PRODUCTIVITY IMPROVEMENT THROUGH TOTAL QUALITY MANAGEMENT
A HOLISTIC APPROACH

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Abstract. This paper aims at discussion on the holistic approach of productivity; its concept, hard and soft factors, TQM tools and techniques, measuring indices and improvements programs applicable in all types of primary, secondary and tertiary industries. Impact of positive productivity is also highlighted in the national prosperity scenario.

Productivity starts from the generic production model with all input resources and transformation facility including controlled conditions which lead to specified outcomes of goods and services. The resources can be both in hard and soft form. Variability in all these resources and transformation conditions is a natural phenomenon. Reduction in variability of all these factors can be done through TQM philosophy of continual improvement that leads to higher productivity.

Monitoring and measurement of partial and total productivity is done through different indices in all types of industries which become the key for self comparison with its past performance and even with competitors in the sector, region and globe.

Different structured productivity improvement programs can be run to use TQM tools and techniques to reduce variability, resources utilization, waste and rework, thus enhance quality of outputs.

The importance of productivity improvement can be judged from the facts the almost all countries of the world have established their National Productivity Organization (NPO). Even cooperation among nations is visible in the form of different regional productivity forums for the better cause of higher national prosperity.

Enhanced partial and total productivity can lead to a positive chain reaction from micro to macro level; such as higher outcome, decreased cost, more margin of profit, more incentives for employees, more finances are available for re-energizing the system hard and soft factors, increased dividend and more employment opportunities etc. This higher productivity growth can lead to more inputs into national exchequer which can be used for further industrial and socio-economic mega development projects, thus reducing poverty and financial differential in a society. This shall also brighten the chances of quality of social life and bring harmony and peace at nation level.

Keywords. Production, Productivity, Resources, Variability Factors, TQM Philosophy, Tools and Techniques, Productivity Measurements and Improvement Programs and its Indices, NPO, Socio-Economic Benefits

1 Introduction

Productivity is usually taken in isolated scenario and cases. This usually lacks the holistic system approach of a productivity improvement project starting from its vision till operational tasks. As such, the benefit gained at one part of a system in time is eaten by the sluggishness performance at another part of the same system. The focus of discussion here is at the holistic approach of productivity; starting from its basic concept, associated factors affecting it, the TQM tools and techniques used in productivity improvement program and measurement in all types of industries, social and academic fields. Due to sever impact of productivity on national economy, it is at the top of national agenda of industrialized countries to have good monitoring and assessment system of performance of individuals and organizations. Underdeveloped and developing courtiers can take great advantage out of productivity implementation as the huge gap for productivity improvement in these economies. Higher productivity can be linked to national prosperity and soci-economic development and balancing system.

2 A Generic Production System

The business of each enterprise (whether manufacturing or service) is influenced by two major forces - Internal (within enterprise, called micro level forces) and externals (national / global, called macro level forces). These forces are produced by a number of factors which are either totally or partially controllable by the managers. These forces do affect the decision making and production outcome of the system either positively or negatively as shown in Figure 1(Muhlemann et al., 1992).

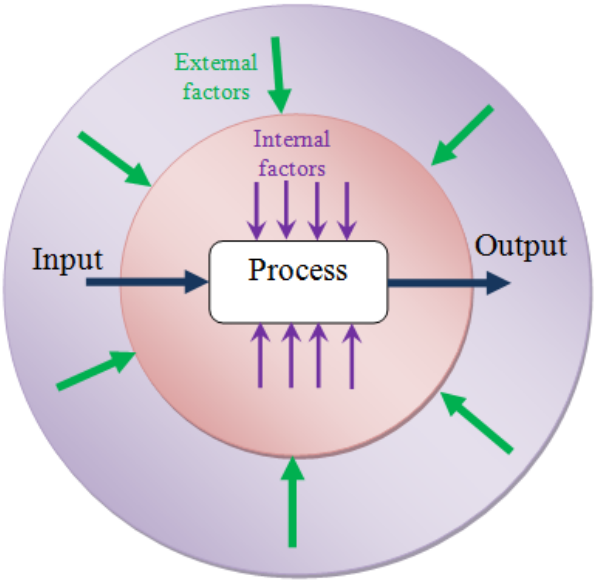


Fig. 1. Factor which generate Internal and External Forces in an Enterprise

Internally, the production system of each enterprise consists of hard and soft factors of infrastructure, machines and human resource etc. The external factors can include structural adjustment, natural resources, government and infrastructure as shown in Table 1 (Prokopenko, 1987). Due to variations in all these major internal, external and conversion factors affect the desirable outcome of a production system of an enterprise.

