

Productivity and Economic Growth

A MANAGEMENT GUIDE

2



NATIONAL PRODUCTIVITY COUNCIL

ABOUT NPC

The National Productivity Council is an autonomous organization registered as a Society. It is tripartite in its constitution and representatives of Government, employers, workers and various other interests participate in its working. Established in 1958, the Council conducts its activities in collaboration with institutions and organizations interested in the Productivity Drive. Besides its headquarters at New Delhi, NPC operates through eight Regional Directorates. In addition, there are 49 Local Productivity Councils.

The purpose of NPC is to stimulate productivity consciousness in the country and to provide service with a view to maximizing the utilization of available resources of men, machines, materials and power ; to wage war against waste ; and to help secure for the people of the country a better and higher standard of living. To this end, NPC collects and disseminates information about techniques and procedures of productivity. In collaboration with Local Productivity Councils and various institutions and organizations, it organizes and conducts training programmes for various levels of Management in the subjects of productivity. It has also organized an advisory service for industries to facilitate the introduction of productivity techniques.

Recognizing that for a more intensive productivity effort, the training and other activities of NPC, designed to acquaint management with productivity techniques, should be supported by demonstration of their validity and value in application, NPC offers a Productivity Survey and Implementation Service (PSIS) to industry. The demand for this service has been rapidly growing. This service is intended to assist industry adopt techniques of higher management and operational efficiency consistent with the economic and social aspirations of the community. PSIS is a highly competent consultancy service concerned with the investigation of management and operational practices and problems, and recommendation of measures of improvement and their implementation. NPC has established a special Fuel Efficiency Service. It has set up cells for servicing small scale industries. It has introduced a National Scheme of Supervisory Development under which an examination is held and certificates awarded to successful candidates. NPC also conducts a two-year practice-oriented programme for training in Industrial Engineering for first class graduates in Engineering disciplines.

NPC publications include pamphlets, manuals, and Reports of Productivity Teams. NPC utilizes audio-visual media of films, radio and exhibitions for propagating the concept and techniques of productivity. Through these media NPC seeks to carry the message of productivity and create an appropriate climate for increasing national productivity.

Productivity And Economic Growth

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P R E F A C E

A beginning for the promotion of a Productivity movement was made in the country on a systematic basis with the establishment of the National Productivity Council (NPC) in 1958. Since then, many enterprises, executives and employees have become familiar with the concept and techniques of Productivity. However, it cannot be said that the task of a wide-spread development of the appropriate attitudes and making Productivity a way of life has been accomplished. A simple exposition of productivity discussing its full significance from technical, economic and sociological points of view can serve as means of making the concerned organisations and individuals aware of this task. Such an exposition can also emphasise the importance of increased productivity at the micro-level as the surest way of achieving a rising rate of economic growth at the macro-level. In this context, this booklet explains the meaning and implications of productivity; describes the techniques of raising the levels of productivity and suggests a plan of action that can be followed at micro - and macro-levels for linking the drive for productivity with the plans of promoting rapid economic development.

This guide on Method Study has been prepared by *Shri M. V. V. Raman* Regional Director, NPC, Madras.

The list of reference books for further studies has been given in the prospectus of the National Certificate Examination in Supervision. It must be stressed here that all these guides are not intended as a substitute for enterprise level assistance for supervisory development in the way of training, demonstrations, seminars, etc., but mainly as an aid to these. It goes without saying that these publications will not only help the candidates preparing for the National Certificate Examinations but also others who wish to have some basic understanding of the subjects. It is hoped that managers of all forward looking enterprises will make an all-out effort towards training their supervisors and skilled workers.



(G. R. DALVI)
Executive Director
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Productivity and Economic Growth

Economic growth in simple terms signifies material progress. It includes the provision of goods and services for the population; provision of adequate income and leisure to enjoy the goods and services produced; it also includes the provision of a continuous rise in the rate of growth to satisfy a given population in the above terms in a condition of national security and internal law and order.

MEANING OF PRODUCTIVITY

In order that we may produce a product or provide a service, we must have resources in the form of men, machines, materials, money etc. In a broad sense, productivity means goods and services produced in relation to the resources utilised in producing the same. Productivity is thus implied in every economic activity and is defined as the ratio of output to input. This simply means that in order to produce a product or a service, either in the field, factories, offices or any other place of economic activity, certain resources would have to be employed in the form of inputs to obtain output, and productivity takes into consideration both these aspects simultaneously. Higher productivity can be regarded as efficient use of the inputs in terms of layout, materials and services. The cumulation of economic values produced in all sectors of the economy computed in terms of money a near accurate measure of Gross National Product and National Income of a country. It is the Gross National Product (GNP) which is available for distribution among the factors of production or the individual members of the community. Higher the productivity, higher will be the GNP, which in turn will provide for a higher level of economic well-being for the people.

Productivity is not production. Production merely means volume of output. Production can be increased without consideration of cost, by increasing the input

of labour, material and equipment. Duplication of a factory or additional shift increases production. But this may not increase productivity. Productivity is not merely volume of output, but output in relation to the resources employed. Productivity may increase without increase of production; productivity increases when lesser quantities of inputs are employed for the same production. Productivity also increases when more output is turned out for the same resources. If one hundred men in a factory turn out the same quantity of goods of the same quality over the same period as 130 men in another factory, equal in all respects, though the production is the same in both the factories, the productivity is not the same. The labour productivity in the factory employing only hundred men is obviously higher.

We have explained the meaning of productivity. The next question is when we talk about productivity, whose productivity do we have in mind? Productivity is sometimes expressed in terms of output per man or per man-hour. This has given rise to the misunderstanding that productivity always means labour productivity. This misunderstanding gives rise to the impression that productivity would cause displacement or unemployment of labour. This is not necessarily true. Productivity can also be expressed as output per unit cost of materials, as output per unit of floor space, as output per machine or machine-hour, as output per unit capital or as output per unit energy consumed etc. Thus, increased productivity does not necessarily mean reduction in labour employed, but implies efficient utilisation of the different factors of production.

One of the simple and basic measures of economic growth is derived from the national income analysis. In this analysis the gross national product is expressed in monetary terms. The influence of price fluctuations on the monetary figures for the national product are eliminated by expressing it in terms of base year prices or considering at constant prices. If this national product in monetary terms is divided by the total population, the national product per capita is obtained. Thus, the current per capita national product expressed in terms of the price level in a given base year, may be regarded as the level of productivity achieved in the national economy.

It should be mentioned that increases in the national product could be obtained by increase in productivity and also by use of increased input resources. In this connection the pessimistic prophecies of earlier economists may be pointed out. They had indicated that the limited natural resources would not be able to support the expanding population with the result that chaos and misery would follow. Experience has shown that this was a wrong assessment of the possibilities of economic growth, and did not take into consideration the immense potentialities of productivity advances based on scientific and technological progress. Recent studies in economic growth and productivity have clearly brought out that economic growth and consequent material progress have coincided with the advances in productivity.

INDIA RANKS 20TH. IN PER CAPITA GROSS NATIONAL PRODUCT (IN RUPEES)
 AMONG 26 ASIAN COUNTRIES (BASED ON RECENT WORLD BANK SURVEY)

