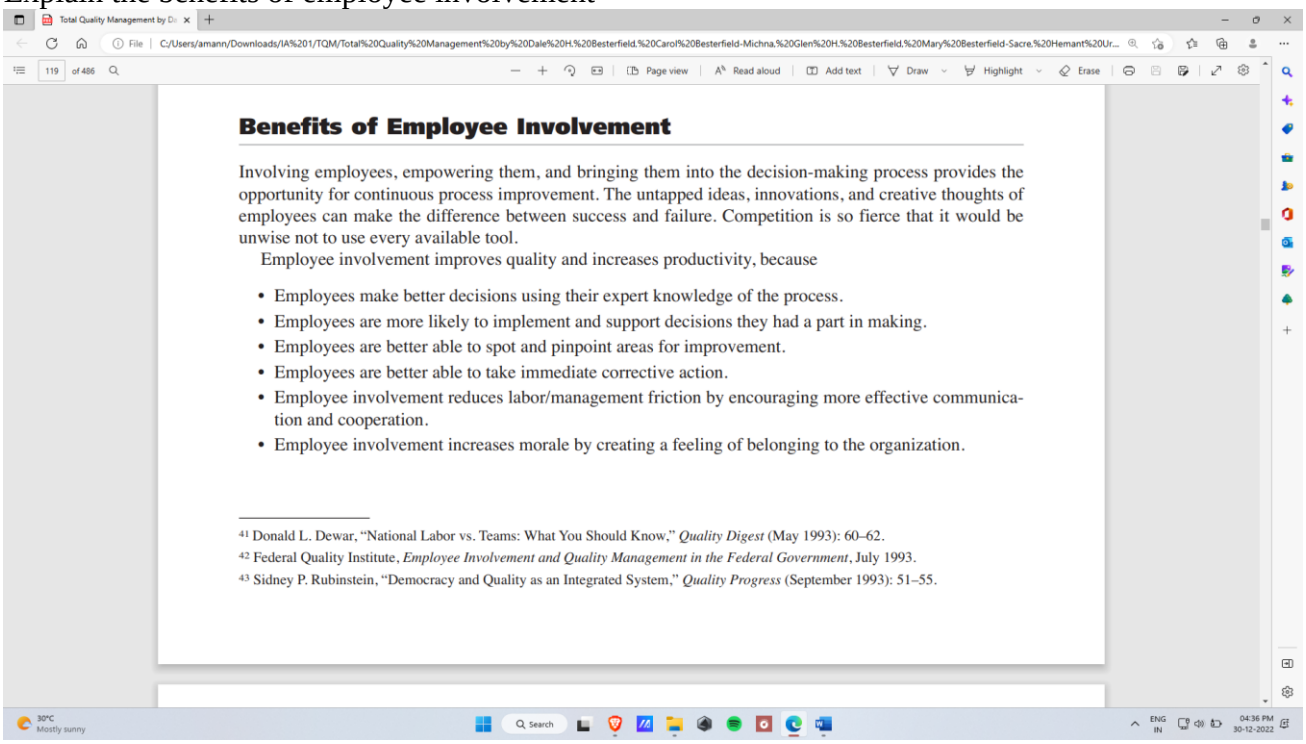
Q.No	
1	Define and explain the following • Performance • Reward • Recognition • Empowerment • Gainsharing
2	Explain the benefits of employee involvement  **Benefits of Employee Involvement** Involving employees, empowering them, and bringing them into the decision-making process provides the opportunity for continuous process improvement. The untapped ideas, innovations, and creative thoughts of employees can make the difference between success and failure. Competition is so fierce that it would be unwise not to use every available tool. Employee involvement improves quality and increases productivity, because • Employees make better decisions using their expert knowledge of the process. • Employees are more likely to implement and support decisions they had a part in making. • Employees are better able to spot and pinpoint areas for improvement. • Employees are better able to take immediate corrective action. • Employee involvement reduces labor/management friction by encouraging more effective communication and cooperation. • Employee involvement increases morale by creating a feeling of belonging to the organization. [41] Donald L. Dewar, "National Labor vs. Teams: What You Should Know," *Quality Digest* (May 1993): 60–62. [42] Federal Quality Institute, *Employee Involvement and Quality Management in the Federal Government*, July 1993. [43] Sidney P. Rubinstein, "Democracy and Quality as an Integrated System," *Quality Progress* (September 1993): 51–55.
3	Explain Juran Trilogy

