D-3437

MODELING A PROFESSIONAL SERVICE FIRM

by

John D.W. Morecroft
System Dynamics Group
Sloan School of Management
Massachusetts Institute of Technology
Cambridge, Massachusetts

Geoffrey P. Mott
Boston Consulting Group
Los Angeles, California

Zafer Achi
McKinsey and Company, Inc.
Paris, France

May 1983

MODELING A PROFESSIONAL SERVICE FIRM

John D. W. Morecroft
Geoffrey P. Mott
Zafer J. Achi
Sloan School of Management
Massachusetts Institute of Technology
Cambridge, MA 02139

ABSTRACT

Practitioners of Management Science have repeatedly confronted the problem of assessing the impact of variables such as job satisfaction and career aspirations on the performance of organizations. This problem is most acutely felt by service firms where the quality of 'output' is directly determined by factors that, because intangible, are difficult to define and control. In this article the authors use the methodology of System Dynamics to model the behavior of a professional CPA firm. The impact of qualitative variables on the behavior of a typical office is explicitly analyzed and translated into 'hard' economic terms. The results make some interesting observations about the key factors influencing long-term behavior in a people-intensive system, particularly in terms of the relationship between actions at senior levels and consequences further down the system. For instance, the way managers and partners allocate their time between apparently 'competing' activities is a critical factor influencing not only short-term behavior at junior levels but also the process whereby long-term judgments are made about the organization. Each activity has a different return profile (particularly with respect to time) and a different set of associated risks. The study contributes to an understanding of how critical aspects of human resource planning such as management time allocation contribute to the broader, strategic direction of the firm.

1. THE PROBLEM

Professional service firms struggle with the problem of turnover and its impact on morale and productivity. Human resource planning has consistently been unable to address itself to this problem in any but the most limited fashion. Personnel consultants abound, whole departments are created around human resource needs, yet still the problem persists.

The reason for this lack of headway in approaching human resource problems is obvious. The behavior of human assets is much less predictable than that of physical plant and equipment, which makes the development of a systematic framework for analyzing their behavior extremely difficult. Any meaningful 'model' of behavior must necessarily incorporate an evaluation not only of the obvious (deterministic) implications of actions and policies decided at one level of the organization upon all other levels, but also the less direct, often lagged, second and third order effects.

As a consequence human resource planning has failed to make an impact on the strategic planning of most firms. Instead human resource plans "fall out" of the product-market plans and profitability goals of the firm and take the form of ratio analysis (e.g. how many staff members do I need per

partner?), conceived of and executed in a totally unconstrained manner.

2. THE NEED

There is today very little published research about managing attrition in a professional service firm. Industry experts such as Don Giacomino at Marquette University and David Maister at Harvard have produced articles which examine the problem but their focus is exceptional [1], [2]. This is not surprising in view of the more general problem faced by human resource planning specialists. As explained by Craft (1980), the lack of theoretical foundation and, in particular, appropriate modeling techniques causes human resource planning to suffer from: "... a lack of involvement ...in strategic and organizational planning activity". [3], the major vehicles by which a company forms an integrated picture of its own future.

Among professional service firms particular concern is felt concerning the management of attrition by auditing firms. Their industry is currently going through major structural changes as a result of the decline in growth of demand for basic audit services. Concern for human resource matters has been provoked by the two developments arising out of these changes:

- a reduction in margins associated with audit services has focused attention on cost issues in an environment where recruiting costs, in particular, are escalating rapidly,
- changing personnel requirements and job technology ratios[1] as firms attempt to develop non-audit financial services.

The stakes here are high. Those major CPA firms that succeed in implementing a broader view of their professional mission will be in a better position to survive the inevitable shake-out in their industry. The watchword for any professional service firm is growth. For CPA firms growth will henceforth mean taking business from other CPA firms and financial service specialists. To do this effectively, developing and retaining a superior pool of professional staff is of paramount importance.