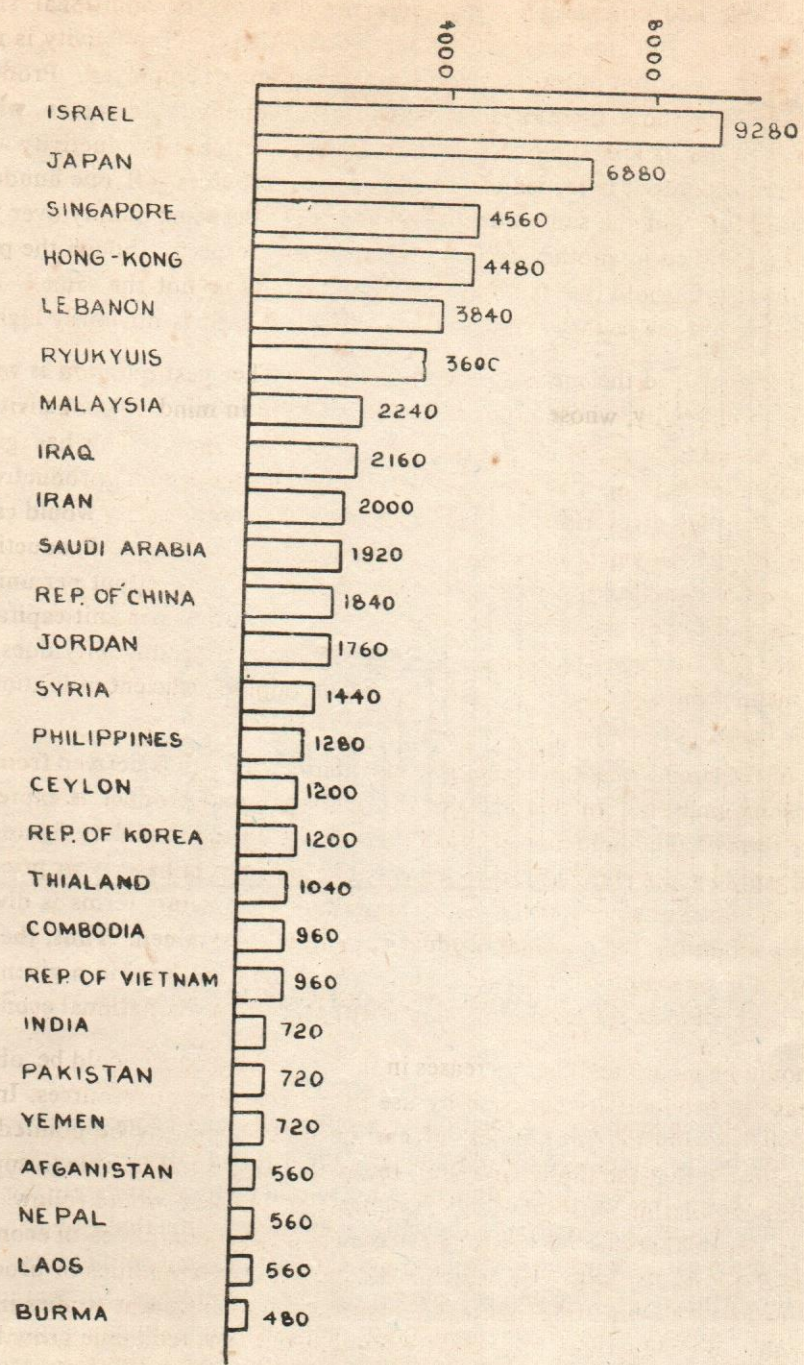


FIGURE - 1

PER CAPITA GDP IN 1963

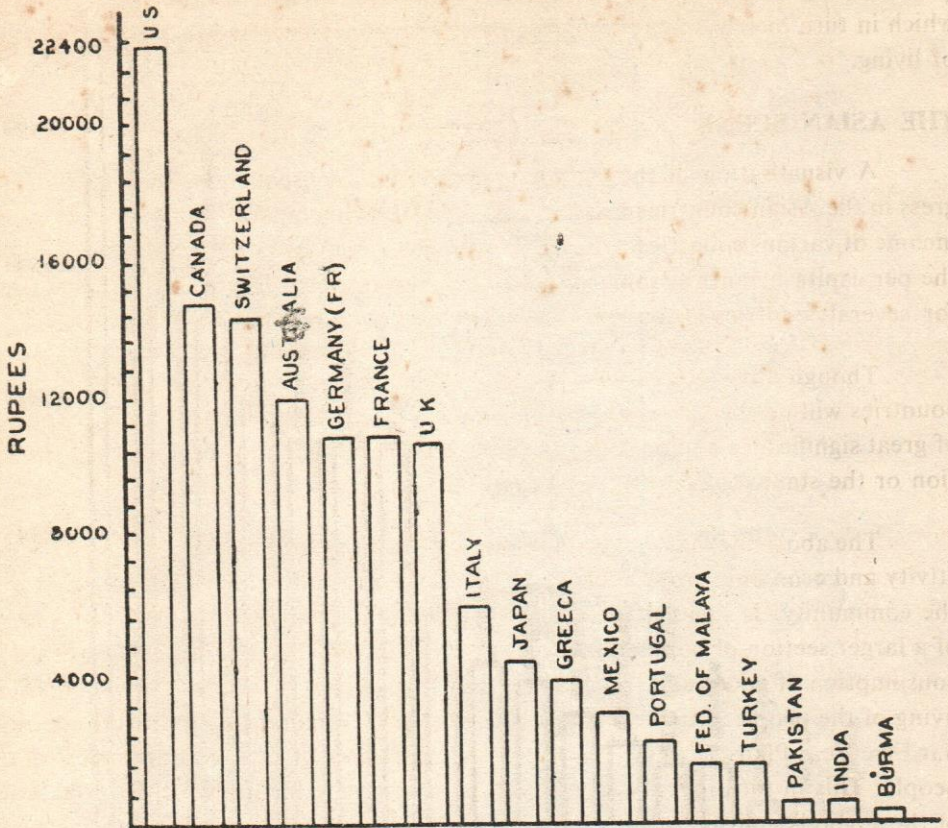


FIGURE-2

SOURCE-STATISTICAL SURVEY OF ECONOMY OF JAPAN

Having touched upon the relation of productivity and economic growth, we may mention briefly how productivity changes affect factors like costs, prices, profits, output, employment and investment—all essential factors intimately connected with economic growth. Analysing logically, increased productivity of goods and services from the existing resources, will reduce the cost per unit so that it is possible to sell at lower prices, leaving enough margin for increase in wages for workers and more profit for the industry. This will create more demand, stimulate investment, and create more employment. This, of course, may involve a time lag, but these

benefits of increased productivity are surely shared by capital, labour and the consumers. Higher productivity enhances the national wealth and per capita income which in turn increase the purchasing power of money and lead to higher standards of living.

THE ASIAN SCENE

A visualisation of the economic growth and consequently the material progress in the Asian countries may be obtained from a comparative view of per capita income of various countries. Based on a recent World Bank Survey, Figure 1 shows the per capita income in some of the Asian countries. Figure 2 shows the same for several countries of the West as well as Asia (Figures shown on pages 3 & 4).

Though direct comparisons of national income or per capita income of several countries will not be very meaningful, what that income can buy for an individual is of great significance and provides an indication of the extent of prosperity of the nation or the standard of living of the individual.

The above idea may be elaborated further. Prosperity in the context of productivity and economic growth relates to the economic well-being of a large section of the community. It signifies the availability of goods and services for the well-being of a larger section of population at prices it can afford. The quantum and quality of consumption of goods and services may be taken as an indicator of the standard of living of the people. In fact, this is a major goal of planning as has been stated in our Five Year Plans, namely to raise the standard of living for the mass of the people. This in turn means the availability of adequate facilities for the production of these goods and services at prices people can afford. "These items that seem to cover the most pertinent aspects of levels of living are:*

- i) food and nutrition;
- ii) clothing;
- iii) housing, including sanitation;
- iv) health facilities;
- v) educational facilities;
- vi) information media;
- vii) energy consumption;
- viii) transportation.

*Asian Drama, Vol. 1, G. Myrdal, p. 538, Penguin Books.

“For each of these eight components of consumption (except housing) summary statistical evidence are presented in Table 1.”

Table 1

Economic indicators	Year	India	United Kingdom	United States
1. Food				
1.1 Calories per head per day	1958	2,050	3,290	3,100
1.2 Proteins per head per day (grams)	1958	57	86	91
2. Clothing				
2.1 Annual textile consumption (kilograms per head)	1956-58	2.4	11.7	15.5
2.2 of which cotton (percent)	1956-58	92	49	67
3. Physicians—number per 100,000 population	1960	17.6	104	125
4. Newsprint radios telephones				
4.1 Annual newsprint consumption (kilograms per head)	1960	0.2	24.9	36.6
4.2 Radio receiver licenses per 10,000 population	1960	50	2,890	9,410
4.3 Telephones per 10,000 population	1960	10	1,562	4,285
5. Energy—annual consumption of coal equivalent (kg. per head)	1961	150	4,925	8,042
6. Transportation				
6.1 Motor vehicles per 10,000 population	1957	11	1,070	3,922
6.2 Ton-kilometers of road and rail freight per head	1957	199	1,399	7,691
6.3 Percent of rail, road and inland waterway freight traffic accounted for by rail	1957	88	43	56

Economic indicator	Year	India	United Kingdom	United States
6.4 Passenger-kilometers per head	1957	304	4,208	6,450
6.5 Percent of total rail and motor passenger traffic accounted for by rail	1957	59	17	4
6.6 Length of railroad in kilometers per 10,000 population	1957	1.29	5.93	20.59

The production aspect of the basic infra-structure may also be indicated (Table 2) which reveals higher values for countries which have higher economic growth and consequently higher levels of consumption as revealed in Table 1,

Table 2

PER CAPITA PRODUCTION OF SELECTED ITEMS

Items	Year	India	UK	USA
Crude Steel (kg)	1967	12	441	580
Electric Energy (Kwt)	1967	85	3,802	6,614
Petroleum Products (kg)	1967	25	1,444	2,013
Cement (kg)	1967	22	325	324
Aluminium (kg)	1967	0.2	4	18
Copper (Index)	1967	100	2012	15,708
Sulphuric Acid (kg)	1967	2	59	131
Chemical Fertilizer (kg)	1967	0.8	16	31

Source : *And Miles to Go...*, published by FICCI, New Delhi.

HOW TO INCREASE PRODUCTIVITY

From the discussion presented above a broad approach to the problem of increasing productivity may be derived. When we consider this aspect, we are moving from generalities to specific situations. Every economic activity has productivity implications and this has to be examined in detail for achieving higher productivity. The cumulative achievements of higher productivity of individual activities constitutes higher productivity in the aggregate at the national level. This idea is illustrated in the model shown in Figure 3.

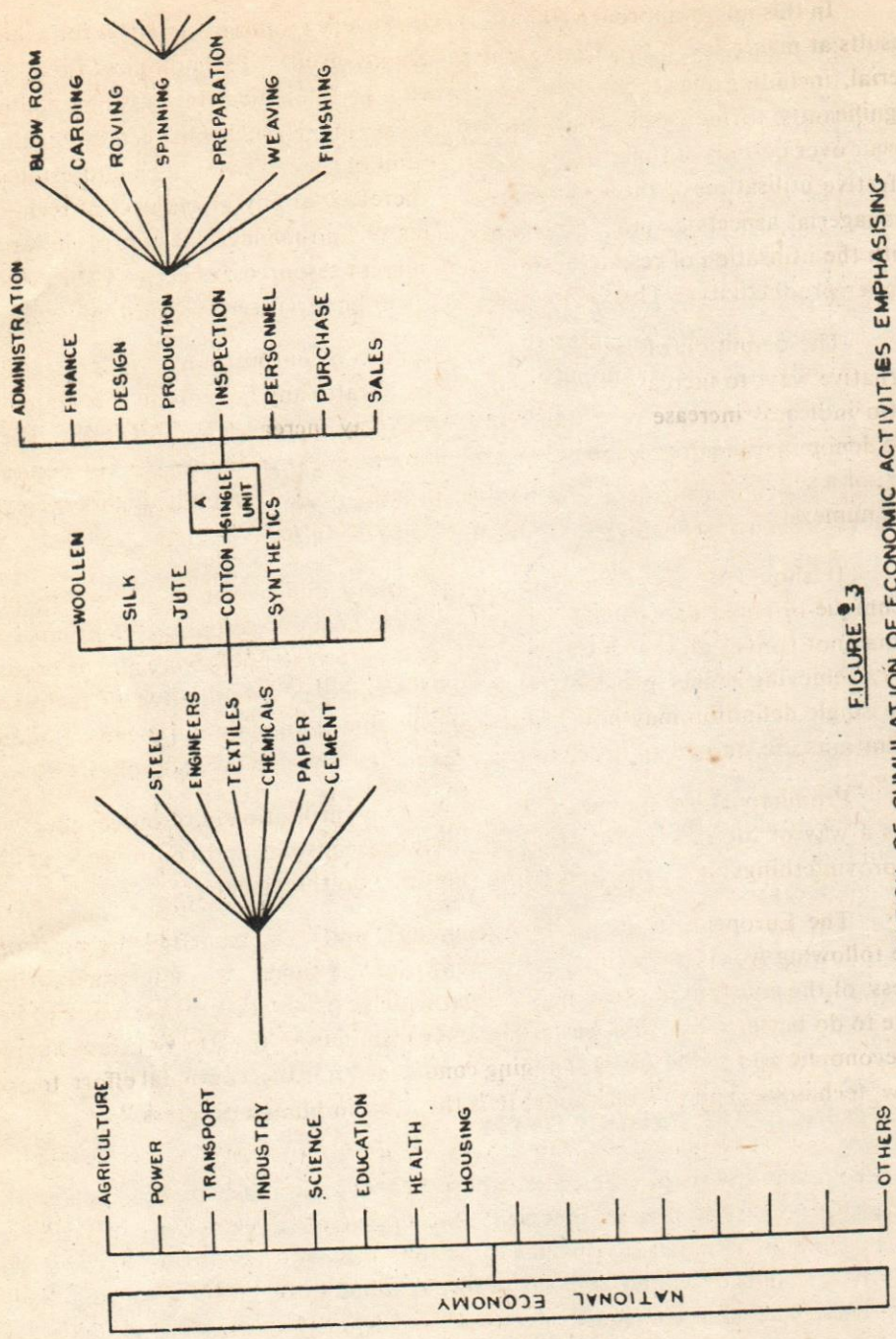


FIGURE 3
 VISUALISATION OF CUMULATION OF ECONOMIC ACTIVITIES EMPHASISING
 MICRO APPROACH TO ACHIEVE RESULTS AT MACRO LEVEL

