

# 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

$$\text{Total Productivity} = \frac{\text{Total tangible output}}{\text{Total tangible input}}$$
  
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 [OECC, 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 firms 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 Lyneis (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 considerations 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.

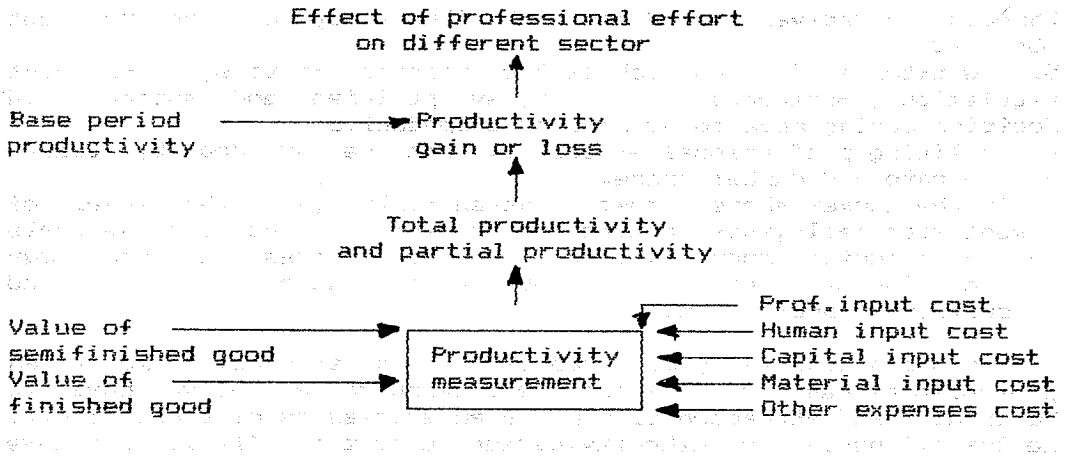


Fig.1 Factors involved in productivity measurement and effect of measuring productivity on other sectors.

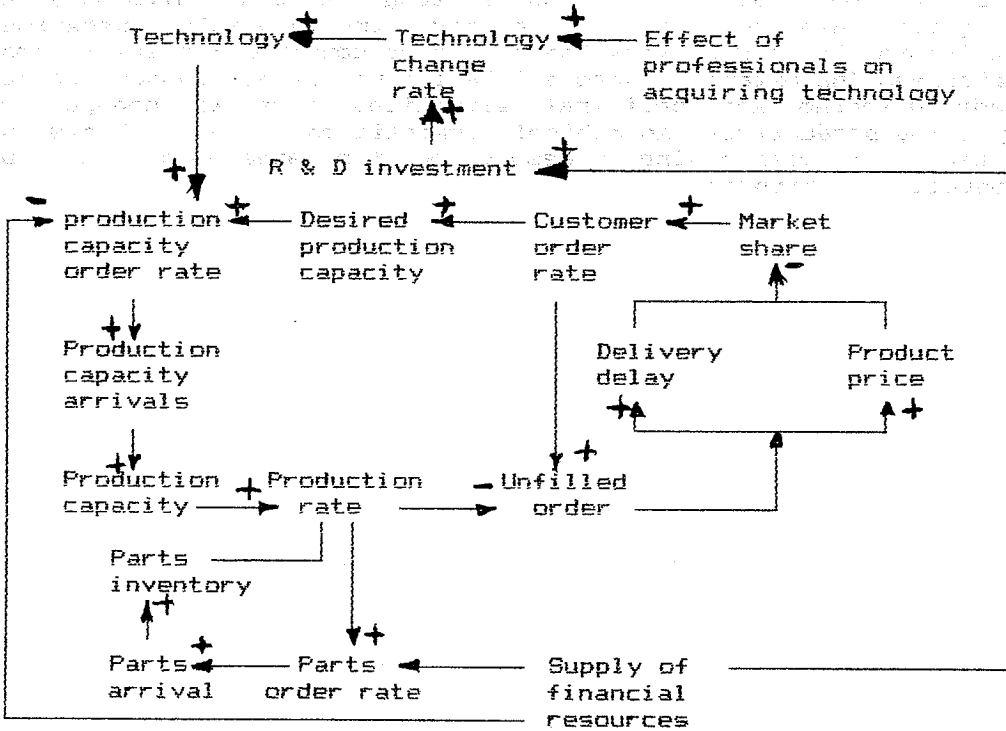


Fig.2 The production capacity, technology and market demand sector.