Table 1. Major Factors of an Enterprise

Internal Factors– Micro level	External Factors - Macro level (National /Global)
• Quality of Product • Quality of processes Plant and equipment • Technology • Material and Energy • People • Organization and Systems • Work Method • Management Styles • protocol / Procedures	• Structural adjustments which include economic and demographic and social • Natural resources which include Human, land, energy and raw material • Government and infrastructure which include institutional mechanism, policies and strategy, infrastructure and public enterprises

Production can be defined as the creation of goods and services through a system of transformation or conversion. Productivity is derived from this generic production system which uses both hard and soft factors as input resources along with transformation facility on time base. A generic production model is shown in Figure 2 (Heizer & Render, 2001).

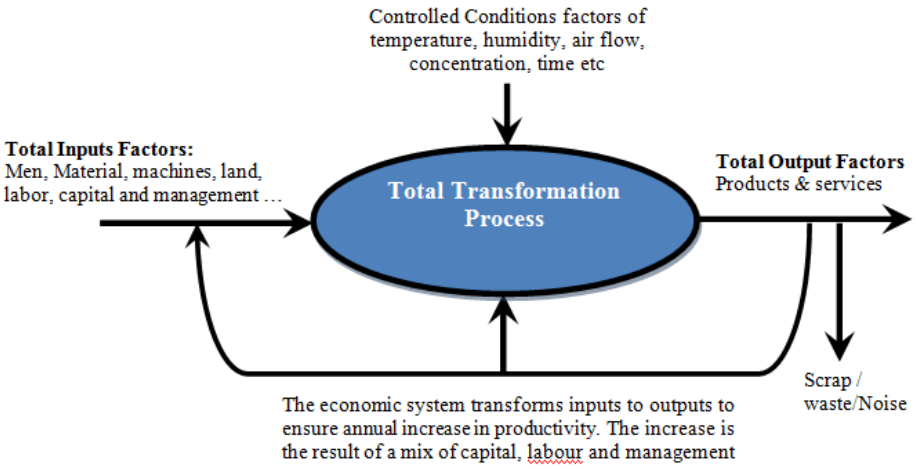


Fig. 2. A Generic Production System Model of Transforming Inputs into Outputs

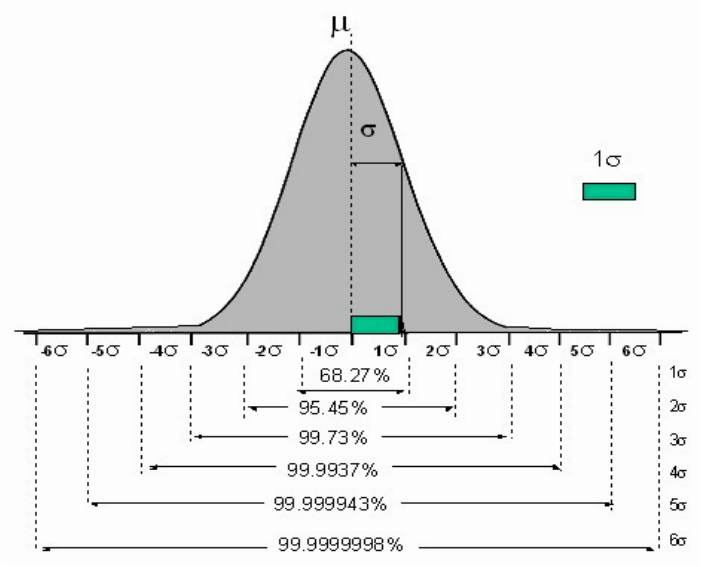
Variability is a natural phenomenon in all these hard, soft and other associated conversion factors (both at micro and macro level). Variations occur in the quality characteristics or attributes of all these major factors like; size, moisture contents, materials composition, strength of cutting tools, capability of measurement and inspection gauges and human working behavior etc (Dotson et al. 2003;

Huma,1988; Kennedy & Andrew, 1967 and Sharp,1962). All the variations must be kept within specified or desired tolerance limits to be acceptable by the customers.

Variations may occur at random but its combined effect can be depicted statistically. Understanding the differences between common and special causes of variations is important for the purpose of control. 'Common Causes' of variations are always present due to natural contents of a production system. Systems governed only by common causes are usually stable. However, 'Special Causes' of variation (assignable causes) arise from some sources which cause the production system to behave abnormally like; bad material batch from a supplier, poorly trained operators, excessive tool wear and improper calibration of equipment etc. Unnatural production system variations are easily detectable and must be corrected first due to its economic reasons and system destabilization.