In this micro-approach (that is, tackling every economic activity) for achieving results at macro-level, two basic elements are involved: Technological and Managerial, including management of personnel. Technological innovations contribute significantly to increases in productivity. Of course, such changes of technology occur over periods of time. At any given point of time, we would be interested in the effective utilisation of the technology and therefore at any given level of technology managerial aspects assume importance. This techno-managerial approach concerns with the utilisation of resources, including human resources, effectively for achieving higher productivity. This micro-approach will be discussed in detail later.

The definition of productivity as the ratio of output/input, itself suggests alternative ways to increase productivity; being a ratio any increase in the value of the ratio indicates increase in productivity. We may increase the numerator, keeping the denominator same; we may keep the numerator same, but reduce the denominator; or a slight increase in the denominator with proportionately higher increase in the numerator—all these variations increase the ratio.

It should be emphasised that productivity improvement is not purely a technique-oriented approach. Though we have given a definition of productivity, it may not convey all that it stands for at least in terms of achieving higher productivity; achieving higher productivity is such a complex combination of factors that any single definition may not bring out all that it implies and means. Following definitions are quoted in order to bring home the diversity of its implications:

Productivity is war on waste and inefficiency; utilisation of resources effectively; it is a way of life and an attitude of mind; it is a constant and continuous effort at improving things; it means motivating people to do things better.

The European Productivity Agency has aptly summarised the position in the following words: "Productivity is an attitude of mind. It is a mentality of progress, of the constant improvement of that which exists. It is the certainty of being able to do better today than yesterday and continuously. It is the constant adaption of economic and social life to changing conditions; it is the continual effort to apply new techniques and new methods; it is the faith in human progress."

The Anatomy of Productivity

This chapter on anatomy of productivity discusses the implications of productivity in some technical detail with a view to establishing a basis for formulating a plan of action towards increasing productivity.

PRODUCTIVITY MEASUREMENT

Productivity has been defined as the ratio of output to input. The input or "input factors" may relate to any one or more or all the factors employed in producing a given output. Thus one may speak of productivity of labour, capital, material, power, machines, etc., or any combination of the inputs. This brings to the fore the choice of factors for use in productivity measurement in any situation and consequently the interpretation of the concept of measurement used. However, in practice the choice of factors is limited to those cases where measurements are possible. The practical meaning of productivity is the effective utilisation of resources or "input factors." It is to be appreciated that there is no absolute value for productivity in any given situation, and when one talks of higher productivity, it is relative to the past period, or to some other standards, which may be another similar producing unit or even other nations. Since productivity is expressed as a ratio, higher productivity can be achieved in several ways namely, keeping the output same and reducing the input factors; for the same inputs obtaining higher output; or effecting changes in both output and input in such a way that the ratio becomes higher compared to previous period. Improvement in the 'quality' of output for the same output and input may also be viewed as higher productivity.

Measurement of productivity, as is the case with measurement in any other field, provides information as to the level attained, rate of growth, utilisation

of resources, and consequently pinpoints the critical areas and factors which impede productivity at various levels—plant, industry and global; it also permits comparisons at various levels, Productivity Measurement thus forms a basis for planning, evaluating and taking appropriate measures for improving productivity at various levels, contributing to more rapid economic growth.

The overall productivity of industry, or any other sectors, would be of great interest in the general economic analysis. The contribution of individual sectors adds up to the national productivity. "The rate at which average levels of productivity rise in different sectors is a true measure of the pace and quality of the advance achieved...the only enduring basis for the strength and dynamism of the economy is a rising level of productivity*....." The industry-wise studies bring out the aspects of commonness and differences between industries and within an industry in productivity levels, and also highlights the technical, economic and managerial aspects and their contribution to higher productivity. The productivity measurement at plant level might relate to the whole plant; to individual processes; and to individual operations and operatives. The object might be to throw light on any aspect of 'managerial effectiveness' in an individual plant or group or plants under the same management.

A popular measure of productivity is the productivity of labour. Labour productivity is measured by the ratio of quantity of output produced to the labour input measured in units of time, that is output produced per unit of time. However to use labour input as measure of productivity or for that matter, the use of any one factor alone as a basis for measuring productivity tells 'only part of the story' and the part provides an insufficient explanation. This point is elaborated in the following paragraphs.

Rostas** maintains that labour productivity is the most appropriate concept for measuring productivity. "We have made it clear in our terminology that we regard productivity of labour as a measurement of general efficiency in the use of labour and not of the effort of the labour which latter is obviously too narrow to be of much value. We have also stated that productivity of labour is influenced by the combined effect of a large number of separate though interrelated factors such as the amount and quality of equipment employed, technical improvements, managerial efficiency, the flow of materials and components, the relative contributions of units at different levels of efficiency as well as the skill and effort of workers... Its importance is derived from the central position of labour

*The Third Five Year Plan, Planning Commission, Government of India, 1961.

**L. Rostas, Alternative Productivity Concepts in Productivity Measurement, Vol. I, pp. 31-42, European Productivity Agency.

and is particularly appropriate for a society in which, in Marshall's words, man is both "the end and an agent of production".... It is through this dual role that productivity of labour becomes an important indicator of the standard of living." This appears to suggest that productivity of labour may be reckoned as a measure of general industrial efficiency.

On the other hand Fabricant* points out that 'Indexes of Productivity based on the comparison of output with the input of both labour and tangible capital are better measures of efficiency than those based on labour input or capital input alone.' He also mentions that though this index is 'broader than any other indexes now available, it fails to cover adequately the investment in education, science, technology, and social organisation that serves to increase production.'

It should be mentioned that at least in the developing countries with large populations, the concept of labour productivity may be misleading. The concept of labour productivity has created the impression that in order to obtain higher productivity, it is necessary to retrench labour and instal labour-saving equipment. This view of productivity should not be allowed to linger as it would hamper the growth of productivity and productivity movement. It should be made as a policy statement that productivity increases have to be achieved with methods and means best suited to individual societies taking into consideration the maximum utilisation of available labour. It follows, therefore, that in developing countries a complete picture of productivity can be obtained by considering not only labour productivity but also other related measurements appropriate to the situation; for example, capital equipment or machine utilisation, material utilisation, efficiency of management, etc.

PRODUCTIVITY CHANGE

The measurement and interpretation of productivity changes is of great significance as it explains the cause for the changes; "partitioning" the quantum of observed changes to various sources that cause the same would be purpose of measurement study in depth. Theoretically it would be easy to enumerate the sources that would contribute to higher productivity: the quality of the labour force, effective (not merely longer) work, better capital equipment, technology, better management, social organisation which provides motivation and incentives and the like. Some broad conclusions based on actual studies in the measurement and interpretation of productivity may be mentioned.

*Fabricant in Productivity Trends in the United States, J.W. Kendrick, National Bureau of Economic Research, New York.

Melman* has concluded: "The dramatic rise of industrial productivity over the last century is traceable primarily to transformations in the technique of production... at the same time techniques for organising production have been evolved..."

Kendrick** found for the United States economy, for the period 1899 to 1957, that only one half of the growth of the national product could be attributed to the increased inputs of labour and capital and the other half was caused by other factors, particularly attributed to "technical progress."

The above results of Kendrick have also been confirmed by other researches using the production function growth formula.***

The studies made on these lines are presented in Table 3. The table shows the average as 3 percent and one half of the growth is caused by "Technical Progress."

In order to get a better understanding of the "technical progress" or the residue in the Cobb-Douglas function, Denison has attempted at the macro-level to partition the contributory factor to the residual. This is given in Table 4. The table shows that the education and research have been the most important contributor to the growth of the American economy over the last 30 years.

In an attempt to explain the changes in labour productivity, Salter**** has examined the movement of labour productivity in a number of British industries

*S. Melman, *Dynamic Factors in Industrial Productivity*, John Wiley and Sons Inc., New York, 1956.

**J.W. Kendrick, *Productivity Trends in the United States*, op. cit.

***The Cobb-Douglas Production function with a trend component can be expressed as follows: (Odd Aukrust, *Productivity Measurement Review*, February 1965)

$$O = c K^a N^b e^{zt}$$

where O =output, K =capital and N =employment and c, a, b , and z are constants.

This function assumes that the growth rates of output ($\Delta O/O$), capital ($\Delta K/K$) and labour ($\Delta N/N$) measured as annual percentage increases are related to each other through the relation:

$$\Delta O/O = a \Delta K/K + b \Delta N/N + z.$$

where a and b are constant and z , residual, can be taken to represent the annual percentage increase in output due to technical progress.

****W.E.G. Salter, *Productivity: A Technical Change*, Cambridge University Press, 1960.

Table 3

ESTIMATES OF THE COEFFICIENTS OF THE COBB-DOUGLAS PRODUCTION FUNCTION
WITH A TREND COMPONENT FOR FOUR COUNTRIES

	a		b		z
	Percent Increase of output by 1 Percent Increase of capital	Percent Increase of output by 1 Percent Increase of labour	Percent Increase of output by 1 Percent Increase of imports	Trend, Ascribe to Technical Progress	
United States (1909-1949) (Private non- farm activity)	0.35	0.65	...	1.5	
Finland (1925-1952) (Industry)	0.26	0.74	...	1.2	
W. Germany (1925-1957) (Total eco- nomy)	0.34	0.76	0.23	1.9	

In the study for West Germany, output was measured as national product + exports, and imports correspondingly included on the right-hand side as a separate factor of production symmetrically with K and N.