The Juran Trilogy[2]

Process improvement involves planning. One of the best approaches is the one developed by Dr. Joseph Juran. It has three components: planning, control, and improvement, and is referred to as the Juran Trilogy. It is based loosely on financial processes such as bud-geting (planning), expense measurement (control), and cost reduction (improvement).

Planning

The planning component begins with external customers. Once quality goals are established, marketing determines the external customers, and all organizational personnel (managers, members of multifunctional teams, or work groups) determine the internal customers. External customers may be quite numerous, as is the case of a bank supply organization, where they include tellers, financial planners, loan officers, auditors, managers, and the bank's customers. Where there are numerous customers, a Pareto diagram (see Chapter 15) might be useful to determine the vital few.

Once the customers are determined, their needs are discovered. This activity requires the customers to state needs in their own words and from their own viewpoint; however, real needs may differ from stated needs. For example, a stated need may be an automobile, whereas the real need is transportation or a status symbol. In addition, internal customers may not wish to voice real needs out of fear of the consequences. One might discover these needs by (1) being a user of the product or service, (2) communicating with customers through product or service satisfaction and dissatisfaction information, or (3) simulation in the laboratory. Because customer needs are stated from their viewpoint, they should be translated to requirements that are understandable to the organization and its suppliers.

The next step in the planning process is to develop product and/or service features that respond to customer needs, meet the needs of the organization and its suppliers, are competitive, and optimize the costs of all stakeholders. This step typically is performed by a multifunctional team. Quality function deployment (Chapter 10), Taguchi's quality engineering (Chapter 16), and quality by design (Chapter 11) are some of the approaches that can be used. It is important that the design team, rather than a single department, approve the final design and that the team be composed of all functional areas within an organization as well as customers and suppliers.

The fourth step is to develop the processes able to produce the product and/or ser-vice features. Some of this planning would have occurred during the previous step. This step is also performed by a multifunctional team with a liaison to the design team. Activities include determining the necessary facilities, training, and operation, control, and maintenance of the facilities. Of particular concern will be the "scaling up" from the laboratory or prototype environment to the real process environment. Additional activities include process capability evaluation and process control type and location.

Transferring plans to operations is the final step of the planning process. Once again, a multifunctional team with a liaison to the other teams is used. When training is necessary, it should be performed by members of the process planning team. Process validation is necessary to ensure, with a high degree of assur-

Control

Control is used by operating forces to help meet the product, process, and service requirements. It uses the feedback loop and consists of the following steps:

1. Determine items/subjects to be controlled and their units of measure.
2. Set goals for the controls and determine what sensors need to be put in place to measure the product, process, or service.
3. Measure actual performance.
4. Compare actual performance to goals.
5. Act on the difference.

Statistical process control (see Chapter 15) is the primary technique for achieving control. The basic statistical process control (SPC) tools are Pareto diagrams, flow diagrams, cause-and-effect diagrams, check sheets, histograms, control charts, and scatter diagrams. In addition, process capability information such as C_p and C_{pk} are used to determine if the process is capable and is centered.

Improvement

The third part of the trilogy aims to attain levels of performance that are significantly higher than current levels. Process improvements begin with the establishment of an effective infrastructure such as the quality council (see Chapter 2). Two of the duties of the council are to identify the improvement projects and establish the project teams with a project owner. In addition, the quality council needs to provide the teams with the resources to determine the causes, create solutions, and establish controls to hold the gains (see Chapter 4). The problem-solving method described in a later section may be applied to improve the process, while the quality council is the driver that ensures that improvement is continuous and neverending. Process improvement can be incremental or breakthrough.