The benefit of lesser variations is shared by all particularly the producers (give higher outcome due to less scrap, waste and rework) and customers (get products with uniform quality characteristics at low price).

Variability in quality characteristics is measured in the form of **sigma (σ)** which refers to the number of standard deviations away from the mean (desired / design value) in a bell shaped curve, NDC. NDC is a natural phenomenon experienced in mass production of any characteristic of any entity (product, process, enterprise etc). Hence, measurement and control of all these variability factors is a must to reduced material wastage, thus improve quality and productivity. Higher the variability (greater will be the value of data dispersion - sigma), lower is the precision (quality) on a Normal Distribution Curve - NDC as shown in Figure 3 (Rawoof, 1999 and Nawar, 2008).



Sigma (Deviation from Mean)

Fig. 3. Normal Distribution Curve (NDC) and Different Value of Sigma

Design specification which include; Limits (Nawar, 2008), Tolerance, Accuracy (Evans & Lindsay, 2005) and Precision (Groover, 2004 and Evans & Lindsay, 2002) are at the hub of variability. Technologies play its vital role to meet the contrasting requirements of low variability, low rejection, low rework and low cost of production against high precision, accuracy and productivity.

3 Productivity and its Measures

It has been defined by different organizations from different perspective. International Labor Organization (ILO) defines productivity as the ratio between output of wealth and the input of resources used in the process of production (Prokopenko, 1987).

The European Productivity Agency (EPA) has defined productivity as an attitude of mind. It is a mentality of progress of the constant improvement of any thing that exists. It is the certainty of being able to do better today than yesterday; and continuously. It is the constant adaptation of economic and social life to changing conditions and it is the continual effort to apply new techniques and methods.

Productivity is denoted by the equation as;

$$\text{Productivity} * = \frac{Output}{Input}$$

* Productivity use time as base and no compromise on quality

A productivity ratio may be computed for a single operation, a department, a facility, an organization, or even an entire country. Productivity increases when an enterprise:

- Become more efficient; output increases with no increase in input.
- Downsize: output remains the same and input is decreased.
- Expand: both output and input grow with output growing more rapidly.
- Retrench: both output and input decrease, with input decreasing faster, or
- Achieve breakthroughs: output increases while input decreases.

3.1 Partial (Single or Multi Factors) and Total Factors Productivity

Productivity can be divided into partial (single factor), multi factors and total factors productivity.

3.1.1 Partial Productivity (Single Factor Productivity)

The choice whether productivity is to be measured in output per labor hour, output per capital rupee invested or some other measure is important to managers because it is vital to be able to measure and evaluate the performance of an individual and organization's constituent parts. Here, just one resource input is used to measure productivity, called single factor or partial productivity.

Units produced = 1000

Labour hours used = 250

$$\text{Partial Productivity} = \frac{\text{Total Units Produced}}{\text{Labor Hours Used}}$$

Which is equal to 1000/250 = 4 units per labour hour (total output per person in time domain)

Managers generally utilize partial productivity measures because the data is readily available. Also, since the total of multifactor measures provides an aggregate perspective, partial factor productivity measures are easier to relate to specific processes. Labor-based hours (generally, readily available information) is a frequently used input variable in the equation. When this is the case, it would seem that productivity could be increased by substituting machinery for labor. However, that may not necessarily be a wise decision. Labor-based measures do not include mechanization and automation in the input; thus when automation replaces labor, misinterpretation may occur.

Other partial factor measure options could appear as output/labor, output/machine, output/capital, or output/energy. Terms applied to some other partial factor measures include capital productivity (using machine hours or dollars invested), energy productivity (using kilowatt hours), and materials productivity (using inventory dollars)

3.1.2 Multi Factors Productivity

A broader view of productivity is a multi-factor which includes some inputs; labour, material, energy, capital etc. It is the ratio of some inputs to an organization to its total output. This means that some resources in different form are used in the transformation process to get output as product or service.

$$\text{Multi Factors Productivity} = \frac{\text{Total Ouput}}{\text{Labour} + \text{Material} + \text{Energy} + \text{capital} + \text{Misc Items..}}$$

3.1.3 Total Productivity

$$\text{Total Productivity} = \frac{\text{Total Output}}{\text{Total Input}}$$

Total productivity ratios reflect simultaneous changes in outputs and inputs. As such, total productivity ratios provide the most inclusive type of index for measuring productivity and may be preferred in making comparisons of productivity at higher level. However, it does not show the interaction between each input and output separately and are thus too broad to be used as a tool for improving specific or single areas.

