PRODUCTIVITY

Productivity refers to the ratio between the output from production processes to its input. Productivity may be conceived of as a measure of the technical or engineering efficiency of production. As such quantitative measures of input, and sometimes output, are emphasized.

Typical Productivity Calculations

Measures of size and resources may be combined in many different ways. The three common approaches to defining productivity based on the model of Figure 2 are referred to as physical, functional, and economic productivity. Regardless of the approach selected, adjustments may be needed for the factors of diseconomy of scale, reuse, requirements churn, and quality at delivery.

a) Physical Productivity: This is a ratio of the amount of product to the resources consumed (usually effort). Product may be measured in lines of code, classes, screens, or any other unit of product. Typically, effort is measured in terms of staff hours, days, or months. The physical size also may be used to estimate software performance factors (e.g., memory utilization as a function of lines of code).

b) Functional Productivity: This is a ratio of the amount of the functionality delivered to the resources consumed (usually effort). Functionality may be measured in terms of use cases, requirements, features, or function points (as appropriate to the nature of the software and the development method). Typically, effort is measured in terms of staff hours, days, or months. Traditional measures of Function Points work best with information processing systems. The effort involved in embedded and scientific software is likely to be underestimated with these measures, although several variations of Function Points have been developed that attempt to deal with this issue.

c) Economic Productivity: This is a ratio of the value of the product produced to the cost of the resources used to produce it. Economic productivity helps to evaluate the economic efficiency of an organization. Economic productivity usually is not used to predict project cost because the outcome can be affected by many factors outside the control of the project, such as sales volume, inflation, interest rates, and substitutions in resources or materials, as well as all the other factors that affect physical and functional measures of productivity. However, understanding economic productivity is essential to making good decisions about outsourcing and subcontracting. The basic calculation of economic productivity is as follows:

Economic Productivity = Value/Cost

PROBLEMS IN MEASUREMENT OF PRODUCTIVITY OF KNOWLEDGE WORKERS

Productivity implies measurement, which in turn, is an essential step in the control process. Although there is a general agreement about the need for improving productivity, there is little consensus about the fundamental causes of the problem and what to do about them. The blame has been assigned to various factors. Some people place it on the greater proportion of less skilled workers with respect to the total labor force, but others disagree. There are those who see cutback in research and the emphasis on immediate results as the main culprit. Another reason given for the productivity dilemma is the growing affluence of people, which makes them less ambitious. Still others cite the breakdown in family structure, the workers_ attitudes, and government policies

and regulations. Another problem is that the measurement of skills work is relatively easy, but it becomes more difficult for knowledge work. The difference between the two kinds is the relative use of knowledge and skills.

COST CONTROL

Cost control is the measure taken by management to assure that the cost objectives set down in the planning stage are attained and to assure that all segments of the organization function in a manner consistent with its policies.

Steps involved in designing process of cost control system

- **Establishing norms:** To exercise cost control it is essential to establish norms, targets or parameters which may serve as yardsticks to achieve the ultimate objective. These standards, norms or targets may be set on the basis of research, study or past actual.
- **Appraisal:** The actual results are compared with the set norms to ascertain the degree of utilization of men, machines and materials. The deviations are analyzed so as to arrive at the causes which are controllable and uncontrollable.
- **Corrective measures:** The variances are reviewed and remedial measures or revision of targets, norms, standards etc., as required are taken.

Advantages of cost control

- Better utilization of resources
- To prepare for meeting a future competitive position.
- Reasonable price for the customers
- Firm standing in domestic and export markets.
- By continuous search for improvement creates proper climate for the increase efficiency.
- Improves the image of company for long-term benefits.
- Improve the rate of return on investment.

PURCHASE CONTROL

Purchase control is an element of material control. Material procurement is known as the purchase function. The functional responsibility of purchasing is that of the purchase manager or the purchaser. Purchasing is an important function of materials management because in purchase of materials, a substantial portion of the company's finance is committed which affects cash flow position of the company. Success of a business is to a large extent influenced by the efficiency of its purchase organization.