Source : See Odd Aukrust, *op. cit.*, p. 16

Table 4

ALLOCATION OF GROWTH RATE OF TOTAL REAL NATIONAL INCOME AMONG THE
SOURCES OF GROWTH 1929-1957

	Percentage points in growth rate
Increased employment (net effect of more man-years, shorter hours, and changes in composition of labour force)	0.90
Increased use of capital	0.43
Education and research :	
Better educated labour force	0.67
Advance of knowledge	0.58
Economies of scale :	
Growth of national markets	0.27
Independent growth of local markets	0.27
Other factors :	
Change in lag of application of knowledge	0.01
Reduced waste of labour in agriculture	0.02
Industry shift from agriculture	0.05
Restrictions against optimum use of resources	0.07
Total growth rate	2.93

Source : Edward F. Denison : The Sources of Economic Growth in the United States and the Alternative before Us, Committee for Economic Development, New York, 1962. As given by Odd Aukrust, op. cit, p. 21.

between 1924 and 1950. The empirical analysis is based on a comparison of the experience of twenty-eight industries. Movements of output, employment, output per head, prices, costs and earnings are compared over the period of 1924-50. Salter points out that the interpretative conclusions derived from the analysis should be regarded as highly tentative...cross-section correlation analysis where each industry is treated as an observation reveals sizeable associations between movements of many of the variables. These coefficients appear to reflect underlying real associations even when allowance has been made for the statistical problems of skewed observations, errors of observation and deficiencies in the sample.

On the basis of the inter-industry correlation studies, Salter* observes: "The most appropriate means of deriving an explanation of the pattern of results is to consider alternative causes of increases in productivity; increased personal efficiency of labour, factors of substitution, technical change and economies of scale. Each such cause may be expected to involve a distinctive pattern of inter-industry cost and price behaviour and by examining the observed data we may derive the explanation of the productivity movements which is most consistent with the results."

Based on the studies as explained above, Salter draws the following conclusions:

- i) The hypothesis that the increases in labour productivity originate in greater personal efficiency of labour is rejected.
- ii) The hypothesis that the results are principally the product of factor substitution is unsatisfactory.
- iii) The results are consistent with uneven rates of technical advance between industries when these advances are of the type which tend to save labour, capital and materials.
- iv) The results may also be partially explained, by the uneven impact of economies of scale.
- v) Although the suggested explanation places primary emphasis on technical change and economies of scale, this does not mean that factors of substitution and the personal efficiency of labour are unimportant.

Hollander** has done a penetrating analysis of the causes of productivity change. He has also mentioned various studies with regard to the interpretation of produc-

*Salter, op. cit., p. 145.

**S. Hollander, the Sources of Increased Efficiency. A Study of Du Pont (Rayon Plants), The M.I.T. Press, Cambridge, Massachusetts, U.S.A.

tivity change; in essence these studies suggest that the increase in output per head in the United States is mainly the contribution of "technical change" than that of growth of resources per head. However, the importance of the macro-economic studies' conclusion is reduced by the broad character of the technical change, which includes causes like economies of scale, changes in the efficiency of resource allocation, improvements in quality, technological improvements, improved managerial efficiency and the like, in fact all causes excepting that of increased inputs. Obviously, any study that would pinpoint a cause in a clear way would be of great significance. In order to obviate the problem of the type mentioned above, Hollander has carried out a micro-study of the Du Pont Rayon Plants for the period 1929-1960. Hollander defines the 'technical change' thus: "By the term 'technical change,' we shall refer throughout this study to changes in the technique of production of given commodities by specific plants designed to reduce unit production costs. These changes in technique may be of a 'technological' nature they may represent the introduction of different or improved inputs from those hitherto used at the plant; or they may be 'managerial' and consist in improved organisation of work and the like. It is intended, however, that the term should apply only to such changes which are brought about by a deliberate decision to reduce costs, although it is not necessary that the decision be taken by 'higher-ranking' management. Specifically the problems relate to:

- i) cost reductions observed at particular plants as a result of changes in the technique of production;
- ii) relationship between scale and technical change;
- iii) relationship between the various changes in technique and investment in plant and equipment;
- iv) rate of introduction of new technology into the economic system particularly the role of formal research activities as contrasted to small improvements in technique.

The study is concerned with changes in unit cost rather than with improvements in quality of the product, as the former can be quantitatively defined. The main conclusions of this micro-study at various plants were:

- i) The contribution of 'technical change' was of overwhelming importance; in fact, it varied from 95 to 100 per cent in the various plants in terms of total net reduction in unit factory costs. Improved inputs and improvements in organisation are included in technical changes; it has been found in the case of textile-yarn plants approximately 2 per cent of the unit cost reduction was attributable to improved wood pulps; in

the case of tire-cord plants the proportion was between 10 to 15 per cent; the contribution of improved labour and better organisation varied between plants and generally accounted for less than 10 per cent of the entire net reduction in units costs resulting from technical change.

- ii) The contribution of plants expansion was relatively small compared with that of technical change, amounting to 15 per cent.
- iii) The studies reveal that over 80 per cent of the cost reductions resulting from technical change at each plant depended upon investment. Replacement investment was of particular importance, usually at least two-thirds, and in some cases as much as 90 per cent of the investment outlays required to implement technical change represented replacement of, or alternations to, existing equipment. It is further pointed out that though the studies have shown 'significant' changes, it is possible to make the existing plant yield volumes of output as efficiently as a new built plant and the outlays would be relatively small compared to new plant. In this connection, Hollander* further points out: "There is a growing body of evidence, at the micro-economic level that even without new investment it is possible to raise the efficiency of existing plants. Thus for example, the Horndal works in Sweden had no new investment for a period of fifteen years and yet output per man-hour increased by 2 percent annually"... A recent study comparing the rates of growth and investment in several European countries and the United States within the last decade presents data which show that no country achieved a very rapid growth without a high rate of investment although a number of countries which did invest heavily failed to achieve a high growth rate."
- iv) Another interesting conclusion is: "Much new technology appears to be generated as a by-product of current production; our study tends to support the view to some extent that a considerable portion of 'technical change' can be ascribed to experience, that is to the very activity of production which gives rise to problems for which favourable responses are selected over time."

It is apparent that the above types of penetrating studies are important; the lesson to be learnt is not that the considerations mentioned are applicable to all situations and economies with equal force. The state of technologies and its applications differ in different economies and as such the need for studies which evolve to partition causes of increased productivity are of considerable use

* Hollander, op. cit., p. 202.

The possibilities of increasing productivity within the scope of existing technology is also of great significance.*

In continuation of the interpretation of productivity changes both at macro- and micro-levels two interesting relationships may be presented.**

- i) Research and Development Expenditure in relation to per capita GNP (at market price): Figure 4.19)
- ii) Power generated and National Income in various countries of the world; Figure 5.

A PROFILE OF PRODUCTIVITY

There are specific reasons for discussing the American scene with regard to productivity in some detail. Firstly, United States of America had done extremely well in all sectors of the economy and has been able to provide standards of living for its people that are undoubtedly high. Secondly, many groups of people from all over the world have studied the American Productivity and have documented the same.*** Thirdly, there are lessons which are applicable to developing economies, and therefore, a study of the same would be worthwhile.

The American Economy is characterised by high production and high consumption.

A brief summary of the American Productivity may be given: In the last 100 years output has doubled every 25 years; American industrial output has roughly doubled between 1939 and 1950. By 1975, it is expected to be double of that in 1950.

About 60 years back American worker turned out roughly the same amount as his counterpart in U.K., Germany, France and enjoyed broadly the same standard of living. Today he turns out 2 to 5 times as much.

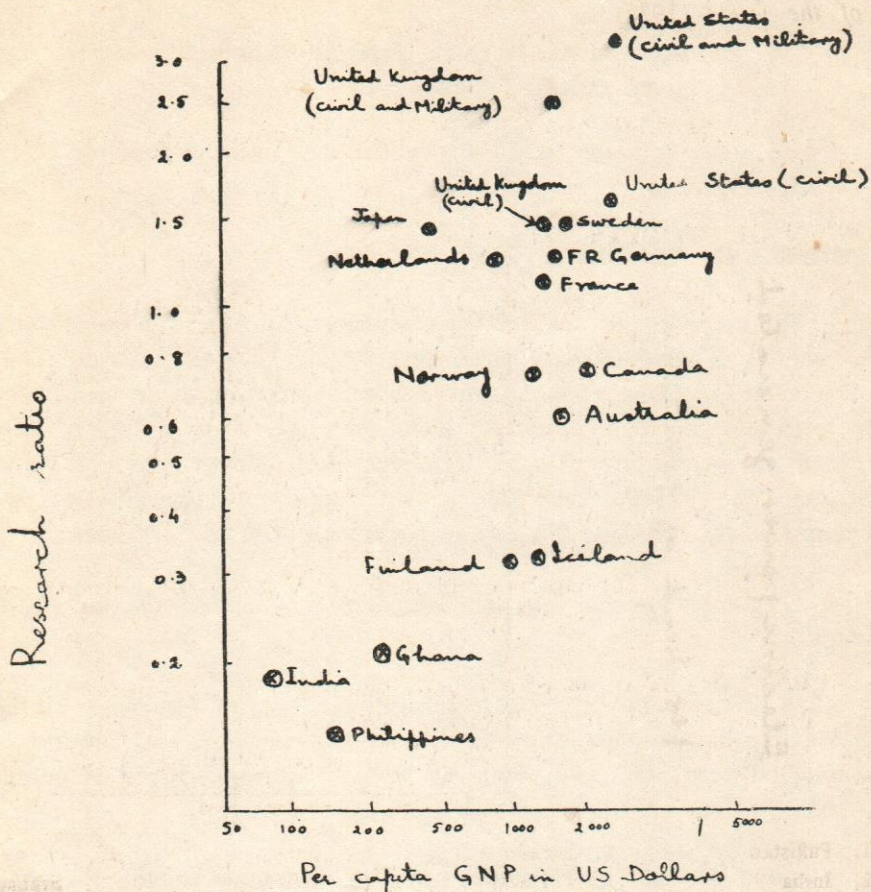
Eight hours of work buys for an American from $1\frac{1}{2}$ to 4 times the quantity of goods that eight hours buy per British or West German worker. Figure 6 summarises the situation nicely. The consumption per head has risen more than 50% above the pre-war level.

