TQM

THE NEW MANAGEMENT MODEL

Dr. Chinnakurli S Ramesh
Kunwar Singh

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CHAPTER 1

COMPREHENSIVE PRODUCTIVE MAINTENANCE IN QUALITY MANAGEMENT

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ABSTRACT:

Total Productive Maintenance (TPM), which involves collaboration throughout the entire organization, aims to maintain the current plant and equipment at its highest level of productivity. Usually, the initial job is to persuade maintenance and production staff to collaborate by removing their conventional barriers. In this chapter discussed about the total productive maintenance the main objective of this chapter is to Know how to organize and handle the transition calculate the six biggest losses, pinpoint the gaps, and establish the target for improvement. Examine some instances of TPM implementation done well.

KEYWORDS:

Equipment, Maintenance, Management, Productive, Staff,Work.

INTRODUCTION

A profitable manufacturing system depends on proper maintenance; try running a production line with broken machinery. Total Productive Maintenance (TPM), which involves collaboration throughout the entire organization, aims to maintain the current plant and equipment at its highest level of productivity. Usually, the initial job is to persuade maintenance and production staff to collaborate by removing their conventional barriers.Peak performance or total productivity is the goal that people working together without respect to organizational structure, using their abilities and innovation, can achieve [1]. This strategy does not imply that fundamental methods like predictive and preventative maintenance are not employed; on the contrary, they are crucial to laying the groundwork for a successful TPM environment[2].

Preventative maintenance is the process of regularly completing tasks on the equipment, such as lubrication, to keep it operating, whereas predictive maintenance is the process of using data and statistical methods to predict when a piece of equipment will fail [3]. The goal of the entire maintenance function should be to get rid of unforeseen equipment and plant maintenance. The goal is to develop a system that enables all maintenance tasks to be planned so that they don't obstruct the manufacturing cycle. Equipment failures that are unexpected shouldn't happen. Prior to the development of computer-aided manufacturing, certain organizations' operators were in charge of their equipment and took a certain amount of pleasure in it. Operators spent a portion of their workday maintaining their equipment with the assistance of maintenance personnel. More tools are now available to us thanks to recent technological advancements for the maintenance function[4].

Scope

1. **Total Quality Management:**A technique within Total Quality Management (TQM) called Comprehensive Productive Maintenance (CPM) aims to maximize an

organization's use of its machinery and equipment. The following significant elements are part of the CPM scope in TQM

2. **Equipment Management:** The core of CPM is the efficient management of equipment over the course of its life. This involves decisions about choosing, installing, scheduling maintenance, and replacing equipment. To make sure that equipment functions at its best and satisfies the organization's standards for productivity and quality, CPM emphasizes the need for a systematic and proactive approach.[5][6]
3. **Preventive Maintenance:** CPM places a strong emphasis on the application of preventive maintenance procedures to stop equipment failures and breakdowns. This include creating maintenance schedules, carrying out routine checks, and carrying out standard maintenance procedures like cleaning, lubrication, and calibration. Organizations may avoid unexpected downtime, minimize disruptions, and maintain constant production quality and efficiency by proactively addressing foreseeable concerns.

When TPM is broken down into its three words, we have total refers to everything when manufacturing and maintenance personnel collaborate. Producing goods and services that meet or surpass customers' expectations is referred to as being productive. Equipment and plants should always be kept in as good as or better than their original state. The main objectives of TPM are:

1. Preserving and enhancing equipment capacity.
2. Lifelong equipment maintenance.
3. Obtaining assistance from all divisions of the operation.
4. Encouraging feedback from all staff members.
5. Making use of teams for ongoing development.

Without also paralleling the principles total quality management, organizations that apply the principles (Programme in) failure mode effect analysis, employee involvement, continuous improvement, just-in-time manufacturing, statistical process control, and experimental design, to name a few, cannot succeed [7][8]. How can a corporation apply just-in-time production, for instance, when equipment downtime and failures are not frequent? Or, how can businesses encourage problem-reporting from machine operators or staff members of the maintenance department if they are not included on the team?

The Scheme

Any performance evaluation starts with determining the existing operating parameters. Where are we right now? How do the systems we currently employ function? What state are the machinery and equipment in right now? Do we have functioning systems already and just need to make improvements, or are we beginning from scratch? The principle of Total Quality Management (TQM) is extended to the maintenance function through Total Productive Maintenance (TPM). An organization can begin working towards TPM with these simple steps. Management picks up the new way of thinking. The new philosophy is promoted by the management.

Everyone in the organization receives funding for and development of training.The need for improvement is noted. Performance objectives are created. A strategy for implementation is created. Independent work groups are formed.

Although there is no one perfect implementation strategy, following these steps will provide you a solid foundation[9][10].

DISCUSSION

New Philosophy

Change is one of the hardest things for senior management to handle. They must educate themselves about TPM and how it will impact their business. There are numerous successful examples, but there are also lots of businesses that have tried and failed at various performance-improving strategies. Benchmarking against a prosperous organization will yield insightful data. Management must make a special effort to facilitate cultural transformation on an ongoing basis from top to bottom. The simple solution is to embrace the positive performance metrics of today and ask, why change? The solution is to improve profitability and gain a competitive edge. Many of an organization's rivals are probably making improvements, and they will likely surpass other organizations that don't change in the future by a wide margin. Additionally, the idea that I am the chief, I know more than those who work here exists in management. TPM only aims to make use of an underutilized resource the intellect and problem-solving skills of every employee of the company. So, it's essential to give people the power to decide. This strategy is not permissive management because management is still in charge of the organization's performance. But it does indicate a distinct approach to management.

The fad-of-the-month method to modifying management techniques has been used by many organizations. Employees now question the credibility of this strategy. When management is replaced, the new manager instead of building on prior successes creates a "new system" that is intended to address all of the organization's issues. It appears that a lack of ownership contributes to low morale and managerial unhappiness. Ownership should be based on what is best for the client and the staff members that assist the client. Understanding what needs to be done is aided by an examination of Southwest Airlines' or Hewlett Packard's operating procedures. These businesses, as well as others, place a strong emphasis on the empowerment of their employees. It is challenging to contest their performance metrics. In the beginning, management will have to put in more effort. It will eventually result in less work as everyone begins to address their own issues.

Encouraging the Philosophy

Senior management must devote a lot of time to system promotion. They must promote the concept and demonstrate to the staff their unwavering dedication to its success. Similar to TQM or any other significant organizational transformation, top-level commitment is required. Positive outcomes won't occur until there is dedication to and believe in the new mindset. Lip service to a new idea is given far too frequently. This behavior is typically motivated by the expectation that the new technology will provide a quick payback on investment and resolve certain pressing issues. A sustained dedication to the new philosophy is necessary. Other companies have demonstrated that it is a better method of conducting business.

Management should set an example by putting the new ideology into practice. Organizations that are struggling can partially be attributed to false leadership. Simply starting to practice the new philosophy is one of the best methods to incorporate it. Start granting the maintenance and manufacturing staff more independence, in other words. Employees typically react as soon as they sense that management is committed to changing the organization's course for the better. When TPM is introduced with great hoopla, employees tend to dismiss it as the newest trick to persuade them to work more. The greatest strategy to change first and set the example is for management to change first and lead the way in order to establish credibility.

Training

Teach the philosophy to all levels of managers. Senior management should come first, followed by first-line supervisors. Teach the WHY in addition to the HOW. The implications of implementing this ideology within an organization must be thoroughly explained to senior management. Is top management committed to making the long-term sacrifices necessary to get results? Some managers might need to be replaced or forced to retire early because they won't alter their interpersonal communication style. It's important to identify the managers who adopt the new philosophy easily. Middle management needs to understand how to work in teams and understand how small autonomous work groups operate. This organizational level appears to be the one that is having the most trouble with the transition. Middle managers have been hurt by downsizing in recent years. Of fact, management in this area has historically been exaggerated. The management structures that are created by the TPM and TQM principles are flatter. When you give people the freedom to choose for themselves, you don't need as many levels of management making sure that workers are performing their duties properly.