3. THE FRAMEWORK

The growing competitive pressures on CPA firms create a need for improvements in the management of human resource programs. A recent study undertaken by the authors used

(1) job technology ratios are defined as the ratio of Partners to Managers to Junior Staff appropriate for a given type of audit activity.

system dynamics modelling to create an integrated framework for the design and implementation of policies to enhance the performance of a big 8 CPA firm. The focus was on the individual office in the system and the model was built to be a generic representation of the behavioral forces that come together to determine performance in a typical office, with a series of constants reflecting the impact of exogenous factors (e.g. the underlying growth of the regional economy) upon the system.

Three crucial elements were brought together in developing this model in order both to depict the system as accurately as possible and to create the appropriate environment within the firm which would enable this work to be understood and integrated into the mainstream of the firm's strategic thinking. First, the organization's own data base was invoked as a source of preliminary information about the past history of personnel practices and their impact on performance. Looking at historical data made it possible to understand how accurately staff attrition had been predicted by the organization. For instance, a high but stable level of historical attrition would have shifted attention more toward the basic recruiting process of the firm, whereas the wide fluctuations in attrition levels that were, in fact, observed focused interest primarily upon the

internal structure of the human resource system and how it influences individuals once recruited.

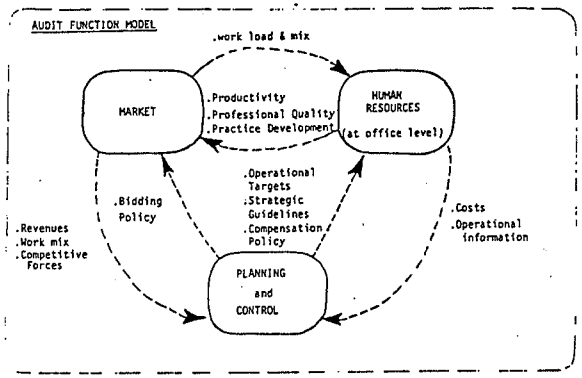
The second element of the study was extensive interviews with professionals at all levels to understand the mental models that influence decision-making processes. Given that the 'problem' (reference mode) seemed to be the internal operation of the human resource system, it was important to capture the informal decision mechanisms characteristic of the firm.

Thirdly, the principals of feedback structure were brought to bear upon the problem in order to understand how instability and decline are transmitted through the system and, therefore, how to influence behavior in such a way as to reduce instability and turn negative energy to positive.

4. THE MODEL

The model has three subsystems as shown in figure 1.

Figure 1: Subsystem Definition



The function of the Human Resource Subsystem (HRS) is to trace the career path of new professionals through the system and replicate the decision processes that determine at what point, if any, the individual will exit the organization. In so doing, the subsystem tracks the key variables that influence behavior: its outputs are productivity, professional work quality, practice development skills and operating costs.

The Market Subsystem is segmented into two components: basic audit work and non-audit services, which are interlinked since most non-audit services come from audit clients.

Hence, superior audit work enhances the prospect of non-audit services.

Non-audit services are desirable for two reasons: first, the margins are higher since the product is less of a commodity and its price can therefore be based upon 'value' rather than cost; second, audit professionals strive to become rounded business consultants, which is not possible in an environment where the workmix is entirely audit-related.

The Planning and Control Subsystem is an important piece of model structure. In addition to performing the internal accounting functions of the firm it takes in a large amount of operational and market information to determine bidding policy, salary levels and all the formal procedures for monitoring performance in the HRS. Its function is to shape the internal environment and external client base to meet the objectives of the top management of the firm - the partners.

4.1 THE HUMAN RESOURCE SUBSYSTEM

The model follows the career path of new recruits brought in at the staff level and describes the processes by which decisions are made about staying or leaving as these professionals move up the promotional ladder. Some of the decision functions involved reflect formal policy such as

the "up-or-out" philosophy of most professional service organizations. Others reflect informal management procedures, including the way managers and partners chose to allocate their time between competing activities such as engagements, administration, recruiting and staff development. Still others reflect the perceptions of those within the system about such factors as the attractiveness of attaining partner status and how career opportunities within the firm compare with other alternatives.

