Chapter - 2

Concepts and Models of Productivity
Measurements—A Review

2.1 Introduction
2.2 Concepts of Productivity
2.3 Productivity and Performance
2.4 Productivity Measurement Models
2.5 Conclusion
2.6 References
Chapter -2

Concepts and Models of Productivity Measurements – A Review

2.1. Introduction:

Productivity plays a crucial role in the economic development of a country. Increased productivity is likely to lead to increased profitability of the enterprise. Better level living of the people as well as greater national economic strength is the outcome of higher productivity. Irrespective of varying socio-economic achievements of the nation, productivity has influence on costs, prices, profit, output, employment and investment. Productivity is also an important measure of management performance in every enterprise. The term “productivity” here refers to mean capital, labour, material and total productivity. The productivity of economic system is generally expressed as the ratio between the output of wealth produced and the input of resources used upon the process of production. Widely speaking, productivity is a concept that expresses the relationship between the quantity of goods and services produced and the quantity of labour, land, energy and other resources those produce it. In the other words, a measure of productivity is generally expressed as a ratio relating output (goods and services) to one more the input (labour capital, land, energy, materials etc), which is associated with that output.

In a business organization various inputs (e.g. raw materials, labour, capital, plant and machinery, utilities) are used to produce the final output (e.g. products or services). Productivity refers to the efficiency and effectiveness with which these inputs are used in producing the output. Efficiency and
effectiveness can be improved only by eliminating wastage in all forms. The higher productivity can be achieved either by the same output with lower input or by producing higher output with lower input.¹

Productivity is often confused with higher production. Higher production does not necessarily mean higher productivity. If increase in output is achieved with corresponding increase in input, there is no increase in productivity. Higher productivity can be attained only by better utilization of resources.

Though a higher productivity results in cost reduction and thus favorably influences the profitability and competitiveness of the firm, yet profitability is not measure of productivity. Profitability depends upon market realization, which is influenced by complex market forces, such as, demand for the product or service, competitor’s strategy, government policy etc. Therefore, profitability has no relationship with productivity.²

2.2. Concepts of Productivity:

The concept of Productivity lies in the very sub-conscious mind of every human being. Those who take account of the days work done before going to sleep at night are, in fact, measuring their productivity and its effectiveness to themselves, their families and the work around them. The object of any technique introduced in this world aim at bringing forth the potentialities which exist in the sub-conscious mind.³ The word “Productivity” has become such a buzz word these days that it is almost rare not to find it mentioned in some context or the other in trade magazines, newspapers, management briefs etc.⁴ The concept of productivity introduces the idea of relationship between product and associated inputs. It is measured by the ratio obtained by dividing the output of goods and services produced by one or all the factors of production.⁵ Peter Drucker defines productivity as “that balance between all
factors of production that will give the greatest output for the smallest effort." B.B.Lal (1965) has stated that "Productivity refers to measurable relationships between well-defined out puts and inputs i.e., between the production results and the relative production agents in both the financial and physical terms in relation to given time and conditions. According to Karl Marx and his followers, Productivity was interpreted as output per unit of labour input in something like a "normal" or "trend" sense.

Bukharin N. (1925), a theoretician once ranked second only to Lenin said, "the productivity of labour is a precise measure of the balance between society and nature. It is a measure of the mutual interaction between the environment and the system by which the position of the system in the environment is determined and an alternation of which will indicate inevitable changes throughout the internal life of society. Rotshtein (1947) says: "productivity is described as a cultural characteristic described as the most general indicator of all factors of the organisation and technique of social production as a whole." Kendrick, John W. (1981) defines productivity as follows: "It is the relationship of outputs of goods and services in real physical volume to inputs of the basic labour and non-human resources used in the production process, also measured in physical units such as, hours worked, machine hours and so forth." ILO stated that productivity might be taken to constitute the ratio of available goods and services to the potential resources of the group, community or country.

Productivity has been defined in different ways, some of them are elaborated below:

1. Productivity is defined as the ratio between output and input.
2. Productivity is also taken the mean efficiency in all activities.
3. Productivity also involves elimination of wastage in all its forms.
4. Productivity is the function of providing more and more of everything have more and more peopled with less consumption by ways of resources.

Productivity only increases when a given level of production is achieved with less input resources than before. That is, when labour, capital, materials, land etc inputs has employed less than before and production of output is the same or increased, we call productivity has increased.

Essentially importance of productivity is based on human concern for the following.