* This aspect will be dealt in some detail in the next chapter.

** From the OECD Observer (1963).

*** See G. Hutton, We Too Can Prosper, The Macmillan Co., New York, 1953.

Research and Development Expenditure in relation to per capita GNP (at market Prices - 1961 or nearest year)



at year of RD estimate

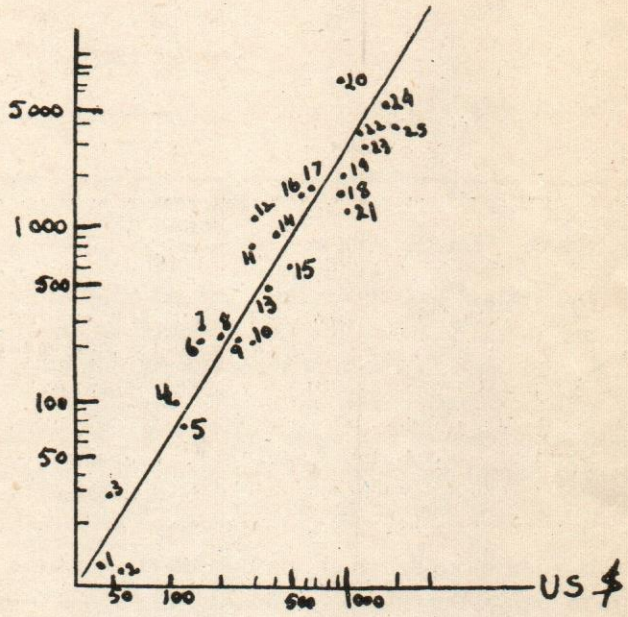
$$\text{Research ratio} = \frac{\text{Gross national expenditure on R \& D}}{\text{Gross national product at market prices}} \times 100$$

Figure - 4

Source OECD Observer

Relation between power generated and national Income in various countries of the world (1957)

Electric power generated
per head of population



- | | | | |
|-------------|---------------------------|-------------------|-----------------|
| 1. Pakistan | 8. Mexico | 14. Italy | 20. Norway |
| 2. India | 9. Portugal | 15. Ireland | 21. France |
| 3. Nigeria | 10. Greece | 16. Austria | 22. Sweden |
| 4. Turkey | 11. Japan | 17. Finland | 23. Switzerland |
| 5. Iraq | 12. Union of South Africa | 18. Australia | 24. Canada |
| 6. Brazil | 13. Spain | 19. Great Britain | 25. USA |

Source OECD observer

Fig. 5

HOW MANY MEN PER JOB ?

(Number required to produce the same output as one man in United States)

Country	Steel	Chemicals	Metal Products	Electrical Machinery	Transport Equipment	Non-Electrical Machinery
United States	1.0	1.0	1.0	1.0	1.0	1.0
Britain	2.3	3.4	2.2	4.2	3.2	3.5
West Germany	1.7	2.6	3.2	3.8	2.4	3.2
France	1.6	3.0	3.1	2.6	2.0	2.3
Sweden	Not Available	2.5	2.6	2.3	1.4	1.9
Italy	1.2	2.5	4.2	2.3	2.1	2.4

Figure 6

Source: *The Economist*, Oct. 1, 1966.

Dr. Rostas* has shown that "the ratio of horsepower per worker in the U.K., and the U.S., bears the same relation as the ratio of output per worker in the U.K. and the U.S., i.e. 'broadly speaking, output per worker is double in the U.S., and horsepower per worker is also double. Also the higher rate of increase in horsepower per worker in the U.S. runs parallel with the higher rate of increase in output per worker.'" The studies of the Anglo-American Council on Productivity also confirm the same.

In addition to this high production-consumption aspect, there is enough leisure to enjoy the higher standards of living achieved; this prosperity is certainly due to higher productivity of the American economy.

The major source of the causes for this high productivity is traceable to changes in the technique of production or technology, efficient management, human relations based on enlightened understanding, incentives in and out of industry and certain in-built characteristics of the population which may be termed as cultural aspects.

Changes in technique of production and its impact on productivity have been already discussed; more specifically these relate to powered equipment in all processes and techniques of organising production. To cite an example, the coal production in the USA was $2\frac{1}{2}$ tons per man per day about sixty years ago;

* L. Rostas, *Comparative Productivity in British and American Industry*, Cambridge University Press, 1948.

during 1953 it was 13 tons per man per day. The worker earned more money and did not work any harder.

Almost all the productivity teams which have visited USA (both British and Indian and others) have spoken in superlative terms in respect of management in USA. There is 'quality in management' which gets better results; the methods adopted are simple, clear and quick. 'Any new discovery or change that might be developed in their research department and found worth while, would be introduced into production process at the earliest.* The enlightened understanding as to duties and responsibilities for the preservation of high material standard achieved and the democratic way of life, recognition of merit, evaluation and the prompt action appear to be the characteristics of the dynamic management in U.S.A. The implications of good management as revealed in the Anglo-American Council on Productivity Teams' findings can be listed as:**

- i) Training of its personnel, from shop-floor to office, in its special skills, both within and outside the firm;
- ii) the appropriate organisation to 'spot' managerial talent, train it, give it the right kinds of experience, and promote it, with sole regard to its merit and efficiency;
- iii) provision, awareness and utilization of detailed measurements of all productive 'performances' and costings thereof;
- iv) organisation and administration of managerial skills to secure the most efficient, effective, and economical controls over productive processes;
- v) use of (i) to (iv) inclusive to secure the highest possible degree of utilisation of machinery (including maintenance), materials, fuel and power, man-power and any other ingredient in the productive processes;
- vi) the pre-planning of all operations to secure the smoothest and fastest flow through all the productive processes;
- vii) the closest and best team work in and between all departments, and the measures to secure it;
- viii) close and continuous pressure for greater standardization, simplification and specialization of components or processes and of end-products;

* G. Hutton, op. cit., p. 129-30.

** Quality Control in Japan, USA and Britain, published by the National Productivity Council of India, 1963.

- ix) close and continuous pressure for research, experimentation, modifications, and improvements;
- x) an artist's awareness of the human tolerance within which all these conditions can be fulfilled.

Human relations in the American Society and particularly in the American industry have several striking features. The first is the growth of trade unions, their membership, resources, specialised knowledge, and their ability to negotiate on equal terms with management. Second is the willingness of management to share all the available information with trade union personnel; the success of human relations, probably, lies in "the deep conviction of both American management and labour that 'the American way' of high and rising wages, high and rising real material standards of living, and reasonably high and rising profits for private enterprise (including profits distributed to private stockholders, who in America are more broadly spread among various income-groups than in Britain), depends on their joint success in keeping productivity high and constantly rising. They also seem to be convinced that high and rising productivity depends on intense utilization of machines and men, which in turn depends on their own high co-operative efficiency."* This is in contrast to the traditional prejudices and distrust that may be noticed in the developing countries. Thirdly researches of social scientists in USA have provided a deep understanding with reference to people at work—individually and in groups—in various situations. Lastly, which is true of the whole American population, is that they are not afraid of changes—whether they are changes of jobs, houses, or places; their adaptability to new situations and mobility has been a great contribution to the maintenance of good relations, as this takes care of the 'shifts' consequent on productivity improvements.

The three elements namely, technology, management and human relations, appear to be of much importance for developing countries. In addition, there are many other aspects in the American economy, such as incentives in and out of industry, and other characteristics of the economy and people, which have been responsible for the present status.

*G. Hutton, *op. cit.*, pp. 143-44.

Productivity Techniques

In the previous chapter a detailed discussion of the productivity from the technical point of view was considered; aspects like Productivity Measurement, Interpretation of Productivity Change, factors contributing to higher productivity were discussed, based on some of the published findings of research in the field. In this chapter, the nature and role of productivity techniques in raising the levels of productivity will be discussed.

PRODUCTIVITY TECHNIQUES

In the drive for increasing productivity the effective starting point is an individual unit, a factory, a farm, an office etc. The cumulative effort at individual level and in the various sectors of the economy adds to the national wealth which in turn is distributed to the people contributing to higher living standards for the people. Thus the techniques which help in increasing the productivity at unit level assume great importance. The range of productivity techniques is really very wide. Techniques for achieving higher productivity may vary from application of fundamental and applied research, studies in developing new products and processes, speeding up of existing processes through mechanization and automation, to utilisation of existing resources effectively and motivating people to achieve higher productivity. Of course, the results achieved will vary. These aspects of increasing productivity have been well brought out as described below:*

"Prof. I.B.W. Benenschot who draws a distinction between technical measures (which usually require substantial capital investment) and organisational measures for increasing productivity, believes that in general the first are about three times important as the second in increasing the productivity. The importance of methods

* Higher Productivity in Manufacturing Industries, ILO Publication, 1954, p. 79.

of increasing productivity without adding investment becomes all the greater when one thinks in terms not of labour productivity alone, but of making the most efficient use of all resources taken together. In underdeveloped countries especially, lack of capital and abundant labour often makes it more important to increase output per machine or per unit of capital than output per worker."

Thus, when one speaks of productivity techniques, they generally relate to those techniques which require little or no capital, but contribute to the increase in productivity, though other methods are not ruled out of consideration.

NATURE OF PRODUCTIVITY TECHNIQUES

The nature of productivity techniques can be appreciated by first discussing productivity and level of technology. This is shown in Figure 7. Productivity achieved in terms of results (output and cost) has different implications at different levels of technology. The implication of Figure 7 is that the results of research and its application can bring about spectacular increases in productivity. To appreciate this, one has only to scan the improvements that have come about in all fields—speed of transportation, coal mining, agricultural production, life-saving drugs, communications, etc., over the last century.

It is also important to recognise that at each level of technology, effective utilisation of resources is of greatest importance; otherwise, maximum benefit in terms of improved quality, higher quantity, lower costs and improved services would not be achieved. This brings to the fore that at any given level of technology the pacing factor is management of technology.

