CHAPTER-I

INTRODUCTION:
MEANING OF PRODUCTIVITY

Productivity is the talk of the day and increase in productivity is looked upon as the key to prosperity at all levels. Historically, the term is believed to have been used for the first time in 1776 by Economist Quesney. For a long time, its meaning remained rather vague. Afterwards, towards the close of 19th Century it was understood as "the faculty to produce". It was only in the beginning of the twentieth century that the term began to be used in a more precise sense. In its modern sense, it refers to the relationship between the result and the means employed, or, to be more specific, between the product and the factors used for obtaining it. It seeks to measure the economic soundness of the use of the means. Consequently, productivity can be considered to be higher if the same product is obtained with more limited means; it will be lower if the same product can be obtained by a larger quantity of the means. It will be maximum when the highest output is obtained with the minimum expense of resources; it will be lowest when the resources are not used in most economical manner with the result that the smallest amount of output requires the maximum expenses of resources for the purposes. Thus productivity is concerned with providing more plentiful
supplies of goods/services, increasing segment of the community with the emphasis on better utilisation of resources. Productivity is, thus, the measure of efficiency of utilisation of resources. It can be quantitatively expressed as the ratio of output in term of the goods/services and the input in terms of the resources used.

Productivity means

to the shareholder—higher dividends,
to the management—more capital,
to the consumer—less cost,
to the Government—more revenue and
to the worker—GREATER EARNING

PRODUCTIVITY DOES NOT MEAN –

(a) **just more Production**: It should be with less resources.
(b) **Work Harder**: The aim actually is to reduce the physical, perceptual and mental effort
(c) **Work Faster**: Work faster than normal which may lead to accidents, arrears and injuries to health.
(d) **Working longer hours**
(e) **More production at any cost**: Productivity should lead to reduction in the cost of production.
Productivity is—

(a) **not confined to factories only**

Productivity covers all spheres of economic and social activities.

(b) **not merely for the shop floor or the office desk:**

It should really start from the top. It is more effective if thought of at the planning and design stages.

(c) **not somebody else job**

Productivity should not lead to redundancy or retrenchment to approaches to productivity.

1. **CONCEPT OF PRODUCTIVITY:**

The most common definition of productivity is that it is the ratio between the output of a given commodity measured by its volume and one or more of the input factors, also measured by their volume. The substance of this definition has often been expressed differently by different writers. One such definition is that it is "The average amount of goods and services produced by a unit of a productive factor in a specified period of time."\(^1\) Another, which describes productivity as a ratio of certain input to a certain output, explains the objective of a productivity drive

to be "to get more for less." that is "more output by less effort, for less capital or less raw material than before, or higher rates of economic growth at less economic technical and social costs."¹ The ILO's formal definition of the term is that it is "the ratio between the 'output' of wealth produced and the 'input' of resources used up in the process of production." The problem of increasing productivity, says the ILO, may be said to be the problem of "making more efficient use of all types of resources in employment of using them to produce so many goods and services as possible at the lowest possible real cost."²

An involved description which will need some explanation and clarification, of productivity quoted with approval by the study group on productivity and incentive set up by the National Commission on Labour, is that it is the process of optimizing/maximising the economic utilisation of all available resources and investigating and utilising the best known resources, as also creating new resources for different activities, be it industrial, commercial,


²Higher Productivity in Manufacturing Industries (Geneva) ILO 1954, p.7.
agricultural, services or any economic activity involved in our day to day life.

Human relation experts, casting their nets much wider than more definitions concentrate on the causes of higher productivity. Summarizing the conclusions of U.K. productivity team which visited American Industry, Peter Drucker, in his book, The Practice of Management, says that the real causes of higher productivity in the U.S. is the basic attitudes of managers and workers. "Productivity is an attitude, was their unanimous conclusion."

This is not a definition of productivity, but it is an admirable summing up of the motivations behind higher productivity. Other writers quote the view that "superior management plus the climate of our production-oriented society", is responsible for the high productivity of the American workers. That such attitudes of the mind favouring and insisting on, high levels of productivity have not caught on in India despite our despatching numerous tripartite productivity team to various foreign countries and going through the motions of learning all about productivity has been admitted by the study group which says: "However, the impact of these programmes
(relating to better human relationship, improved utilisation of resources, and innovations in particular fields of work) has not come up to expectations."