4 Productivity Indices

Productivity analysis is important for productivity improvement. It is a very effective tool for decision making at all levels. The success of productivity measurement and analysis largely depends on a clear understanding by all parties concerned i.e. enterprise, managers, workers, employers, government institutions etc of why productivity measurement and analysis is important for the effectiveness of the

organization. The answer is that productivity indices indicate where to look for opportunities to improve and also shows how well improvement efforts are faring.

Productivity indices help to establish realistic targets and check points for diagnostic activities during an organization development process, pointing to bottle-necks and barriers to performance. Furthermore, there can be no improvement in industrial relations or proper correspondence between productivity, wage levels and gains sharing policies without a sound measuring system.

Productivity indices are also useful in inter-country and inter-firm comparisons designed to detect factors accounting for economic growth. In order to have a value for comparison purposes, organizations compute their productivity index. A productivity index is the ratio of productivity measured in some time period to the productivity measured in a base period. For example, if the base period's productivity is calculated to be 1.75 and the following period's productivity is calculated to 1.93, the resulting productivity index would be 1.93/1.75 = 1.10. This would indicate that the firm's productivity had increased 10 percent. By tracking productivity indexes over time, managers can evaluate the success, or failure of projects and decisions made.

Productivity improvement measures (indices) (Garyer & Shotbolt, 1980) have been developed over time and many others are in the process of evolution. A sample list of some major productivity improvement indices are shown in Table 2 where as its detailed formulation is placed in **Annexure A.**

Table 2. A Sample List of Some Major Productivity Indices

S No.	Productivity Indices
1	National productivity
2	Value Addition Productivity
3	Profitability Productivity
4	Resources Productivity
5	Human Resource / Labor Productivity
6	Capital Productivity
7	Working Capital Productivity
8	Inventory Productivity
9	Cost Productivity
10	Foreign Exchange Productivity
11	Energy Productivity
12	Raw Material Productivity

5 Applicability of Productivity

Productivity is applicable in all types of primary, secondary and tertiary industry and social life as shown in **Annexure B** (Groover, 2004). Primary industries are those that cultivate and exploit natural resources. Secondary industry takes the outputs of primary industries and converts them into consumer and capital goods. Manufacturing is the principal activity in this category. Tertiary industries

constitute the service sector of the economy. However, in literature, discussion is mostly focused on manufacturing productivity rather than natural resources and services productivity.

6 TQM Philosophy and Productivity

Total Quality Management (TQM) philosophy has integrated a number of qualitative and quantitative quality improvement tools and techniques under its umbrella to control defect, rework and waste by reducing variability in a production system, thus enhance productivity of products and services (Levinson & Rerick, 2002; Omachonu & Ross, 1999 and Crosby, 1979). Quality and productivity are closely related like; Siamese twins. Productivity is the outcome (both quantity and quality) of a production system in time domain.

Design limits, tolerance, accuracy and precision play a vital role in acceptance of outcome (Nawar, 2008 and Besterfield et al. 1999). Limits are the two extreme permissible values of a parameter of a variable. The Upper Tolerance Limit (UTL) for a parameter is the largest value permitted for that particular variable and the Lower Tolerance Limit (LTL) for a parameter is the smallest value permitted for that parameter. The difference between the two limits of values, UTL and LTL for a product parameter gives the tolerance. Acceptability of a product / service is based on the tolerance for use by the customer. The relationship between quality (precision) and productivity is shown in Figure 4. As the variability is reduced, more and more sigma (1σ, 2σ, 3σ, 4σ, 5σ, 6σ….) is brought into design limits (tolerance), thus the quality (precision) improves and rejection reduces (Nawar, 2005).