First-line managers must become familiar with their position in what will probably be a new environment. Supervisors who are accustomed to leading their teams will find the adjustment simple. The era of the dictatorial manager is over. This will be challenging for supervisors who have been giving employees explicit instructions. Supervisors will give up some of their authority, even though it might just be apparent. A workforce with a high level of education does not accept that management style. In actuality, a manager is only as good as their capacity to develop their staff. As members of an autonomous work group, employees must get familiar with the numerous instruments utilized in carrying out their duties. There should be some instruction on the duties performed by production and maintenance personnel. The exchange of ideas between production and maintenance personnel is a significant advantage of TPM.

Needs Improvement

The majority of the time, there are a few machines that seem to be about to malfunction or need a lot of maintenance. No one in the company is more equipped to spot these issues than the employees who regularly use the equipment. Allowing the operators and maintenance personnel to identify the equipment and systems that require the greatest care is a smart beginning step. It is crucial to have a coordination team made up of operators and specialists for this operation. By taking this measure, the organization will establish credibility and begin its TPM journey. Identifying the present situation is one of the team's first steps. What is the starting point, in other words? The following metrics were created by the Japanese and are used by the majority of experts. Measurement and tracking are required for six primary loss areas losses from downtime. Scheduled events includestart-ups, shift changes, coffee and lunch breaks. Scheduled maintenance shutdowns.Unanticipated downtime includes reduced speed losses, equipment failure, changeovers, and lack of material.Idling and brief halts, stagnations, quality losses of poor, process incompatibilities and scrap are the others methods.

Goal

After identifying the areas that require development, goals should be developed. Setting a deadline for solving the top priority issue is a smart initial objective. Because it causes them more issues on a regular basis, technicians and operators will likely want it completed more quickly than management. The first step in getting the organization to work as a team is identifying needs and creating goals.

Creating Plans

First, create and carry out a comprehensive training strategy for all personnel. Plans should be made for creating the autonomous work groups throughout the training phase. Consider assembling groups of maintenance operators and technicians to tackle extremely challenging issues. To address some of the fundamental issues, management can define priorities and commit resources. The establishment of independent work groups, which are teams established for everyday activities, will be facilitated by using the team approach. Employees should now be able to contribute to the structure of these autonomous teams. It is important to plan for the possibility that autonomous work groups will evolve over time. The organizational structure will evolve as processes and procedures are enhanced. Unreasonably, autonomous work groups would be expected to adapt as well.

Independent Work Groups

The formation of autonomous work groups is based on the activity's natural flow. Initially, give the operator ownership of the machinery and the level of maintenance that he is capable of. Next, list the maintenance staff members who are skilled in particular fields or who work in those areas. An independent work group is created by bringing together operators andmaintenance staff. These organizations need to have the power to decide how to keep the machinery in top working condition. Depending on the application and industry, autonomous work groups will have varied organizational structures. The operations staff consults with maintenance technicians. They instruct operators on how to perform certain jobs including lubrication, minor repair work, and setups. The autonomous work group's principal objective is to minimize the need for maintenance work. Freeing up highly qualified maintenance technicians from the more boring everyday jobs is a secondary advantage. Major overhauls and helping with troubleshooting issues that the autonomous work group cannot solve are handled more efficiently by skilled experts.

Examples

There are several instances of businesses using complete productive maintenance to free up their production staff and reduce the time and cost spent on maintenance. The organizations that used complete productive maintenance are represented in a variety of ways in the examples below. By eliminating the use of outside contractors for vehicle work and standardizing procedures, the U.S. Postal Service in Albany, New York, was able to save $86,000 yearly.311 other institutions in the Northeast are adjusting their practices based on their adjustment of maintenance processes, and 179 sites nationally could save $4.5 million if they did the same. The U.S. Postal Service in Albany, New York was a finalist for the 2000 RIT/USA Today Quality Cup as a result of their efforts. Yamaha Corp. presented a complete productive maintenance award to Yamato Kogyo Corp. of Japan, a manufacturer of motorcycle control cables, in the 1990s.4 Using total productive maintenance, they boosted employee suggestion rates by over 300% to 5 per employee per month, increased productivity by 130%, cut accidents by 90%, and reduced defects by 95%.

Using total productive maintenance, a group of employees at the Japanese base Kadena Air Base were able to lower the failure rate of AIM-9 missiles from 102 per month to 15 or less per month, earning them the 1995 RIT/USA Today Quality Cup for government.5 The multidisciplinary team concentrated on the argon gas used to cool the missile as the cause of the issues after considering several missile malfunctions and fixes. Repair after a missile launches improperly for the first time, technicians check that argon bottles are properly sealed, all argon bottles are fitted with new $0.13 O-ring seals, pilots are trained to describe

issues to technicians, and repairs are started on the metal probes to which the argon bottle attaches are among the outcomes of the team's total productive maintenance Programme.

They organized teams to reduce equipment failures and defects in the first phase of total productive maintenance. The second phase featured better design for manufacturability and better production management. The third phase involved enhancing plant automation. The fourth phase involved improving office automation. Their focus on overall productive maintenance had the desired effects of a 75% defect reduction, a 50% increase in output, and a 95% reduction in equipment breakdowns. By using total productive maintenance to cut maintenance costs by $12.7 million over the course of 18 months, an eight-person multidisciplinary team at the Tennessee Valley Authority's Brown Ferry nuclear plant won the 1997 RIT/USAToday Quality Cup for government and former Vice President Al Gore's Hammer award.7 The team's main goal was to use multiple software programmes to reduce the amount of paperwork that was processed manually. Change procedures were shortened from 25 to 8 hours, work order processing was shortened from 37 to 22 hours, and reactor closure for maintenance was shortened from 32 to 19 days as a result of the team's efforts.

Exemplary Organization for TQM

36 upscale hotels are managed by The Ritz-Carlton Hotel Company, a separate business unit of Marriott International, Inc., in the Americas, Europe, Asia, Australia, the Middle East, Africa, and the Caribbean. The Mobil Travel Guide has awarded all of them four or five stars, while the American Automobile Association has given them diamond ratings. More than 85% of the 17,000 staff members who make up "The Ladies and Gentlemen of The Ritz-Carlton" work in hotels. The corporation supports employees' advancement within the company by providing possibilities for professional growth and extensive training programmes. Horst Schulze, president and chief operating officer of Ritz-Carlton, started off as a waiter's trainee in a hotel in Europe.

To be the premier global provider of luxury travel and hospitality products and services, reads the organization's mission statement. The Gold Standards, which include the company's Motto, Credo, Employee Promise, Three Steps of Service, and The Ritz-Carlton Basics basically a list of performance expectations and the protocol for interacting with customers and attending to their needs are distributed to each employee in the form of a wallet-sized booklet. These are emphasized throughout the company's incentive and recognition Programme, daily five- to 10-minute briefings, and the company's 250-hour training Programme for front-line staff. The Ritz-Carlton is meticulous on every level. Standards are created for all processes, methods of data collecting and analysis are reviewed by outside specialists, and steps for all quality-improvement and problem-solving procedures are documented. Additionally, key procedures are broken down to locate potential error-prone areas.

CONCLUSION

TPM is a TQM extension for maintenance tasks. Managing the change requires management to show commitment, get involved, promote the philosophy, provide resources, and support training, just like managing any other improvement Programme.Finding and quantifying the six major losses on a single essential machine, which call for the most care and attention, is one of the first tasks for the teams. Goals are chosen and an action plan is created based on the situation as it stands right now. The formation of autonomous workgroups should occur during the training phase. As part of this procedure, the operator is held responsible for the routine maintenance tasks for which he or she is qualified, and the maintenance worker with

the required degree of ability is assigned to the independent work group. TPM has been effectively deployed globally in a large number of organizations.