1. Higher production
2. Better quality
3. Less consumption of resources
4. Benefit for both industry and community
5. Attitude towards constant improvement

The factors determining productivity fall into the following seven categories.

1. Technical factors
2. Management factors
3. Financial factors
4. Labour factors
5. Government factors
6. Environmental factors
7. Natural factors

Productivity refers to comparison between the quantity of goods or services produced and the quantity of resources employed in the process.

The above definitions are fundamentally alike as to basic tenet, which, however, differed in the context of use. In other words, regardless of the type of production, economic or political system, the definition of productivity
remains the same. Further to make the concept more clear, it is worthwhile at this stage to point out the opinion of some authors who distinguished the concept of productivity from some other related concepts. Thus, it can be concluded that, productivity is not a measure of the volume of production. Rather it is relationship of output to input; an increase in production may not imply improved productivity. It depends on the inputs and their efficiency.

2.3. Productivity and Performance:

When employees are viewed as a form of investment, it becomes necessary for the managers to utilize the employees, talents and develop their job skills. In other words it becomes the responsibility of the managers to create the necessary conditions for improving employees performance. The difference between productivity and performance is that ‘performance’ refers to an employees actual manifest behavior at work, ‘productivity’ on the other hand, is the output of such behavior when the employee interacts with other resources of the organization. These may include co-workers, superiors, subordinates and other material (tools, machine) and the environment support system available in the organization. Thus, while performance is dependent on the employees psychological make-up (ability, training, experience and motivation), productivity is dependent on the employee’s dependence on or interaction with other people, administrative system, physical environment, technology, etc. of the work place. Productivity and performance evaluation, therefore can not be interchangeably used. But productivity measurement can be a part of performance.

2.4. Productivity Measurement Models:

Productivity models were developed by the researches, economists and planners for the growth and development of business. Sarddana and Varat
conducted a research work in the models of productivity measurement and they identified seven important models as under.

5. Surrogate Models.
7. System Approach Based Models.

1. Production Function Models:

Principally by the economists the models considered Production as the major activity of an organization therefore infer that measurement of productivity is synonymous of the production. In 1928 Cobb and Douglas\(^1\) have pioneered research in productivity measurement area of applied economics with the production as the Function as

\[ P = AL^aK^{1-a} \]

Denotations P, L, k, represent productivity output, inputs of labour and input of capital respectively. A and a one parameters, while ‘a’ represents the productivity of labour. In the same way (1-a) represents the productivity of capital. The function which subsequently has been assumed the name Cobb-Douglas Production Function as first conceived is intended to test the neo-classical assumption of constant returns, i.e. if both the Labour and capital inputs are increased by certain proportion output will increase exactly in the same proportion. In 1937, David Durand\(^2\) modified these Cobb-Douglas production Function by suggesting that the productivity of Labour and of capital be estimated freely so that the function takes the from:

\[ P = AL^bK^b \]
The main weakness of the function is that it does not discuss anything regarding technological change, which might have improved productivity and output growth. The production function models have assumed that labour and capital form the only or major inputs of a production function. In practice, other input variables are also present. Other input variables such as, the scale of production, technology of methods, tool manufacturing processes, the product mix, the process cycle and the product quality requirements play important role of production. In-fact, models based on production function are indirect models of productivity measurement.

2. Financial Ratio Based Models:

The concept underlying the use of the financial ratios is to assess the financial performance of a company. The contributors recommend that the performance of a company is essentially determined in terms of its growth in total capital employed, in fixed assets, in sales and in profits. The protagonists of this model believe that the performance of a company can be studied in areas, such as, stability, liquidity, the assets, stock and creditors turnover, profitability and coverage.

Briefly the concerned ratios are as follows:

i) Stability is recommended to be assessed through ratio of Net Fixed Assets to Net Worth as well as Equity Ratio. Performance on liquidity is assessed through ratio of:

   a) Current Ratio \[= \frac{\text{Current Assets}}{\text{Current Liability}}\]

   b) Quick Ratio \[= \frac{\text{Current Assets-Inventory}}{\text{Current Liability}}\]

   or Quick Ratio \[= \frac{\text{Quick Assets}}{\text{Current Liability}}\]
ii) Inventory turn over ratio = \( \frac{\text{Cost of goods sold}}{\text{Average Inventories}} \)

iii) Profitability ratio are mainly the:

a) Return on Sales = \( \frac{\text{Net Profit before tax}}{\text{Net Sales}} \)

b) Return on Total Capital Employed = \( \frac{\text{Net Profit before tax}}{\text{Capital employed}} \)

c) Return on Equity Capital = \( \frac{\text{Net Profit before tax}}{\text{Equity Capital}} \)

d) Return on fixed Assets = \( \frac{\text{Net profit before tax}}{\text{Fixed Assets}} \)

e) Profit Productivity = \( \frac{\text{Net Profit before tax}}{\text{Total cost of Production}} \)