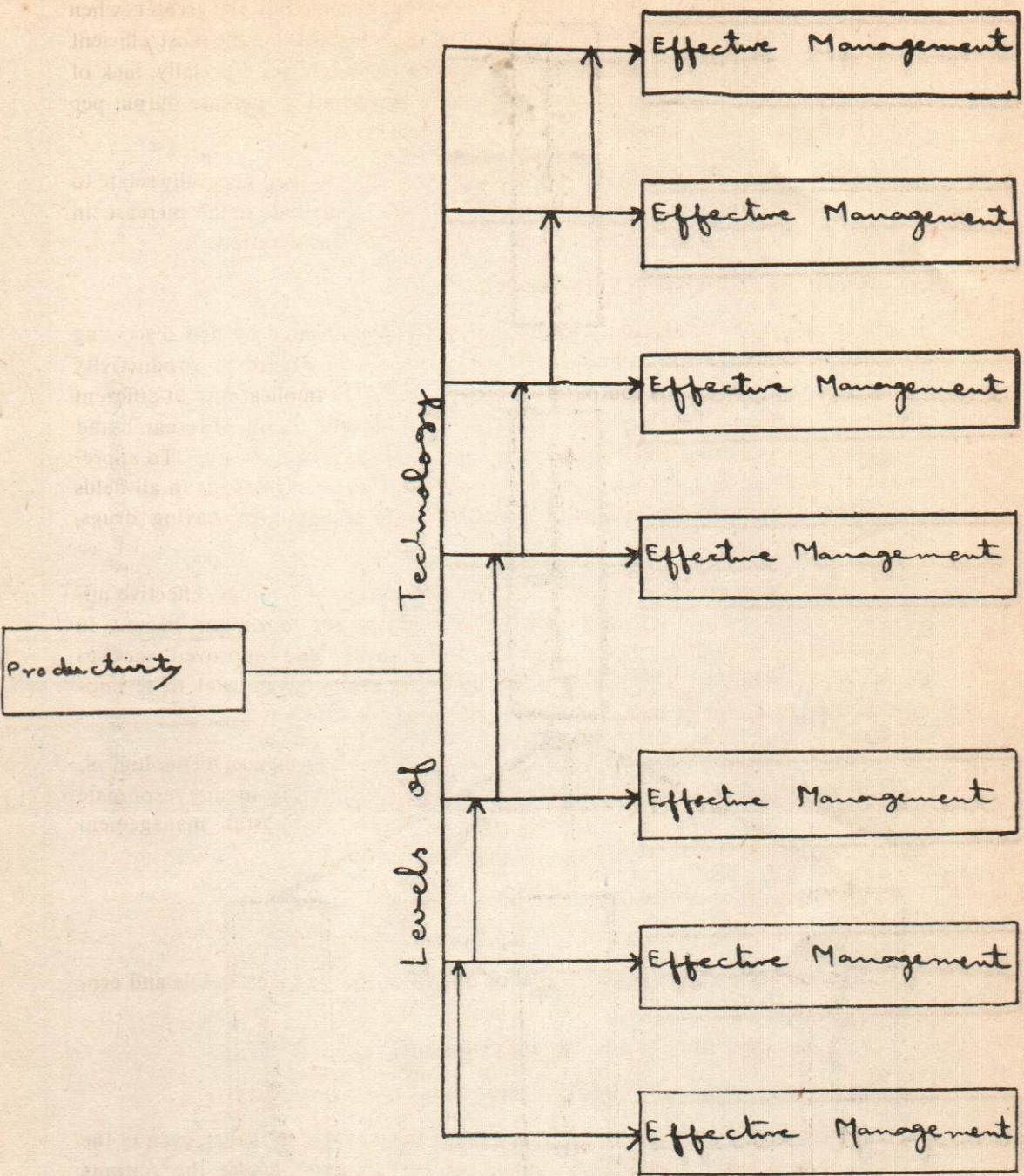
Again at each level of technology, for effective performance, technological, economy and human aspects have to be taken into account; for in any economic activity these three aspects would always be there. Successful management implies management of these aspects, as shown in Figure 8.

This visualisation presupposes that management:

- i) will be on the lookout for improvements constantly;
- ii) implement changes, technical or otherwise that are worthwhile and economic;
- iii) has the ability to adapt to new situations; and
- iv) sees future trends both in technology and management.

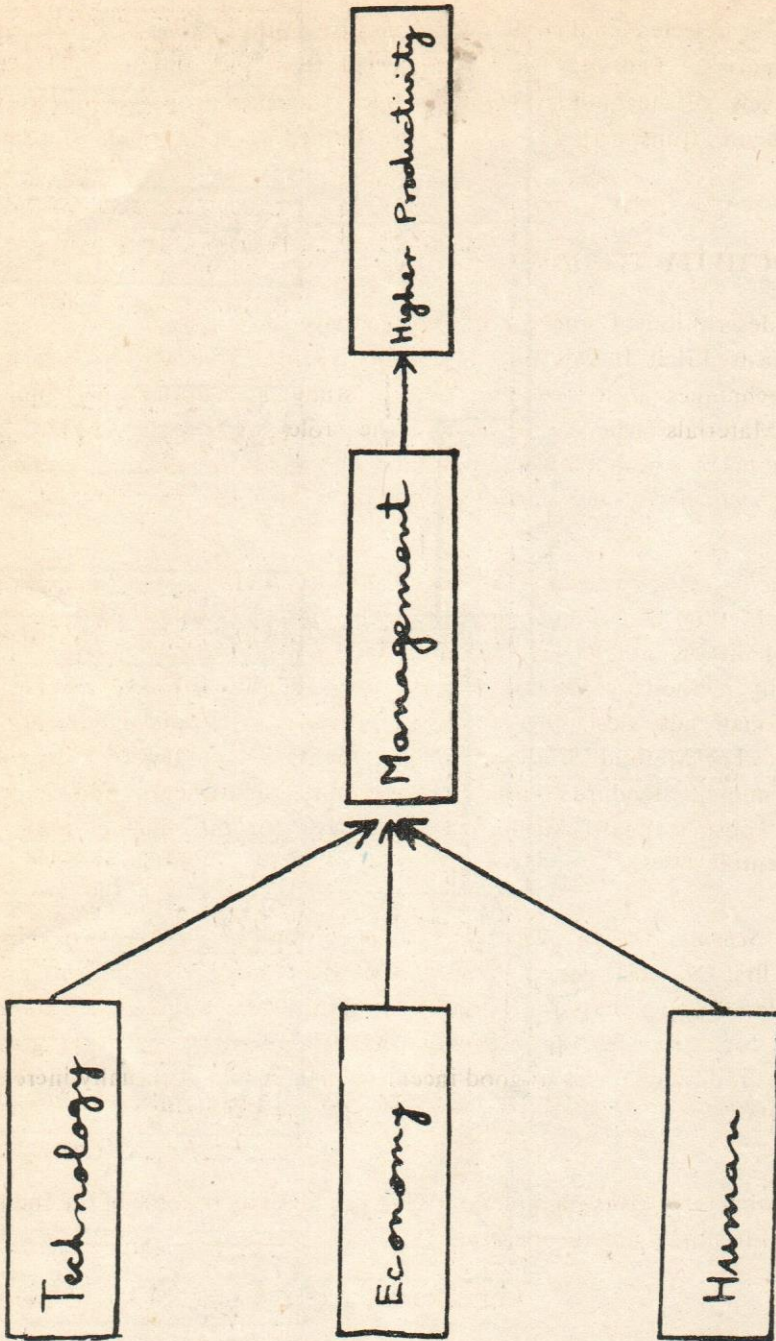
The implications of productivity and technology at the unit level, even in the short run, may be appreciated with the aid of an example, where the outputs

*S. Melman, *op. cit.*, p. 15.



Production, Technology and Management

Fig. 7



Management at any given level of Technology
Fig. 8

per man-hour in selected industrial operations using alternative methods, are shown as in Figure 9. This may be distinguished from the outputs achievable at different levels of technology, for example, transportation, from ox-cart stage to supersonic transport, which may be termed as long range improvements.

SOME PRODUCTIVITY TECHNIQUES

A brief description of some of the productivity techniques is given below. It is to be emphasised that this is not an exhaustive list of productivity techniques. The techniques described are: Work study and Incentives; Quality Control and Materials Management, and the role of standardization. In addition the importance of human relations and the need for equitable sharing of the gains of productivity have been emphasised.

Work Study embraces two techniques—namely, Method Study and Work Measurement. Method Study is concerned with the 'best' way of doing a job and Work Measurement tells how long it should be taken to do the job. The improvements in methods come by rearrangement of work place, movement and handling of materials, designing simple jigs and fixtures and modifications in the design. The Method Study and Work Measurement together provide a basis of determining standard outputs in sections, departments and in the whole plant. Those standards again provide a basis for introducing incentive schemes on scientific lines.

Incentive Schemes, when properly introduced, should achieve two things simultaneously, first the cost per unit of the product must come down and, secondly, provide an opportunity for workers to earn more wages. It is said that the scope for increasing productivity through incentives is very great. "In many of the Indian factories a good incentive plan would eventually increase effort by over 100%".*

The following table gives examples of rise in productivity in some of the Indian factories where incentives are in operation.**

* R.L. Mitchel, ILO Expert in Productivity, Journal of National Productivity Council of India, Vol. 2, No. 5.

** M.K. Ramananda, Productivity, Vol. 2, No. 5.

Automatic Gaging Machine

A Measuring Operation

Visual Limit Gage

Electrical Limit Gage

Snap Gage

Micrometer Caliper

Surface gage with
Dial indicator

Steel Rule & Caliper.

Fork-Lift Truck, Electric

A Transporting Operation

Low Lift Truck, Electric

Hand Truck Hydraulic Lift

Hand Truck Two Wheel

No Truck Hand Rolling.

Automatic Lathe
(Single Spindle)

Semi Automatic Lathe

Manually guided Lathe.

A Metal Removing Operation

Relative Outputs per man-hour
(Index Numbers)

Output per man-hour in selected Industrial Operations using Alternative Methods

Figure 9

Table 5

Type of Industry	Productivity before incentive	Productivity after incentive
Medium Engineering	38	65
Cast Iron Foundary	42	64
Ship Repair Yard	33	45
Manual Transporting Group	36	72
Small Repair Shop	48	70
Small Size Production Unit	37	60

The Modern Quality Control activities have been broadly defined as under:*
 "The ultimate object of all Quality Control (QC) endeavour is to provide quality assurance of the finished product and to assure optimum quality costs for that product. To accomplish this objective, every producer needs an integrated programme for the control of product quality including its reliability elements,encompasses the planning, the control, the evaluation and the reporting of all quality aspects of the product from its conception through manufacture, processing, storage, delivery, installation, maintenance and repair to the end of its service life."