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CHAPTER 2

MANAGEMENT RESOURCES IN TOTAL QUALITY MANAGEMENT

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ABSTRACT:

This chapter highlights a few more tools that, in some instances, can work well for both teams and individuals. Instead of using objective data, they rely on subjective information. The usage of these tools has been shown to be beneficial in process optimization, cost cutting, policy implementation, and new product development.This chapter highlights a few more tools that, in some instances, can work well for both teams and individuals. Instead of using objective data, they rely on subjective information. The usage of these tools has been shown to be beneficial in process optimization, cost cutting, policy implementation, and new product development.

KEYWORDS:

Health, Process, Tools, Team, Work Team.

INTRODUCTION

Although the statistical process control (SPC) tools covered in Chapter 15 are great for solving problems, there are numerous circumstances in which they are inappropriate. This chapter highlights a few more tools that, in some instances, can work well for both teams and individuals. Instead of using objective data, they rely on subjective information. The usage of these tools has been shown to be beneficial in process optimization, cost cutting, policy implementation, and new product development[1][2]. Although this tool is fairly straightforward, it works well. By concentrating on the process rather than the individuals, it may be possible to identify the problem's underlying cause. The process is to give a detailed description of the issue before posing a why question. To find the true cause, you might need to ask why twice, once, or even three times. The idea will be demonstrated with an example. Why did we not deliver on time? It didn't go as planned. Numerous engineering adjustments were made. The customer asked for them. The group recommended modifying the delivery date whenever there were engineering changes. The ability to think critically is greatly enhanced by this instrument. It is typically a speedy approach to problem-solving[3][4].

Field Analysis Forced

This study is intended to pinpoint the forces and elements that might have an impact on the issue or objective. In order to strengthen the positives and minimize or eliminate the negatives, an organization can benefit from a greater understanding of the encouraging, driving, and restraining, inhibiting forces. The steps are to define the objective, establish criteria for judging the success of improvement actions, brainstorm the forces that support and hinder achieving the goal, rank the forces in order of importance, and then take action to strengthen the promoting forces and weaken the inhibiting forces. The utility will be shown through an example.Determining a situation's positives and negatives, helping people to priorities conflicting forces, and identifying the underlying reasons are some of the benefits[5].

Group Nominal Technique

Everyone on the team can contribute ideas and issues using this strategy, which leads to wise conclusions[6]. The method will be demonstrated using an example. Assume that the group needs to select a problem to tackle. Each person identifies the issue they believe to be most pressing on a sheet of paper[7]. All of the issues are listed on a flip chart after the papers have been collected. The team then ranks the issues from least to most significant using another piece of paper for each member. Numbers are assigned to the ranks, with 1 being the least important and increasing to the most important. The item with the highest score is deemed to be the most essential when the scores for each issue are added up[8].

Tools and Principles of TQM

But first, I'd want to talk about the guiding concepts for TQM tools. So that the consumer is ultimately pleased and satisfied, all employees and management must be dedicated to growing the organization's productivity and efficiency as well as the quality of its goods and services. Management might implement additional financial incentives, employee of the month programmes, and other initiatives to foster more dedication. Customer satisfaction should be a top priority for the organization's whole culture. And the senior management must set the example for the rest of the organization[9]. The organization's ultimate goal is to keep its current clientele while attracting new ones in order to expand its network of devoted clients. All goods and services must be developed with the goal of keeping the consumer satisfied. Employees must receive the essential training and be made aware of workplace policies and behaviors if they are to comprehend the organization's goals, culture, and ethos. Most importantly, their comments must be taken into account so that they feel appreciated by the organization. This will give them a sense of empowerment and enable them to operate at their most productive levels[10].

DISCUSSION

Interconnection Diagram

The Interrelationship Diagraph (ID) makes clear how several elements of a complex situation interact with one another. The team can then use the primary drivers and outcomes to solve the issue by categorizing the cause-and-effect linkages among all the variables. The process will be itemized because it is a little more difficult than the prior tools. The issue or problem statement should be accepted by the team. All of the concepts or problems from brainstorming or other techniques should be arranged, preferably in a circle. Assess the cause-and-effect relationship between the first problem, "Lack of respect for others, and Lack of awareness of impact. Issue B is shown as the arrow from Issue B because it is stronger than Issue A in this case. (d), (e), and (f), each issue in the circle is contrasted with Issue A. Only Issues B and E are connected to Issue A. The initial iteration is finished.

Comparing Issue B to Issues C, D, E, and F is the second iteration. In the third round, Issue C is contrasted with Issues D, E, and F. Comparing Issue D to Issues E and F is the subject of the fourth iteration. Comparing Issue E and Issue F is the subject of the sixth iteration. Review the entire diagram and make any required revisions. Finding out about upstream and downstream processes from other individuals is a smart idea. Counting the incoming and outgoing arrows and adding this data below the box completes the diagram. Because it has five outgoing and zero incoming arrows, Issue B is the "driver" of the diagram. Usually, that is the main reason. Issue E has the greatest number of incoming arrows. It serves as a useful metric of achievement. With the use of a relationship diagram, a team can investigate cause-

and-effect linkages methodically, find core causes from subjective data, foster team cohesion and efficiency, and inspire members to think in multiple directions.

Chart of a Tree

This method is used to break down any broad goal into progressively more specific ones in order to attain the goal. First, pick an action-oriented objective statement from the affinity diagram, interrelationship diagram, brainstorming, team purpose statement, etc. Next, decide on the primary headings utilizing the brainstorming process, as shown in Figure. 1a-d under Means. The next level is created in the third stage by examining the major headings. What issues need to be resolved in order to accomplish the goal? At each level, ask this question again. Three levels under the goal aregenerally enough to finish the diagram and assign the proper values. The diagram should be examined to see if anything was overlooked and whether these activities will produce the desired results.The tree diagram fosters innovative thinking among team members, simplifies complicated tasks, and fosters a culture of problem-solving.

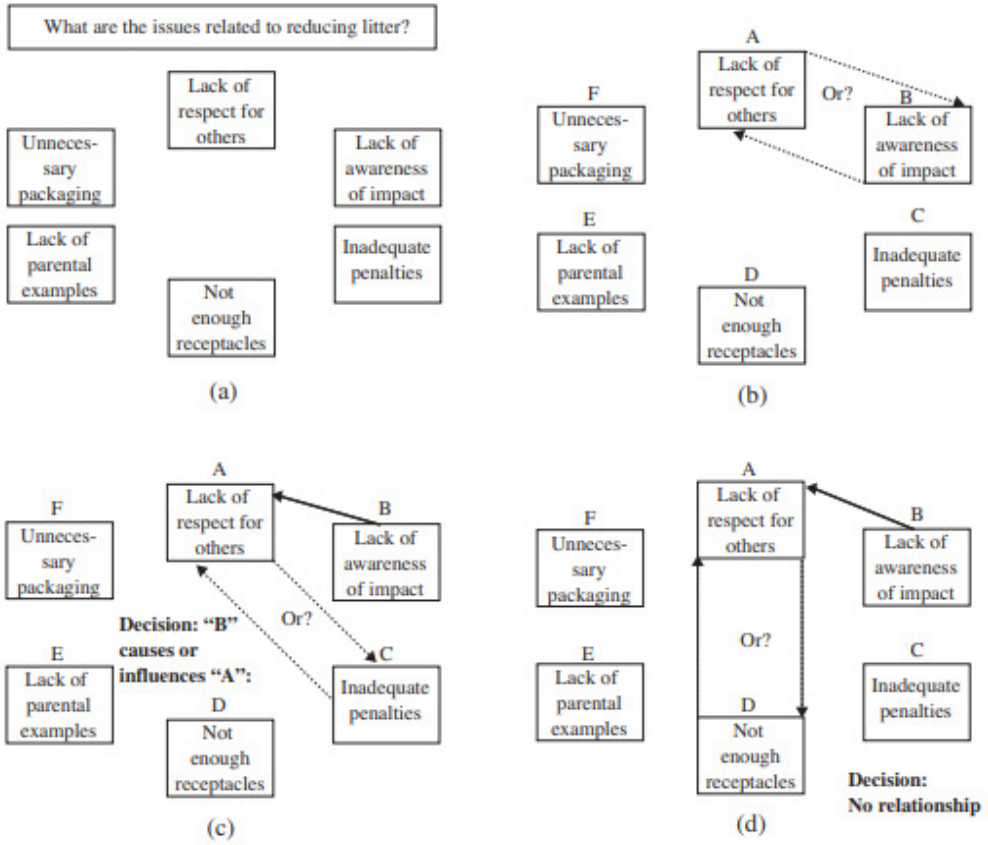

Figure 1: Diagram showing the Interrelationship for first iteration [TQM Book Dale H. BesterField].