Figure 5-2 provides an example of how the three continuous improvement processes interrelate.[3] In the figure, Juran provides a distinction between sporadic waste and chronic waste. The sporadic waste can be identified and corrected through quality control. The chronic waste requires an improvement process. As a solution is found through the improvement process, lessons learned are brought back to the quality planning process so that new goals for the organization may be established.

4	Describe PDSA cycle

The PDSA Cycle

The basic Plan-Do-Study-Act (PDSA) cycle was first developed by Shewhart and then modified by Deming.[6] It is an effective improvement technique. Figure 5-3 illustrates the cycle.

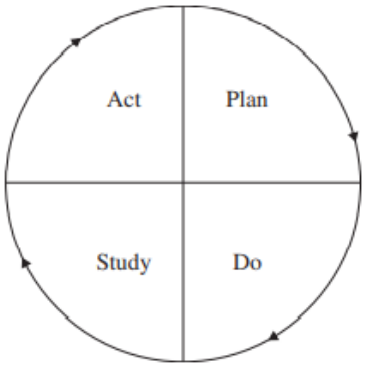


Figure 5-3 The PDSA Cycle

[6] Shewhart's cycle was called Plan-Do-Check-Act (PDCA).

The four steps in the cycle are exactly as stated. First, *plan* carefully what is to be done. Next, carry out the plan (*do* it). Third, *study* the results—did the plan work as intended, or were the results different? Finally, *act* on the results by identifying what worked as planned and what didn't. Using the knowledge learned, develop an improved plan and repeat the cycle. The PDSA cycle is a simple adaptation of the more elaborate problem-solving method discussed in the next section.

5	Explain Kaizen and Six Sigma

Kaizen

Kaizen is a Japanese word for the philosophy that defines management's role in continuously encouraging and implementing small improvements involving everyone. It is the process of continuous improvement in small increments that make the process more—efficient, effective, under control, and adaptable. Improvements are usually accomplished at little or no expense, without sophisticated techniques or expensive equipment. It focuses on simplification by breaking down complex processes into their sub-processes and then improving them.

The Kaizen improvement focuses on the use of:[13]

1. Value-added and non-value-added work activities.
2. *Muda*, which refers to the seven classes of waste—over-production, delay, transportation, processing, inventory, wasted motion, and defective parts.
3. Principles of motion study and the use of cell technology.
4. Principles of materials handling and use of one-piece flow.
5. Documentation of standard operating procedures.
6. The five S's for workplace organization, which are five Japanese words that mean proper arrangement (*seiko*), orderliness (*seiton*), personal cleanliness (*seiketso*), cleanup (*seiso*), and discipline (*shitsuke*).
7. Visual management by means of visual displays that everyone in the plant can use for better communications.
8. Just-in-time principles to produce only the units in the right quantities, at the right time, and with the right resources.
9. *Poka-yoke* to prevent or detect errors.
10. Team dynamics, which include problem solving, communication skills, and conflict resolution.

Kaizen relies heavily on a culture that encourages suggestions by operators who continually try to incrementally improve their job or process. An example of a Kaizen-type improvement would be the change in color of a welding booth from black to white to improve operator visibility. This change results in a small improvement in weld quality and a substantial improvement in operator satisfaction. The PDSA cycle described earlier may be used to help implement Kaizen concepts.

Six-Sigma

In 1999, M. Harry and R. Schroeder published *Six Sigma: The Breakthrough Management Strategy Revolutionizing the World's Top Corporations*. Since that time, there has been considerable interest in the subject; therefore, the authors have devoted much space to a review of the concept.

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[14] Business India May 3, 2009.