An important feature of the model is that it captures the sharp contrasts in the decision-making process of junior staff, managers and partners. Juniors assess overload, job satisfaction and career opportunities in significantly different ways from their more senior colleagues. Similarly, the time horizon for decision-making varies between levels, generally being shorter for junior staff members who tend to react more hastily to events around them, lacking the experience and longer purview to understand their true implications.(2)

The features outlined in this section represent a generic set of variables common to all offices in the client system. The model contains a multitude of indexing and table functions, which

---

(2) It does not always follow, however, that junior profes-

were specified in structured discussions with partners and office professionals.

Both linear and non-linear functions were developed. The non-linear functions reflect the stickiness and inertia of decision-making behavior in complex systems. In organizational and product-market environments, non-linear relationships tend either to be S-shaped (representing a diffusion and saturation process) or stairstep-shaped. In the latter case, the dependent variable is highly insensitive to large changes in the value of the driving variable and is only induced to change under extreme conditions. Such relationships characterize many of the policies and procedures of the firm which are implemented as Standard Operating Procedures (see Cyert and March [4]) and are, therefore, insensitive to all but the most extreme deviations from 'standard' or normal circumstances. One example of this kind of relationship is the reaction of the system to the quality of its staff. Under most circumstances it will continue to promote a "normal" fraction of staff professionals. Only when

sionals adopt a shorter time horizon than their more senior colleagues. One of the authors has analyzed the HRS in the Tax function of the same CPA firm and found the opposite situation. The time horizon for decision-making is primarily a function of the kind of individual (age, qualifications, outside experience) recruited into the system.

faced with extremely good or poor staff will it deviate from this norm.

In sum, most of the variables embodied in the model reflect fundamental features of most human systems, based as they are upon the input of a fairly homogeneous group of individuals with similar backgrounds and objectives. The features themselves are not unpredictable. The behavior of the system when all these features are brought together in an uncertain and 'sticky' environment is unpredictable. The following section examines some of the behavioral patterns observed in simulation runs of the model.

5. ANALYSIS OF MODEL BEHAVIOR

The behavior of the model was examined under conditions which simulated workload variations. The first set of conditions served to test the basic structural integrity of the model by subjecting it to a one-time increase in workload. In the absence of other shocks the system had to be able to absorb this step variation fairly smoothly to provide evidence of robustness.

The second set of conditions incorporated variations in workload of a more complex kind -- those induced by the seasonality of the business. These fluctuations were invoked as a sine function with 30% amplifications yielding a maximum monthly variation in workload of 185%. This simulated seasonal cycle closely approximated the observed seasonal pattern of a typical office where, because of the predominance of calendar year ends in most corporations, the workload is heaviest from November to March.

5.1 10% INCREASE IN WORKLOAD

In equilibrium the system exhibits steady improvements in productivity and profitability as a result of the unencumbered operation of the "up-or-out" policy. When subjected to a sudden 10% increase in workload the system adjusts rapidly and shows itself capable of taking advantage of "growth" environment to perpetuate still higher levels of performance. Some overstaffing occurs as the system interprets the workload increase as a sign of sustained growth. But the organization quickly loses its illusions about growth and eliminates overstaffing through a combination of natural attrition and lowered recruiting targets. Within a period of months the former equilibrium returns.

5.2 SEASONAL VARIATIONS IN WORKLOAD

Seasonality introduces an annual cycle of oscillations into the system. To a new recruit, these oscillations in workload come as a shock. To second or third-year professionals the unpredictable consequences of seasonality also come as a shock since they find themselves facing new job responsibilities and grappling with seasonality induced disturbances at several levels (e.g. in their attempts to 'supervise' more junior staff). In all, the impact of seasonality is far more complex than that of the one-time shock analyzed above.

The question of individual perspective is critical to understanding the detailed behavior of the simulation runs. Seasonality introduces disturbances of equal amplitude in both directions at the workload level. But individuals do not react symmetrically on the upside and on the downside. In fact, reactions to downside events are far more acute since individuals are not indifferent between the following alternatives:

1. work 70 hrs per week for 4 months and 30 hours per week for 8 months: average of 43 hrs/week
2. work 43 hours per week for 12 months.