A Network Diagram of Activity

Programme evaluation and review technique (PERT), critical path method (CPM), arrow diagram, and activity on node (AON) are some of the names and variations of this instrument. It enables the team to plan a project effectively.The figure displays important activity path, concurrent tasks, and completion timeframes. Not all of the tasks are displayed due to space considerations. Make connecting arrows after numbering each task. Post the task completion time in the lower left box after determining it. Hours, days, or weeks are

used to measure completion times. Finish the four last boxes in each job to identify the critical path. The earliest start time (ES), earliest finish time (EF), latest start (LS), and latest finish (LF) are represented by the boxes below.

Figure in a Matrix

Individuals or groups can use the matrix diagram to locate, evaluate, and rank the relationships between two or more variables. Tables are used to display data, which can be either objective or subjective and be represented by symbols with or without numerical values. The usage of the matrix diagram in quality function deployment (QFD), which was covered in Chapter 10, is excellent. There are a minimum of five common formats.

Tree Diagrams

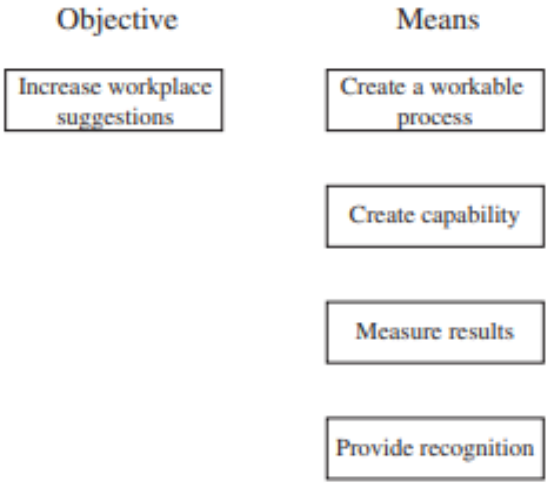

Figure 2: Diagram showing the Objective and means in tree Diagram[TQM Book Dale H. BesterField].

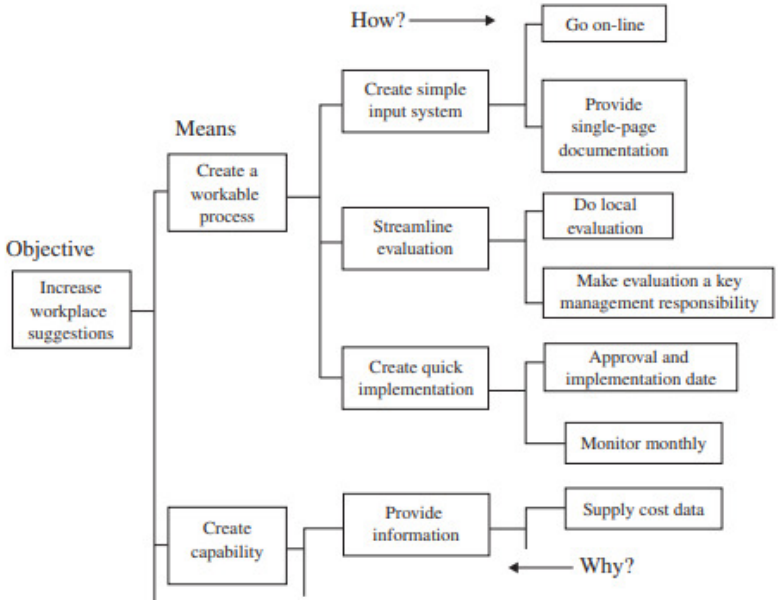

Figure 3: Diagramshowing the exemplary organization for TQM compete [TQM Book Dale H. BesterField].

The case study of Community Health Care is presented here to show how the TQM concepts can be successfully applied in a novel way. Scientific research and a data-based approach to

problem solving produced a magnificent contribution that enhanced community health in India's tribal areas (Figure. 2).The Society for Action and Research in Community Health also known as search was founded in 1986 by Dr. Abhay and his wife, Dr. Rani Bang. Rani and Abhay both earned postgraduate degrees in public health from John Hopkins University and were gold medalists. Gandhian ideals served as a source of inspiration. The main goal of search was to enhance the general health of the very underdeveloped and underprivileged tribes in and around Gadchiroli, located in the center of India. They invested a lot of time in learning about the needs and goals of the indigenous people because there were no trustworthy health data available in this area.

Dr. Rani Bang was the first to bring to the world's attention that rural women had a significant hidden burden of gynecological diseases by performing the first-ever study in two villages of the Gadchiroli region, which was published in the Lancet Journal. The Traditional Birth Attendants (TBAs) or Daais in the communities were subsequently taught by her to serve as village-level health professionals (Figure. 3). She spoke forcefully for the requirement of an all-inclusive reproductive healthcare Programme for rural women in India.

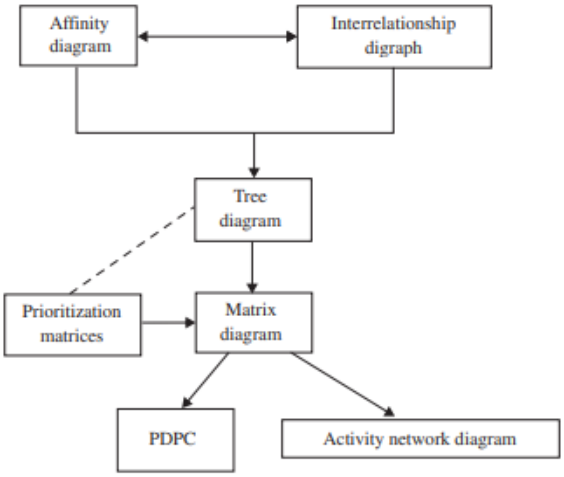

Figure 4: Diagram showing the overview of the System Flow [TQM Book Dale H. BesterField].

They made the decision to focus their efforts on lowering the newborn death rates based on surveys and conversations with those in the area. Search gathered data on baby deaths and came to the conclusion that pneumonia was the main cause of infant deaths, accounting for more than 25% of deaths in children under the age of five (Figure. 4). Contrary to the widely circulated narrative at the time, this was a fact-based discovery. Due to the numerous limitations caused by poverty and illiteracy, a novel but thorough and systematic strategy was taken to address this issue. Many TBAs and village health workers (VHWs) received training in the recognition and management of pneumonia. There were four messages sent.

1. A youngster with a cough who does not have rapid breathing can be treated at home.
2. Rapid or labored breathing is a sign of pneumonia and requires medical attention.
3. The villages with the medical facilities offer treatment.
4. Free access to the effective medication koura (co-trimoxazole) was made possible.

Two health Jabra's or carnivals were staged nearby to raise awareness. They soon discovered that over 41% of cases with borderline respiratory rates were misdiagnosed as pneumonia by the uneducated TBAs using a visual method. As a result, the Breath Counter tool was created, and TBAs were trained to use it to identify pediatric pneumonia. Breath Counter was an easy, affordable, and reliable way to identify pediatric pneumonia even illiterate people could use

it. The Breath Counter employed an abacus with two rows of beads for children of different ages. One red and five white beads were used. It had a one-minute sand clock. One white bead was moved every ten breaths according to a straightforward manner. Pneumonia was identified if a red bead was required. Utilizing the breath counter considerably increased diagnosis accuracy to 82%. It also got around the limitation that the TBAs couldn't count past 12. Children with pneumonia were given the appropriate medication if they had a positive diagnosis. Each child who was saved paid US$2.64 for their medications.