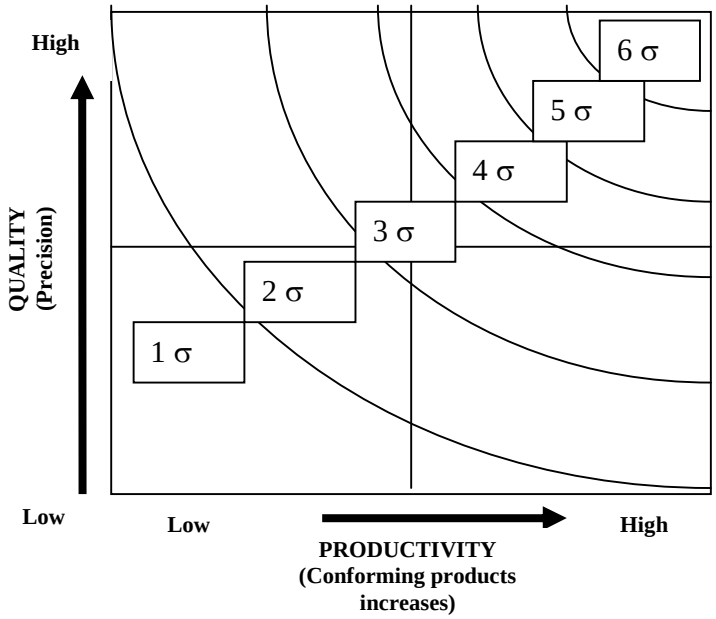


Fig. 4. Quality (precision) and Productivity (output) at Different Sigma within Design Limits

7 Productivity Improvement through Application of TQM Tools and Techniques in Hard, Soft (HR) and Mgmt Factors

A number of TQM improvement tools and techniques are being used to reduce variability in factors of a production system; thus reduces waste, rework, rejection, material used and time elapsed etc and improve quality (outcome) which leads to higher productivity. A few major TQM tools and techniques are listed here in Table 4 (Crosby, 1979; Prokopenko, 1987, Henderson & Larco, 1999; and Nawar, 2008).

Table 4. A few Major Productivity Improvement TQM Tools and Techniques

• Work Study (method study and time measurement) • Kanban • kaizen • Automation • Zero Defects • Just-In-time (JIT) • Suggestion system / ideas generation • Value analysis • Cost – benefit analysis • Pareto analysis • Cause – effect analysis • Human Resource Development (HRD) • Infrastructure development • Layout • Work simplification (process flow chart) • Benchmarking • Lean production • Six sigma • Pareto analysis	• Total Productive Maintenance (TPM) • 5 - S system • Productivity Improvement Circle (PIC) • Teamwork • Work Improvement Team (WIT) • Cellular Manufacturing (CM) • Poka-Yoke • Brainstorming • Force field analysis • Nominal group technique • Zero based budgeting • Design of experiment • Organization structure • Quality Control Charts

8 A Generic Strategy for Productivity Improvement Programs (PIP)

Productivity improvement can be realized through TQM tools and techniques, investment in infrastructure, technology and HRD etc. An enterprise may undertake a number of key steps toward improving productivity like;

- Don't confuse productivity with efficiency. Efficiency is a narrower concept that pertains to getting the most output of a given set of resource. Productivity is a broader concept that pertains to use of overall resources.
- Look at the system as a whole in deciding which operations are most critical; it is over-all productivity that is important.
- Make it clear that management supports and encourages productivity improvement.

- Develop methods for achieving productivity improvement, such as soliciting ideas from workers (teams of workers, engineers, and managers), studying how other firms have increased productivity and re-examining the way work is done.
- Establish reasonable goals for improvement.
- Develop productivity measures for all operations; measurement is the first step in managing and controlling an organization.
- Measure improvements and publicize them.
- Consider incentives to reward workers for contributions

All organizations must develop a strategy and structure for its productivity issues. A generic strategy for productivity improvement programs with associated issues is shown in **Annexure C**. However, there may be a number of issues which shows low productivity but all of them can not be taken in one go (phase) due to time, resources and focus limitations. The best option available is to use 'Pareto Analysis' (cost or frequency based importance) to prioritize the areas and issue to be under taken under PIP. Also, every organization can also develop a specific road map for PIP according to their peculiar circumstances. However, a common PIP approach (road map) can be as follows (Prokopenko, 1987).

- Preliminary diagnosis (identify where you are now and how you compare with others)
- Orientation to PIP (identify the main productivity problem)
- Organization diagnosis and action planning (decide where you want to be - goal)
- Implementation (introduce action for improvement)
- Review and revision

9 National Productivity Organizations

The importance of productivity improvement can be judged from the facts the almost all countries of the world are having their National Productivity Organization (NPO) which focuses on how to improve productivity in all sectors of industries and economy. Even cooperation among nations is visible in the form of different regional forums for the better cause of higher productivity, national and global prosperity. List of a few major national and regional productivity organizations is shown in **Annexure D**.