Though the concept of productivity is an old one, it is only in recent times that problems relating to the measurement of productivity and the employment of productivity data is detailed. Economic planning have assumed importance, formerly, even in an advanced countries like U.S., productivity was studied by the economist primarily from the point of view of the economic growth of the nation. For that purpose, rough measures of the long term change in productivity were found sufficient. Output per man-hour was no doubt, one of several factors considered relevant in collective bargaining, but specific interest in establishing a direct relationship between changes in output per man hour and change in wages began to develop with the General Motors Contract of 1948 which introduced into wage bargaining a new concept, namely, the annual improvement factor which was supposed to be based on the estimated long-term gain in national output per man-hour. When once productivity became the centre of current interest, academic circles were not slow to point out the inadequacy of the concept of output per man-hour as a measure of
overall productive efficiency. This led economists and in particular John Kandrick, in the 1960 to distinguish between single factor (or partial) productivities and total factor (or total) productivity.

When output is measured per unit of a single factor such as labour or capital, the measure so obtained came to be called single or partial factor productivity. This is not a particularly satisfying concept because production is the end result of the combination of factors in certain proportions and when these proportions were varied for reasons such as changes in relative factor prices or in technical knowledge, "changes in the ratio of output to one input reflect inter-factor substitution as well as changes in overall productive efficiency."¹ So a single factor productivity is not a true measure of overall productive efficiency nor is that single factor solely responsible for the improved overall productive efficiency overall productive efficiency should reflect the relationship between output and all the input factors of production, of which labour, through the most commonly employed denominator of the relevant ratio, is only one. However, there is no consensus of opinion even in an advanced country as to the appropriate-

ness of adequacy of the concept of "total factor productivity", as originally propounded by John Kendrick, which is reckoned only in term of inputs of labour and capital. The objection raised is that the so-called "total" factor productivity is not based on the totality of inputs. According to Stanley H. Ruttenberg: "when the measure does not include other input such as education, science, technology, social organisation, cultural heritage and quality of human skills, how can it be called "total factor productivity." Overall productive efficiency depends not merely on the physical contribution of certain tangible inputs such as labour or capital but on a host of other intangible inputs which do not lend themselves to ready quantitative measurement. Thus while Economists have moved away from output per man-hour, called 'Labour' productivity, as an insufficient concept of productive efficiency, they have yet not arrived at an agreed or acceptable definition of "total" or "total factor" productivity which would be a true measure of variations in overall productive efficiency.

The object of raising productivity is clear, namely, to get the largest volume of output for the lowest

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employment of the different inputs, but because of the seemingly insurmountable difficulties in evolving precise measures of both output and input, or in agreeing to one particular concept as yielding a satisfying and workable measure of productivity, productivity continues, despite the many learned studies and expositions made in recent times, to be a rather hazy concept, employed in practice in different ways by those who realise its importance. Economists talk about it in many voices. That is why we hear of comments such as that, "The whole concept of productivity is not a clear one." that it is "nothing else but a specific state of mind, an attitude, a common will which commands social development "that" productivity is at the same time a very complex concept and a very simple one.¹ That productivity is one of the most elusive concepts in economic literature" or that productivity is a subject surrounded by considerable confusion.

In India, enquiries into level, and rate of increase of productivity were almost non-existent until very recent times. A few independent research scholars have attempted to study productivity changes in particular

industries, somewhat on the lines of enquiries made in advanced countries, but the national commission on labour says: "Their results have not been generally acceptable."\(^1\)

Productivity is clearly a measure of the overall efficiency of production— the net result of the way the various inputs, tangible as well as intangible, are combined to get the most out of the least. However, as the study group on productivity and incentive puts it: "Productivity is a most complex phenomenon in industrial society. It is influenced by so many factors—--to disentanglable any separate force in this web of causative factors with any precision in well-high impossible."\(^2\)

2. OBJECTS OF PRODUCTIVITY:

We have mentioned above that the main objective of a productivity drive is "to get more for less", that is, "more output for less effort, for less capital or for less raw materials than before, or higher rates of economic


\(^2\)Report of the study Group of productivity and incentives (Govt. of India: National Commission on Labour, 1967), Chapter 2.
growth at less economic, technical and social costs." This statement has many economic implication.

Higher productivity is not an end in itself. It is a means to a difficult goal, namely, rapid economic growth only if it is accorded unquestioned prominence in national economic policy—not in theory but in practice—not as a unquestioned prominence in national economic policy— not in theory but in practice, not as a mere public relations slogan, but as something desperately important for the nation's progress. India's productivity year 1966 was the occasion for a number of well worded speeches and articles, but its impact on production was negligible. Sloth and indifference continued to stalk the scene everybody talked of productivity, but nobody did anything to promote it. "The objective of increasing productivity must be raised to the level of high national purpose" declares the study group on productivity and incentives— an admirable mode of expression indeed—but there was no attempt to do anything of that kind even in the productivity year.