Infant mortality rates for children under the age of five who died from pneumonia decreased to roughly 8.1 per 1000 children after the first year of intervention, down from 17.5 in the control areas where no actions were taken. Together with their colleagues, Abhay and Rani Bang have created a model for a village healthcare Programme that is now known both nationally and internationally. Recently, they showed how village-level neonatal care may be offered. They have also shown how to treat pediatric pneumonia. The best measure of their success is the drop in infant mortality from 121 to 30 in their work area, which was made possible by their creative strategy of empowering the village women to care for the health of their community. The NGOs and Indian Council of Medical Research (ICMR) of the Indian Government have successfully implemented this approach in 5 states, and it has most recently been incorporated into India's 11th Five Year Plan.

The World Health Organization and the Indian government, for which Abhay Bang is currently a member of the National Commission on Population, have both hired him as a consultant. Additionally, he is a member of the Global Saving Newborn Lives Initiative advisory board. He has received numerous honors, including the prestigious Mahatma Gandhi Award and the Maharashtra Bhutan. Rani Bang has received a national award for women's development through the application of science and technology in honor of her outstanding and groundbreaking contributions over the past 25 years to enhancing women's health in rural India through creative and effective research methods that are conducted with and for the people. She was the driving force behind the creation of a complete village healthcare Programme, which is today recognized as a model both nationally and internationally. Gadchiroli, Maharashtra, has had a more than 75% decrease in infant mortality as a result of this novel strategy of empowering rural women to look after the health of their community.

CONCLUSION

Numerous real-world issues call for non-statistical solutions that rely on the team members' collective insight, knowledge, and experience. Why-Why, Force Field Analysis, and Nominal Group Technique are a few tools thatwhen tackling problems, are frequently employed. In order to solve complicated problems, concepts must be developed, categorized, and their relationships must be visualized. In these circumstances, affinity diagrams and interrelationship diagrams are helpful.Matrix mapping the relationships between the variables is made easier by using diagrams. Network diagrams and Process Decision Programme Charts are helpful tools for project planning and launching emergency countermeasures.

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CHAPTER 3

STATISTICAL PROCESS CONTROL FOR QUALITY ENHANCEMENT

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ABSTRACT:

Statistical process control (SPC) is one of the best technological instruments for enhancing the quality of goods and services. There are seven fundamental methods. The term statistical is a bit misleading because the first four procedures are not genuinely statistical. In this chapter discussed about the statistical process control the objective of this chapter is to Statistical process control (SPC) is one of the best technological instruments for enhancing the quality of goods and services. There are seven fundamental methods. The term statistical is a bit misleading because the first four procedures are not genuinely statistical.

KEYWORDS:

Control,Statistical,Process,Technical Instruments,SPC.

INTRODUCTION

Statistical process control (SPC) is one of the best technological instruments for enhancing the quality of goods and services.There are seven fundamental methods. The term "statistical" is a bit misleading because the first four procedures are not genuinely statistical. Additionally, this technological instrument has the potential to both regulate and optimize the process.

Pareto Chart

Alfredo Pareto (1848–1923) did in-depth research on the wealth distribution in Europe. He discovered that there were a small number of wealthy individuals and a large number of poor individuals. This wealth disparity became a central concept in economic theory. Dr. Joseph Juan saw that this idea was universal and could be used in a variety of contexts. The terms vital few and "useful many" are his inventions [1][2]. A Pareto diagram is a graph that lists data categories in descending order from left to right. The types of coating machines are the data classifications in this instance. Other categories for data include issues, grievances, reasons, kinds of nonconformities, and so forth. The useful many are on the right, while the essential few are on the left. It may be required to group some of the helpful many into a category labelled "other" under some circumstances. This category is positioned far to the right when it is utilized.The percentage of each category can be displayed above the column[3].

The vertical scale is dollars or frequency. Pareto charts were created in this instance for both frequency and money.The figure shows that machine 35 has the most nonconformities, but machine 51 has the highest cash value. The difference between a Pareto diagram and a histogram can be seen in the fact that a Pareto diagram's horizontal scale is categorical while a histogram's scale is numerical. The biggest issues are discovered using Pareto diagrams[4][5]. Typically, 25% of the pieces produce 75% of the total. The graphic illustrates

this reality, with coating machines 35 and 51 making up nearly 75% of the total. Actually, by arranging the things in descending order, the most crucial ones may be found. The graph, however, has the advantage of giving a visual impact and highlighting those few crucial traits that require attention. After that, resources are allocated to execute the required corrective action. A few of the essential handful include most of the sales come from a small number of clients. The majority of the cost of scrap or rework is attributable to a few operations. Most client complaints are the result of a few nonconformities. The majority of parts that are returned come from just a few sources. Most of the process downtime is caused by a small number of issues. A Pareto diagram is relatively easy to create. Five steps are involved:

1. Choose the classification scheme for the data, such as problem, cause, nonconformity, etc.

2. Choose between using dollars (best), frequency, or both to rank the attributes.

3. Compile data for a suitable time period or make use of historical data.

4. Condense the information and list the categories in order of largest to smallest.

5. Create the diagram and identify the key elements.

Scope

The use of statistical methods to monitor, regulate, and enhance processes falls under the purview of Statistical Process Control (SPC), which is a component of Total Quality Management (TQM). SPC is a potent instrument that may be used to guarantee that processes stay under control, deliver reliable outcomes, and meet or exceed quality standards[6][7]. The following essential elements are part of SPC's TQM scope:

1. **Process Monitoring:** SPC focuses on continuously watching processes for any fluctuations or departures from the intended performance. Utilizing statistical methods like control charts, histograms, and run charts, it entails the gathering and analysis of process data. Organizations can spot trends, patterns, or anomalies by tracking the performance of their processes. These could point to the need for corrective action.
2. **Statistical Analytic Methods:** SPC uses statistical analytic methods to examine data, interpret it, and come to intelligent conclusions. This entails estimating process parameters, doing hypothesis tests, and running regression analyses, in addition to computing process capability indices. An understanding of process performance, variability, and probable sources of variation can be gained by statistical analysis[8].
3. **Control Charts:**Control charts are a crucial component of SPC. They are graphical depictions of process data over time, and control limits are used to show the allowed range of fluctuation. Organizations can discern between special cause variation caused by certain causes or events and common cause variation inherent to the process using control charts. Businesses can spot when a process is out of control and take the necessary steps to bring it back under control by using control charts efficiently.
4. **Process Control and Improvement:** SPC enables businesses to actively manage their processes and take data-driven actions to make them better. Organizations can pinpoint problem areas, put right the wrongs, and improve process performance by continuously monitoring and analyzing process data. By offering a methodical approach to process control and improvement, SPC supports the idea of continuous improvement in TQM.
5. **Stability and capabilities of processes:** SPC aids in evaluating the stability and capabilities of processes. While process capability assesses a process's ability to fulfil predetermined requirements, process stability refers to the consistency and predictability of a process' performance. SPC tools and procedures give organizations the capacity to

assess and develop the stability and capability of their processes, which improves quality, lowers defects, and boosts customer happiness[9].

6. **Data-Driven Decision Making:** SPC encourages data-driven decision-making by offering unbiased statistics on the efficiency of processes. Organizations can use real data and statistical analysis to inform their decisions rather than depending on subjective judgments or assumptions. SPC makes ensuring that decisions are supported by facts, resulting in better process improvement and problem-solving[10].

DISCUSSION

Procedure Flow Chart

Building a process flow diagram may be beneficial for various goods and services. A flow diagram for the order input process is shown in Figure. 1 for a company that makes petrol filling station hose nozzles on demand. These flowcharts depict how the good or service goes through the various processing steps. It is simple to visualize the complete system using the diagram, recognize possible problem areas, and locate control functions. The query "Who is the next customer?" is resolved. Steps can be changed, cut down, combined, or eliminated to achieve improvements. Industrial engineers utilize standardized symbols, however their use is not required to solve problems. The figures' symbols ought to be enough.

