

# THE DYNAMICS OF COLLEGIAL SYSTEMS IN THE DEVELOPING COUNTRIES

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## ABSTRACT

This Paper develops a conceptual model of a collegial system working without external adjudication or an institutional charter governing the conduct of its operations. The model is applicable to many of the academic and research organizations established in the developing countries, which have attempted to emulate the equivalent professional organizations in the advanced industrial countries but have achieved low efficacy. The analysis suggests that an unadjudicated collegial system is not sustainable, for it will tend to create an authoritarian administration which will impair the collegial norms and misallocate scarce resources to the activities fueling bureaucratization and expansion of administrative scope, while professional autonomy, innovativeness and self-actualized behavior are suppressed. Professional conduct tends to be more-value rational than the bureaucracy since it is subject to reviews by external peers. Thus, legitimization of referent power is essential to creating value-rational decisions which assure a balanced resource allocation that sustains a collegial system. Limiting scope of the administration through an external scrutiny of its conduct or a charter appears to facilitate this process.

**Key Words:** Higher education, research and development, organizational behavior, developing countries, professionalism, collegiality, system dynamics, computer simulation

## INTRODUCTION

There have lately been placed a heavy emphasis on higher education, research and development in the developing countries. Many universities, institutes and research and development organizations attempting to emulate similar institutions in the advanced industrial countries have been established at national, non-government and multilateral levels. Many more are being planned. The efficacy of these organizations is, however, generally low since they often are unable to maintain collegial values essential to professional performance.

Often, collegial organizations deteriorate from the development of a power struggle between the instrumental and value-rational interests over which collegiality deteriorates. In particular, institutions that are located in a monopolistic market or a non-competing environment that create internal rather than external terms of reference and those cut off from adjudication by professional peers through limiting referent power of the professionals, whose performance is subject to review by the external peers, may rarely be able to maintain collegial values that sustain them in the long run. Such organizations run high risk of failure.

This paper attempts to understand the processes creating decay in professional organizations using a formal model of the decision relationships underlying the main functions of a collegial system. The fragmented information concerning the behavioral relationships found in the literature serves as a basis for constructing a formal model using *system dynamics* method (Forrester 1980, Saeed 1991). The model can be generalized to subsume institutions employing professionals and engaged in the production of intangible services. It incorporates three types of decision processes existing in a collegial system: those governing resource allocation, production, and value creation. Experimentation with this model helps to understand the nature of the internal trends potentially existing in a collegial system. Extended experimentation also helps to identify appropriate entry points for maintaining professional health in collegial systems.

The study suggests that the absence of an organizational norm, a charter or a means of adjudication by external peers, that should curtail administrative scope and protect the prerogatives of the professionals to referent power, a collegial organization would tend to centralize operations over the course of its growth and pursue instrumental rather than value rational interests, which not only makes it difficult to maintain a healthy professional environment but also misallocates resources to unproductive activities that may eventually lead to a closure due to economic reasons.

#### THE PERFORMANCE OF COLLEGIAL ORGANIZATIONS

Collegial organizations consist of groups of professionals creating intangible products or services. Institutional norms governing the conduct of the actors in collegial organizations develop out of a balance between the referent power of the externally adjudicated professionals that upholds value-rationalism and the manifest power of the largely unadjudicated administrators subscribing to instrumentalism. A university is a typical example of a collegial system where the referent power of the faculty must maintain a value-rational decision process so instrumental interests are kept at bay and a high degree of professional health is maintained. Collegiality is thus an organizational value rationalizing referent power. Max Weber defined many organizational arrangements under which the *monocratic character of authority* is limited by the *principle of collegiality* (Weber 1978).

The literature on the performance of the collegial organizations is fragmented and provides static views of the organizational processes rather than a coherent theory that may explain the diversity of the patterns experienced. Gouldner's seminal work on manifest and latent roles in collegial systems identified two important latent role models, cosmopolitans and locals, which seemed to influence the performance and the inner coherence of an organization (Gouldner 1957). Gouldner did not, however, analyse the dynamics of interaction between those latent roles and how this might affect the economic and professional health of the collegial system in the long run. In a more recent study, Benvensite (1987) has emphasized the need to cultivate cosmopolitan professional roles to maintain innovation in an organization. He does not, however, clearly identify an organizational process that should accomplish this, but seems to leave intervention to leadership. Unfortunately, intervention by leadership often requires centralization of decision-making and concentration of power that will often create ruthless pursuit of instrumental interests which is further intensified in the presence of machiavellian attitudes (Jennings 1960).

The consequences of the loss of collegiality in a university manifest both in the economic and value-related indicators. Indeed, the studies on the mortality of the university have focussed both on economic and value related attributes, although separately and using a variety of measures. The economic attitudes addressed include shrinking student enrollment (Freeman and Hannan 1975) and shrinking revenues (Cameron 1983). The value related attitudes addressed are the maladaptation to a shrinking environmental niche (Greenhalgh 1983), professional stagnation (Whetten 1987), loss of legitimacy (Benson 1973), and deteriorating and unsatisfactory organizational performance that causes members and clients to become disgruntled (Hirshman 1970).

Zammuto (1982) has examined changes in the population of US colleges and universities that occurred between the early 1970's and the early 1980's. He suggests that the decline and failure rates are strongly associated with the institutional environment. Other investigators of the causes of decline have addressed the internal forces that may explain the onset of a downturn. Since academic institutions produce an intangible product, their economic and value-related attributes may be strongly intertwined. Truly, the propositions concerning the internal causes of success or failure of a collegial system often attribute the loss of value-rationalism, which eventually results in the loss of a collegial culture, to bureaucratization and centralization processes that precipitate economic conditions causing decline (Waters 1989). In general, the fallibility of centralizing the decision process in professional organizations is quite widely recognized. Clark (1990) suggests that in order to sustain a productive academic environment, officially mandated orders should be avoided and both strategic and operational decision making decentralized to the point where the responsibility for institutional advancement is largely localized.

A formal analysis of the value processes that affect economic growth in the developing countries through changes in the commitment of a government to public welfare and consolidation of its own power appears in Saeed (1990). Saeed's model focuses on the allocation of resources to the production and control activities and on the consequences of the functioning of the political system under such allocation for the subsequent rounds of resource allocation. These processes entail strong feedbacks affecting the value orientation of a government. These feedbacks can create functional or dysfunctional outcomes depending on the decision structure of the government organization. An attempt is made in this paper to apply the concepts underlying the resource allocation and value maintenance processes developed in Saeed (1990) to a formal collegial organization.