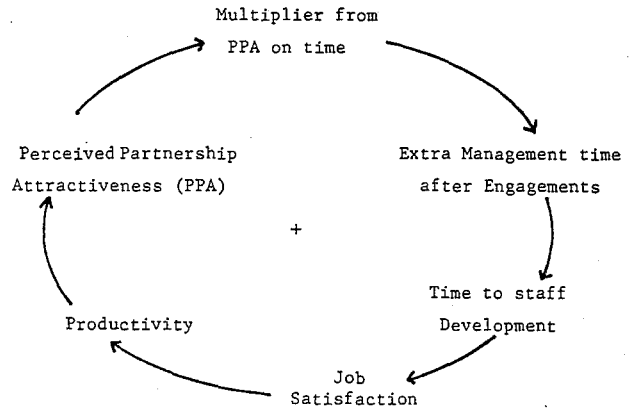
The consequence of this fundamental behavioral pattern is that -- each year -- the system deteriorates in busy season more than it improves in the off-season and thus faces each new year at a slight disadvantage relative to the previous year. A secular pattern of decline results where the powerful systemic trend overshadows the basic annual oscillations induced by seasonality.

To better understand the causes of declining performance it is helpful to consider the barriers to self correction of the problem. Declining performance might be arrested by allocating more management time to staff support and development which would work through morale and job satisfaction to improve productivity. However the system does not naturally work in this way. It lacks the flexibility to change the focus of management effort, tending instead to adopt a "firefighting" approach by increasing time spent on engagements. This approach implicitly accepts declining efficiency and attempts to work around the problem. Hence staff development efforts actually decrease in this scenario which aggravates the initial problem.

Moreover, as efficiency declines so do profits. Partner utilization increases as workload rises (more hours are required to do the same job) but the number of Partners

remains constant because there is insufficient profit to 'justify' more partners. As a result, partner quality of life decreases, reducing the attractiveness of the partnership to all professionals. This trend, in turn, reduces the level of commitment felt by partners and managers who begin to look less favorably on any activities beyond simply serving their client base. Thus, selling effort and staff development activity decline further,reinforcing the process described above. This complex behavioral circuit is outlined in figure 2 which shows the basic productivity loop augmented by the partnership attractiveness function to provide a powerful positive feedback mechanism.

Figure 2.



5.3 CLIENT REACTION TO SEASONALITY ANALYSIS

The client observed that the office which had been used to model the system had indeed experienced some of the patterns of disturbance indicated by the simulation runs but that performance had more recently been on an uptrend. Upon examination of historical records it became apparent that the amplification of the seasonal cycle had declined over time, since this office had succeeded in increasing off-season business and changing its mix of year ends. System behavior was then simulated across a range of seasonal amplifications and the results showed that, from year to year, performance improved as seasonality declined, despite the underlying trend toward decline along any given seasonal path.

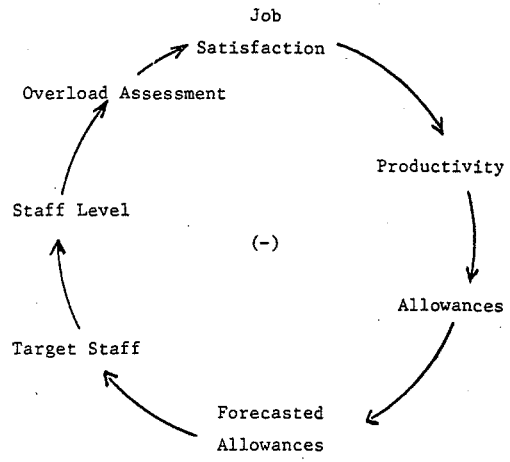
This observation was important because the client admitted that the seasonal amplification in this particular office was now as low as could reasonably be expected. An awareness that the natural trend of the system would henceforth be one of decline was helpful in focusing the clients' attention upon the fundamental question of how to neutralize the impact of seasonality.

5.4 NATURAL LIMITS ON THE SECULAR DECLINE

Left to itself this system produces a long-term pattern of decline. However, over a long period of time (6-8 yrs)

two mechanisms within the system combine to halt the decline in productivity and overall performance. The first mechanism is the existence of a negative control loop outlined in figure 3. This loop gains strength as the system's rate of decline slows after yr 5. (as a result of hitting the flatter part of the non-linear curves described earlier). The system becomes better able to forecast its own inefficiencies over time which leads to more accurate targets for staffing levels. This, in turn, begins to operate positively on job satisfaction by reducing overload and ultimately improves productivity somewhat.