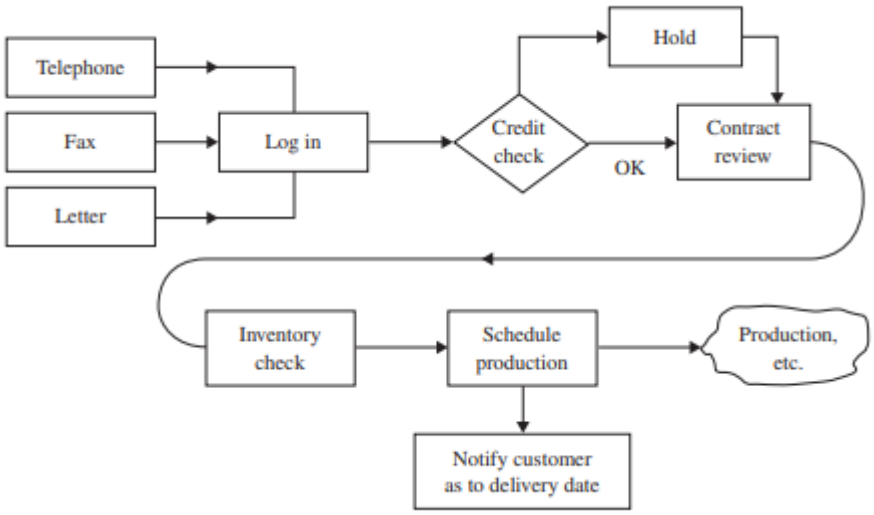

Figure 1: Diagram showing the Order Entry Activity Flow [TQM Book, Dale H. BesterField].

Causation and Effect Chart

A cause-and-effect (C&E) diagram is a visual representation made up of lines and symbols that shows the connection between an effect and its causes. Because of its design, it is sometimes known as an Ishikawa diagram or a fishbone diagram and was created by Dr. Kaoru Ishikawa in 1943.C&E diagrams can be used to study a good effect and identify the causes, or to investigate a bad effect and take action to address the causes. For each effect, there will probably be a number of causes.

A C&E diagram is shown in Figure. 1, with the causes on the left and the effects on the right. The aspect of quality that requires improving is the effect. The primary causes of work methods, materials, measurement, people, equipment, and the environment are sometimes divided into categories. As mentioned in the chapter on customer satisfaction, there may be additional significant factors for issues of this nature.Numerous minor causes are further split

into each major cause. For instance, we may list training, knowledge, skill, physical attributes, and other things under work methods. C&E diagrams can be used to visualise all of these root causes, both big and minor.

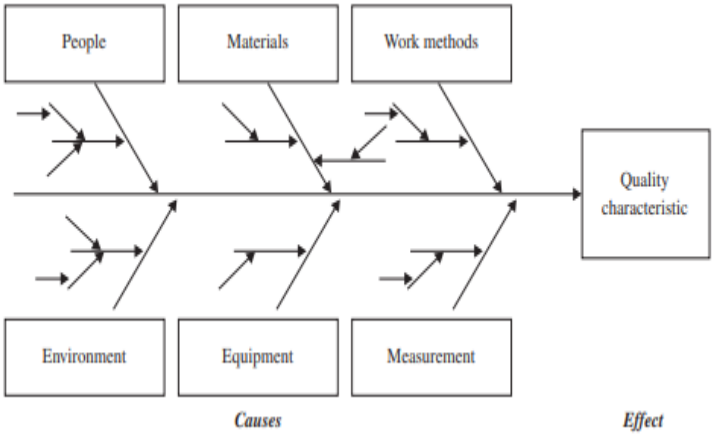

Figure 2: Diagram showing the Cause-and-Effect [TQM Book University of Peshawar].

A C&E diagram for peeling house paint using the four main causes is shown in Figure 2. The project team must first determine the effect or quality issue before creating a C&E diagram. The team leader places it on the right side of a sizeable piece of paper. The primary causes are then determined and plotted on the figure. The project team must engage in brainstorming to identify all the minor causes. The C&E diagram is a good fit for the idea-generation technique known as brainstorming. It makes use of the group's ability for original thought. A more accurate and useful result will be obtained by paying attention to a few key factors. The team's participation is enabled by each member taking turns contributing one suggestion at a time. Members are eliminated from that round if they are unable to come up with a minor cause. There might be another thought.

A subsequent round. This process stops one or two people from taking over the brainstorming session. More ideas, not better ones, are promoted. An idea from one person will inspire an idea from another, and so on. Frequently, the ideal solution will result from a silly, or "dumb," concept. It’s forbidden to criticise a notion. A free-flowing exchange of ideas that unleashes the imagination should take place. The diagram is used to represent every idea. Evaluation of concepts happens later. One of the main factors influencing involvement is the diagram's visibility. It is suggested that you use a 2-foot by 3-foot piece of paper so that you have room for all the smaller factors. For optimum visibility, it ought to be taped to a wall. Establish a constructive environment rather than a whining session. Instead than going over how a problem started, concentrate on finding a solution. The team leader should use the why, what, where, when, who, and how methods when posing inquiries.

Hold another brainstorming session after letting the ideas sit for a while. After the initial meeting, distribute copies of the ideas to the team members. The brainstorming process ends when no new ideas can be produced. The C&E diagram must be analysed to ascertain the most likely reasons after it is finished. This task is completed in a different session. Each individual will vote on the minor causes according to the protocol. Team members are allowed to vote for multiple causes. As seen in Figure. 2, the reasons that received the most votes are circled, and the four or five causes that are most likely to have an impact are identified.

To address the root reasons and enhance the process, solutions are created. Cost, feasibility, resistance to change, consequences, training, and other factors will all be taken into consideration while evaluating potential solutions. Testing and implementation occur after the team has reached a consensus on solutions. In order to encourage continuing reference as similar or new issues develop, diagrams are put in strategic locations. As solutions and advancements are made, the diagrams are updated. The C&E diagram can be used in a wide variety of situations, including research, production, marketing, office work, customer support, and more. The involvement and input of everyone participating in the brainstorming process is one of its biggest features. The diagrams help because they are:

1. Examine current circumstances in order to improve the quality of the product or service, make better use of the available resources, and cut expenses.
2. Get rid of issues that lead to nonconformities and client complaints.
3. Streamline current and future operations.
4. Train and educate staff members in decision-making and remedial action procedures.

Histogram

The histogram is the first statistical SPC approach. Figure. 1's illustration of the process variation serves as its description. The process capability and, if required, the relationship to the specifications and the nominal (goal) are graphically estimated by the histogram. Indicating any data gaps and the population's shape are also suggested by this. The volume of data that has been gathered in business, industry, and government is vast. It can be more confusing than beneficial to focus on just one thing, like the amount of daily billing errors made by a sizable bank. Consider the information .as an illustration. It is obvious that these statistics are difficult to use and ineffective at describing their qualities in this manner. To indicate what value the data tend to cluster around and how the data are scattered or spread out, some method of summarising the data is required. This data summary requires the use of both graphical and analytical tools.

Individual Data

The frequency distribution, which summarises how the data points occur within each division of observed values or groupings of observed values, is shown graphically as a plot or image. In order to summarise data, analytical methods compute a measure of the central tendency average, median, anda measure of dispersion range and standard deviation is also included. The use of both graphical and analytical methods is not uncommon. A means of processing the data is required because poorly organised data are essentially worthless. The idea will be demonstrated using. An analyst analysing the data as it is presented in this table would find it challenging to understand the significance of the data. Calculating the frequency of each number will give you a much better understanding, as demonstrated.

Establishing an array, which is an organisation of unprocessed numerical data in ascending or descending order of magnitude, is the initial stage. In the first column of the table, an array in ascending order from 0 to 5 is displayed. The next step is to tabulate each value's frequency by inserting a checkmark in the relevant row and beneath the tabulation column. Place tally. Starting with the numbers 0, 1, 1, 2... And continuing until all the data have been tabulated. The frequency column, which is the final in the table, contains the numerical value for the total number of tallies.