Advantages:

a) Continuous availability of materials: It ensures the continuous flow of materials. So production work may not be held up for want of materials. A manufacturer can complete schedule of production in time.

b) Purchasing of right quantity: Purchase of right quantity of materials avoids locking up of working capital. It minimizes risk of surplus and obsolete stores. It means there should not be possibility of overstocking and under stocking.

c) Purchasing of right quality: Purchase of materials of proper quality and specification avoids waste of materials and loss in production. Effective purchase control prevents wastes and losses of materials right from the purchase till their consumptions. It enables the management to reduce cost of production.

d) Economy in purchasing: The purchasing of materials is a highly specialized function. By purchasing materials at reasonable prices, the efficient purchaser is able to make a valuable contribution to the success of a business.

f) Works as information centre: It serves as a function centre on the materials knowledge relating to prices, sources of supply, specifications, mode of delivery, etc. By providing continuous information to the management it is possible to prepare planning for production.

g) Development of business relationship: Purchasing of materials from the best market and from reliable suppliers develops business relationships. The result is that there may be smooth supply of materials in time and so it avoid disputes and financial losses.

g) Finding of alternative source of supply: If a particular supplier fails to supply the materials in time, it is possible to develop alternate sources of supply. the effect of this is that the production work is not disturbed.

h) Fixing responsibilities: Effective purchase control fix the responsibilities of operating units and individuals connected with the purchase, storage and handling of materials.

In short, the basic objective of the effective purchase control is to ensure continuity of supply of requisite quantity of material, to avoid held up of production and loss in production and at the same time reduces the ultimate cost of the finished products.

MAINTENANCE CONTROL

Maintenance department has to exercise effective cost control, to carry out the maintenance functions in a pre-specified budget, which is possible only through the following measures:

First line supervisors must be apprised of the cost information of the various materials so that the objective of the management can be met without extra expenditure on maintenance functions

A monthly review of the budget provisions and expenditures actually incurred in respect of each centre/shop will provide guidelines to the departmental head to exercise better cost control.

The total expenditure to be incurred can be uniformly spread over the year for better budgetary control. However, the same may not be true in all cases particularly where overhauling of equipment has to be carried out due to unforeseen breakdowns. Some budgetary provisions must be set aside, to meet out unforeseen exigencies.

The controllable elements of cost such as manpower cost and material cost can be discussed with the concerned personnel, which may help in reducing the total cost of maintenance. Emphasis should be given to reduce the overhead expenditures, as other expenditures cannot be compromised.

It is observed through studies that the manpower cost is normally fixed, but the same way increase due to overtime cost. However, the material cost, which is the prime factor in maintenance cost, can be reduced by timely inspections designed, to detect failures. If the inspection is carried out as per schedule, the total failure of parts may be avoided, which otherwise would increase the maintenance cost. The proper handling of the equipment by the operators also reduces the frequency of repair and material requirements. Operators, who check their equipment regularly and use it within the operating limits, can help avoid many unwanted repairs. In the same way a good record of equipment failures/ maintenance would indicate the nature of failures, which can then be corrected even permanently.

QUALITY CONTROL

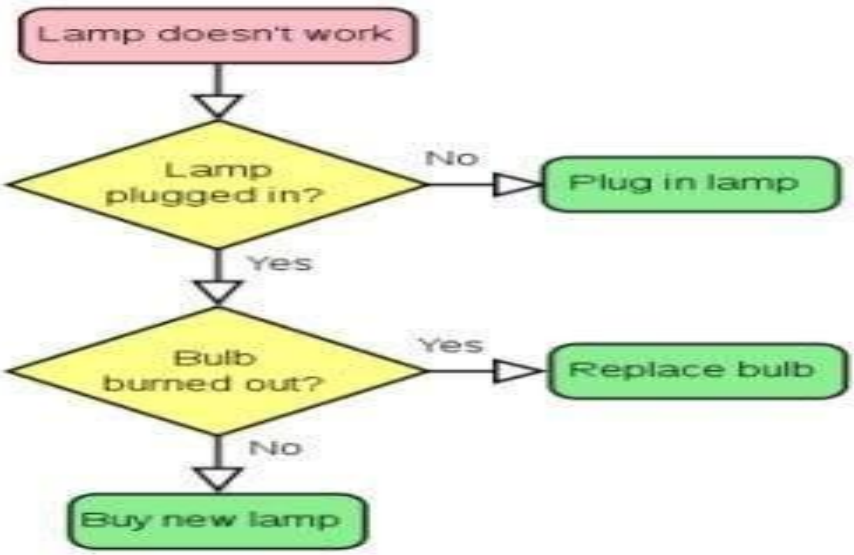
Quality control refers to the technical process that gathers, examines, analyze & report the progress of the project & conformance with the performance requirements