Rising productivity serves an important purpose in regard to both internal economic development and stability and external balance of trade. Regarding the
former, the ILO printed out in its General Report on wages in 1948 "So long as prices remain responsive to change in wage costs, increases in real wage rates without shrinking employment can be sustained only by enhanced productivity and production." This has been our experience too, during inflation in recent times. Wage increases of any significant dimensions, and coverage have invariably been accompanied by price increases, and though they have been both frequent and substantial in money terms in many industries and employments. They have not led to any appreciable rise in the real wage level in the absence of commensurate productivity increases. Higher productivity resulting in lower unit wage costs is, in such circumstances, the only way of rising the real wage level and of maintaining the stability of the price level.

Productivity has much to do also with export promotion. We shall revert to this subject in a later section where we shall be dealing with the consequences of the low level of productivity of the Indian economy—particularly of its organized manufacturing sector. Here it would suffice to say that cost and quality competitiveness in the international market is the sole means of ensuring a
rising level of exports. AUN Team of exports, which visited India in February 1967, suggested that reduction in cost and prices, if necessary by the introduction of a mechanised system such as automation, and concentration on qualitative production were essential for export promotion.\textsuperscript{1} Subsidization of exports for redressing cost differentials can only be a short term device, as a long term arrangement it is a counsel of despair. That would be proof enough that we are paying the price of high-cool economy at home by shutting ourselves away from world markets through our high prices and high protective tariffs and that we can, therefore, cut no ice in International markets. That this was the malady afflicting the Indian export trade was the general consensus of opinion of distinguished economists at the Indian Economic Conference in December, 1967.

The importance of rising levels of productivity rising competitively with corresponding increases in other countries in ensuring a high rate of economic growth and raising living standards has been stressed at the highest policy levels in several of the leading countries of the

\textsuperscript{1}Productivity, Vol. VIII-1, p.67.
world Walter Reuther, president of American Federation of Labour, said in 1946: "living standards do not rise by any magic formula. They can rise only when workers produce more per hour and per year of work." Productivity, it made it possible for the society to obtain incomparably more products than was the case under feudal conditions."

Here at any rate, is a meeting of great minds, in regard to the role of productivity in rapid economic development, there is perfect agreement between the different political and economic systems. Productivity is so fundamental to growth that it would be no exaggeration to say that an inadequate rate of growth of productivity might, in the long run, endanger the very survival of an economic system. Both Lenin and Stalin were merely referring to the historical fact even as they were extolling the merits of communism.

In our own country, despite the failure of Indian Productivity year, the close relationship between the rate of growth of economic development and the rate of increase of productivity has not altogether escaped attention at the higher levels. The member of planning

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commission incharge of industrial development said "that productivity is not merely a theoretical concept but a factor of immense practical importance is evident from the close relationship that exists between the rate of economic development achieved by the various countries and improvements these countries have secured in productivity." He gave the rate of increase of Labour Productivity in the developed countries in 1965-66.

The same opinion has been expressed in both the U.K. and U.S.S.R. Prince Philip, Patron of National Productivity year organized by the British Productivity Council, said, "No amount of economic juggling can alter the fact that in the long run our solvency depends on the efficiency of our industries and upon the national productivity- - - -. The level of living is a matter of higher productivity and an increase in productivity leads to an increase in economic welfare." 

This was nothing more than an echo of what Lenin, Stalin and other communist leaders have said about productivity from the very early days of communist rule in Russia. Lenin said: "In the last analysis, productivity


of labour is the most important, the principal thing for the victory of the new social system. Capitalism created a productivity of labour unknown under serfdom. Capitalism can be utterly vanquished, and will be utterly vanquished, by socialism creating a new and much higher productivity of labour — — — Communism is the higher productivity of labour."¹ Stalin more or less repeated the same arguments: "Why did capitalism smash and defeat Feudalism? — — because it created high norms of labour...."

3. MEASUREMENT OF PRODUCTIVITY:

Need for productivity studies can be visualised from micro and macro approach. Micro approach has a bearing on the sharing of gains of rise in productivity by labour and capital. Macro approach has a bearing on determination and operation of income policy to regulate income of the factors of the production so that the price level is commensurately controlled. It is in this light that the productivity study has to prove way for formulating economic policies to maintain economic stability in the economy. The income policy based on

productivity study will supplement the successful operation of monetary and fiscal policies.