The impact of Quality Control will be felt when the analysis of quality costs is presented**. The components of quality costs are:

Prevention Costs: are for the purpose of keeping defects from occurring in the first place. Included here are such costs as Quality Control, Engineering, Employees, Quality Training and Quality Maintenance of pattern and tools.

Appraisal Costs: include the expenses for maintaining company quality levels by means of formal evaluations of product quality. This involves such cost elements as inspection, test, quality audits, laboratory acceptance examination, outside endorsements.

* General Professional Council, American Society for Quality Control.

** A.V. Feigenbaum, *Industrial Quality Control*, May 1957; see also his book, *Total Quality Control*, McGraw Hill Book Co.

Failure Costs: are caused by defective materials and products that do not meet company quality specifications. They include such loss elements as scrap, spoilage, rework, field complaints and so on.

Clifford* in a paper says that quality costs (in American industries) in many companies are in the same general region as total company profits. In the absence of any formal studies on quality costs, he estimates the quality costs components as:

Prevention	2%	—	10%
Appraisal	20%	—	40%
Failure	50%	—	80%

British experience** suggests that the cost of providing quality assurance can amount to 12% of total turnover; and the breakdown of the costs involved would be as under:

Failure costs	65%
Appraisal costs	30%
Prevention costs	5%

Further experience of application of effective quality control in some companies reveals that by increasing the prevention costs slightly by about 5% the other costs could be reduced considerably, by about 35% of the total quality costs. If one were to make such estimates in Indian industries, a rough guess would be that we spend much less on prevention, though the appraisal and failure costs have been guessed at 20% of the total sales turnover. A slight increase in prevention costs would bring down the appraisal and failure costs drastically, the increase in prevention cost being small fraction of other costs.

Quality Control methods not only provide a definite quality assurance, but also provide a basis for reducing the cost; and this is exactly what is needed in India at the present juncture. Experience has shown that it is not just sufficient to produce a product, but alongwith it one must produce an information system capable of answering questions pertaining to product and processes. Through this approach a better understanding of the process is obtained which helps in improving the quality and at the same time reducing the costs.

* Paul C. Clifford, International Conference on Quality Control, London, 1960.

** Frank Nixon, SQC Conference Papers, Madras, 1967.

It is well-known that in any industry generally 50 to 60 per cent of the costs are due to materials; it, therefore, becomes necessary to give attention to *materials management*. Materials Management, in the broadest sense, emphasises the effective utilization of materials—raw, in-process and finished. The basic problem for any industry is to stock materials at economic levels that are best suited for producing the required quality products. Some of the techniques that have been employed in this field are ABC Analysis that tells which are the important inventories that require attention; Economic Order Quantity, which assists in determining the right purchase quantity, and other techniques like classification and coding, value analysis, standardization of materials, processes and products, layout and handling which assist in physical control over materials; better purchasing procedures, source selection, and effective vendor relations add to the effective management of materials.

The advantages of these procedures are: reduction in the capital locked up, reduction of obsolete materials, remedy for over and under stocking and ensuring the availability at the right time and prices and increasing rapidity of turnover. Apart from these, economy in floor space and labour and clerical expenses can be achieved which will assist in reducing the overhead expenses. Opinions have been expressed in many quarters that it is possible to show reductions in inventory ranging 30% to 50% of its original value by the use of the techniques mentioned above.

Standardization in a developing economy plays an important role in hastening economic development. "If the developing countries have to catch up with the industrially advanced in as short a period as possible, they cannot afford to allow their industries to go through the same experience. They can bypass the eighteenth and nineteenth century problems experienced by the developed countries by the judicious application of standardization from the earliest stages of planning, design and establishment of industries. The modern form of organised standardization is as much an instrument of direction and coordination as of efficient production and distribution; its application at early stages ensures interchangeability and eliminates the need for the reduction of variety. The rate of economic growth of developing countries depends to a large extent on systematic and rational development of the industrial sector on the basis of the latest achievements of science and technology. Some of the major problems that countries have to tackle in the process of introducing balanced industrialization on a broad front centre around the following points:

- a) Closer integration and co-ordinated development of different types of industries, both in the small and large-scale sectors considered viable for the country's economy;

- b) optimum utilization of available human resources and material resources, maximum use of capital equipment and systematic exploitation of unexplored resources;
- c) Rapid development and provision of power, transport communication and marketing facilities;
- d) Rapid transfer and maximum use of the accumulated wealth of technical know-how and practical experience from the industrially advanced countries with a view to evolving correct procedures for installing and maintaining heavy machinery such as transformers, rectifiers, boilers, etc., and minimizing wastage during handling, processing, transport and marketing of products;
- e) A check on the growth of an unnecessary variety of materials, parts, tools and appliances, and an assurance of their interchangeability;
- f) Assurance of consumer satisfaction of products through their quality, serviceability and workmanship at economical cost;
- g) raising the quality and quantity of exports to augment foreign exchange resources to freely enable importation of capital equipment, machines components, specialized items and basic raw materials;
- h) bringing the results of applied research expeditiously to the doorsteps of industry and consumers.

Organised standardization provides effective solutions to these problems and helps developing countries to change over to an industrial economy in a systematic and orderly manner.”*

In the ultimate analysis, it should be emphasised that productivity techniques can bear fruitful results only in an atmosphere of good human relations particularly at the plant level; good labour-management relations are absolutely essential.

Here, there are two aspects to consider: First, the management and second, the labour union. It should be appreciated that ‘Management is the skill with its own discipline and fields of knowledge.’ A union of workers (well supported by all workers) with good leadership that appreciates the problems of management, and can negotiate with the management on the problems of workers is also essential. A well-trained management and a trade union,

* Industrial Development and Standardization, The International Industrial Development Organisation (UNIDO).

with mutual understanding of each others' problems, can create an atmosphere required for increasing productivity.

The importance of good human relations may be gauged from the following statements:*

The direct incentives will increase production by 20 to 50 per cent but 'the ingredient I find in excellent companies has a potential that overshadows the productivity increase achievable through an industrial engineering techniques, when we learn to manage people, the increased productivity will be likened to the relationships of the water wheel to nuclear energy.'

SPAN AND FLOW CONCEPTS

The results of the application of productivity techniques could be explained in terms of 'Span and Flow' concepts, which enables one to understand the implications clearly, and applicable to all economic activities carried out in all spheres of the economy.**

'Span' means the time required to perform a task, and 'Flow' means the units obtained in a given time. Reducing the span and/or accelerating the flow productivity rise; the application of productivity techniques reduces the span and increases the flow, thus contributing to significant productivity rise.

SHARING THE GAINS OF PRODUCTIVITY

It has been discussed earlier that the implication of higher productivity is that the cost per unit must come down. This may happen in one of several ways; lesser input for any given output; more output for given input; or changes in both input and output such that the present ratio would be higher as compared to previous situation. Thus higher productivity implies reduced cost per unit.

It was also mentioned that the impact of productivity would be felt as a chain reaction: the lower prices would increase the purchasing power of money and generate higher demand for existing as well as new products; this would also lead to higher wages for workers and higher profits for the industry which again helps in expanding or starting newer factories; this expansion creates all-round development and more employment and in general leads to higher levels of living.

It, therefore, follows that the above results of the gains of productivity could only arise if the participants—labour, capital and management—are motivated

* John Patton, President of John Patton Engineering Firm, as quoted in the book 'People and Productivity' by R.A. Sutermeister, McGraw Hill Book Co.

** B. N. Bhattasali, Productivity Means Prosperity, Asian Productivity Organisation, Tokyo.

to contribute their best not only to the individual unit but also to society (consumers) at large. Herein arises the importance of sharing the gains of productivity. If the gains are not shared equitably, the expected chain reaction may not set in and thus the expected results will not be achieved.

The crux of the matter, namely, higher productivity and consequently the achievement of higher standard of living to the masses, therefore, rests on sharing the gains of productivity. This is a vital aspect for, if the participants do not appreciate and contribute to higher productivity, there will be nothing to share and no material progress could be achieved.

The Planning Commission* has summarised the situation aptly: "Neither the exercise of their organised strength in industrial conflicts nor laws and the intervention of the State can help the workers much in realising their aspirations. Their gains can arise only out of the strength and dynamism of the economy, the only enduring basis of which is a rising level of productivity. No increase in profits, which does not come out of improvements in productivity but has its origin in current scarcity and the stresses of development, can be regarded as a sign of prosperity. Management has given the lead by bringing about the maximum rationalisation in its own sphere and eliminating all unjustifiable practices which at present act as disincentives in drawing the best out of the workers. The vicious circle of poverty and unemployment and low productivity can be broken only by a tremendous stress on the maximum possible contribution being made by all the participants in the processes of production. For the workers no real advance in their standard of living is possible without a steady increase in productivity, because any increase in wages, generally, beyond certain narrow limits, would otherwise be nullified by a rise in prices."

The British Trade Union Representatives who visited U.S.A. to study productivity in American industries have stressed**

- i) British trade unionists' interests can be harmed by the forcing of increases in pay unrelated to increases in output or productivity;
- ii) a maximum of flexibility and mobility of labour is to be encouraged to meet demands on the British economy;
- iii) training of the leading trade unions' officials in production engineering is to be encouraged and extended;
- iv) the economic implications of an increase in the standard of living should be brought home to trade unionists more;

*Third Five Year Plan, Planning Commission, Govt. of India.

**C. Hutton, op. cit., p. 153.

- v) they should not oppose technological advances, but should insist on full consultation before and during introduction of new techniques, methods, etc., and of adequate scales of pay for rearranged jobs.

Though sharing the gains of productivity is such an important issue, there appears to be no universal rule or formulae to help in the decision of equitably sharing the gains. It appears that the solution may have to be worked out at the unit level, which implies the labour and management must come to agreement on this aspect keeping in view not only their immediate interests but also the wider interests of society at large of which both labour and management are a part. This again brings to the fore the importance of labour-management relations based on enlightened understanding of the situation.