10 Benefits of Higher Productivity

Higher productivity triggers a positive chain reaction. Negative productivity put industries and societies into a vicious trap circle. Some major benefits of higher productivity are noted here in Table 5.

Table 5. Some Major Benefits of Enhanced Productivity

• Lower cost of production • Cheaper pricing of goods in the market (reduced inflation) • Better quality of goods and services • More buyers of goods • Greater profit • Better wages, bonus and working conditions • Business expansion • Investment in technology • More employment	• More advancement opportunities Business diversification • Economies of a scales • Greater government revenue (GDP) • More income • Better social services • Better infrastructures for industry and commerce • More foreign investment • Higher standard of living • Higher economic growth

11 Challenge Ahead for Productivity Improvement in Pakistan

Productivity is mostly focused in manufacturing industry and not in other primary and tertiary industries which has a great share of contribution in the national exchequer of Pakistan. NPO of Pakistan is putting its efforts for improving productivity. The causes of low productivity have their origin in the following sources;

- The first category contains the indigenous or internal factors mainly in the form of poor management practices, low quality culture and education, low priorities for improvement, system and technology deficiencies, high rate of rejection and waste, and low utilization of resources.
- The second category consists of external factors of national / global nature like; the shortages / costs of essential inputs - power, raw materials, transportation, taxes, political, economical, and technological etc over which the management of an enterprise has partial or no control.

The challenges before the Pakistani managers is in every field, therefore, efforts must be put in improving the internal causes of low productivity and also manage to reduce the harm full effects of external factors.

12 Conclusion

In short, this paper presents a good holistic approach for productivity improvement starting from its basic concepts, measurement indices to improvement strategy development. This paper also urge upon all workers and managers at all level and in different types of industries for its application at individual, sector and national level. Great opportunity exist for the less and least industrialized countries to improve the quality of working and social life, improve economy, reduce financial differential and bring harmony to the society by enhancing productivity.

Annexure A

A Few Major Productivity Improvement Indices

1. National productivity

$$\text{National Productivity} = \frac{\text{GNP}}{\text{Population}}$$

2. Value Addition Productivity

a. $$\text{value addition per employee} = \frac{\text{value added}}{\text{PopulatioTotal number of employees}}$$

b. $$\text{Total value addition} = \frac{\text{value added}}{\text{Labour+Capital inputs}}$$

c. $$\text{value addition per workhours} = \frac{\text{Value added}}{\text{Total work-hours worked}}$$

d. $$\text{value addition per worker} = \frac{\text{value added}}{\text{Number of workers}}$$

e. $$\text{value addition per dollar salary /wage} = \frac{\text{value added}}{\text{salaries and wages}}$$

f. $$\text{value addition per asset} = \frac{\text{value added}}{\text{tengible and intengible assets}}$$

g. $$\text{value addition per capital} = \frac{\text{value added}}{\text{Tangible and financial capital}}$$

h. $$\text{value addition per tangible asset} = \frac{\text{value added}}{\text{Tangible asset}}$$

i. $$\text{value addition per fixed asset} = \frac{\text{value added}}{\text{fixed assets}}$$

j. $$\text{value addition per machinery / euipment} = \frac{\text{value added}}{\text{machinery and equipment}}$$

k. $$\text{value addition per direct worker} = \frac{\text{value added}}{\text{Number of direct workers}}$$

l. $$\text{value addition per indirect worker} = \frac{\text{value added}}{\text{Number of indirect workers}}$$

m. $$\text{value addition per woker's shift} = \frac{\text{value added}}{\text{No of hours worked on first shift}}$$

n. $$\text{value addition per funtional area} = \frac{\text{value added}}{\text{salaries / wages of production department}}$$

o. $$\text{value addition per securities} = \frac{\text{value added}}{\text{marketable securities}}$$

p. $$\text{value addition per accoutns receivable} = \frac{\text{value added}}{\text{accounts receivable}}$$

q. $\text{value addition per inventory} = \frac{\text{value added}}{\text{inventories}}$

3. Profitability Productivity

a. Primary profitability ratios

a. $\frac{\text{Net profit}}{\text{Net sales}}$

b. $\frac{\text{Cost of goods}}{\text{Net sales}}$

c. $\frac{\text{Operating expenses}}{\text{Net sales}}$

d. $\frac{\text{Interest expense}}{\text{Net sales}}$

b. Secondary profitability ratios

a. $\text{Total assets turnover} = \frac{\text{Net sales}}{\text{Total assets}}$

b. $\text{Accounts receivable turnover} = \frac{\text{Net sales}}{\text{Total inventory}}$

c. $\text{Fixed assets turnover} = \frac{\text{Net sales}}{\text{Fixed assets}}$

d. $\text{Inventory turnover} = \frac{\text{Net sales}}{\text{Total inventory}}$

4. Resources Productivity

a. $\text{Total earnings productivity} = \frac{\text{Total earnings}}{\text{conversion cost}}$