#### THE FORMAL COLLEGIAL ORGANIZATION: A SYSTEM DYNAMICS MODEL

A collegial system involves both production and value maintenance processes, although their performance cannot be measured on a cardinal scale (Weber 1978). The cause and effect relationships governing these processes may be identified on the basis of the existing theoretical and empirical information, which exists in fragmented form. A formal system dynamics model of these processes is developed in this section for experimentation to understand the dynamics of a collegial system. Following the flow diagramming convention of the system dynamics method, the rectangles represent stocks, the valve symbols flows and the circles intermediate computations. The circles containing a ~ represent nonlinear behavioral relationships (Richardson & Pugh 1981, Richmond et. al. 1987, Saeed 1991). This model is implemented on an Apple Macintosh personal computer using iTHINK software.<sup>1</sup> Three main decision systems discussed below are covered by the model. These are: resource allocation between professional and administrative activities, production and organizational health, and value creation. Technical details and a computer program listing can be obtained from the author on request.

##### *a) Resource allocation between professional and administrative activities:*

Figure 1 illustrates the processes allocating resources between administrative and professional activities in a collegial organization.

The allocation of the total budget between the two activities depends on *economic health*, *value rational pressures* and *instrumental pressures*. When perceived economic health is good, administrative activities tend to expand in preparation for a larger expected size. When *economic health* is bad, administration may be reduced, although, not directly in proportion to economic health (Katz and Kahn 1978). The *instrumental pressures* increase allocations to administration, while *value rational pressures* tend to limit this allocation in an effort to maintain the support for the professional activities. The total *budget* of the organization adjusts towards a *potential budget* after a delay representing time elapsed between sales effort and its fruition. *Potential budget* is determined in the first instance by *production*. However, administrative *expediency* representing marketing or fund-raising effort will increase the production to potential budget yield, while a lack of *innovativeness* in the institution will reduce market appeal thus limiting the effectiveness of the sales effort. *Expediency* depends on the size of the administrative resources.

##### *b) Production and Organizational Health*

Figure 2 shows the processes underlying production and the determination of organizational health. *Professional resources* represent the production workforce of the collegial system. Production, although difficult to measure in any tangible terms, can be assumed to depend on the professional resources and their *productivity*.

Productivity is a function of *innovativeness* and *organizational citizenship* — values depending respectively on professional health and authoritarianism experienced in the organization.

<sup>1</sup> iTHINK is a trade mark of High Performance Systems, 45 Lyme Road Suite 300, Hanover, NH 03755, U.S.A.

Organizational *citizenship*, an indicator of the employee altruism for the organization contributes to improving the *productivity*. *Citizenship* is suppressed by the practice of *authoritarianism* manifest in a large administrative *scope* since it limits the opportunities for self-determination (Organ 1988). *Economic health* is the ratio between the actual and the expected levels of production. After a certain recognition delay, the *economic health* comes to influence the budget allocation decisions as described in section (a) above.

### c) Value Creation

In addition to production, collegial organizations must also support a value system that maintains a collegial culture allowing referent power of the professionals to prevail upon the manifest administrative authority. A strengthening of the collegial culture will promote value rationalism in the organization which will tend to give priority to the professional agenda. A weakening of the collegial culture will create instrumentalism that will lead to an increased emphasis on control while also suppressing self-actualized behavior and thus alienating professionals (Benvensite 1987, Waters 1989). Figure 3 shows the relationships underlying the value creation and maintenance processes.

Figure 1: Resource allocation in a collegial system

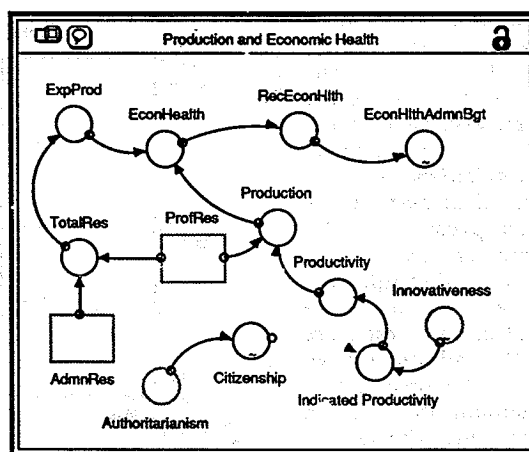
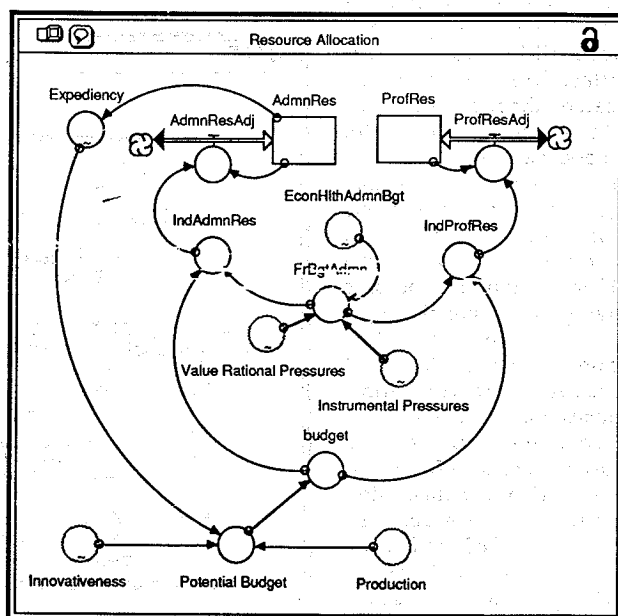
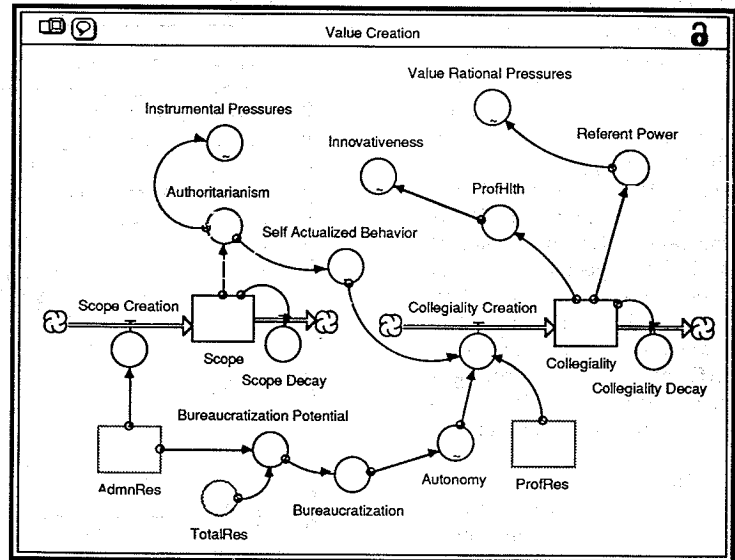


Figure 2: Production process and organizational health

Figure 3: The value creation and maintenance system

Values and attitudes in an organization must be constantly reinforced as otherwise they are susceptible to decay. *Collegiality* is a value created through the free interaction of the professionals, which is made possible when a reasonable degree of *autonomy* exists while the organizational environment also supports the self-actualization processes driving professional effort. However, the rigidities created by a high degree of *bureaucratization* limit *autonomy* and the alienation of the professionals from the decision process created by an authoritarian administration suppresses *self-actualized behavior*. *Collegiality* maintains *referent power* that generates *value rational pressures*. It also breeds *professional health* necessary for preserving *innovativeness* in the organization.