Analysis demonstrates that it is possible to see how the data are distributed. A frequency distribution is an arrangement of data that shows the frequency of values in each category. If the Tabulation column is removed, the resultant table is categorised as a frequency distribution. The frequency distribution is a fundamental statistical concept and an effective

way to visualise data. For the purpose of solving quality control issues, it is essential to think of a group of numbers as having some kind of distribution. There are various frequency distribution kinds, and the type of distribution might reveal the method used to solve an issue. Frequency distributions are depicted graphically as histograms when more visual clarity is required. Several rectangles that individually reflect the frequency of the observed values in each row and column make up a histogram.

Combined Data

The information is divided up into cells when there are many categories. Typically, there should be between 5 and 20 cells. The following are general guidelines: When there are fewer than 100 observations, use 5 to 9 cells when there are between 100 and 500 observations, use 8 to 17 cells and when there are more than 500 observations, use 15 to 20 cells. The amount of cells in the recommendations are overlapping to offer flexibility. A histogram for the quality characteristic temperature. The temperature check sheet was used to gather the data. The interval is the separation between the middle points of adjacent cells. The distance between the cell midpoints and its boundaries is half. The midpoint value will be as accurate as the ungrouped data if an odd cell interval is selected, in this case five degrees. Because all values in the cell adopt the middle value when any extra calculations are conducted, this arrangement is preferable.

Fundamentals of Statistics

It is essential to have a foundation in statistics before reading about the next SPC tool. According to its definition, statistics is the branch of mathematics that deals with the gathering, tabulating, analysis, interpretation, and presentation of numerical data. Each division depends on the precision and completeness of the one that comes before it. The tensile strength of a plastic component can be measured by a technician, or data can be gathered manually by an operator utilising a check sheet. It can be tallied using standard paper and pencil methods or a computer. A quick visual inspection or laborious mathematics can both be used in analysis. The final data are analysed and presented to help with decision-making regarding quality. Direct observation or indirect data collection via written or spoken inquiries are both possible. Market researchers and public opinion pollsters frequently employ the latter technique. For quality control purposes, information is gathered by direct observation and is categorised as either variables or attributes.

Variables are those aspects of a product that can be measured, like weight expressed in grimes. In contrast, attributes are those qualities that may be categorised as either conforming or not conforming to standards, like a go-no go gauge. For many quality control issues, a histogram is adequate. A graphical technique, however, is either undesired or requires the extra information offered by analytical techniques for a wide variety of issues. The benefit of analytical methods over graphs is that they take up less room to describe a set of data. They also have the benefit of enabling data comparisons between different collections. They also permit extra computations and deductions. Measures of central tendency and measures of dispersion are the two main analytical techniques for describing a set of data.

Individuals and Sample

Now is a good time to look at the ideas of a population and a sample. A tiny piece, or sample, is chosen to represent all of the steel shafts in order to create a frequency distribution of the weight of steel shafts. The entire collection of steel shafts serves as the population. Statistics refers to the computation of averages, standard deviations, and other measurements from samples. The estimated statistics will be higher or smaller than their true population values,

or parameters, due to the varying composition of samples. The best estimate of the parameters' reference (standard) values at a given moment is regarded as a parameter. The population might only have so many things, like the amount of steel shafts that can be produced in a day.

It might be limitless or almost infinite, as the amount of rivets used to build one jet aeroplane in a year. Depending on the circumstances, a different definition of the population may be used. As a result, a study of a product might include data from 5,000 pieces, a week's worth of production, an hour's worth of production, and so forth. A sample is chosen since it is infrequently possible to measure the entire population. Sampling is required when it could be impossible to collect data from the entire population, when doing so would be too expensive, when the product would be destroyed during the required inspection, or when testing the entire population might be too risky, as it might be with a new drug. Actually, a population-wide analysis might not be as precise as sampling. It has been demonstrated that sampling is more accurate than 100% manual inspection of low percent nonconforming product.

CONCLUSION

Pareto charts are useful to identify a crucial few causes or elements and how to priorities. Process flow diagrams are useful to visualize the trouble spots and improvement opportunities for the process, if any. Check sheets and histograms, run charts, control charts, and scatter plots are some of the basic and simple but quite useful tools we have seen to solve problems.This is possibly because inspectors prejudge each item they evaluate as being acceptable out of boredom and exhaustion.

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CHAPTER 4

TAGUCHI'S METHOD FOR PRODUCT QUALITY

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ABSTRACT:

The Taguchi method, often called Taguchi's Quality Engineering or Taguchi's Robust Design, is a statistical strategy for enhancing the quality of product design and manufacturing processes. Engineer and statistician Genichi Taguchi from Japan created it. In this chapter discussed about the Taguchi` quality engineering. A crucial element of Total Quality Management (TQM), which strives to improve product quality by streamlining the design and production processes, is Taguchi's Quality Engineering.

KEYWORDS:

Design, Improvement, Loss, Organizations, Product, Quality, Taguchi.

INTRODUCTION

The design of experiments (DOE) method, statistical quality control (SQC) in the US, and total quality control (TQC) in Japan are all significant components of the body of knowledge related to quality sciences. This corpus of knowledge has lately been expanded by mechanical engineer Dr. Genichi Taguchi, who has won four Deming Awards. He specifically introduced the loss function idea, which incorporates specifications as a secondary consideration and combines cost, target, and variation into one statistic. In addition, he created the idea of robustness, which denotes the consideration of noise sources to guarantee proper system operation. Uncontrollable variables like noise can significantly change how a procedure or product is carried out[1][2].Total Quality Management (TQM), a management philosophy and methodology that seeks to enhance the quality and effectiveness of goods and services, includes Taguchi's Quality Engineering as a fundamental component. By concentrating on the design and production processes, Taguchi's approaches offer a systematic method for attaining quality improvement. A thorough explanation of Taguchi's Quality Engineering within the framework of Total Quality Management may be found below:

1. **Genichi Taguchi:**Genichi Taguchi, a Japanese engineer and statistician, created Taguchi's Quality Engineering in the 1950s and 1960s. Taguchi noted that conventional methods of quality control, which depended on examining and sporting goods to fulfil requirements, were ineffective and expensive. He suggested a proactive strategy for quality improvement that took the design and manufacturing processes into account[3].
2. **Taguchi's Quality Engineering:**The foundation of Taguchi's Quality Engineering is the idea that a product or service's quality is mostly established during the design phase. It is possible to lower variability and raise final product quality by optimizing the design and production processes. Taguchi emphasized the idea of resilient design, which refers to creating goods that are impervious to changes in the environment in which they are produced[4].
3. **Quality Loss Function:** The quality loss function is a key idea in Taguchi's strategy. Taguchi claimed that the variation from the ideal goal value should also be taken into account when evaluating quality. The cost or loss resulting from departures from the

target value is quantified by the quality loss function. Organizations can increase customer satisfaction and cut expenses by minimizing this loss[5].

4. **Designing Sturdy Goods**:Designing sturdy goods and processes is the main focus of Taguchi's Quality Engineering. Less susceptible to variances or noisy elements, such as shifts in materials, temperature, humidity, or operator skill, a robust design is one that is built to withstand these conditions. Organizations may produce goods that consistently fulfil consumer expectations by understanding and managing the critical factors that influence product performance[6].
5. **Orthogonal Arrays:**Orthogonal arrays are used in Taguchi's method for designing experimental parameters. The effective testing of numerous factors and their interactions is made possible by orthogonal arrays. Organizations can identify the ideal values of design parameters that will produce reliable and high-quality goods by undertaking well planned trials. This makes it possible to identify important variables that have a big impact on quality and figure out what their ideal values should be[7].
6. **Optimization for Quality Improvement:** Taguchi's Quality Engineering offers a methodical framework for optimization for quality improvement. To determine the ideal settings and process conditions that minimize quality loss, it entails a cycle of trial, analysis, and optimization. Organizations can achieve higher quality, less variability, and lower costs by continuously modifying and optimizing the design and manufacturing processes.
7. **TQM Integration:** Taguchi's approaches closely adhere to the tenets and objectives of total quality management (TQM). The focus of TQM is on integrating quality into every part of the organization and including all employees in quality improvement. A planned and methodical approach to attaining quality improvement is provided by Taguchi's Quality Engineering, which can be included into the larger TQM framework.

