3000	Rs15

Gross Audit Fees Earned for the Past Year:	
Partner:	6,000 hr @ Rs 40/hr = Rs 2,40,000
Manager:	12,000 hr @ Rs 30/hr = Rs 3,60,000
Senior:	25,000 hr @ Rs 20/hr = Rs 5,04,000
Staff:	57,000 hr @ Rs 15/hr = Rs 8,55,000
Total	Rs 19,59,000

TABLE-2 PROJECTED INFORMATION FOR NEXT YEAR BASED ON THE GOALS SET BY THE FIRM

1. Chargeable Hours (an increase of 5%)			
Partner:	6,000 × 105% =	6,300	
Manager:	12,000 × 105% =	12,600	
Senior:	25,200 × 105% =	26,460	
Staff:	57,000 × 105% =	59,850	
Total		1,05,210	
2. Total Hours by Position			
Partner	Chargeable	Nonchargeable	Total
Partner:	6,300	1,500	7,800
Manager:	12,600	1,500	14,100
Senior:	26,460	1,800	28,260
Staff:	59,850	3,000	62,850
Total			Rs1,13,010
3. Billing Rates/Hour (an increase of 5%)			
Partner:	Rs 40 × 105% =	Rs 42.00	
Manager:	30 × 105% =	Rs 31.50	
Senior:	20 × 105% =	Rs 21.00	
Staff:	10 × 105% =	Rs 15.75	

TABLE-3 Anticipated REVENUES AND EXPENSES

1. Gross Audit Fees			
Partner:	6,300 hr @	Rs 40.00/hr =	Rs 2,64,600
Manager:	12,600 hr @	Rs 31.50/hr =	Rs 3,96,900
Senior:	26,460 hr @	Rs 21.00/hr =	Rs 5,55,660
Staff:	59,850 hr @	Rs 15.75/hr =	Rs 9,42,638
Total			Rs 21,59,798
2. Expenses			
Salaries			
Partners	(Rs 30,000. X ₁)		
Managers	(Rs 20,000. X ₂)		
Seniors	(Rs 15,000. X ₃)		
Staff	(Rs 10,000. X ₄)		
3. Other Expenses			
Estimated amount for rent, depreciation, dues Insurance, secretarial salaries, supplies and other expenses			Rs 1,350,000

GOAL PROGRAMMING MODEL

Variables:

Let,

X₁= Number of review accomplices needed

X₂= Number of review administrators needed

X₃= Number of review seniors needed

X₄= Number of review staff needed

Y₁= New hourly charging rate for accomplices

Y₂= New hourly charging rate for managers

Y₃= New hourly charging rate for seniors

Y₄= New hourly charging rate for staff

Z₁= Chargeable-hours from clients in the 0-1000 chargeable hour range

Z₂= Chargeable-hours from clients in the 1001-5000 chargeable hour range

Z₃= Chargeable-hours from clients in the over 5000 chargeable hour range

Z₄= Average chargeable-hours from each type Z₃ client.

The Goal constraints are developed as follows:

A. Gross Audit Fees and Related goals. A goal set by the firm is to build gross review expenses by approximately 10% over the previous year. The achievement of this goal is dependent on three interrelated subgoals: (1) to increase chargeable hours by 5%; (2) to maintain the present level of

total nonchargeable hours per personnel classification; and (3) to increase the hourly billing rates per classification by 5%.

The partners in charge of the firm's planning function have decided that in order to achieve the subgoal of increasing chargeable hours by 5%, the firm must obtain new clients. A few of the means by which new clients may be obtained are referrals from present clients, speaking engagements by partners and other qualified people in the firm, and the publication of articles in accounting and business journals. All of these approaches require non-chargeable time to be spent by the firm's personnel.

To achieve the subgoal of increasing the hourly billing rates per classification by 5% over the past year, the firm's planning group believes that it is necessary to upgrade their auditing services. The primary means of upgrading services are to conduct professional development courses for the audit personnel and to engage in research aimed toward advancing the firm's auditing techniques. Quality services are also a prerequisite for obtaining new clients.