*Authoritarianism* is bred by *scope* which represents the extent to which the administrative processes govern professional functions. Once created, *authoritarianism* leads to *instrumental pressures* while also suppressing *self-actualized behavior*. *Scope* is created through the mobilization of the administrative resources when the administrative functions of the organization are unadjudicated by an organizational charter or censure by external peers.

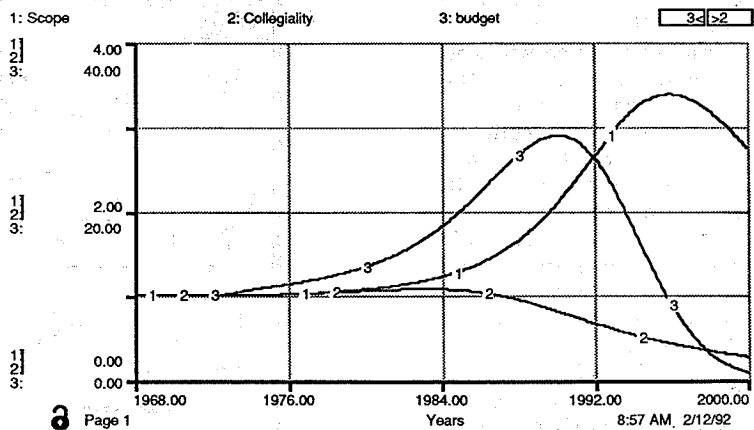


Figure 4: Key economic and value related indicators over the life cycle of the unadjudicated collegial system

## THE DYNAMICS OF THE UNADJUDICATED COLLEGIAL SYSTEM

The model of the last section is parameterized in a way that an equilibrium exists in all stocks. The initial values of collegiality scope and bureaucratization thus issued are assumed to be moderate and are scaled at unity. The total amount of initial resources is assumed to be 10 units. 80% of these resources are allocated to professional activities and only 20% to administration. The system is disturbed by stepping up the ambient production to budget ratio implying stepping up of the fund raising or marketing effort or its yield from a change in the environmental support.

Figure 4 shows a simulation of the model over a hypothetical 32 year period starting in equilibrium in year 1968 and stepping up the production to budget ratio by 20% in year 1972. There is a healthy increase in budget from 10 in the year 1972 to about 30 in year 1990, but thereafter, a rapid downturn is experienced. Scope and collegiality change very little until year 1980, after which, scope rises rapidly while collegiality decays. Scope continues to rise even after budget has turned down.

Figure 5: Changes in selected value indicators

The plots of the changes in other facets of value orientation appear in Figure 5 and those concerning the power structure and healthiness in Figure 6. It is seen that both bureaucratization and authoritarianism, which stifle collegiality creation rise while values supporting collegiality, autonomy and self actualized behavior, decline. The net effect of these changes in value orientation is devastating for the organization. Innovativeness and autonomy plunge, while both economic health and professional health decay. Expediency rises as much as it can, but is unable to sustain budget since productivity is curtailed by falling innovativeness and impoverished citizenship behavior. The decline in budget eventually atrophies the organization. Although such dynamics may often be attributed to the personalities of the leadership in charge over different parts of the pattern, it should be noted that the model only displays a continuation of the long term trends arising out of its durable decision structure that does not include any personality-related changes.

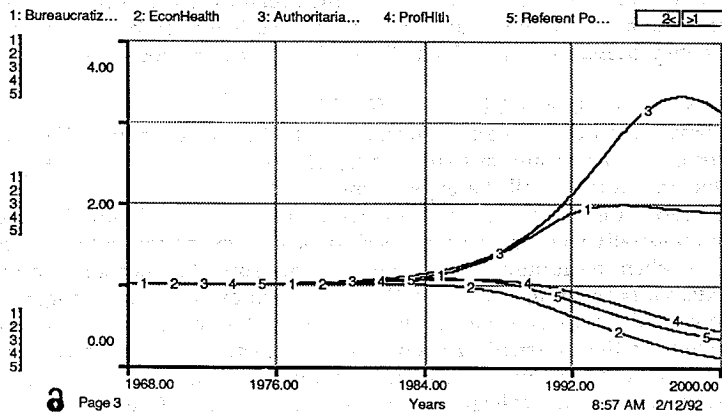
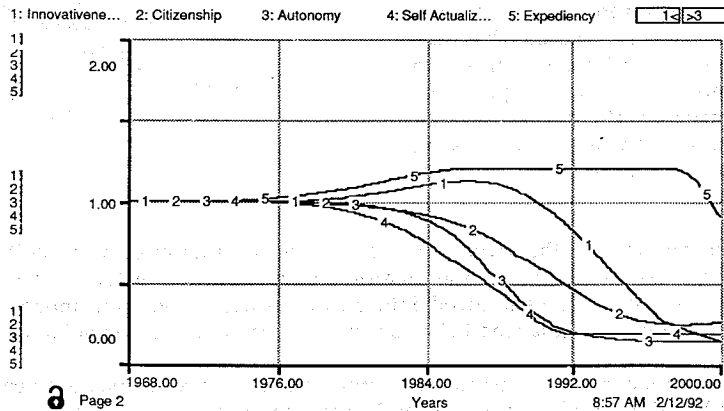
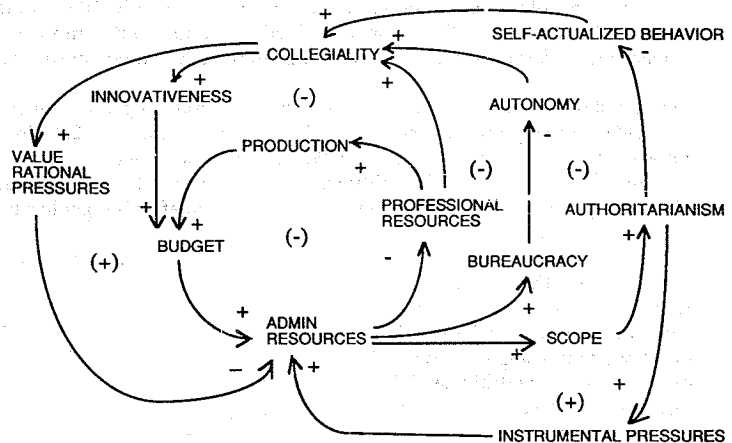


Figure 6: Changes in power structure and healthiness

Figure 7: Feedback processes in the collegial system

The pattern exhibited in Figures 4, 5 and 6 can be explained by examining the feedback loops in the system shown in Figure 7.