This model is not ideal and fully representative. Financial ratios are generally derived from the published profit & loss account and the balance sheet statement of a company. The data contained do not throw light on as to how well all the resources have been utilized. Thus, at best financial measures relevant to productivity under this model can be set to represent financial performance and partly representative of productivity picture.

3. **Production Based Model:**

This model can be categorized into two variations:

i) Output as value of production.

ii) Output as value addition.

i) Models based on output as value of production:

There are a number of methods for productivity measurements of which some of the methods are presented below:
a) Production Index = \( \frac{\text{Production of period}}{\text{Production of Base period}} \)

b) Production index = \( \frac{\text{Value Created}}{\text{Labour Input}} \)

c) TPM (Total Productivity Measure) = \( \frac{V}{M+Q+C} \)

Where;

- \( V \) = Value of the total output,
- \( M \) = Input of Manpower
- \( Q \) = Input of Materials
- \( C \) = Input of Capital.

ii) Models based output as value addition. There are two important models which are as follows:

   a) Productivity = \( \frac{V-Q}{M} \) and also \( \frac{V-Q}{M+C} \)

   and Total Productivity = \( \frac{C+P}{C} \)

Where;

- \( P \) = Profits, \( V \) = Value of the Total Output, \( M \) = Input of Manpower. \( Q \) = Input of Materials, \( C \) = Input of Capital.

   b) TFP = \( \frac{(S+C+MP)-E}{(W+B)+(K_w+K_f)fb,df} \)

Where,

- TFP = Total Factor Productivity.

\( S \) = Sales, \( C \) = Inventory, \( MP \) = Manufacturing plant, \( E \) = Exclusions. \( W \) = Wages and Salaries, \( B \) = Benefits, \( K_w \) = Working Capital, \( K_f \) = Fixed Capital, \( fb \) = Investor Contribution Adjustment, \( df \) = Price Deflator Factor.
Production based models have a number of inadequacies. It is argued that factorial productivity, as stressed in this model, does not project the status of productivity of a company. For example, labour productivity can be significant attended by adding to the inputs of capital and materials. Environmental factors might also affect labour productivity. This model also presumes that the principal activity of a firm is manufacturing of products. This is only partially correct. Further, market price has an impact on production, which is not taken into consideration in this model.

4. **Product Oriented Models:**

Under these models there are two methods, which are as follows:

a) Rate of Return on Investment (ROI) method.

\[
\text{ROI} = \frac{\text{Net profit before Tax}}{\text{Total Assets}}
\]

b) Transfer price method:

\[
\text{Productivity} = \frac{\text{Aggregate output}}{\text{Inputs}}
\]

Inputs are measured in terms of total cost of input as –

i) Raw Materials Costs (ii) Personnel Costs (iii) Capital Costs (covering invest on capital depreciation; Stock Investment etc) (iv) Indirect Production Costs and (v) Purchase for Production (Utilities). Output, under this model, is in terms of marginal cost of all the weighted sum of all products considered as outputs.
5. **Surrogate Models:**

Two widely used simple measurement methods that are used under this method are as follows:

a) Labour productivity = \( \frac{\text{Actual Pay}}{\text{Standard pay}} \)

a) Aggarwal's²⁰ Surrogate Composite Measures relevant to employee satisfaction, customer satisfaction, and investors' satisfaction.

b) i) Customers Satisfaction = \( \frac{\text{Total Sales Revenue}}{\text{Total No. of Customers}} \)

   ii) Employee Satisfaction = \( \frac{\text{Total Value Added}}{\text{Total No. of Wage Man-Hours}} \)

   iii) Investors Satisfaction = \( \frac{\text{Net profit}}{\text{Total Investment}} \)

   Suppliers Satisfaction = \( \frac{\text{Total Purchase (Monetary)}}{\text{Total No. Suppliers}} \)

On the basis of the above the composite productivity Index

\[ = AX \text{ Investors satisfaction } + \]
\[ = BX \text{ Employees satisfaction } + \]
\[ = CX \text{ Customers satisfaction } + \]
\[ = DX \text{ Suppliers satisfaction} \]

There are other methods for measurement of surrogate productivity based on key financial areas (such as, capacity utilization, cost of production and the like).