[15] Michael Hammer and James Champy, *Reengineering the Corporation, A Manifesto for Business Revolution* (New York, NY: HarperCollins, 1993).

[16] Robert E. Cole, "Reengineering the Corporation: A Review Essay," *Quality Management Journal* (July 1994): 77–85.

[17] Dagestino, Kathryn, Wendy L. Moore, and Jorn Teutloff, "Hustle, That's All," *Quality Progress* (September 2000): 73–79.

Statistical Aspects

According to James Harrington, "Six sigma was simply a TQM process that uses process capability analysis (see Chapter 15) as a way of measuring progress."[18] Sigma, σ, is the Greek symbol for the statistical measurement of dispersion called standard deviation. It is the best measurement of process variability, because the smaller the deviation value, the less variability in the process. Figure 5-5 shows a process that is normally distributed and centered with the upper and lower specification limits (USL and LSL) established at ± 6 σ. For this situation, 99.9999998% of the product or service will be between specifications, and the nonconformance rate will be 0.002 parts per million, or 2.0 per billion. The situation diagrammed represents a process capability index (C_p) of 2.0. A C_p of 1.33 has been a defacto standard. Table 5-4 shows the percent between specifications, the nonconformance rate, and process capability for different specification limit locations.

According to the six-sigma philosophy, processes rarely stay centered—the center tends to "shift" above and below the target, μ. Figure 5-6 shows a process that is normally distributed, but has shifted within a range of 1.5σ above and 1.5σ below the target. For the diagrammed situation, 99.9996600% of the product or service will be between specifications and the nonconformance rate will be 3.4 ppm. This off-center situation gives a process capability index (C_{pk}) of 1.5 with 1.0 being the defacto standard. Note that the

6	Explain the categories of Quality Cots

Categories of Quality Cost

INTERNAL FAILURE COSTS

These are costs which are associated with the defects or non-conforming situations that are found prior to shipment of the product to customer. These costs can be reduced to zero if no defect existed prior to shipment. Whenever quality appraisals are carried out, there exists a possibility of discovering non-conforming situations. Such situations are salvaged by either rework, complete replacement or scrapping. The total cost of carrying out re-inspection/re-tests, failure analysis, evaluation, disposition and subsequent actions are included in the internal failure cost. In summary, this includes all material, labor, energy and overhead expenses that are wasted on account of non-conforming or defective product or service.

Examples of internal failure costs are:

- Rework, fixing of bugs detected in internal testing of software
- Premium freight due to late delivery
- Internal scrap
- Engineering and drawing changes to correct errors
- Energy cost for remelting of rejected castings

EXTERNAL FAILURE COSTS

Often the defects are found only after the product reaches the dealer or customer. Such costs are included in the external failure costs. This component of quality cost also disappears if there are no defects. Some examples of external failure cost are:

- **Complaints:** Complaints from customer are analyzed, resolved and communication is sent to customer. Sometimes it may also involve field service or adjustments.
- **Warranty claims:** Recall of vehicles for defects, costs involved in repairs or replacement of product during warranty period, the cost associated with receipt, evaluation and replacement of defective product from field.
- **Retrofit and recall costs:** It is often required to modify or update the product in order to incorporate new design changes in order to overcome design deficiencies. There are several cases in recent past, where automobiles were recalled due to failure investigation reports on the steel used in the manufacturing.
- **Liabilities and penalties:** Insurance claims and contractual obligatory claims are included in such types of costs.
- **Allowances and customer goodwill:** The cost of concessions offered to the customer due to substandard product, poor quality or costs incurred because the customer is not completely satisfied with the quality because his expectations were higher than those delivered to him by the product.
- External failure costs will also include lost sales and loss of goodwill although these are difficult to measure

7 Define benchmarking. Explain the process of Benchmarking

Benchmarking Defined

Benchmarking is the systematic search for best practices, innovative ideas, and highly effective operating procedures. Benchmarking considers the experience of others and uses it. Indeed,- it is the common-sense proposition to learn from others what they do right and then imitate it to avoid reinventing the wheel. Benchmarking is not new and indeed has been around for a long time. In fact, in the 1800s, Francis Lowell, a New England colonist, studied British textile mills and imported many ideas along with improvements he made for the burgeoning American textile mills.