Where, Conversion Cost = Total salaries and wages + Total purchased services + Depreciation

b. $\text{Profit productivity} = \frac{\text{Profit}}{\text{conversion cost}}$

c. Resource utilization productivity

d. $\text{Process work productiivty} = \frac{\text{Time or cost incurred on productive \& } \textit{ancillary work}}{\text{Total time or conversion cost (including idle time/cost)}} = \frac{Cd}{C}$

e. $\text{Process work productiivty} = \frac{\text{Time or cost incurred on productive work}}{\text{Total time or conversion cost available}} = \frac{Ce}{C}$

5. Human Resource / Labor Productivity

a. $\text{Individual worker / labour productivity} = \frac{\text{Output}}{\text{Input of labour/worker's efforts}}$

b. Value addition per direct worker $= \frac{\text{Value added}}{\text{Number of direct workers}}$

c. Value addition per indirect worker $= \frac{\text{Value added}}{\text{Number of indirect workers}}$

d. Value addition per worker's shift $= \frac{\text{Value added}}{\text{Number of hours worked on first shift}}$

e. Value addition per funtional area $= \frac{\text{Value added}}{\text{salaries/wages of finance department}}$

f. Value addition per employee $= \frac{\text{Value added}}{\text{Total Number of employees}}$

g. Total Value addition $= \frac{\text{Value added}}{\text{Labour+Capital inputs}}$

h. Value addition per work hours $= \frac{\text{Value added}}{\text{Toatal work-hours worked}}$

i. Value addition per worker $= \frac{\text{Value added}}{\text{Number of workers}}$

j. Value addition per dollar salary/wages $= \frac{\text{Value added}}{\text{Salaries and wages}}$

6. Capital Productivity

a. Value addition per asset $= \frac{\text{Value added}}{\text{Tangible and intangible assets}}$

b. Value addition per capital $= \frac{\text{Value added}}{\text{Tangible and financial capital}}$

c. Value addition per tangible asset $= \frac{\text{Value added}}{\text{Tangible assets}}$

d. Value addition per fixed asset $= \frac{\text{Value added}}{\text{Fixed assets}}$

e. Value addition per machinery/equipment $= \frac{\text{Value added}}{\text{Machinery and Equipment}}$

f. Value addition per securities $= \frac{\text{Value added}}{\text{Marketable securites}}$

g. Value addition per accounts receivable $= \frac{\text{Value added}}{\text{Accounts receivable}}$

h. Value addition per inventory $= \frac{\text{Value added}}{\text{Inventories}}$

7. Working Capital Productivity

$$\text{Working Capital Productivity} = \frac{\text{Total earnings}}{\text{Throughput materials} + \text{conversion costs}}$$

8. Inventory Productivity

$$\text{Inventory Productivity} = \frac{\text{Total earnings}}{\text{Throughput materials} + \text{carrying costs/charges}}$$

9. Cost Productivity

a. $\text{Direct cost Productivity} = \frac{\text{Total outputd}}{\text{Direct Cost}}$

b. $\text{Indirect cost Productivity} = \frac{\text{Total outputd}}{\text{Indirect Cost}}$

c. $\text{Total cost Productivity} = \frac{\text{Total outputd}}{\text{Total (Direct+Indirect) Cost}}$

10. Foreign Exchange Productivity

$$\text{Foreign exchange productivity} = \frac{\text{Total outputd}}{\text{Total foreign exchange utilized}}$$

11. Energy Productivity

$$\text{Energy productivity} = \frac{\text{Total outputd}}{\text{Total cost (or units/KW) of energy utilized}}$$

12. Raw Material Productivity

$$\text{Raw material productivity} = \frac{\text{Total outputd}}{\text{Total cost (or units/tonnes) of raw materails utilized}}$$