Measurement of productivity depends upon the definition of the concept of productivity as such. Productivity is defined as a measure of efficiency with which resources are converted into commodities and services. However, this is a very broad-based definition and in the measurement of productivity we require a precise definition indicating the quantitative measurement of change in productivity. J.N. Kendrick has defined "Productivity as a term to denote the ratio of output to any related input or class inputs. In this sense, there is a spectrum of productivity ratio, each of which indicates the savings achieved in particular cost elements over time as a result of changes in productive efficiency and factor substitution." In order to measure changes in productivity efficiency output must be related to the aggregate of corresponding inputs.

A Partial factor productivity or partial productivity ratios:

Partial productivity has been defined as a ratio of

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1Soloman Fabricant: 'Basic facts on productivity changes: National Bureau of Economic Research.

output to any particular input and we can thus obtain partial productivity of labour and/or capital. However, partial productivity ratios do not measure changes in the efficiency of that particular resources only nor of productive efficiency generally. The progress cannot be assigned to labour or capital but we have to take into account various factors which effect productivity. These factors are quality changes in factors of production etc. Since these factors are not taken into account or are implicitly assumed, partial productivity is to that extent a simple measure of productivity measurement. Partial productivity ratio tells only part of the story. A better measure of productivity is, therefore, one that compares output with combined use of all resources. In this case the problem is the type of resources which should be taken into account in measuring change in productivity. Proportions in which factors are combined usually change over time because of changes in relation to factor prices or in technical knowledge. When proportions vary, changes in the ratio of output to one input or class of inputs reflect inter factor substitution as
well as changes in overall productive efficiency.

The theoretical literature on productivity measurement can be divided into two major groups:

A- Partial factor productivity or partial productivity ratio.

B- Production function

It may be mentioned that the first group deals in assigning productivity to one or total inputs as a measure of productivity. Second group deals with estimation of input-output relations. This tries to find out functional relationship between input and output. Further attempts have been made to find out the exact nature of technical change and magnitude of its impact on production.

Quantitative measurement of some factors such as skill of workers, technical advances, quality of raw materials etc., is almost impossible. Thus, these are to be left out and only those factors which are capable of quantitative measurement have to be included in the list of combined use of all resources. In a simple equation, it can be written as:

Value of production = value of factors
This may be further elaborated as:

\[
\text{Volume of products} \times \text{prices of products per unit} = \text{Volume of factors} \times \text{prices of factors per unit}
\]

Thus, it is clear that if gross output is taken into account for productivity measurement, then the corresponding factor inputs of labour, capital and materials will have to be considered. If net output should be considered, then factor inputs of labour and capital alone will be taken into account. In a study of industrial productivity, net output approach is preferred to gross output approach.

The above mentioned index of productivity is the ratio of the index of net output at constant prices to the weighted average index of labour and capital input both at constant prices. The rational of such an index of productivity is that it will be inverse of the cost price of production calculated at contract price.¹

cost price of production is falling in the same proportion. The resultant savings are the gains of productivity increases.

Kendrick has also emphasised a separate measure of increase in real product and productivity attributable to economies in the use of raw material consumption. Fabricant also mentions that productivity based on comparison of output with the input of both labour and tangible capital are better measures of efficiency; indeed, this index is the best currently available approximation to a measure of efficiency.¹

Thus an appropriate index of productivity would be a ratio of the weighted index of output to the weighted average index of various input items. It would more precisely be stated by the formula:

\[
P = \frac{Q}{w_1 l_1 + w_2 l_2 + w_3 l_3 + \ldots + w_n l_n / h_n}
\]

where \(P\) is productivity index and \(Q\) is the index of output of products and by products of an industry, \(l_1, l_2, \ldots, l_n\) and \(h_n\) are the indices of various production

¹Soloman Fabricant: 'Basic facts on productivity change' Occasional paper No. 63 of 1959, by National Bureau of Economic Research, U.S.A.
inputs of the given industry and $w_1 - w_n$ are the weights attached to each unit respectively.