The steps involved in quality control process are

1) Determine what parameter is to be controlled.
2) Establish its criticality and whether you need to control before, during or after results are produced.
3) Establish a specification for the parameter to be controlled which provides limits of acceptability and units of measure.
4) Produce plans for control which specify the means by which the characteristics will be achieved and variation detected and removed.
5) Organize resources to implement the plans for quality control.
6) Install a sensor at an appropriate point in the process to sense variance from specification.
7) Collect and transmit data to a place for analysis.
8) Verify the results and diagnose the cause of variance.
9) Propose remedies and decide on the action needed to restore the status quo.
10) Take the agreed action and check that the variance has been corrected.

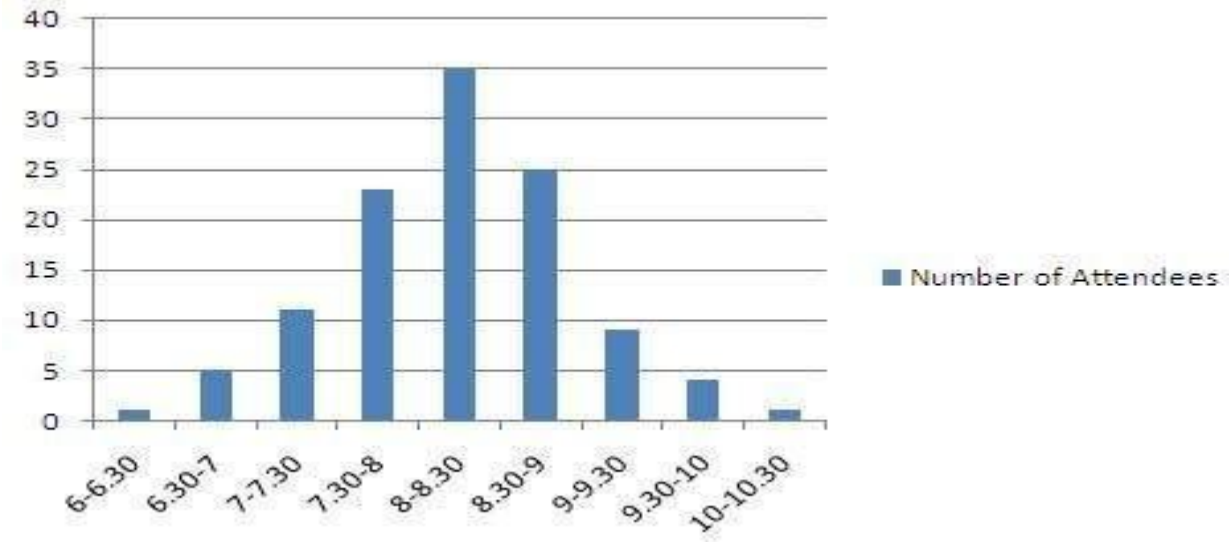
TOOLS & TECHNIQUES OF QUALITY

1. Flow Charts: This is one of the basic quality tool that can be used for analyzing a sequence of events. The tool maps out a sequence of events that take place sequentially or in parallel. The flow chart can be used to understand a complex process in order to find the relationships and dependencies between events. You can also get a brief idea about the critical path of the process and the events involved in the critical path. Flow charts can be used for any field to illustrate complex processes in a simple way.