The limits to growth arise at the outset due to a rising allocation of resources to the administrative activities over periods of good economic health and the reluctance to cut down administrative budget during periods of poor health. These limits are further accentuated due to the rigidities created by the expanding bureaucracy which reduces autonomy, thus curtailing the development of collegiality and the ensuing commitment to value-rationalism.



Furthermore, in the absence of a charter or a tradition of peer audit providing adjudication of the organization's activities, the increased bureaucratization fuels the creation of scope which allows operations to be centralized into an authoritarian working mode. This alienates professionals, inhibiting self-actualized behavior and further stifling the creation of collegiality.

Authoritarianism also promotes instrumentalism and an emphasis on control. These developments not only reduce productive resources, but also limit their yield. A downturn is precipitated when budget begins to decline due to a low level of production and poor professional health and innovativeness that attracts fewer and fewer resources to the organization. Expediency will rise with the increase in scope creating much promotional effort but its yield is limited by the falling production and innovativeness. These processes snowball due to the positive feedback loops shown in Figure 7.

## WHAT SUSTAINS COLLEGIAL SYSTEMS?

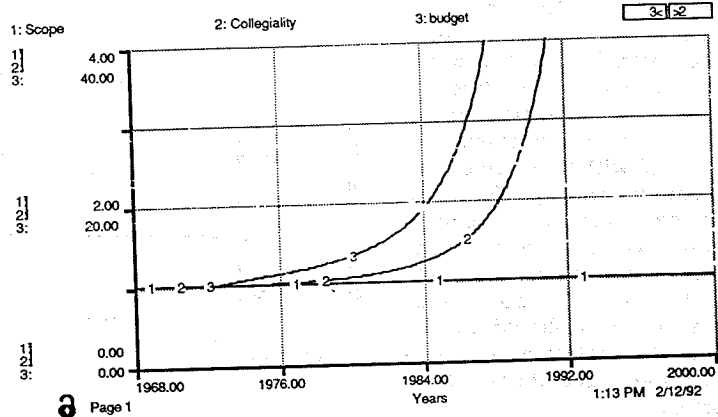
Many experiments were performed with the model to identify a critical element in the decision structure that should sustain a collegial system both professionally and economically. A complete documentation of all the experiments would be cumbersome. It is discovered that there exist two powerful insidious positive feedback loops shown in Figure 7 created due to the ease with which administrative resources can be used to yield an expansion in scope. These feedback loops can function only when the administrative actions are not subject adjudication through an organizational charter or external peer audit, which is often possible in autonomous non-government organizations located in monopolistic markets and not having a well developed collegial tradition of legitimizing the referent power of the externally reviewed professionals. The presence of multi-ethnic and multi-cultural variety in the membership of the organization may often make it further difficult to adhere to a generally accepted collegial order, which may further facilitate the expansion of scope.

The presence of an institutional charter and adjudication of the services produced as well as the organizational norms and practices by external peers would imply that the relationship between scope creation and administrative resources is severed.

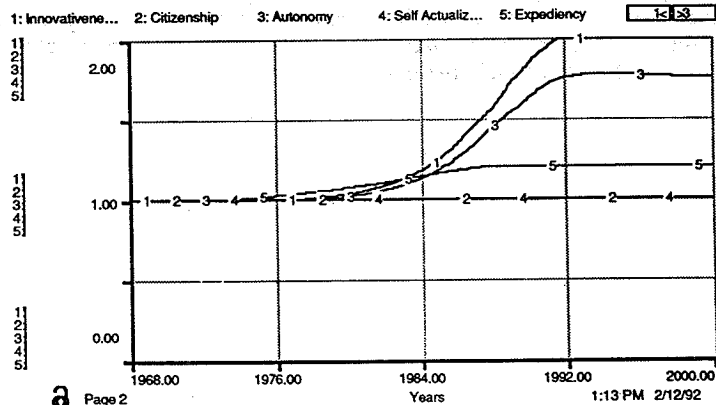
Figure 8: Key economic and value-related variables in the revised system

Figures 8, 9 10 show simulations of the model with this change. It is observed that the organization experiences sustained growth with a value system conducive to professionalism, a balanced power structure robust levels of economic and professional health. The change basically helps to maintain an input into the decision process from the value rational pressures which preserves a balanced allocation of the resources between professional and administrative sectors of the organization. There indeed would be other constraints to growth due to the processes not covered by the model but the catastrophic decline arising from misallocation of resources and the stifling of collegial values shown in the earlier set of simulations is eliminated.

It should be recognized that a change in the administrative structure of an unadjudicated collegial organization may not be possible without a large scale change in the leadership and the administrative coalition it has formed. When its power is limited, an existing administrative coalition will fear much animus from the professionals because of the past hostilities between the two groups which are bound to develop under an authoritarian administrative role. This coalition will strongly resist any decentralization drive, although it might give this move a lip service.



Page 1



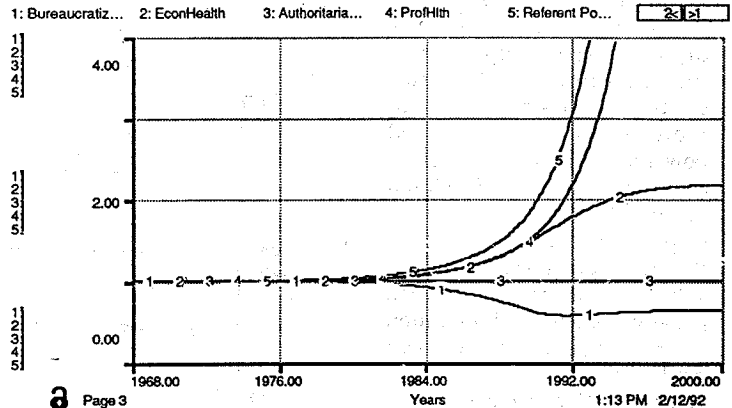
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Figure 9: Organizational values in the revised system



Figure 10: Power structure in the revised system

Additionally, limiting tenure of the senior administrators and making it mandatory for their key rule-making and norm-setting decisions to be approved by a plenary professional committee would help to create a tradition of internal adjudication of the administrative decisions that is linked with the outside peers through the professional review process. Frequent comparisons with the administrative norms in well-balanced collegial organizations should further help to maintain a value-rational decision-making process.



## CONCLUSION

This paper has attempted to explain the dynamics of growth in an unadjudicated collegial system. This pattern is characterized by a decay of collegiality over the course of growth which is accompanied by the creation of a highly centralized bureaucracy.