Thus, input indices can be combined into an overall index of input by a weighting system determined according to the relationship between the various factors compensations in the base-year. In a given year the total share of labour in the form of wages etc., plus the total share of salaried staff in the shape of salaries plus the total share of capital in the shape of net revenue (i.e. rent, profits, interest on borrowed capital etc.) should be equal to the total net value of output. Hence, the importance of base year weights, because, otherwise, by adopting current weights, we will obtain a measure of production itself. In other words, by combining the relevant input indices of the year of comparison (nth year) by weights according to the relationship of their base year (0th year) compensation, we would obtain a measure of what the output factor would have been, had the base year productive efficiencies of input factors prevailed. By comparing the real net output of factors in the nth year, with the measure at the base year weights (excepted output in the nth year at base year efficiency of factor inputs) we obtain a measure
of productivity change in the nth year. It may be repeated that an appropriate index of total factor productivity change is a ratio of the weighted index of output to the weighted index of various inputs in which output is weighted by unit product prices at factor cost in the base year and inputs are weighted by unit factor compensation in the base year.

Partial productivity ratio as a measure of productivity change has some merits of its own. It is a simple method of measurement of productivity. In an economy, where technical changes are taking place slowly, this ratio is a satisfactory method of measurement of productivity because once technological change is held constant, change in productivity can reasonably be attributed to labour and capital. Another advantage of this method is that even if there is some deficiency in collection of data, the deficiency does not get magnified in productivity ratio and there are less variations due to this defect. In developing countries, where data collecting agencies are on their way to perfection, this method is that any change in productivity is attributable to one or more inputs and other factors such as technical change, change in the quality of
factors of production, do not figure in productivity change. As the method is simple, the ratios speak very little about the input output relationship and sometimes amounts to saying that output is divisible into one or more inputs. It should not, therefore, be used as a precise measurement tool and small changes should not be considered significant. The index can be better visualized as a indicator of the trend of productivity change rather than the measure of the change itself.

Thus, the productivity ratios cannot be used to indicate the proportion in which the wages should rise in real term. In this monumental work on productivity Trends in United States between 1879 and 1957, Kendrick has observed that real average earnings of employees have risen proportionately more than the total factor productivity and in certain sub-groups more than even partial labour productivity. However, if the productivity index displays an advancing trend, the wage rates and capital return necessarily will rise since this is the channel through which gains of productivity are distributed amongst the workers and investors.
Thus, in view of the limitations of this measure, production functions are used in measuring productivity changes. A brief review is presented below:

**PRODUCTION FUNCTION:**

The concept of 'production function' by which we understand that the physical volume of output depends on quantities of inputs employed in production process i.e. estimation of input-output relation is closely related to the productivity measurement, composition of input varies over time and a given quantity of output can usually be produced with differing combination of inputs, the actual combination used during a given period being the least costly at the relative prices obtaining a different inputs in that period. This results in factor substitution. There is an increasing tendency, therefore, to estimate productivity changes in terms of complete production function.

In the first instance, there is an arithmatic index for measuring productivity change. The index of productivity 'A' is given by:

\[ Y = A (W_0L + 10k) \]

or
A = \frac{Y}{WCL + iok}

'A' is thus an average productivity of an arithmetical combination of labour and capital with factor prices in the base year as weights.

Notation:

Y = Index of output in physical units
L = Index of labour input in physical units
K = Index of capital input in physical units
A = Residual, total factor productivity or technical changes
W = Wage per unit of labour
J = Rental per unit of capital services
O = Base year magnitudes
T = Time

YLKA = Relative (percentage) rate of change of the respective variables per unit of time.

B = Ratio of value of capital input to the value of output (the relative income share of capital)

X = Ratio of value of labour input to the value of output (the relative income share of labour)

Constant prices are used as weights relating to any one period or can be an average of, over several periods.
The pioneers of the use of this method are Schmookler, Abramovits and Kendrick.

The method implicitly assumes that the production function is linear in labour and capital (i.e. doubling the amount of labour and capital will double the amount of output) that competition prevails in the factor methods and that the firms are in equilibrium with respect to their use of labour and capital. However, the assumptions are not justifiable. The assumption of linearity of production function implies that marginal products of the inputs are independent of the qualities of imports and that capital and labour are perfect substitutes in production. Moreover, equality of marginal product of capital with its price requires a long run equilibrium. Besides this, the price of capital in practice is not a rental payment for use of capital nor for market rate of interest, but the average rate of return.

It is implicitly assumed in this method that the marginal products of inputs are changed only by the other 'forces' and always in the same proportion so that their ratios remains constant and independent of the ratio
of quantities of inputs, however, fixed capital may grow relative of labour.¹

In the slow measure, factor changes are combined geometrically (weighting by the elasticity of output with respect to each factor) rather than arithmetically (weighting prices) one of the critical assumption underlying Solow's derivation is the neutrality of the technical change. It must be assumed that the technological change does not shift the ratio of the marginal product of capital to marginal product of labour. But this does not sound realistic.