	Process Organizations that benchmark, adapt the process to best fit their own needs and culture. Although th ber of steps in the process may vary from organization to organization, the following six steps contain techniques. 1. Decide what to benchmark. 2. Understand current performance. 3. Plan. 4. Study others. 5. Learn from the data. 6. Use the findings.
8	Define the meaning of customer satisfaction. Explain the internal and external customer. This question was asked in last IA mostly it wont come
9	Explain the basic concepts to achieve the motivated workforce

Achieving a Motivated Work Force[8]

The building of a motivated work force is for the most part an indirect process. Managers at all levels cannot cause an employee to become motivated; they must create the environment for individuals to motivate themselves. Concepts to achieve a motivated work force are as follows:

1. *Know thyself*. Managers must understand their own motivations, strengths, and weaknesses. This understanding can best be obtained by having peers and employees anonymously appraise the manager's performance. Some organizations like Cummins India Ltd. have implemented 360 degree feedback system for the managers. Motivating managers know that the most valuable resource is people and that their success largely depends on employees achieving their goals.

[6] Ann S. Daughtrey and Betty R. Hicks, *Contemporary Supervision* (New York: McGraw-Hill, 1989).

[7] Fred Luthans and Mark J. Martinko, *The Practice of Supervision and Management*, McGraw-Hill Book Company, New York, 1979.

[8] This section adapted, with permission, from Theodore B. Kinni, "Motivating the Unmotivated," *Quality Digest* (March 1993).

TABLE 4-1
What Employees Want

Factor	Employee Rating	Manager Rating
Interesting work	1	5
Appreciation	2	8
Involvement	3	10
Job security	4	2
Good pay	5	1
Promotion/growth	6	3
Good working conditions	7	4
Loyalty to employees	8	7
Help with personal problems	9	9
Tactful discipline	10	6

10	Describe the criteria and strategy for performance measurement.

Criteria

All organizations have some measurements in place that can be adapted for TQM. However, some measurements may need to be added. In order to evaluate the existing measures or add new ones, the following ten criteria are recommended:

1. *Simple*: Measures should be understandable by those who will use them.
2. *Few in number*: The important measures must be distinguished from the unimportant ones so that users can concentrate on just a few. Two or three measures should be sufficient for any work group, with the number increasing for departments, functional areas, plants, and corporations. Quality councils may wish to use composite measures such as a customer satisfaction index. It is composed of several weighted metrics such as on-time delivery, cost, product or service quality, and complaints.
3. *Developed by users*: In order to ensure ownership of the measures, they must be developed by the user. Measures dictated by a higher authority will usually not receive support from downstream units. However, in some cases, measures are mandated by the customer.
4. *Relevance to customer*: Measures must be relevant to the needs of internal or external customers. Control over important changes should be vested in the people who are held responsible for the performance measure. They also decide what measures to use and set target goals.
5. *Improvement*: Although correcting nonconformances and making current decisions are important, the focus should be on improvement, prevention, and strategic long-term planning and goal setting. Measures are used to promote improvement, not to identify poor performance and penalize the low performers. They should be sensitive to the improvements made.
6. *Cost*: Of course, the bottom line is that cost and profit must reflect an improved financial picture, as shown by the cost of poor quality system and other financial data. In addition, the cost of measurement should be considered.
7. *Visible*: Facility-wide measures should be posted in a central location, such as the lunch or break room, where everyone can see them. Likewise, unit measures should be posted at the machine or work center.
8. *Timely*: Financial and accounting data are often presented too late to be actionable. This may require that measurements are taken hourly, daily, or weekly rather than monthly or quarterly as in traditional

accounting systems. A significant portion of measurements need to be operational rather than financial.[2] Data needs to be measured, analyzed, and evaluated with respect to the desired goals so that the information can be used effectively in decision making.