However, the Surrogate Model suffers from some limitations. For instance the inter-relation between the parameters as well as their co-relation to the output
can vary depending upon the environment and actual expectations of the company. The relationship is not static, consequently the results cannot be compared to values of a base period. Even simple requirements such as a change in product mix or change in technology can affect the expression and measurement result.

6. Economic Utility Models:

Several authors have recently veered to a point of view that productivity is essentially related to the economic activity of an organization. Kurosawa\textsuperscript{21} in his well-reasoned paper considers that performance of economic activity comprises of: i) profitability, measured as the ratio of profit to capital. ii) Rentability, as ratio of total revenue to total cost.

Karosawa considers production function as linear in which “gross output is directly proportional to the total input, and productivity as a proportional constant that converts total input into gross output and any change in the proportional constant is defined as technical progress”. He also proposes measurement of Index Rentability as: \( \frac{\text{Index of market effect}}{\text{Index of productivity}} \) where –

\[
\text{Index of Market Effect} = \frac{\text{Index of price of products}}{\text{Index of price of Input factors}}
\]

\[
\text{Index of Productivity} = \frac{\text{Index of Output of Products}}{\text{Index of Total Input Factors}}
\]

Norwegian Productivity Institute (NPI) has Introduced concept of Economic Productivity (E.P) as:

\[
E.P = \frac{\text{Sales and Revenue}}{L+C+M \& S}
\]
Where,

\[ L = \text{Cost of Labour} \]
\[ C = \text{Capital} \]
\[ M \& S = \text{Materials \& Services}. \]

As also, \( E.P = \frac{\text{Value Added} + (M\& S)}{L+C+(M&S)} \)

Where,

\( \text{Value Added} = \text{Sales} - (M \& S \text{ consumed}). \) The main disadvantage of these approach’s is that there do not provide one single indicator of productivity.

7. Systems Approach Based Models:

As an approach it is entirely different from the conventional productivity measurement models. In this context, Richard Mason in an article titled “A General systems theory of productivity” published in 1978 considers productivity as a system concept. He advocates that the exercise of productivity measurement is basically reduced to measure the “level of output, a system has generated in relation to the input resources consumed during the production process.” The author farther recommends that the measurement of productivity shall depend upon the type of environment of the system.

Based on their approaches there are four basic types of productivity measures as follow:

A. Partial Productivity:

As to partial productivity, various techniques are found in use. In the context manufacturing enterprise in Bangladesh Anwarul Islam22 pointed out following five techniques:
I) Productivity = \frac{\text{Output}}{\text{Labour Input}}

II) Productivity = \frac{\text{Output}}{\text{Stock Input}}

III) Productivity = \frac{\text{Output}}{\text{Capital Input}}

IV) Productivity = \frac{\text{Output}}{\text{Energy Input}}

V) Productivity = \frac{\text{Output}}{\text{Materials Input}}

In the context of partial productivity, S.N. Nandi\(^{23}\) pointed out the following five partial measures based on the work of Martin.

a) Profit productivity = \frac{T-C}{C} = E-I

b) Working Capital Productivity = \frac{T}{M+C}

c) Inventory Productivity = \frac{T}{M+C_{\text{inv}}}

d) Process work productivity = \frac{cd}{c}

e) Productive work productivity = \frac{Ce}{C}

Where,

\( T \) = Purchased Services + Wages + Depreciation + Profit = Gross Sales – Materials.

\( C \) = Wages & Salaries + Depreciation + Capital cost + Running cost
\( E = \) Total Earning Productivity.

\( M = \) Material cost.

\( C_{inv} = \) Inventory Carrying cost.

\( cd = \) Processing cost.

\( C_e = \) Productive work cost.

B. Total Productivity:

According to American Centre (1981) \(^{24}\) Total Productivity can be worked out as follows.

\[
\text{Productivity} = \frac{\text{Output}}{\text{Labour} + \text{Material} + \text{Energy} + \text{Capital} + \text{Others}}.
\]

According to Craig and Harris\(^{25}\), Total Productivity may be measured as follows:

\[
Pt = \frac{Ot}{L+C+R+Q}
\]

Where,

\( Pt = \) Total productivity.