The analysis shows that the use of administrative resources to create scope is a key factor precipitating the characteristic growth pattern, which is unsustainable. Adherence to an institutional charter or peer audit limiting administrative powers and supporting the exercise of referent professional power is the key to the health of a collegial system. Implementation of such a structural change in an existing unadjudicated organization may, however, pose difficulties due to the resistance from the power coalitions. A personnel change affecting the structure of the power coalitions might, therefore, be a viable entry point for initiating a value change and creating a platform for the constitution of desirable traditions and charters.

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# MEASURING AND IMPROVING TOTAL PRODUCTIVITY: AN INTEGRATED APPROACH.

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## Introduction

Productivity is a complex concept. In simple way productivity is defined as the quotient obtained by dividing output by all the factors of production

$$\text{Total Productivity} = (\text{Total tangible output}) / (\text{Total tangible input})$$
  
Sumanth [1985] defines output as value of finished units of product, value of partial units produced, dividends from securities, interest from bonds and other income added together. The inputs are human, material, capital, energy and other expenses taken together. In the same way the partial productivity is defined as "the quotient obtained by dividing output by one of the factors of production [OECD, 1950]. In this paper the output factors considered are value of finished and semi finished goods and the input factors are the cost of labour, managerial, material, capital (capacity), and other expenses.

The improvement of productivity depends upon a variety of factors [Sumanth & Omachonu, 1982] acting together to increase the value of output factors faster than the cost of input factors. The public debate often has been centered around the relative importance of each factor and often in a oversimplified attempt to fix upon a dominant one. The factors responsible for improvement of productivity are:

1. Money or capital
2. Management
3. Personnel

It is generally agreed that capital plays the most important part. However, capital investment and technology both are highly significant elements in sustaining productivity in an enterprise, industry or nation and so have attracted the lion share of attention. Although capital investment, production capacity, technology, and research and development received careful attention but at the same time authors have not directed themselves to one track solution (Rosow, 1981).

Management is a more subtle issue, it has been implicit in the productivity equation especially at enterprise level. The need for leadership and freedom of decision making for top executives to grip the problem of low productivity has also been stressed by authors (Fuller 1981, Yankelovich 1979, Joji 1979, BLS).

Personnel or the human factor is the third category of factors which has also received principal focus now a days. A work force that is highly educated and more diverse than ever before offers organizations a rich pool of talent. At the same time, however, these workers tend to use their skills and to develop their individual abilities on the job. Because these new breed of workers are no longer willing to follow orders blindly, they are more difficult to manage; but if managed wisely, they have much

to offer to the organization in terms of initiative and resourcefulness. The importance of human factor to productivity and to the need for using it well can not be ignored (Hersheur, 1978).

Finally, the real and lasting answer to achieving a satisfactory rate of productivity growth lies in the ability to bring all of these factors into harmonious interaction. Capital investment with its innovations, new technology and long term commitment to research and development is generated by a free and profitable economy with reasonably balanced growth (Rosow, 1981). But profitable economy depends on sound management practices that is committed to productivity and quality. In the same sense, the human talent within every organization hold the potential for ever-increasing contributions to the efficiency of the enterprise. This paper presents a system dynamics model and stresses on system thinking towards the complex problem of productivity (Frazer 1981, McLaughlan 1978, BLS, Jacob & Jacob 1979).

### Modeling the productivity measurement and improvement system

To study the process of productivity measurement and improvement effectively, the policy makers must bring all the perceptions and experience into a form which is understandable by all and determine simultaneously all their implications in short and long runs. The interactions of a manufacturing organization and its basic components are shown in fig. 1. In the centre lies the concern for productivity measurement and improvement. The factors that are involved in the measurement of productivity of an organization are depicted. The use of measuring productivity index is to inform management for initiating actions for efficient utilization of resources. In this model we have considered the three important resources that influence it are capital/technology, professional/managerial and personnel/labor resources. These three components are inter-dependent and are required simultaneously as inputs within a manufacturing organization. The capital/technology refers to items such as capital, machine tools, equipment R & D and other facilities. The professional/managerial resources sector deals with managerial capabilities, management practices, linkages and organizational culture required for harmonious coordination. The personnel sector refers to labor pool, skill requirements, motivation and experience. The productivity improvement depends upon the interaction of these factors.

#### The Model Structure

##### Technology/capital loop :

The loop in fig. 2 describes the interactions of technology, production capacity, market share and financial resources. When a new technology is introduced in the form of new production machinery, it enhances the existing production capacity. It is assumed that due to increase in customer order rate of a given product, the firm needs additional production capacity. This need for additional demand to maintain quality products drives the management to acquire new technology. Besides this, some other factors that may motivate a firm's management to acquire a new

production technology are productivity growth, cost reduction, capacity expansion, quality improvement and making the product more competitive (APO 1989). In this model the production capacity order is influenced by management's effort on acquiring a new technology and research and development activity inside the firm. The increased technology increases the production capacity order rate and hence the production rate. The supply of financial resources influences the production capacity order rate and R&D activities. The delivery delay and the price have negative effects on market share. Finally, the decision whether to invest in new production capacities is constrained by the financial condition of the firm. The new technology often brings destructive affect on workers and their jobs and often involves labour saving operations i.e. increased production with the same number or fewer workers which may displace existing job. The improved technology brings a reduction in labour hiring rate, demands more skills from a person and consequently reduces his motivation.

#### The Personnel Sector

The changes that a new technology makes in the way goods and services are produced and distributed provide potential benefits. The new technology consequently raises the requirement for new skills of labour to deal with it [Diawati, 1993]. This increase in technology requires more on-the-job training and is therefore considered to be the main approach for the firm to meet the skill requirement. This creates more pressure on management effort to provide workers with new knowledge to increase their skill [APO; 1986-A, APO-1986-B, Koib and Irobi, 1990]. Apart from this a variety of other factors like education level, motivation level of workers proper incentives will also influence the up gradation of labour skills (Koike and Inobi 1990). If enough attention is given to the workers for improving their skill backed up by salary and promotion for those who have made effort can be a motivating factor for the workers (Rammathan & Chandratilleke 1989; Milkovitch & Boudreau, 1991).

#### The Motivation Sector

The human resources management which often holds the key to high production rate and hence productivity. There are no two options that human resources utilization is poorer in developing countries as compared to developed countries, the problems in public sectors is even more severe than in the private sectors. Since the labour is a human input to production, companies are usually more concerned with variation in the labour than other production resources. The political situations, labour laws, union contract and financial cost of hiring and firing tries to maintain some labour instability thereby causing problem of labour adjustments (Lyneis, 1984).