9. *Aligned*: A comprehensive set of measures and indicators tied to customer and organizational performance requirements provides a way to align all activities with organizational goals.
10. *Results*: Key result measures need to be guided and balanced by the interests of all stakeholders—customers, employees, stockholders, suppliers, the public, and the community.

Strategy

The quality council has the overall responsibility for the performance measures. It ensures that all the measures are integrated into a total system of measures. To develop the system, the quality council will obtain appropriate information from all of the stake-holders. They will utilize the core values, goals, mission, and vision statements (see Chapter 2) as well as the objectives and criteria given above. With this information, the strategic measurement system is created.

An example of a system that emphasizes percent improvement might contain the functions and metrics as given below:

Quality

- Percent reduction in cost of poor quality
- Percent reduction in nonconformities
- Percent of certified suppliers
- Percent reduction in supplier base
- Percent reduction in corrective action cycle time

Cost

- Percent increase in inventory turnover
- Percent reduction in data transactions
- Percent increase in materials shipped direct to work-in-process by the supplier
- Percent increase in output dollars per employee
- Percent reduction in floor space utilization

Flexibility

- Percent reduction in cycle time
- Percent reduction in setup time
- Percent reduction in lot/batch size
- Percent increase in number of jobs mastered per employee
- Percent increase in common materials used per product

Reliability

- Percent of processes capable of $C_p = 2.0$
- Percent reduction in down time

[2] James W. Cortada, "Balancing Performance Measurements and Quality," *Quality Digest* (December 1994): 48–54.

- Percent reduction in warranty costs
- Percent reduction in design changes
- Percent increase in on-time delivery

Innovation

- Percent reduction in new product introduction time
- Percent increase in new product sales revenue as a percent of total sales revenue
- Percent increase in new patents granted
- Customer perception as a leader in innovation
- Percent of management time spent on or leading innovation

11	Illustrate the performance measure presentation with different measurement techniques

Performance Measure Presentation

There are six basic techniques for presenting performance measures. The simplest and most common i time series graph shown in Figure 6-1. Time as measured by days, weeks, months, and so forth, is show the horizontal axis, and the performance measure is shown on the vertical axis. This type of graph benchm the process and shows favorable and unfavorable trends in the measure.

A second form of presentation is the control chart (see Chapter 15). A control chart for percent non forming is shown in Figure 6-2.

A third presentation technique is the capability index, which is the ratio of the tolerance to the capab There are two measures: one indicates the ability of the process to meet specifications, and the other indi the centering of the process on the target (see Chapter 15).

Another way of measuring quality is Taguchi's loss function. This technique combines target, cost, specifications into one measurement. Figure 6-3 illustrates the concept (see Chapter 16).

The fifth method of presenting performance measures is the cost of poor quality. Money attracts the a tion of senior management; quality costs are described in the next section of this chapter.

The last method includes the performance measurement based on the criteria of national/internati quality awards such as Malcolm Baldrige National Quality Award (U.S.), Deming Prize (Japan) or I Gandhi National Quality Award (India). The criteria for such awards quite effectively measure the perfo ance of TQM effort, on an annual basis. The details are described in the last section of this chapter.

Another approach adopted by many modern organizations is the Balanced Score Card (BSC), which is ai at the assessment of an organization's financial performance in "balance" with the other business aspects. approach is also described in the last section.

[3] Michael G. Tincher and Michael J. Stickler, "Measuring Continuous Improvement," *Actionline* (November 1994): 36–39.