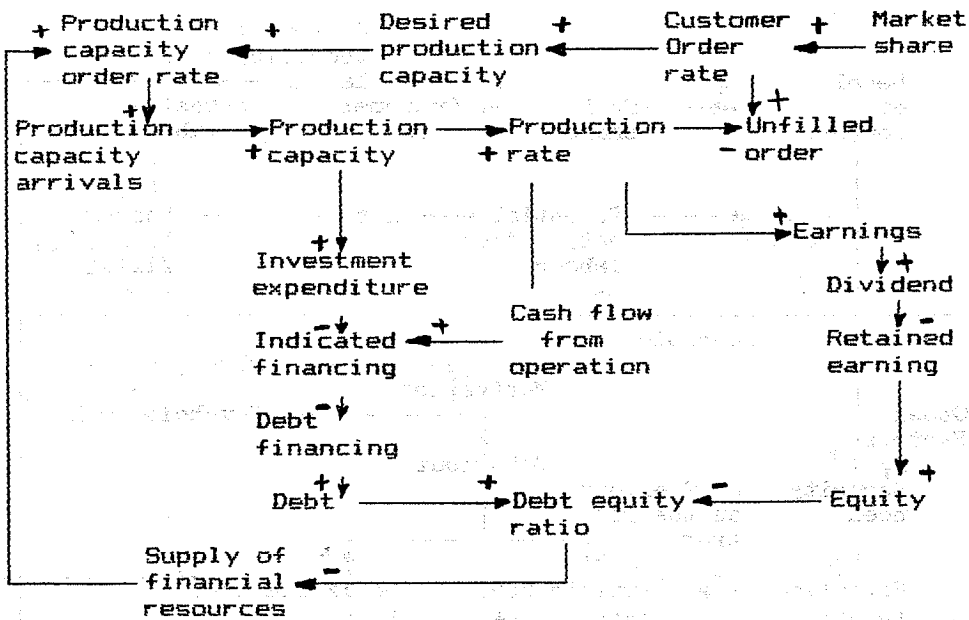


Fig.3 The financial resources sector and its effect on other sector



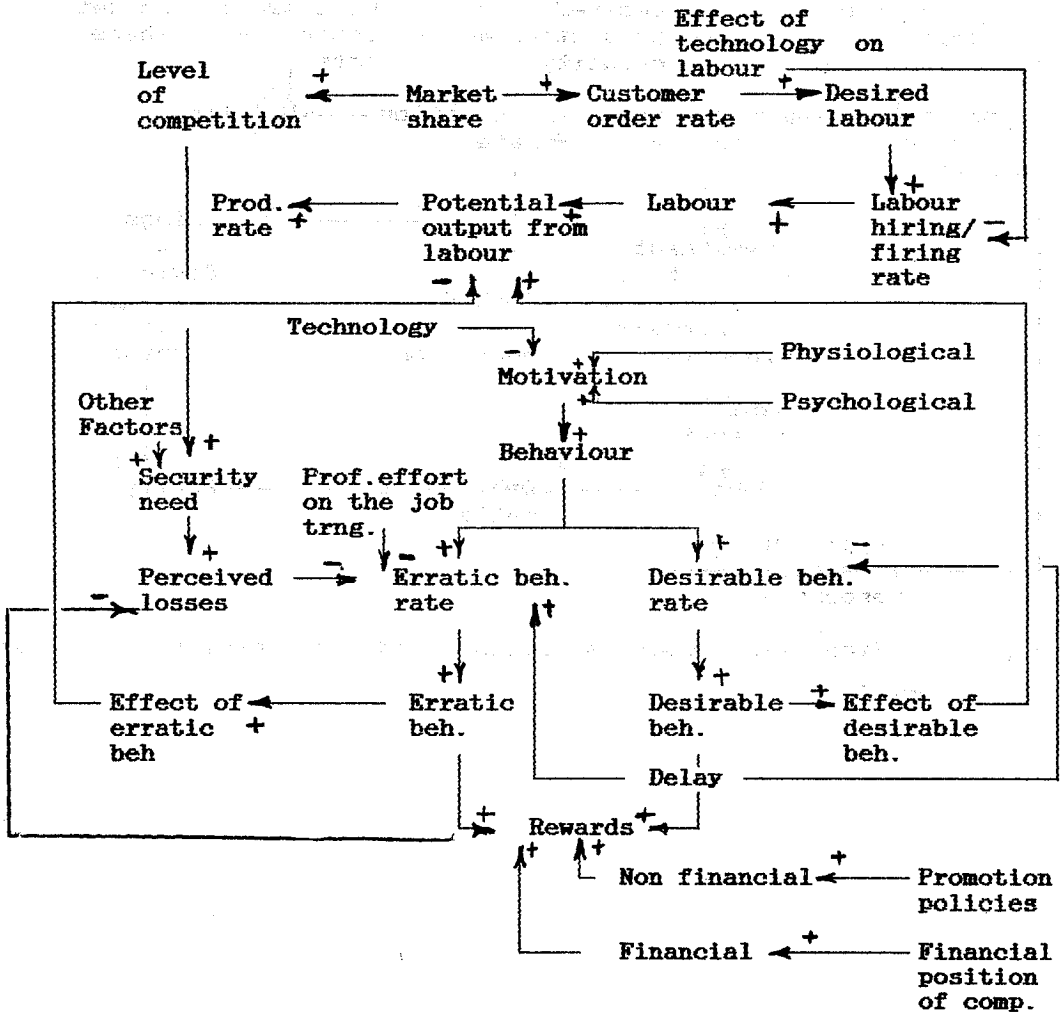


Fig.4: The Labour and Motivation Sector