The thrust to human activity lies in his motivation (Desseler, 1985) and why does the motivation develops the way it does especially in the case of developing countries. According to Maslow (1954) every human being has certain basic need pattern which is common to all. These needs can be categorized into five categories viz physiological, security, social, ego and self actualization. The needs in the inverse proportion of their

satisfaction will create the basic urge in a human being. The behaviour will be a more complex phenomenon substantially influenced by perceived rewards, personality, informal group influences. As a part of the free enterprise society governed by the competition and free trade, a person has to always strive to satisfy his needs. The psychological needs may be satisfied and so also the social needs, if the person happens to be reasonably successful in his life but the security need are seldom satisfied. There always exists a possibility that one may lose what he has already acquired if one does not strive enough to earn it.

The level of competition determines what the level of security need satisfaction is. As a consequence, security need is one of the predominating influence working on the motivational pattern of such an individual. There is always a balancing action between perceived rewards and perceived losses. Contrary to this in a developing countries under socialistic norms the security needs are fully satisfied. It is the ego need (psychological) which takes predominance and as no check is exercised by the security needs the psychological need depending upon personality of the employee may appear in the form of highly erratic behaviour. The balancing is no more because there are no perceived losses, if at all there is anything, it is the perceived gains.

Fig.4 shows the detailed model of the labour sector. The customer order rate influences the desired labour which determines the labour hiring rate which increases the labour pool. The labour pool and labour productivity decides the potential output from the labour, potential output from the labour in turn affects the production rate. As the level of technology increases the labour requirements also decreases causing a low motivation of the employees. The motivation is governed by the need pattern of a person. For simplicity only two categories of needs, the physiological and psychological have been considered, and these needs in the inverse proportion of their satisfaction creates a basic urge in the human being which leads to behaviour. The behaviour can be desirable or erratic depending on many factors such as personnel goal, working conditions and degree of supervision (Sabegh & Sharma, 1991). A person before engaging himself in erratic or desirable behaviour weighs his perceived losses and perceived gains. The perceived losses are affected by the security need satisfaction. The higher is this satisfaction less will be the perceived losses and will lead to more erratic behaviour reducing labour output. The security need satisfaction depends on the level of competition present and also on the government regulation. The level of competition is influenced by the market share, with larger market share and lesser competition security need satisfaction decreases. The delay in rewards, financial and non financial leads to increase in the erratic behaviour. The professional effort for on-the-job training and leadership reduces the erratic behaviour.

#### **The Professional Resources**

Professional resources are again a type of human resources but different and distinct in nature by being oriented towards making

the necessary business decisions, laying down policies and providing organizational leadership (Sharma & Sharma, 1982).

As distinct from effort which contribute directly to enhancing and or supporting the productive function, the managerial know how is the input which sets the direction. Lynesis (1984) states that "professional resources manage the activities of the company, they inevitably influence all aspects of the competitive value of company products in the marketplace, understanding the effect of professional resources on corporate growth is much more difficult than understanding the effect of production and financial resources."

Ranftle (1981) has stressed that the technique practiced by management have tremendous potential for either stimulating or depressing productivity. management attitudes, action and personal example prevade the organization and directly affect employee attitudes motivation and action. In another context he states that "Management must create a proper climate for high productivity- an open, performance oriented professional climate..."

The above discussion shows that the relationship between professional resources and productivity is complex. Productive professionals must exercise acute awareness and perception, continually picking up and interpreting cues and tailoring their approaches and techniques as appropriate for each situation.

Fig 5 shows the professional resources sector model the basic structure of the model is common in many ways with that of the Lynesis (1984). The professional effort available can be directed to other sector depending upon the productivity indices. The productivity indices have been compared with the base period index before deciding the the amount of attention a particular section needs.

#### The Model Limitation

The primary difficulty in using this model is the units which are not easy to measure many behavioural factors quantitatively, however attempts have been made to partial quantify some of the factors. The motivational model has been simulated without bothering for units.

#### Conclusions

Simulation experiments with this model have been tried and following policy guidelines are being suggested.:

1. For organizations to improve productivity especially in developing countries, it is the quality or skill of managerial resources which plays the dominant part in improving productivity.
2. Out of the total professional effort available, more effort has to be directed towards on the job training of employees for improving productivity gains.
3. The productivity measurement provides valuable information to strategic policy planners in making decisions to concentrate on specific operational areas to improve productivity.
4. The management philosophy is to be so oriented that the necessity of striving to earn and its consequent enforcement

through a perceived reward and fulfillment cycle does not get obscured.

5. The external factors such as the political factors, government regulation, Bureaucratic delays, pay policies and autonomy in decision making have to be made more conducive.

6. Declining professional efficiency can be avoided by lesser growth rate and market share.

7. As the market share grows substantially, and the level of competition falls, this reduces the pressure on the professionals thereby reducing productivity. 8. The rapid changes in technology does not improve productivity substantially unless it is matched by quality of professional.

To improve productivity of organization a strongly motivated professional cadre of managerial and technical executives have to be created and attracted to run the enterprise as distinct profit centre all necessary authority, backup support and flexibility have to be offered to make the management more autonomous and accountable for results. Capable professionals willing to shoulder the responsibility have to find the higher births, all other consideration must rank secondary. Strong leadership which influences and alters the motivation aspects of the employees has to be created at all levels and a tough minded philosophy of management has to be pursued, any irresponsible behaviour detrimental to productivity has not to be condoned for any reasons whatsoever. The external factors like labour laws, labour courts trade unionism and political situations have to change for improving productivity. An ethical competition should always be present for maintaining pressure on the management to be productively oriented.



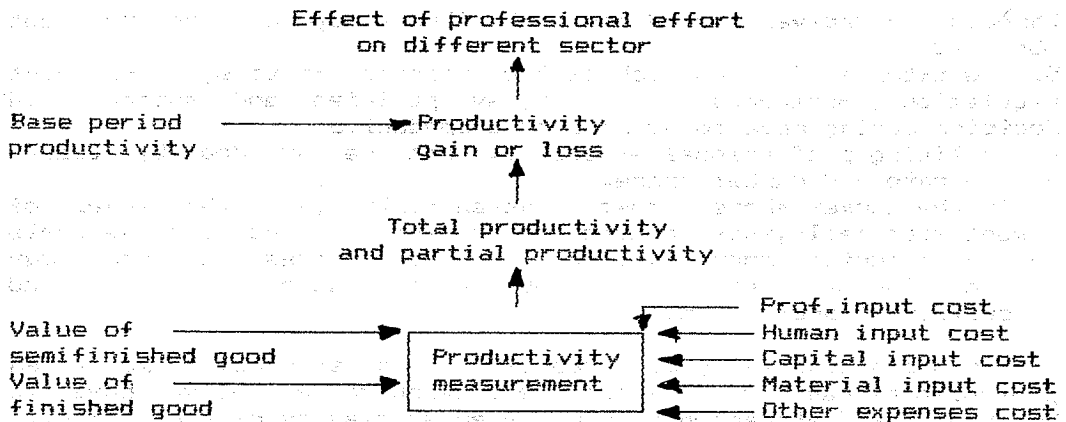


Fig.1 Factors involved in productivity measurement and effect of measuring productivity on other sectors.