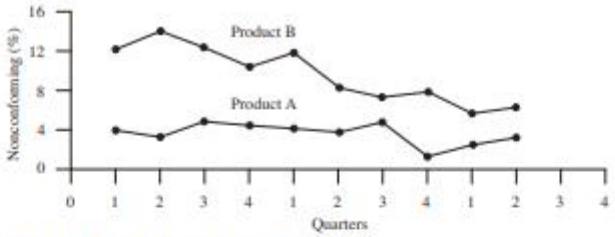

Figure 6-1 Time Series Graph for Percent Nonconforming

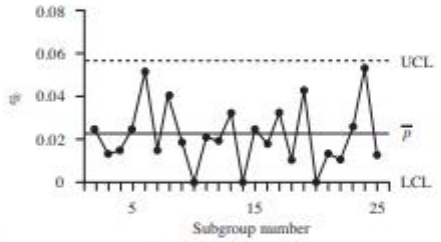

Figure 6-2 Control Chart for Percent Nonconforming

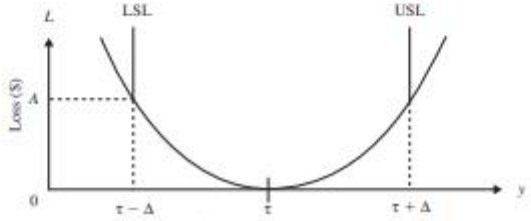

Figure 6-3 Taguchi's Quadratic Loss Function for Nominal-the-Best

12	Explain the different improvement strategies under continuous process improvement

Improvement Strategies[4]

There are four primary improvement strategies—repair, refinement, renovation, and reinvention. Choosing the right strategy for the right situation is critical. It is also true that proper integration of the strategies will produce never-ending improvement.

Repair

This strategy is simple—anything broken must be fixed so that it functions as designed. There are two levels to this strategy. If a customer receives a damaged product, a quick fix is required. This level is a temporary or short-term measure. Although short-term measures shore up the problem, they should not become permanent.

Refinement

This strategy involves activities that continually improve a process that is not broken. Improvements to processes, products, and services are accomplished on an incremental basis. Refinement improves efficiency and effectiveness. It should become an integral part of every employee's job. Both individuals and teams can use this strategy. Typically it relies on doing things just a bit quicker, better, easier, or with less waste. This is the concept behind Kaizen to be discussed later in the chapter. The change may be so gradual that there is no appearance of change. The primary benefit of gradual change is that it produces little resistance from employees. However, because the change is so gradual, management may not recognize and reward the affected employees. Also, minor changes may not be documented or properly communicated.

Organizational programs—such as process improvement teams, suggestion systems, and empowerment—are combinations of repair and refinement. They provide the mechanisms for activities aimed at making these two strategies a part of the daily work life.

Renovation

This strategy results in major or breakthrough improvements. Although the resulting product, service, process, or activity might often appear to be different from the original, it is basically the same. Innovation and technological advancements are key factors in this approach. For example, the process of drilling a hole was originally done by hand with a cranking mechanism; however, with the advent of the electric motor, the electric drill was born. The electric drill has been continually refined by improved bits, chucks, and materials.

More recently, another renovation occurred that was brought about by the development of rechargeable batteries. The rechargeable electric drill is basically the same as the old hand drill. Renovation is more costly than the previous strategies and is usually undertaken by teams rather than individuals.

Reinvention

Reinvention is the most demanding improvement strategy. It is preceded by the feeling that the current approach will never satisfy customer requirements. A new product, service, process, or activity is developed using teams based on a complete understanding of the customer's requirements and expectations. Reinvention or reengineering begins by imagining that the previous condition does not exist—in other words, a clean sheet of paper. Then the team uses in-depth knowledge of the customer's requirements and expectations and invents a new product, service, process, or activity. For example, the process of drilling holes using lasers or water jets was a reinvention.

Reinvention might also be desirable to maintain organization vitality or competitive advantage. An organization should use this strategy sparingly because of resistance to change and the fact that any new product, service, process, or activity will probably need to have the "bugs" removed by repair, refinement, and renovation.

13	Describe Benchmarking Process Same ans as 7

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