An empirical study conducted on the basis of above mentioned production function has shown that major source of increase in total productivity is due to technical change. A study conducted in U.S.A. on this basis, points out that "technical change is a major source of growth accounting for the thirds of total and only a quarter or so accounting for the rate of output is due to growth in fired capital. This finding has an important policy implication, i.e., capital formation but was of small help in promoting growth. Acceleration of technical ¹

progress alone could bring out substantial increase in growth of output.

R. Slow further tries to link capital formation with technical change. This is popularly known as 'embodiment hypothesis' which explains that capital formation is a vehicle of carrying technical change into effect. It amounts to improvement in new capital goods. In the long run, the rate at which stock of capital, measured in efficiency units grows, is first the sum of the rate of growth in the quantity of the capital. Slow\(^1\) and Krishna\(^2\) conducted empirical studies for measuring productivity change. K.L. Krishna in this respect concludes that the contention that investment affects rate of technical change remains unproved.

The basic result of the studies on productivity change is that we do not understand a large fraction of past growth calling this unknown residual as technical change of little help. An alternative approach was:


suggested by Griliches. This approach tries to identify all the factors which bring about changes in output. An attempt is made to quantify these factors and thus minimize the residual. This complete accounting approach has been more useful in knowing the factors which lead to the changes in productivity. Thus, much of these so called technical change can be viewed as an improvement in the efficiency or quality of inputs. In fact, Griliches implicitly uses the concept of embodiment but this is not confined to capital alone but all other factors.

Griliches conducted studies relating to productivity growth in the U.S. agriculture. His major finding was the reduction in residual from 3/4th to less than a fifth of the measured rate of output. The single largest reduction is due to adjustment for improvements in the quality of labour. Griliches thus he uses the concept of embodiment with the wide coverage. He allows embodiment of technical change in both capital and labour. His study significantly brings to light where and how the quality (technical) changes occur and provides in some cases handle for effecting the rate of technical change directly. This methodology was
used by Griliches in the context of U.S. agriculture growth.

Jorgenson¹ and Griliches have emphasized that if quantities of output and input are measured accurately growth in total output may be largely explained by growth in total input and that there is no necessity to attribute residual to technical change. This makes one thing very clear that application of production function for measurement of productivity needs very accurate measurement of data relating to various inputs. If this condition is not satisfied then to that extent the mistakes of original data will get magnified in the final product, resulting in absurd estimates of productivity. Obviously, balance used for weighting gold cannot be used for weighting coal.

In view of this, in developing and under-developed countries, where data collecting agencies are trying hard to bring perfection in the quantitative measurement of various inputs, partial productivity ratio is reasonably scientific and adequate in measuring productivity changes.

PRODUCTIVITY STUDY: Empirical Investigations:

In view of the planned process of economic development in India, and huge investment of private and public sectors, productivity has assumed great importance for speedy development. Having keenly awarded the productivity studies, the Government of India made a request to I.L.O. and a team of productivity exports was sent to India in 1952. The major emphasis was on the application of modern techniques of work study and plant organisation in the context of Indian Textile and Engineering Industries. The second I.L.O. Mission of productivity came to India in September, 1954 and participated in studies and seminars in this respect.

In 1956, Indian productivity Delegation visited Japan and published its report in March, 1957. It recommended the establishment of National Productivity Council. Main function of this Council, which was established in 1958, is to spread productivity awareness amongst employers' and employees' organisations.

Besides this, various institutions and scholars have made special attempts to measure productivity in Indian Industries. Individual scholars have made attempts to measure productivity in case of few selected industries, o
course, non-availability and uncomparability of data have been the two impediments on account of which reliable studies on productivity are not available. However, study undertaken by the labour bureau, Simla on productivity is perhaps the only institutionalized attempt to measure productivity in Indian industries with wide coverage. Before describing Labour Bureau's attempt to measure productivity, a brief measurement of productivity by individual scholars is presented.

One of the scientific studies relating to this aspect and work done by Dr. Balkrishan, physical output has been kept as the basis throughout. The man-hour expanded for productivity a unit of output has been used as an indicator of change in productivity.

Other studies undertaken by the scholars have essentially put emphasis on the application of different methods of measurements of productivity relating to particular industry/industries. This is mainly due to the non-availability of comparable statistics for industries over a period of time as the coverage of

1Dr. R. Balkrishna: Measurement of Productivity in the Indian Industry.
industries under Census of Manufacturing Industries (CMI) and Annual Survey of Industries (ASI) is different. A detailed survey in this connection is available in the July, 1967 issue on the Indian Labour Journal.