Figure 3: Inefficiency Recognition Loop



The other mechanism is related to the 'up-or-out' philosophy of the firm. Although the attractiveness of the partnership declines and the system becomes less efficient over time, the average quality of professionals does not decline primarily because most poor performers leave an unsettled environment at least as quickly as some of the high performers who are attracted to better growth opportunities elsewhere. On balance, quality levels are maintained. In the long run the relative impact of quality on the system increases, gaining some ascendary over the variables that drive system performance downward.

The long cycle, therefore, shows a small upturn in performance toward the end of the simulation period.

5.5 SEASONALITY AND GROWTH - A CHALLENGE TO HUMAN RESOURCE MANAGEMENT

Growth combined with seasonal fluctuations in workload exacerbates the tendency of the system toward secular decline in productivity. The culture of the firm is responsible for this tendence. Growth requires investment of short-term profits to provide longer-term benefits. Lower short-term profits send negative signals to the Planning and Control subsystem inclining it to resist adding new partners (i.e. adding claims to the shrinking profit pool). As a result, the existing partner and manager group becomes overloaded

even though more managers are promoted. Both levels begin to lose their motivation. Partner quality of life declines. Managers' perception of their career opportunities declines (many new managers, few promotions), and the turnover of managers rises rapidly. Loss of motivation leads to reduced commitment to the organization net of engagement time. The situation deteriorates in much the same way as described above but at a faster pace.

5.6 FAILINGS OF THE PLANNING AND CONTROL SUBSYSTEM (PCS)

The primary functions of the PCS are: to ensure that the system has adequate capacity to execute the workload projected for the following time period; and to take the necessary steps to implement firm policy with respect to longer-term growth. Additionally the PCS develops the necessary procedures to translate firm personnel policy into reality such as installing systems for monitoring an individual's professional development.

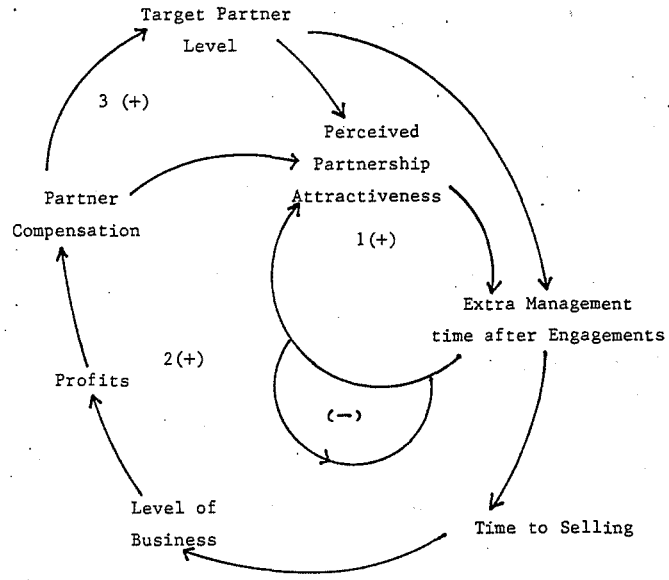
Surprisingly, system performance exhibits a similar patter of secular decline whether or not the Planning and Control system is active. In fact the absolute magnitude of the decline is greater under active planning! The key to this paradox lies in the planning process for promotions into the partnership, hinted at in the previous section.

The PCS sets its targets for the number of partners partly as a function of current profit levels within an office. Such an approach might work well in a simple environment where the yardsticks for measuring performance are unambiguous: (price, cost, margin and volume are all definable; the objective function: maximize profits is quantifiable; responsibilities can be traced within a simple hierarchy). However, in a service organization where the hierarchy of responsibility and 'causality' is much less clearly defined, such an approach is dangerous.