The planning group has determined that the present level of nonchargeable hours per position is adequate to provide the time necessary for obtaining the new clients, the upgrading of services, and the administrative work required to realize the projected increase in chargeable hours and billing rates. By maintaining total nonchargeable hours at the present level, the firm's efficiency will be increased. The increase in audit personnel necessitated by the increase in chargeable hours will reduce nonchargeable hours per employee.

1. Personnel Requirement

The imperatives for the quantity of review faculty needed (see Tables 1 and 2), where d_i^- represents working hours under the projected requirement and d_i^+ represents working hours in excess of the projected requirement, may be expressed as:

$$2500X_1 + d_1^- - d_1^+ = 7800$$

$$2250X_2 + d_2^- - d_2^+ = 14,100$$

$$2250X_3 + d_3^- - d_3^+ = 28,260$$

$$2000X_4 + d_4^- - d_4^+ = 62,850$$

2. Billing Rates

The imperatives for the new hourly charging rates, where d_i^- represents under-achievement of the projected billing rates (see Table 2) and d_i^+ represents over-achievement of the projected billing rates, may be expressed as:

$$Y_1 + d_5^- - d_5^+ = Rs42.00$$

$$Y_2 + d_6^- - d_6^+ = Rs31.50$$

$$Y_3 + d_7^- - d_7^+ = Rs21.00$$

$$Y_4 + d_8^- - d_8^+ = Rs15.75$$

3. Gross Audit Fees

The goal of a 10% increase in gross audit fees, where d_i^- represents underachievement of this goal & d_i^+ represents overachievement, may be expressed as (see Table 2 & Table 3):

$$6300Y_1 + 12,600Y_2 + 26460Y_3 + 59,850Y_4 + d_9^- - d_9^+ = Rs2,159,798$$

B. Management /Staff Ratio. The planning group accepts that it is alluring to keep up a proportion of no less than one administration faculty (accomplices and supervisors) to each five staff men (seniors and staff). This constraint, where d_i^- represents over achievement of the desired ratio and d_i^+ represents underachievement, becomes:

$$X_3 + X_4 - 5X_1 - 5X_2 + d_{10}^- - d_{10}^+ = 0$$

C. Distribution of Clients. Another firm goal set by the planning group is the attainment, of a desirable distribution of clients with respect to size expressed in chargeable hours. The firm would like to be in a position where:

- (1) 10% of their total chargeable hours comes from clients in the 0-1000 chargeable-hour range
- (2) 50% of their total chargeable hours comes from clients in the 1000-5000 chargeable-hour and
- (3) 40% of their total chargeable hours comes from clients in the over-5000 chargeable – hour range.

These constraints then become:

$$Z_1 - 0.01T + d_{11}^- - d_{11}^+ = 0$$

$$Z_2 - 0.50T + d_{12}^- - d_{12}^+ = 0$$

$$Z_3 - 0.40T + d_{13}^- - d_{13}^+ = 0$$

where T = total chargeable hours expressed as (see Table 1):

$$2000X_1 + 2,000X_2 + 2100X_3 + 1900X_4$$

d_i^- = chargeable hours from each classification of clients less than the desirable distribution

d_i^+ = chargeable hours from each classification of clients in excess of the desirable distribution

In addition to these constraints, it is desired that no one client account for more than 20% of the firm's total revenue, which may be expressed in terms of chargeable hours if it is assumed, for purposes of simplification, that each job requires a constant proportion of hours from each personnel classification. This constraint, which is relevant only for chargeable hours from clients in the over-5000 chargeable-hour range, may be expressed as:

$$2Z_4 - Z_3 + d_{14}^- - d_{14}^+ = 0$$

where d_i^+ and d_i^- indicate non accomplishment and accomplishment of the objective individually. Z_3 is the number of chargeable hours to 5000+ clients which ideally (per earlier constraint) would be 40% of total chargeable hours. Z_4 , the hours chargeable to the largest desirable client, can be no more than 20% of total. Consequently, $2Z_4 - Z_3$ should be not exactly or equivalent to zero.