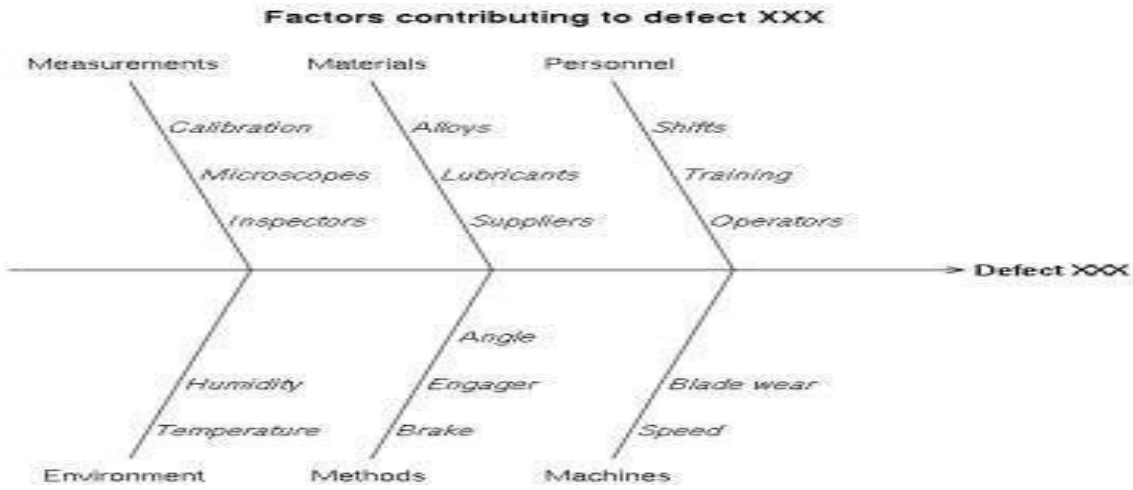


2. Histogram: Histogram is used for illustrating the frequency and the extent in the context of two variables. Histogram is a chart with columns. This represents the distribution by mean. If the histogram is normal, the graph takes the shape of a bell curve. If it is not normal, it may take different shapes based on the condition of the distribution. Histogram can be used to measure something against another thing. Always, it should be two variables. Consider the following example: The following histogram shows morning attendance of a class. The X-axis is the number

of students and the Y-axis the time of the day.



3. Cause and Effect Diagram: Cause and effect diagrams (Ishikawa Diagram) are used for understanding organizational or business problem causes. Organizations face problems everyday and it is required to understand the causes of these problems in order to solve them effectively. Cause and effect diagrams exercise is usually teamwork. A brainstorming session is required in order to come up with an effective cause and effect diagram. All the main components of a problem area are listed and possible causes from each area is listed. Then, most likely causes of the problems are identified to carry out further analysis.



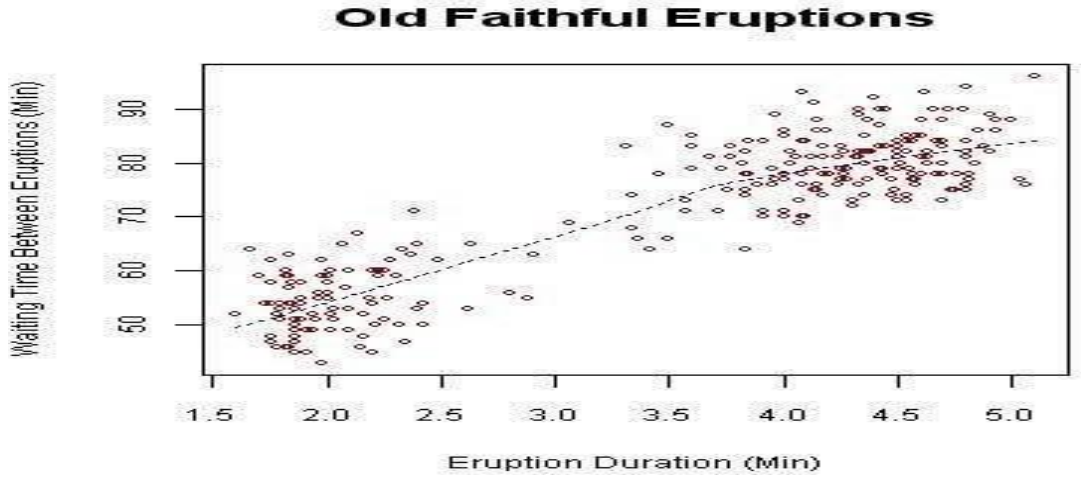
4. Check Sheet: A check sheet can be introduced as the most basic tool for quality. A check sheet is basically used for gathering and organizing data. When this is done with the help of software packages such as Microsoft Excel, you can derive further analysis graphs and automate through macros available. Therefore, it is always a good idea to use a software check sheet for information gathering and organizing needs. One can always use a paper-based check sheet when the information gathered is only used for backup or storing purposes other than further processing.