Figure 4 describes how this policy affects the feedback structure of the HRS. The basic productivity loop (1) is augmented by two further loops. Loop 2 describes how increased management time to engagements naturally reduces time available for selling which ultimately works though to reduce the level of business activity, profits and, therefore, partner compensation. Lower partner compensation makes the partnership less attractive which closes the loop. Loop 3 describes the process whereby, in an attempt to maintain partner compensation, the system targets a lower number of partners. The effect is, however, quite the opposite since a decline in the number of partners exacerbates the time allocation problem which, in turn, drives

system performance down further still. The existence of these two loops explains why the decline is greater under active planning. The basic productivity problem is vitiated by a policy which is attempting to maintain partnership attractiveness, yet only succeeds in reducing it further.

Figure 4: Impact of PCS on feedback structure



6. POLICY INITIATIVES

Several directions for policy making emerge from this analysis. The most obvious is to decouple the number of partners planned for an office from short-term profit considerations and institute, instead, a system of promotion on the basis of demonstrated potential (a proactive vs reactive promotional strategy). In simulation runs this single policy reverses the secular downward trend and, after a short period of declining partner profitability, the performance of the system improves dramatically over the next 7-8 yrs. It should be pointed out that this run demonstrates well why such a policy is not currently pursued. The short-term deterioration in partner profits is a powerful force in maintaining the status quo when the positive value of the policy cannot be projected over a longer time horizon.

Policies which stabilize workload also improve performance. Increased stability enhances managements' ability to allocate time to staff development as well as to selling. Such policies are implemented by tampering with the basic "up-or-out" philosophy of the firm, and establishing new levels such as paraprofessional staff (junior staff level individuals who have no career ambitions) and career managers (individuals who will never be promoted to partner).

For example, a policy of employing paraprofessional staff is successful, within limits, because it introduces into the system a group of individuals who do not enter into the feedback structure of the HRS because they are not on a career path and do not require much management attention. The limits on such a policy are twofold: one is that such individuals make a much more limited commitment to the organization than career professionals; the second is that they are less flexible than career professionals in terms of work scheduling and, therefore, can introduce operational inefficiencies into the system.

A variety of such policy initiatives have been analyzed and variations proposed to help improve system performance. With the current model it is possible to evaluate the specific implementation of individual policies as well as the order in which to effect a series of policies under consideration. On the other hand, certain policies have been thrown out as a result of the insight afforded by the model into the likely reaction of the system. One example of such a policy is aggressively discounting business in the off-season so as to reduce the magnitude of seasonal swings and increase profits. This policy leads to a decline in system performance since it attracts the most

price sensitive clients who generally offer less scope for high quality non-audit work. The resulting unattractive workmix causes a negative reaction in the human resource subsystem, which more than offsets the marginal revenues from such clients.

7. SUMMARY

Depending on the market environment of the office and its competitive position in that market a different set of policies and priorities can be defined. The logic behind a matrix of differing office objectives is made compelling through the kind of analysis that the System Dynamics methodology makes possible. In such cases the methodology is a powerful enabling device to help business executives understand the variety of pressures that exist in different offices and hence to form appropirate, differentiated policy guidelines. Without the ability that System Dynamics provides to bring human resource systems into the domain of rational planning systems a professional service firm is unlikely to be able to develop meaningful, customized policies and procedures for every office or market environment. In the corporate arena one of the most exciting challenges for students of System Dynamics is to help in facilitating this process. The challenge is to make the

approach accessible to managers by focusing on the logical interpretation of the critical structures and how they influence behavior. In this context some of the most important tools of the approach are the Policy Structure diagram and the feedback loop.

REFERENCES

[1] Don E. Giacomino: "Toward Managed Attrition in Public Accounting," Ohio CPA Journal, Summer 1982, pp. 131-135.

[2] David H. Maister: "Balancing the Professional Service Firm," Sloan Management Review, Vol. 24, No. 1, pp. 15-29, Fall 1982.

[3] J. A. Craft: "A Critical Perspective on Human Resource Planning." Human Resource Planning, November 1979, pp. 37-49.

[4] R. M. Cyert and J. G. March: A Behavioral Theory of the Firm. New Jersey: Prentice-Hall, 1963.