Mr. K.K. Bhatia has dealt, in great details, with the trend of productivity in selected industries, Jute Textile, Cotton Textiles, Sugar, Paper and Paper Board, Match, Glass and Glassware, Ceramics, Cement and Hydrogenated Oil, it was observed by the author that the productivity Index in case of jute, Paper and Match Industries has generally remained at about the same or below base year levels while that for cotton textiles after reaching a peak by 1955 has registered a continuous decline to revert to base year level by 1963. On the other hand, total productivity in glass, ceramics and Hydrogenated Oil industry had registered a most phenomenal increase. In all the eight industries, i.e. except Jute Textiles, real wages have all the time been going up while those in the Jute Textile Industry also, they are substantially higher from the base year, although after reaching a peak level by 1955, there has been some marginal decline. One thing, therefore, that stands out clearly is that real wages in those selected industries have borne little relationship

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trends. Increase in real wages in jute, Sugar, Paper, Match and Cement (where productivity has not made any material headway) has been substantially higher while they have not kept pace with the increase in Productivity in class, ceramics and Hydrogenated oil industries, where the productivity increases has been phenomenal.

**Labour Bureau's Productivity Measurement**

As recommended in the second five year plan, Labour Bureau took up a project for constructing productivity indices for a few selected industries based on secondary source data available through published reports of the CMI and ASI. The results of such a study on their trends in the utilisation of labour and other inputs during the period 1947 to 1961 in general in nine major industries viz. Jute Textile, Cotton Textile, Sugar, Paper and Paper Products, Match, Glass and Glassware, Cement, Ceramics and Edible Hydrogenated Oil have been published in memograph entitled "Reports on Trends in Utilisation of Labour and other inputs in selected industries."

The term 'Labour Productivity' is commonly defined as a ratio of physical amount of output achieved in a given

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period to the corresponding amount of labour expended. This term is misunderstood as it points out that productivity change is due to labour alone. In order to avoid this understanding, 'Labour Productivity' has been designated as Labour Utilisation', which is also more in accord with the meaning attached to this ratio. The ratio of output to the labour expended represent the inverse of the real labour castelement and thus, changes in this ratio would signify whether labour as a factor of production has been utilised better or otherwise in conjunction with other factors of production. The term capital utilization and material utilization are defined broadly in a manner analogous to that of 'Labour Utilization'. The focus of attention in the present study was on trends in labour utilisation and trends in the capital and material utilizations would be considered in as much as these throw light on the movements in 'Labour Utilization'.

Indices of labour utilization are obtained by utilizing the ratio of (i) Index of gross output and index of employment and (ii) Index of net output and Index of man-hour. The Index of material utilization is obtained by using the ratio of index of gross output index of materials and fuel consumption. Similarly, the index of
capital utilization is obtained by utilizing the ratio of index of gross output and index of fixed investment.

An analysis of trends in utilization of labour capital and materials, shows that in the Jute Textile Industry in 1952 the index of labour utilization remained at the same level as for 1947, but the other two indices of input utilization declined. Thus it appears that the industry suffered a fall in efficiency during 1919-52 as compared to the efficiency maintained in the base year. In view of general increase in the input utilization efficiency appears to have improved in 1952, 1956 and 1958 as compared to the efficiencies in the respective previous years.

Considering the trends in gross output in relation to number of men employed and those of average earning of workers, it would be observed that there was a general upward trend in the gross output per man and the workers' earnings from 1963 upward. The index number of workers earning was consistently higher than the index number of gross output per man for each year of the period under study. The former was generally, at a still higher level than the index number of net output per man-hour during the period.
In Textile Industry, the industrial efficiency appears to have increased in 1951, 1952 and 1955 as compared to efficiency in the respective preceding years. Efficiency seems to have decreased in 1949, 1956, 1958, 1959 and 1961, as all the three indices of input utilization declined in these, compared to the respective preceding years; considering the trends in gross output per man and average earning of workers, it would be noticed that although there was more or less a steady rise in the average earnings, the gross output per man appeared to have attained a steady level in the later years of period under study. The workers earnings were higher than the net output per man-hour during 1948-49 and from 1959 onwards.