Motor Assembly Check Sheet

Name of Data Recorder: Lester B. Rapp
Location: Rochester, New York
Data Collection Dates: 1/17 - 1/23

Defect Types/ Event Occurrence	Dates							TOTAL
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Supplied parts rusted		|||||	|||||	||||	||			20
Misaligned weld			|||			||		5
Improper test procedure								0
Wrong part issued								3
Film on parts								0
Voids in casting				||||	||			6
Incorrect dimension								2
Adhesive failure								0
Masking insufficient								1
Spray failure			|||||					5
TOTAL		10	13	10	5	4		

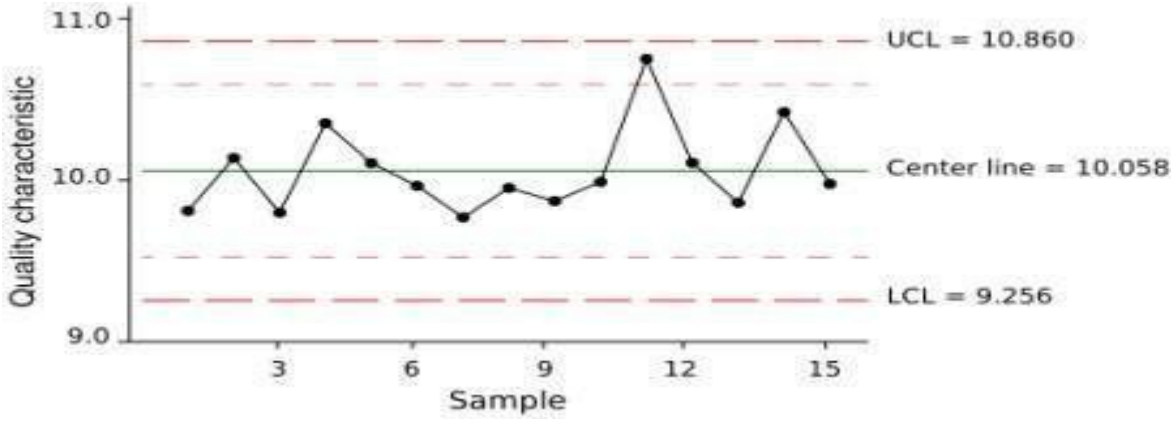
5. Scatter Diagram: When it comes to the values of two variables, scatter diagrams are the best way to present. Scatter diagrams present the relationship between two variables and illustrate the results on a Cartesian plane. Then, further analysis, such as trend analysis can be performed on the values. In these diagrams, one variable denotes one axis and another variable denotes the other axis.



6. Control Charts: Control chart is the best tool for monitoring the performance of a process. These types of charts can be used for monitoring any processes related to function of the organization. These charts allow you to identify the following conditions related to the process that has been monitored.

- Stability of the process
- Predictability of the process
- Identification of common cause of variation

- Special conditions where the monitoring party needs to react



7. Pareto Charts: Pareto charts are used for identifying a set of priorities. You can chart any number of issues/variables related to a specific concern and record the number of occurrences. This way you can figure out the parameters that have the highest impact on the specific concern. This helps you to work on the propriety issues in order to get the condition under control.