\( L = \) Labour input factor.

\( C = \) Capital input factor.

\( R = \) Raw material and purchased parts input factor.

\( Q = \) Other miscellaneous goods and Services input factor.

\( Ot = \) Total output.

A few organisations may find total productivity measurement helpful at the firm or plant level, many authors don’t recommend its use. In fact, well-selected productivity indicators or partial measures furnish comparable
information at less expense; expensive calipers are wasted where a cheap ruler is sufficient.  

C. Factor Productivity:

Since the input comprises a number of diverse factors, it is not possible to measure of diverse of a common physical unit. Therefore, the following different yardsticks are used to measure different input factors.  

<table>
<thead>
<tr>
<th>Factor</th>
<th>Units of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Physical Units (e.g. kg, litre) cost.</td>
</tr>
<tr>
<td>Labour</td>
<td>Man-hour, Man-day, Man-year cost.</td>
</tr>
<tr>
<td>Over head</td>
<td>Cost</td>
</tr>
<tr>
<td>Plant and Machinery</td>
<td>Machine hours, money values.</td>
</tr>
</tbody>
</table>

It is important that once a particular Unit of measurement has been selected for a particular input factor it should be used consistently, otherwise comparison of productivity ratios would lead to misleading conclusions.

Usually, the following ratios are used to express total or overall productivity and partial or factorial productivity of manufacturing business.  

\[
i) \text{ Over all Productivity} = \frac{\text{Cost of Output}}{\text{Cost of Total Input}}
\]

\[
ii) \text{ Labour productivity} = \frac{\text{Total Output}}{\text{Total Man-Hours}}
\]

Or  

\[
\frac{\text{Value Added}}{\text{Total Man-Hours}}
\]
iii) Machine Productivity = \( \frac{\text{Total Output}}{\text{Total Machine Hours}} \)

iv) Material Productivity = \( \frac{\text{Total Output}}{\text{Total Quantity of Material Consumed}} \)

v) Land productivity = \( \frac{\text{Total Output}}{\text{Area of Land Used}} \)

D. Surrogate Measures:

There are selected variables which one considers representative of different areas of production. In this context, selection of the key areas lies with the management. Various variables can be taken as input and output. Byre proposed "pay" as the surrogate measures for which he suggested the following formula:\(^{29}\)

\[
\text{Productivity} = \frac{\text{Actual Pay}}{\text{Standard Pay}}
\]

The study has also evaluated other productivity measurement models and concepts. Bureau of Labour Statistics of Bangladesh measures labour productivity by the following formula:\(^{30}\)

i) Labour Productivity = \( \frac{\text{Output in Taka}}{\text{Number of Workers}} \)

ii) Labour Productivity = \( \frac{\text{Output in Taka}}{\text{All Employees}} \)

The labour productivity measurement can also be made by the following formula:

\[
\text{Labour productivity} = \frac{\text{Per Worker Value Added}}{\text{Per Worker Wage Paid}}
\]
Where per worker value added means value added, divided by number of workers and value added means net value of output means cost of material input. Kandrick attempts a study which is on "productivity trends: capital and labour" related to the U.S economy for the period 1899-1953. He measures the productivity of 33 industry groups and also the private domestic economy Kendrick’s model of measuring productivity can be defined as:

\[ P = \frac{y}{(W_0 + P_0)} \]

Where \( W \) and \( P \) denote real wage and real return on capital respectively and \( L, K \) represent inputs of labour and inputs of capital respectively. \( Y \) = value of production and \( o \) refers to the base year. Expressing all variables as index number, the arithmetic index of productivity can be again be defined as:

\[ P = \frac{(Y_t / Y_o)}{[W_0 (L_t / L_o) + P_0 (K_t / K_o)]} \]

Where \( t \) = Current year. This model is most popular in Asian countries. Seed Iqbal has been given a formula to impute the total or single factor productivity as under:

\[
\text{Productivity} = \frac{AOMP}{RIMP} \times \frac{RIBP}{AOBP}
\]

Where, \( AOMP = \text{Aggregated Output of Measured Period} \)

\( RIMP = \text{Resource Input of Measured Period} \)

\( RIBP = \text{Resource Input of Base Period} \)

\( AOBP = \text{Aggregated Output of Base period} \)
The above formula, by multiplying it with 100, the productivity index can be formulated.