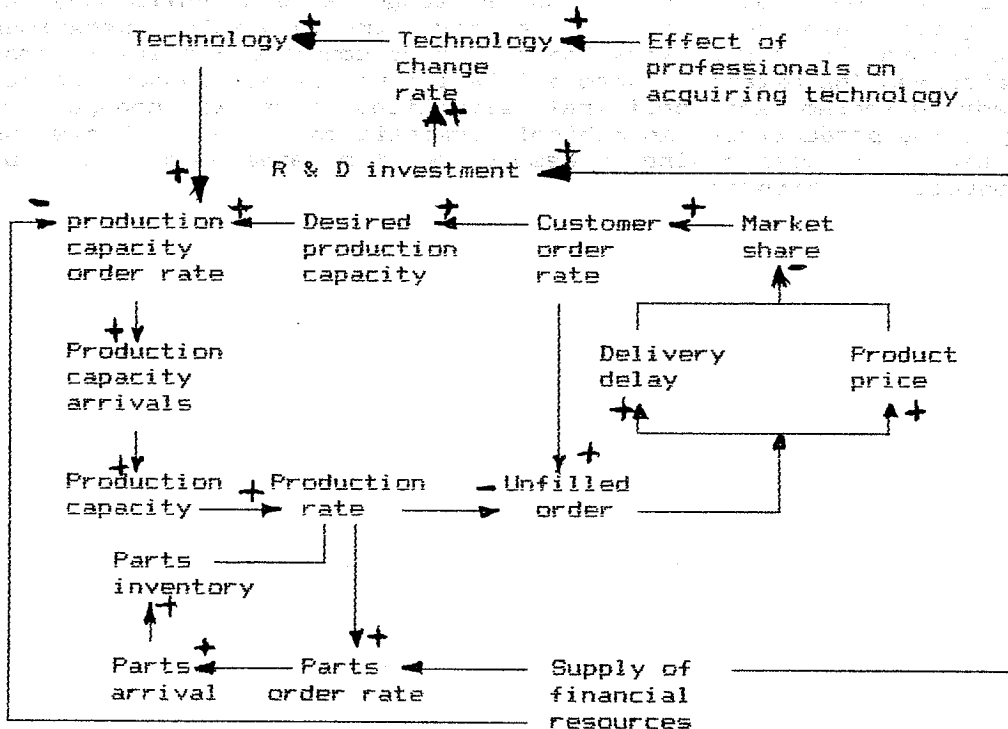


Fig.2 The production capacity, technology and market demand sector.