After studying several aspects of the question, the National Productivity Council of India has come to the conclusion that adoption of the following guidelines as a basis of a productivity policy would go a long way in helping enterprises and unions to make a positive contribution to national economic growth consistent with their respective interests:

- i) There is a need to develop a national approach to sharing the gains of productivity which should be flexible, equitable and simple to understand.
- ii) While it is not easy to develop an overall national formula for sharing the gains of productivity, it should be possible to suggest broad guidelines, and illustrate 'models' or schemes for the purpose.
- iii) Sharing the gains of productivity should be regarded more as a philosophy of Industrial Relations rather than a statistical technique of distributing the gains.
- iv) The managements have the primary responsibility for increasing productivity. They also have the responsibility for motivating labour and seeking its cooperation for increasing productivity.
- v) Comparatively few enterprises have adequate incentive schemes. Therefore, wherever possible, enterprises should be encouraged to induce effective incentive schemes for increasing productivity including measurement thereof. However, it is not advisable to have a high powered body by an Act of Parliament for establishing productivity norms and other related standards. Production norms should be arrived at on the basis of scientific productivity techniques and these should be

**See Sharing the Gains of Productivity, National Productivity Council, 1967.

finally settled through mutual negotiations between managements and trade unions.

- vi) Such incentive schemes should be simple but composite. These schemes must have an element of providing training to employees and motivating them to reduce wastes.
- vii) Such incentive schemes should be evolved with effective participation of workers' representatives.
- viii) Enterprises should be encouraged to introduce job evaluation systems for proper categorisation of workers.
- ix) Enterprises should be encouraged to evolve productivity agreements with participation of workers' representatives. Such productivity agreements should keep in view the interest of the consumers also.
- x) The gains of productivity through application of incentive schemes, productivity agreement, waste reduction and a host of other productivity techniques should be equitably shared between the management and the labour through mutual agreements. For this purpose, organised industries may be categorised on the basis of their wage level. Where the wage level is low, employees should be given a higher share in the gains of productivity.
- xi) Schemes for sharing the gains of productivity should be tried in some of the organised manufacturing industries in the initial stages.*

*Guidelines and illustrative models for Sharing the Gains of Productivity, National Productivity Council, 1962.

Implementation

In the previous chapter, the meaning and implications of productivity specially with reference to technological and economic aspects were discussed in detail with object of bringing to the fore the salient features contributing to higher productivity. Higher productivity, it was noted was not an end in itself but a means for achieving higher levels of living for the people. In this chapter, the salient features are summarised and a basis for a plan of action is evolved.

SALIENT FEATURES

The first salient feature of productivity noted was that the results of increased productivity would be beneficial to all in terms of increasing the standard of living of people. This brings to the fore that everyone employed in gainful employment should contribute to increased productivity to help himself and build a strong nation. In this context, productivity interpreted as an attitude of mind assumes great significance.

It was observed that every economic activity in every sector of the economy had productivity aspect associated with it—technological, economic and managerial, including human aspects.

Studies made towards interpreting the productivity change at the macro-level pointed the 'technical change' or 'technical progress' as a major contributing factor; the term 'technical change' was used in a broad sense which included economies of scale, changes in the efficiency of resources allocation, improvements in quality, technological improvements, improved managerial efficiency and the like.

These studies also indicated that there was no significant relationship between mere accumulation of capital and economic growth.

Studies at interpreting 'Technical Change' in a penetrating manner have indi-

cated that Education and Research (better educated labour force and Advancement of Knowledge) matter a lot in contributing to economic growth and prosperity.

Studies at the micro-level indicate that improved techniques of production either to technological change or managerial efficiency play a large part in increasing productivity.

The micro-studies have also pointed out that even without any major investment, it is possible to raise the efficiency of existing plants.

Productivity techniques—techniques which do not require heavy capital investment, but help in the effective utilisation of a given set of resources—play a major role in increasing productivity at the plant level.

Standardization plays a vital role in a developing economy in hastening the economic development.

Experience and studies suggest that in the ultimate analysis productivity approaches and techniques can bear fruitful results of lasting value only in an atmosphere of good human relations in general and particularly good labour-management relations at the unit level. An 'enlightened' understanding on the part of people in general and particularly labour and management appears to be an essential ingredient in achieving higher productivity.

The gains of productivity should be shared equitably amongst the participants—labour, capital management and society at large. Government also stands to gain through higher productivity through tax revenues; it has also responsibility for framing policies, procedures for economic development so that there is stimulation for achieving higher rate of economic growth.

BASIS FOR A PLAN OF ACTION

The salient features with regard to productivity presented in the previous section, appear to suggest the following plan of action as a feasible proposal. Some of the ideas may be long-range in their character but it appears reasonable to start all the ideas as early as possible and simultaneously, wherever possible.

Productivity as an attitude of mind has been emphasised. The Anglo-American teams which visited the USA have said:* "It is that American Trade Unions and management, customers and producers, politicians and professional men, men and women, old and the young—are more productivity-minded than Europeans."

The implication of productivity as phenomenon benefiting all individuals has been mentioned; this implies that every individual in a society would be bene-

*Hutton, op. cit., p. 182.

fited and since benefits do not accrue without corresponding sacrifice, individuals in a society must contribute towards productivity achievement. This brings to the fore the need for a movement in a society—Productivity Movement. The idea of movement as envisaged here signifies mass participation towards achieving a common goal. The idea of a movement may not be new at least to the people of India. The 'Swadeshi Movement' or the movement for political independence brings back to memory the glorious contribution of popular awakening to the success of the movement. Again another movement is called for—this time to achieve economic independence or higher living standards for masses.

A movement signifies the effective participation of all in a community towards a common goal; the movement achieves success only with the attainment of this goal. In the process of this achievement various phases have to be gone through and the time required for final achievement depends upon the awareness and participation of all concerned.

The phases in the process of achievement of the goal may be visualised as follows: Firstly, the need for a movement. In order to create movement there must be a worthwhile cause, it must be a common cause and affect or concern all the community. It is only then one could expect participation from all which form the foundation on which success could be achieved. The implications of productivity in terms of higher standards of living is certainly of fundamental value to a community and a cause worthwhile for everyone to contribute. Thus, one could think of the productivity movement as a constant and continuous endeavour to do things in a better way for the benefit of the community as a whole and therefore a movement is certainly called for. After this acceptance of the need for a productivity movement, it may be useful to view this movement as a process with several phases until it reaches its goal of creating an attitude of mind in every one for constant and continuous improvements.

The various phases in the process of reaching the ultimate object of the productivity movement are:

- i) awareness of the meaning and implications of productivity;
- ii) enterprise level application of methods, techniques and procedures for the level of productivity;
- iii) securing introduction of incentive schemes and productivity agreements or the force of the enterprise, effective participation of managements, labour and trade unions;
- iv) technicians and the government for achieving results at the level of enterprise and also at the national level.

The three phases presented above are of vital importance in a productivity movement in the sense the movement may not be successful if any one of the phases is not carried out; the clear enunciation of these phases is done to emphasise the components of the productivity movement. In these phases are included, the technological and managerial talent and its application with the understanding of the social and cultural patterns of the community. It is also to be appreciated that these three phases are not independent of each other and capable of implementation simultaneously probably under ideal conditions. However, it is reasonable to visualise the productivity movement as a complex process with the three phases mentioned coming into focus at the appropriate time.

Education as well as research as major contributory factors in economic growth has been brought out emphatically. Where illiteracy is high understanding and common sense will be poor and the masses would be swayed by emotional feelings rather than reason; necessary skill and efficiency would be poor. It is therefore necessary to have an extensive education programme to make an individual a useful citizen and a contributor to growth. Through proper education and training proper attitudes could be created.

With higher standards of education research also flourishes and this brings advances in knowledge and contributes to progress and prosperity.

Productivity at the unit level assumes great significance as this is the starting point in the application of productivity ideas. At the unit level productivity techniques and efficient managerial practices should find increased application. It is therefore necessary to propagate the understanding of the productivity techniques to the point of applicability at each Unit. Successful application of productivity techniques and management practices should be documented and made available for wider dissemination. Productivity literature made available to all concerned would go a long way in the propagation and application of these techniques.

The basic idea in the propagation and application of techniques which may be treated as a part of the productivity movement is not merely the application of a set of techniques but development of an attitude of mind for constant improvements in every sphere of economic activity. This step could get through results and practical demonstration of benefits and may provide the motivation for participation of all concerned for further improvements. Benefits in terms of reduced prices, better products, equitable sharing which should result can bring the required participation. This step could be taken in individual plants, offices and other work centres and depends on the leadership of persons in the superiority and managerial positions. The cumulative effect of all these enlightened activities will pave the way for reaching the ultimate objective of the productivity movement. In this process of gradual

development all groups of people—managers, workers, farmers, consumers, producers, trade union personnel, researchers, educationists—get the required motivation for participation through voluntary understanding as well as benefits which are likely to accrue.

Evaluation of individual units and organisations should become a key function; that is scientific evaluation of activities should be undertaken as a routine feature in individual units and organisations including those concerned with public services. Judging performance by the results achieved in relation to objectives as a criteria of efficiency of individuals and organisations should become a regular feature in all spheres of economic activity. This ensures progress through participation and application of effort by individuals.

Ways and means must be devised to secure harmonious labour-management relations on a continuing basis; mutual understanding of the problems and equitable sharing of gains would surely contribute to the success of good labour-management relations.

Finally, productivity should find more prominent place in our national planning. Now that extensive infra-structure for growth has been laid, the importance of productivity and productivity services in the field with requisite depth and seriousness is all the more vital with reference to the wide variety of economic activities generated in all sectors of the economy. Productivity policies should be developed with reference to economic activities which will hasten the economic growth by utilisation of available resources including technology more effectively. Productivity policies should set the pace for proper and constant evaluation and consolidation of experience; and a productivity plan should be woven into the plan of economic development. It is also necessary to think in terms of fiscal and other incentives to industries and agriculture which all induce to improve their productivity performance.

CONCLUSION

A basis for a plan of action for the development of economic growth through higher productivity in our country has been suggested highlighting the areas where effort should be made. In India spearheading of the productivity movement has been taken up by the National Productivity Council (NPC). With its headquarters at New Delhi, the National Productivity Council established by the Government of India in 1958 on the ILO pattern with representatives of the Government Employers and Workers, has six Regional Directorates located at the principal industrial centres—Bombay, Calcutta, Madras, Bangalore Kanpur and Ludhiana. It has besides a network of 46 Local Productivity Councils organised on the same ILO pattern and working autonomously, but nevertheless intimately with NPC. This organisational

set-up is the main instrument through which they have brought about significant improvements at the plant level and contributed to the growth of industrial productivity.

In addition to the activities of NPC, there are many other institutions organisations, research bodies and associations who are contributing to the productivity movement in their own specialised areas. It is hoped that the efforts of all concerned will quicken the economic growth and achieve the end-result of continuous higher standards of living for all achieve the goal of "Prosperity through Productivity."

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