A review of the available existing literature shows that in Singapore the following productivity measurement techniques are used. 33

i) Productivity
   \[ \text{Productivity} = \frac{\text{Output}}{\text{Input}} \]

ii) Labour Productivity
   \[ \text{Labour Productivity} = \frac{\text{Output}}{\text{Labour}} \]
   \[ \text{= \frac{\text{Quantity/Value of Production}}{\text{Amount of Labour (Number, Man-Hours Etc)}}} \]

iii) Capital Productivity
   \[ \text{Capital Productivity} = \frac{\text{Output}}{\text{Capital}} \]

iv) Raw Material Productivity
   \[ \text{Raw Material Productivity} = \frac{\text{Output}}{\text{Raw Material}} \]

v) Physical Productivity
   \[ \text{Physical Productivity} = \frac{\text{Quantity of Production}}{\text{Amount of Input}} \]

vi) Value Productivity
   \[ \text{Value Productivity} = \frac{\text{Monetary Value of Productivity}}{\text{Amount of Input}} \]

vii) Value Added Productivity
    \[ \text{Value Added Productivity} = \frac{\text{Value Added}}{\text{Amount of Input (Labour or Capital)}} \]

viii) Value Added Productivity
    \[ \text{Value Added Productivity} = \frac{\text{Value Added}}{\text{Amount of Labour}} \]
From the foregoing review of Literature on productivity measurement, it is observed that in general the theory of productivity measurement is based on two approaches viz. Production Function Approach and Ratio Approach. Production function approach is based on the Cobb-Douglas Production function. In general, in the context of ratio analysis, there are two basic categories of pure productivity measures. The first one is called static productivity ratio is at one point time divided by the some ratio at some previous period in time or simply measure of output divided by measures of input for a given time. The second one is called dynamic productivity indexes, that reflects the change in productivity from one period to the next. In measuring productivity, the production function approach in likely to be more sophisticated, which needs refined data. This is mostly applied in developed economies. Ratio approach is also in much use in the developed as well as developing economies because of the simplicity and easy understanding. The ratio-methods have some limitations such as:

i). The ratio-methods compare only some average performances; they do not clearly indicate marginal changes.

ii) The ratio-methods stress ex-post performance i.e. they describe ‘what has happened’ during a past period. It is difficult to make any valid prediction as to the future performance given change in the operational situation.

A review of the existing methods of productivity measurement shows that there are many techniques and indices of productivity measurement as there are factors of production. Different companies follow different productivity measurement techniques by considering their objectives. On the basis of productivity measurement models review in the chapter, a framework for productivity measurement models for the productivity performance evaluation of textile units of Bangladesh has been selected including both public and
private sectors. The Researcher has found appropriate enough to apply the concept of total factor productivity together with some useful partial productivity models for the purpose of the productivity analysis in case of public and private sector textile units of Bangladesh

2.5. Conclusion:

Productivity in simple form and in convention term is the ratio of output and input and in view of the varying concepts of the output and input, there emerges complexities in the measurement of productivity. In such a situation, various methods of productivity measurements have been evaluated. But despite recent progress it is clear that to identify exact measurement of productivity is too much difficult. However, there is no denying the fact that measurement of productivity provides an important yardstick which helps to identify areas for corrective actions and provides a base towards planning controlling and the like. In the above context an attempt has been made in this chapter to identify various productivity Models i. e. Production models, Financial Ratios Based Modes, Product Oriented Models, Surrogate Models, Economic Based Models and System Approach Based Models.

In the succeeding chapter, a comprehensive review of literature along with framework of the study is presented. The concepts of total factor productivity together with some partial productivity models have been identified and explained at length for the purpose of productivity performance evaluation of textile units (both public and private) of Bangladesh during 1990-2000.

2.6 References:

2. Ibid.


6. Kabir, Md Humayun, op. cit. p.27


11. Kendrick, John W., “Background and Overview of Productivity Improvement Programs” Quoted in BMET Project, Special Program, 1987, p.iv-4

12. Kabir, Md. Humayun, op. cit. p.28


20. Kabir, Md Humayun, op. cit., p.122

21. Ibid, p-125


24. Kabir, Md. Humayun, op. cit., p.128

25. Ibid.


27. Bhattacharyya, Asisk K., op. cit., p.834

28. Ibid.

29. Kabir, Md. Humayun, op. cit., p.133

30. BMET Project, Special Program in Research Methodology and Computer Skills at the George Washington University, May 16- August 13, 1987


32. Saeed Iqbal, op. cit., p.76