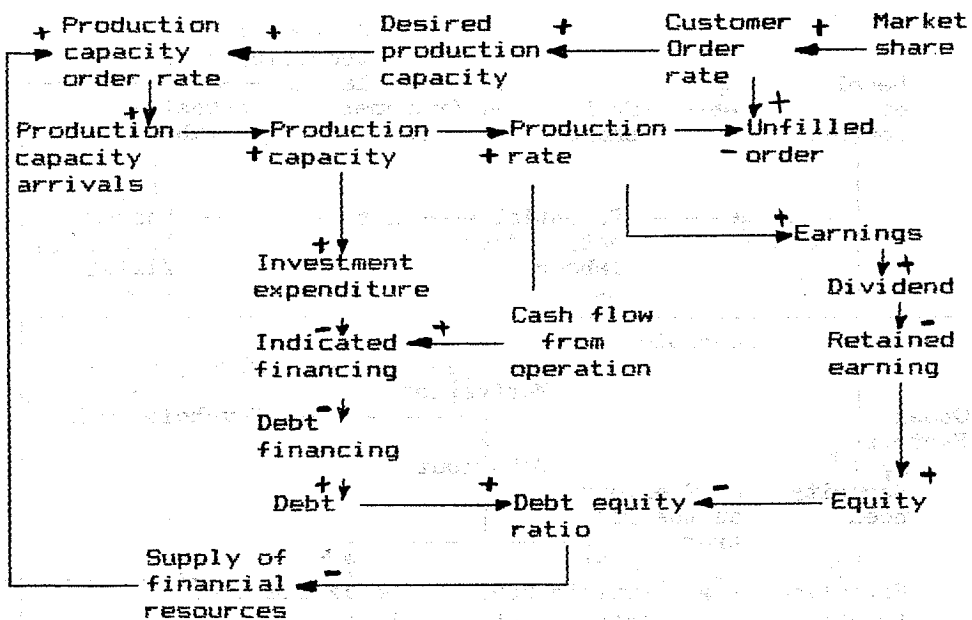


Fig.3 The financial resources sector and its effect on other sector

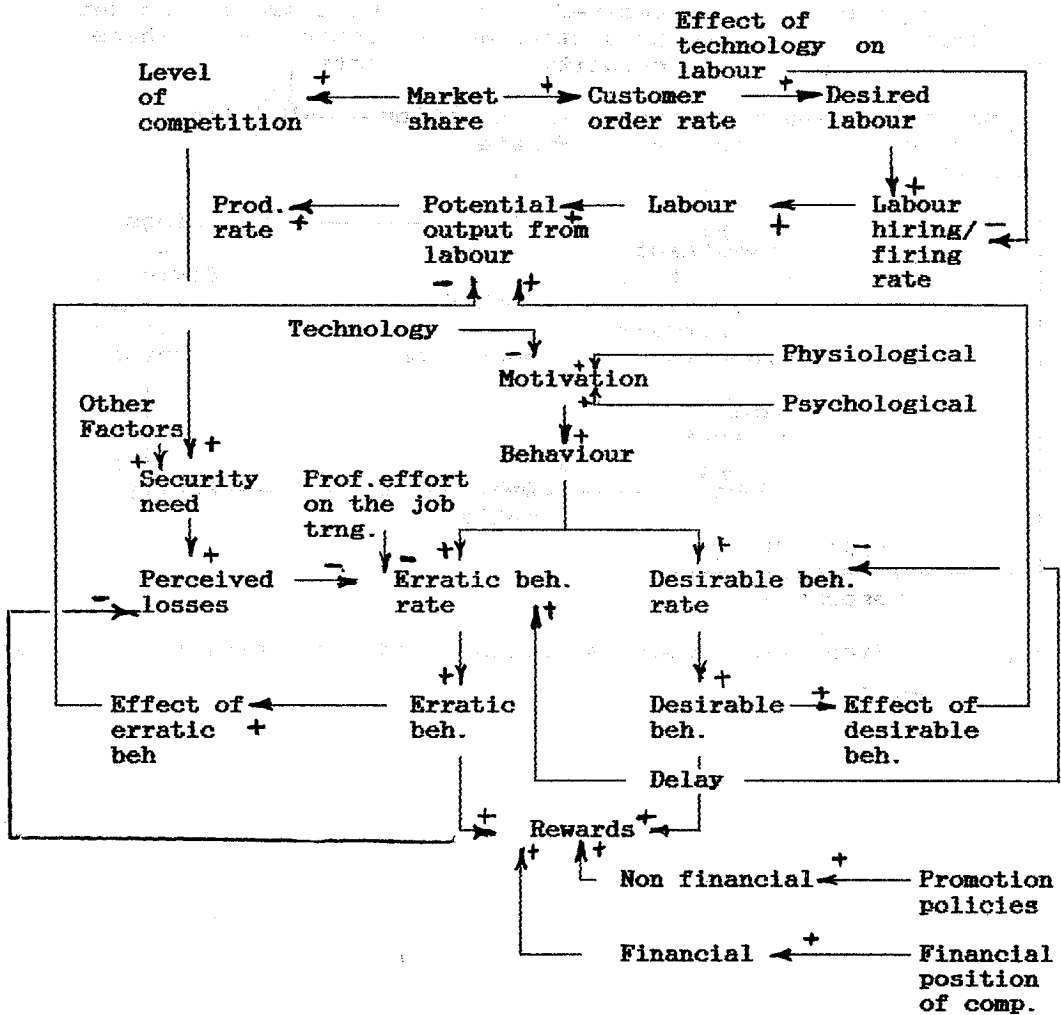


Fig.4: The Labour and Motivation Sector

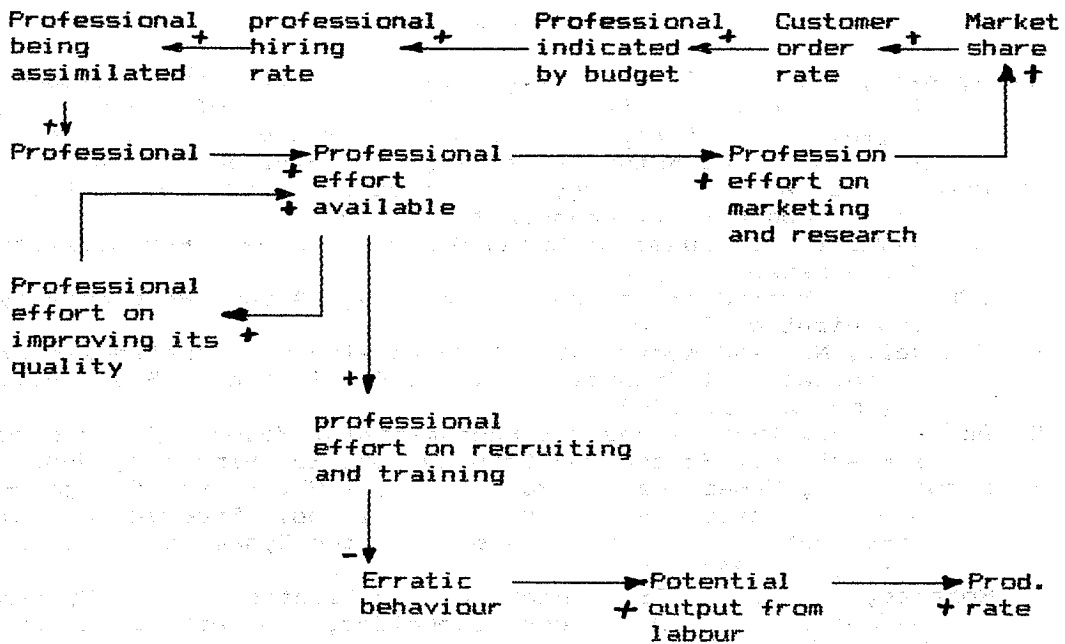


Fig. 5: Professional resources sector and its on effect on market share

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**DESERT ISLAND DYNAMICS:  
AN ANNOTATED SURVEY OF THE ESSENTIAL SYSTEM DYNAMICS LITERATURE**

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**ABSTRACT**

What should every professional system dynamicist know? What are the core works defining our field? This survey of the English-language system dynamics literature identifies and summarizes one view of the essential papers, books, games and software programs that have influenced the development of the field. Such a list serves as a means of reflecting on the foundations of current research and practice, thus providing a catalyst for a continuing discussion among system dynamicists on the major themes of the field and the contributions that define them. In presenting this bibliography, the authors encourage other researchers, practitioners and students to add their views to the present effort.

**INTRODUCTION**

What papers, books, games and software programs constitute the major works of system dynamics? Which contributions best define our paradigm, and which ones have pushed the boundaries of our field in new directions? In short, what system dynamics works would you take with you to a desert island?

We address these questions through an annotated bibliography of the important works in the field. Acknowledging that such a survey is bound to be subjective and limited (perhaps revealing our bias towards managerial applications and publications available in the US), we propose that it be viewed as a starting point for an on-going discussion among system dynamicists. We hope that the present list will catalyze an interchange of views on three questions. What contributions best define the field? What makes a given work significant to the field? What are the major themes and application areas in the field to date? Discussion of these questions can generate an improved version of the present bibliography. Proposals for including, excluding, or better classifying the works described here are welcomed from all.

In addition to serving as a tool for exploring the issues identified above, the bibliography could help to introduce the full range of system dynamics research to those outside the field, and be used as a pedagogical framework for advanced students. Recent efforts to develop a comprehensive bibliography of the field (Cooper and Steinhurst 1992) and to explore the evolution of feedback thought in social science (Richardson 1991) provide a context for the present effort and suggest ways in which users could further explore the themes that emerge from it.

**HOW THE BIBLIOGRAPHY WAS SELECTED**

While one version of this list would simply be the collected works of Jay Forrester (see the next section), in the present effort we attempt to complement the fundamentals that he and his colleagues first articulated in the 1960s with a sampling of the wide range of applications of system dynamics since then. Examples of these applications include the use of system dynamics for dispute resolution, comparative studies with fields as diverse as control theory and institutional economics, dynamic analysis of the effects of economic development, applications to ecology, psychology and physiology, and energy policy studies. Since a small number of works has been chosen to represent these areas, other equally important works have, by necessity, been omitted from our list. In addition, we focus on publications that have emerged from the system dynamics tradition, and thus do not include the vast literature on feedback, dynamics, and simulation in other disciplines; nor do we include the significant collection of criticisms of system dynamics that have appeared in other literatures. Obviously, these are important for one's training as well. Later bibliographies should address these areas.