D. Constraint on Seniors and Staff. It is desired that the number of senior and staff accountants not exceed 42 personnel. This constraint, where d_i^- represents the number of seniors and staff less than 42 and d_i^+ represents the number in excess of 42 becomes:

$$X_3 + X_4 + d_{15}^- - d_{15}^+ = 42$$

E. Net Income. It is alluring to give a base net salary of Rs 1, 00, 000 in the forthcoming year for the development and improvement of the company's accomplices. This constraint, where d_i^- represents under-achievement of the desired net income and d_i^+ represents overachievement of the net income goal, may be expressed as:

$$6300Y_1 + 12,600Y_2 + 26460Y_3 + 59,850Y_4 - 30,000X_1 - 20,000X_2 - 15,000X_3 - 10,000X_4 + d_{16}^- - d_{16}^+ = 1,450,000(1,350,000 + 100,000)$$

Priority Structure for Firm Goals

The partners in charge of the firm's planning function have set the following priority structure for firm goals:

1. Increase gross audit fees by 10% (P_1)
2. Increase chargeable hours by 5% (P_2)
3. Increase billing rates by 5% (P_3).
4. (a) Attain a desirable distribution of clients with respect to size expressed in chargeable hours (P_4).
 (b) Allow no one client to account for more than 20% of the firm's total revenue. This goal is considered to be twice as important as Goal 4(a) 2(P_4).
5. Keep up a proportion of no less than one administration staff to each five staff men (P_5).
6. Hold the number of senior and staff accountants to 42 (P_6).
7. Provide a minimum net income of Rs1, 00, 000 (P_7).

Objective Function

The objective function is formulated as follows:

$$\text{Min} = P_1d_9^- + P_2(d_1^+ + d_2^+ + d_3^+ + d_4^+) + P_3(d_5^+ + d_6^+ + d_7^+ + d_8^+) + 2P_4d_{14}^+ + P_4(d_{11}^+ + d_{12}^+ + d_{13}^+) + P_5d_{10}^+ + P_6d_{15}^+ + P_7d_{16}^+$$

Results and Discussion

The arrangement will be gotten by utilizing QM for WINDOWS bundle, which discussed as follows:

THE FIRST RUN

A. Goal		
1. Gross audit fee increase		Accomplished
2. Chargeable hour increase		Not accomplished
3. Billing rate increase		Accomplished
4. (a) Client distribution		Accomplished
(b) Revenue distribution		Accomplished
5. Management/staff ratio		Accomplished
6. Senior and staff ceiling		Not accomplished
7. Net income		Not accomplished
B. Variables		
$X_1 = 3.12$	$Y_1 = \text{Rs}42.00$	$Z_1 = 11,045.86$
$X_2 = 6.27$	$Y_2 = \text{Rs}31.50$	$Z_2 = 55,229.30$
$X_3 = 12.56$	$Y_3 = \text{Rs}21.00$	$Z_3 = 44,183.45$
$X_4 = 34.37$	$Y_4 = \text{Rs}15.75$	$Z_4 = 22,091.72$

The solution for the first run indicates that the following three goals were not achieved: (1) the chargeable hour increase, (2) the senior and staff ceiling, and (3) the desired net income. In order to achieve the optimum solution for all goals, 5897 staff hours in excess of the projected chargeable hour increase were required. A total of 46.93 senior and staff accountants were required in order to achieve the higher order goals. This figure represents an excess of 4.93 over the desired ceiling of 42. Net income of Rs 58, 734 was attained, resulting in a Rs 41, 266 underachievement of the net income goal of 1 lakh. The goal of a 10% increase in gross audit fees was over-achieved, but only the underachievement of this goal was considered critical.

The client and revenue distributions were achieved in this model, but this probably will not happen very often. For example, if 51%, rather than 50%, of the firm's total chargeable hours came from clients in the 1001-5000 chargeable-hour range, the optimum solution would not be achieved. Nonachievement of this goal would also be the case if one client accounted for 21%, rather than 20%, of the firm's total revenue. Since in neither case would it be rational for the firm to let a client go, the only solution to such a problem would be to change the applicable constraints in the model.

One of the more desirable features of goal programming as an aid in the planning process is that it allows management to review critically their priority structure for goals after an initial solution has been obtained from the planning model. After analyzing the results of the first run, the planning team has decided to modify their hierarchy of goals. This analysis and modification are reflected in the second run.