In the case of Sugar Industry, an analysis of relative changes in gross output in relation to men employed, material and fuel consumed and fixed investment, shows that only in 1948 there was a fall in all three input utilization (Labour, capital and material) as compared to the utilization in the base year (i.e. 1947). Considering the trends in gross output in relation to number of men employed, net output per man-hour and average earning of workers. It would be noticed that gross output per man and net output per man-hour fluctuated appreciably till
1953. Whereas the workers' earnings generally increased in this period. The indices of workers' earnings were considerably higher than the indices of gross output per man and net output per man-hour for each year of the period under study.

4. FACTORS DETERMINING PRODUCTIVITY:
   (a) Factors other than Workers:

   The economies of most underdeveloped countries exhibit certain common characteristics for determining productivity of an industry. For this, firstly, financial factor is of utmost importance because without proper finance industry cannot run smoothly and hence productivity will be adversely affected, whereas if proper finance is available productivity will increase steadily, by utilizing all factors of production. Among the factors other than workers, financial factor has got a pivotal role to determine the productivity in an industry. Secondly Technical factors including the degree of mechanisation, Technical know-how, raw materials, layout and methods and techniques of work determine the level of technological development in any industry. Improvement in methods of work and equipment are reported to have shown increases in productivity ranging from 20 to 200 per cent. Thirdly, managerial factor also affects
the level of productivity. Better planning of work, simplification of methods, work simplification, time and motion study, emphasis on need for reduced wastage and spoilage are some of the contributions of the management to the causes of higher productivity. And lastly Governmental policies also affect the productivity good and favourable Governmental policies increase productivity and vice-versa.

(b) **Factors Related to the Workers:**

Human factor is a pivotal factor in the determination of production. The human side of an enterprises is its dynamic part; good machine, improved methods of work, new processes, in short, all improvement in technology calls for willingness and action on the part of the workers in the industry to serve as agents of higher productivity. Various factors influence on productivity firstly, job confirmation is an important factor which directly effect productivity of an industry. If job of the worker is confirmed than they will devote more time and energy to the work, hence bringing favourable contribution to the productivity, but if their job is temporary, then they do not pay due attention and do not show much interest to work which adversely affect
the productivity in turn. Secondly, training by improving the skill of the employee, brings about an improvement in the quality and quantity of output. A novice, who has just started working without proper training, will normally produce less than other workers who have been systematically trained. In fact, the productivity may not be up to the mark for lack of proper training, and lastly incentives and welfare programmes should be to encourage workers to put in their best on their jobs by overcoming the usual shortcomings in their nature like laziness, indifference, suspicion, distrust of the management. It incentives and welfare programmes are not provided to the workers than productivity will be directly affected therefore, incentive and welfare programmes help to determine productivity in a particular industry.

5. ROLE OF WORKERS IN PRODUCTIVITY:

Workers in any country are one of the important resources of production. Adequate supply of skilled and efficient workers is a most valuable asset. It is not deny that the man has changed the entire outlook of natural phenomena. He cleared the rugged ground of shrubs and wild vegetation, levelled land and planted crops. Later he developed technical know-how and made the barren lands yield
abundant supply of food. Hard work in essence means more reward. The tremendous amount of contribution of workers to final product in view of the current advanced stage of economic and social development is unsurpassed. In fact whatever changes have been brought about in the rate of production is old names due to workers' effect. The role of workers as the common denominator in the measurement of productivity is not, therefore, indespensible Schultz observes "Measured by what Labour contributes to output, the productive capacity of human beings is now vastly larger than all other forms of wealth taken together. The most distinctive feature of our economic system is the growth in human capital. The value of man-power can not be over looked it was man's brain which invented various types of machines and technical know how. When man invented machine is out of order than it is the wit and wisdom of man that puts the machine in the working order, even automatic machines ultimately depends upon the skill of workers like repairing, oiling and handling of the machines etc.

6. NEED TO STUDY THE TOPIC:

It is scarcity of factors that has evolved the concept of productivity in business-world. Certainly the economic rises of modern age has emphasized the
need of raising standard of productivity. Productivity aims at the maximum utilisation of resources. It implies development of an attitude of mind and a constant urge to find better, cheaper, quicker, easier and safer ways of doing a job, manufacturing product and providing services. The productivity usually signifies the ratio between the output of wealth in the form of goods and services and input of resources used up in that output. The productivity as a device of maximum utilization of resources may yield maximum production of desired quality at a minimum possible cost. Workers play a vital role in the productivity of cotton Textile industry, since it fulfils the basic need of clothing. Therefore, production of these industries is essential for human being. The main purpose of writing on this topic is to make detailed and critical study of workers' contribution in productivity of cotton textile industries in U.P., with special reference to Kanpur.