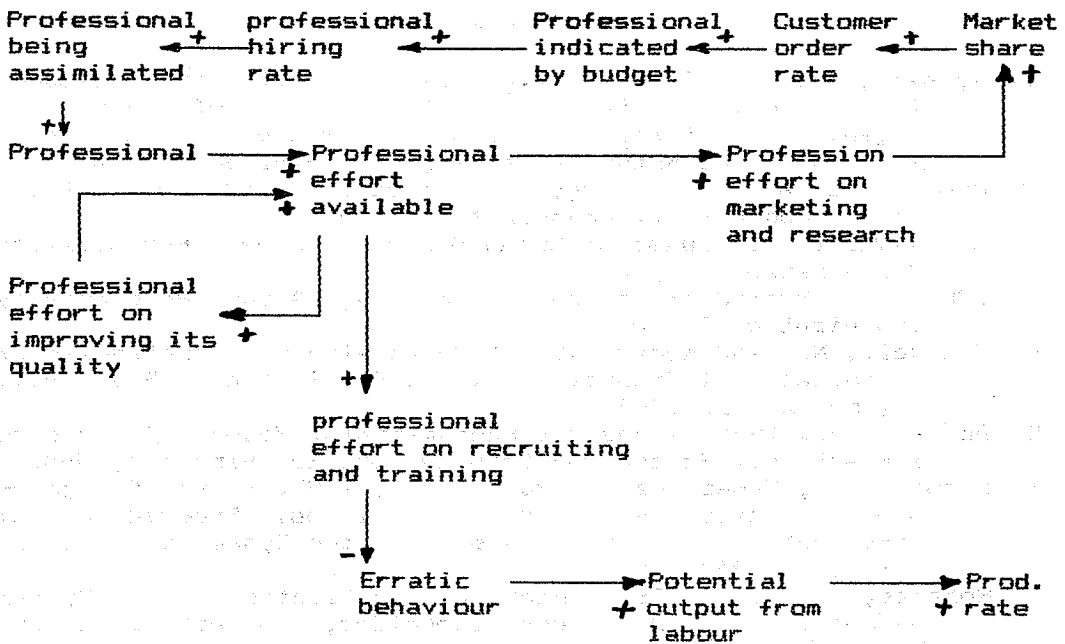


Fig. 5: Professional resources sector and its on effect on market share

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