THE SECOND RUN

A. Modified Priority Structure for Goals

The firm's planning team has decided to give the net income goal the highest priority. All of the other goals remain in the same order except that this modification lowers each goal one priority level. The firm's modified priority structure for goals is:

1. Provide a minimum net income of Rs 1, 00, 000 (P_1).
2. Increase gross audit fees by 10% (P_2).
3. Increase chargeable hours by 5% (P_3).
4. Increase billing rates by 5% (P_4).
5. (a) Attain a desirable distribution of clients with respect to size expressed in chargeable hours (P_5).
 (b) Allow no one client to account for more than 20% of the firm's total revenue.

This goal is considered to be twice as important as goal 5(a) ($2P_5$).

6. Keep up a proportion of no less than one management work force to each five staff men (P_6).
7. Hold the number of senior and staff accountants to 42 (P_7).

B. Objective Function

The objective function for the second run then becomes:

$$\text{Minimize } P_1d_{16}^- + P_2d_9^- + P_3(d_1^+ + d_2^+ + d_3^+ + d_4^+) + P_4(d_5^+ + d_6^+ + d_7^+ + d_8^+) + 2P_5d_{14}^+ + P_5(d_{11}^+ + d_{12}^+ + d_{13}^+) + P_6d_{10}^+ + P_7d_{15}^+$$

C. Goals		
1. Net income		Accomplished
2. Gross audit fee increase		Accomplished
3. Chargeable hour increase		Not accomplished
4. Billing rate increase		Not accomplished
5.(a) Client distribution		Accomplished
(b) Revenue distribution		Accomplished
6. Management /staff ratio		Accomplished
7. Senior and staff ceiling		Not accomplished

D. Variables		
$X_1 = 3.12$	$Y_1 = \text{Rs } 42.00$	$Z_1 = 11,045.86$
$X_2 = 6.27$	$Y_2 = \text{Rs } 31.50$	$Z_2 = 55,229.30$
$X_3 = 6.27$	$Y_3 = \text{Rs } 21.00$	$Z_3 = 44,183.45$
$X_4 = 34.37$	$Y_4 = \text{Rs } 16.44$	$Z_4 = 22,091.72$

The solution for the second run indicates that once again the firm failed to achieve three of its seven goals, but a trade-off of scarce resources has been effected in order to achieve a more desirable goal. Two of the goals not achieved in the first run, the chargeable hour increase and the senior and staff ceiling, were also not achieved by identical amounts in this run. The third goal not achieved in the second run was the billing rate increase. In order to achieve the highest goal, a minimum net income of Rs1, 00, 000, it was necessary to raise the hourly billing rate for staff accountants from the desired rate of Rs15. 75/ hour to Rs16. 44/hour, which resulted in a deviation of Rs0. 69/hour from this goal. Hence,

a trade-off of scarce resources has resulted in the achievement of a more desirable goal.

Conclusions

An attempt has been made in this paper to relate the goal programming technique to the planning function in public accounting firms. Although it is recognized that this approach has both desirable features and limitations, its advantages seem to outweigh its limitations. Goal programming, as demonstrated by the planning model presented in this paper, can be effectively utilized where the firm has multiple, incompatible, and incommensurable goals. Goal programming does not impose on management a requirement that their goals be compressed into a uni-dimensional decision criterion.

Another advantage of goal programming is that it helps to identify the conflicting nature of firm goals and where trade-offs must occur in order to achieve the most desirable goals under the given constraints. The most desirable feature of goal programming is the opportunity it gives to the planning team to review critically its hierarchy of goals after an initial solution has been obtained from the planning model. Both the priority structure for goals and constraints can be modified to attain the most desirable set of objectives.

The most apparent limitation of utilizing the goal programming model in the planning process is that it requires the planning team to define, quantify, and establish an ordinal priority structure for the firm's goals. The goal programming model will provide the optimum solution only if there has been correct definition quantification, and ordering of goals. The effect of this limitation is mitigated somewhat when one considers that the efficacy of any type of formal planning model depends on the organized setting of objectives and the evaluation of alternatives. Although the model presented in this paper is not conclusive evidence that goal programming can be applied effectively to the planning process in public accounting firms, it does indicate that potential exists for such an application.

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