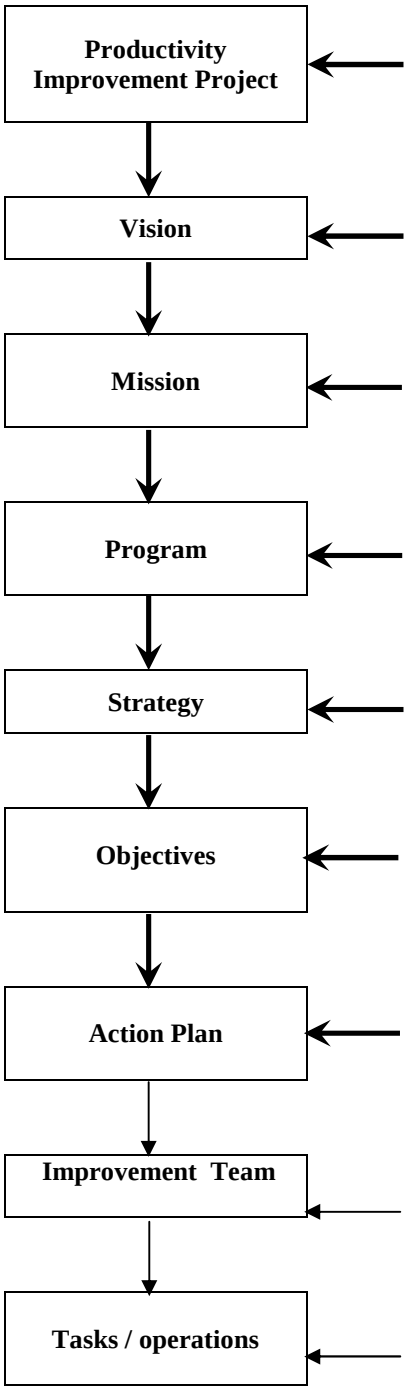
Annexure B

Some Major Types of Industries

Primary industry	Secondary industry		Tertiary industry
• Agriculture • Forestry • Fishing • Livestock • Quarries • Mining • petroleum	• Aerospace • Apparel • Automotive • Basic metals • Beverages • Building materials • Chemicals • Computers • Construction • Consumers Appliances • Electronics • Equipment • Fabricated metals	• Food processing • Glass, ceramics • Heavy machinery • Paper • Petroleum refining • Pharmaceuticals • Plastics (shaping) • Power utilization • Publishing • Textiles • Tire and rubber • Wood and furniture	• Banking • Communications • Education • Entertainment • Financial services • Government • Health and medical • Hotel • Information • Insurance • Legal • Real state • Repair and maintenance • Restaurant • Retail trade • Tourism • Transportation • Wholesale trade

Annexure C

A Generic Strategy for Productivity Improvement Program (PIP) with Associated Issues



Environment must be conducive (1) see External / Internal pressure (2) Top Management Commitment (3) Willingness participation at all management levels (4) acceptance of new ideas

Abstract form of futuristic approach. Vision is to consider the changing environment.

Mission is the statement about the reasons why improvement is necessary and se target.

Improvement program could be about any type of industry. Within that HR, technology, material, process etc can be taken for improvement.

Strategy is a broader contour of model, methods and actions to achieve the mission.

Target to achieve should be clearly defined. Small milestone are easily measurable.

Stipulate tasks, resources and responsibilities. It should be comprehensive and unambiguous.

Composite HR team should be adequately trained, equipped and adequately compensated.

The management should be made responsible to inculcate the atmosphere of creativity, innovation, invite suggestions and make improvements through assigning task / operations.

Annexure D

List of a Few National / Regional Productivity Organizations

S. No	Organizations
1.	Asian Productivity Organization (17 member countries)
2.	American Productivity Centre
3.	Bangladesh Productivity Organization
4.	China Productivity Center
5.	Canadian Labour Market and Productivity Centre
6.	European Association of National Productivity Centers
7.	Germany Rationalisierungs-Kuratorium DER Decutshen Wirtschaft
8.	Hong Kong Productivity Council / Directorate
9.	India National Productivity Council
10.	Indonesia Directorate Center of Training and Productivity Development
11.	Japan Productivity Center for Socio-Economic Development
12.	Korea Productivity Center
13.	Lao National Productivity Organization
14.	Malaysia Productivity Corporation
15.	Mongolia Productivity Organization
16.	National Iranian Productivity Centre
17.	National Productivity Centre of Cambodia
18.	National Productivity Organization of United Kingdom
19.	National Productivity Institution of South Africa
20.	Nepal National Productivity and Economic Development Centre
21.	Pakistan National Productivity Organization
22.	Polish Productivity Centre
23.	Sri Lanka National Productivity Secretariat
24.	Singapore Productivity Association
25.	Thailand Productivity Institute
26.	Vietnam Productivity Centre

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