Organizations can achieve considerable gains in product quality, decreased variability, and increased customer satisfaction by incorporating Taguchi's Quality Engineering into TQM. The technique is a useful tool for organizations aiming to attain excellence in quality management because it places a strong emphasis on proactive quality improvement, robust design, and optimization[8].

Scope

Within Total Quality Management (TQM), Taguchi's Quality Engineering has a broad scope that covers a number of aspects of process quality improvement in the design and manufacturing phases. The following are the main areas where Taguchi's techniques can be used in the context of TQM:

1. **Design Improvement:** According to Taguchi's Quality Engineering, it's critical to create durable goods that are resistant to changes in the manufacturing environment. Organizations can optimize the design of products by identifying the crucial parameters that influence quality and figuring out their ideal values by employing orthogonal arrays and parameter design methodologies. As a result, the performance of the product is improved, variability is decreased, and customer satisfaction is raised[9].
2. **Process Improvement:** Taguchi's techniques can be utilized to streamline production procedures and lessen product output variation. Organizations can reduce the influence of outside influences and increase the consistency of product quality by identifying the important process parameters and their ideal settings. As a result, process capability increases, faults are decreased, and overall process performance is enhanced.

3. **Cost Reduction:** Taguchi's Quality Engineering aims to minimize the deviation from the goal value in order to minimize quality loss. Organizations can decrease product variability and increase product resilience by optimizing the design and production processes, which eventually results in cost savings. This entails lowering warranty costs, scrap, rework, and customer complaints while increasing overall production and efficiency[10].

DISCUSSION

The Taguchi method of quality control is an engineering strategy that places an emphasis on the contributions of product design and development, as well as research and development (R&D), to lowering the incidence of flaws and failures in manufactured items.This technique, created by Japanese engineer and statistician Genichi Taguchi, tries to prevent production variations by prioritizing design over the manufacturing process in quality control.

The Taguchi Method of Quality Control

The Taguchi approach calculates the social cost of a product to determine its quality. Loss in a product is specifically defined by changes and deviations in its function as well as negative side effects that the product causes.Loss from variation in function is a measurement of how differently each product unit performs. The more substantial the loss in function and quality, the higher that variance. This could be expressed as a monetary amount that illustrates how consumption has been influenced by the product's flaws.

Sample of Taguchi Quality Control Method

How far the product's units deviate from those standards will depend on whether the product is a precision drill that must consistently create holes of a specific size in all materials it is operated on. The goal of the Taguchi technique of quality control is to employ research and design to make sure that every unit of the product closely complies with those design requirements and functions as intended. Loss due to unfavorable side effects on society indicates whether or not the product's design could inevitably have a negative effect. For instance, there is a loss of quality in the product if using the precision drill could endanger the user due to the way it is designed. According to the Taguchi technique, efforts would be made during the design phase of production to reduce the likelihood that the drill will be made in a way that could endanger the operator.

Lack of Function

Quality, according to Taguchi, is the harm done to society once a product leaves the factory. Losses to society include failing to fulfil customer expectations, performing below expectations, and having negative side effects.

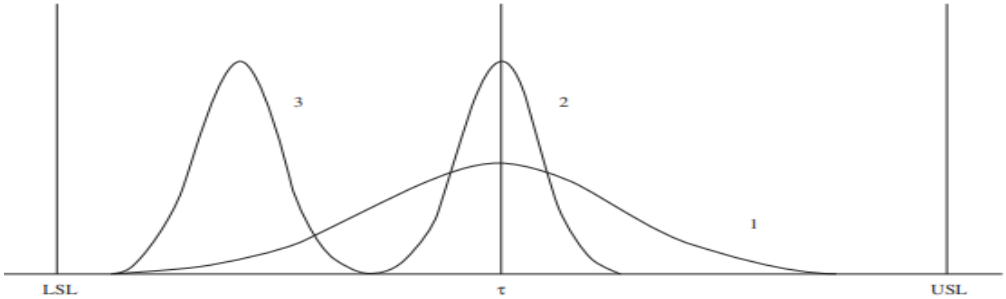

Figure 1: Diagram showing the Vinyl thickness [TQM Book, Dale H. BesterField].

Many practitioners have taken into account production losses, such as the use of raw materials, energy, and labor on useless goods or harmful byproducts.Total loss Producer's loss Customer's loss. An illustration of the loss-to-society notion is provided by the manufacture of enormous vinyl covers to shield materials from the elements. Three steps in the development of vinyl thickness are depicted in Figure. 1.

The method can only just meet the USL and LSL requirements at, but it is on the target. After much effort, the production process was enhanced by lowering the level of variability. The company chose to move the goal closer to the LSL, as illustrated at, in an effort to lower its production costs. The organization's financial situation significantly improved as a result of this action, although the vinyl covers weren't as durable as they formerly were. Farmers suffered a large loss when the covers they had employed to shield their wheat from the elements tore. In addition, supply and demand variables increased the price of wheat, which led to an increase in wheat prices and an additional loss to society. With its negative loss features, the company's reputation weakened, which led to a loss of market share. Losses that are of concern are those brought on by a product's important performance characteristics deviating from the objective, assuming the aim is accurate. Sony provides evidence of the value of focusing on hitting the target. Customers in the United States preferred the color density of exported TV sets made by Sony-Japan over those made by Sony-USA even if the design and specifications were the same. Figure. 2 illustrates the results of this investigation, which showed that the frequency distributions were noticeably different. Despite Sony-Japan's 0.3% deviation from the target, the distribution was uniform and centres on it.

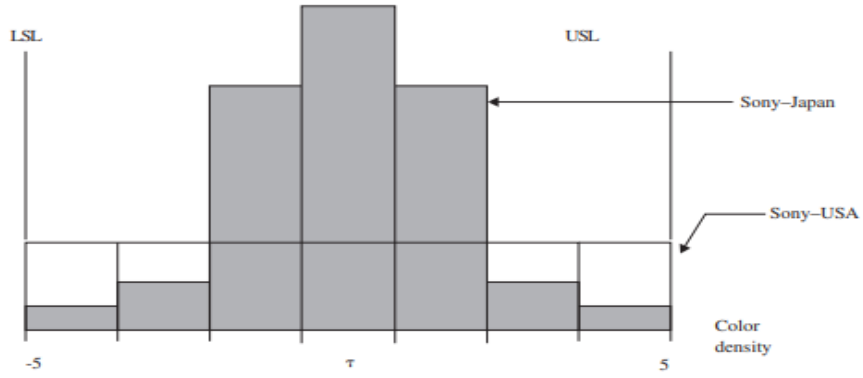

Figure 2: Distribution of Colour Density for Sony-USA and Sony-Japan [TQM Book, Dale H. BesterField].

There were no values outside of requirements in the Sony-USA distribution, which was uniform across all specifications. It was evident that buyers in Japan and the USA thought quality went beyond simply achieving requirements. Similar transmission-related experiences were had by Ford Motor Company. The most typical indicator of quality loss is out of specification. Although this idea might work for accounting, it is a bad idea for all other fields.Those who do are good; those who do not are terrible. From the customer's perspective, a product that barely complies with specifications is just as excellent (or terrible) as one that barely deviates from them. It seems that the improper measurement method is being applied. The loss function addresses the above-mentioned deficit by fusing cost, target, and variation into a single metric.

Nominal-the-Best

Despite the fact that Taguchi created more than 68 loss functions, the nominal-the-best type quadratic function may approximate various circumstances. The step function that depicts the

Sony-USA. When the performance characteristic, y, falls within the parameters, the loss is $0, and when it does not, the loss is $A. The quadratic function, which describes the Sony-Japan issue. When the performance characteristic, y, diverges from the target, loss happens in this scenario. Equation describes the quadratic loss function.

$$L = k(y - \tau)\ 2$$

Where L = cost incurred as quality deviates from the target y = performance characteristic τ = target k = quality loss coefficient

Typical Loss

This loss is based on the supposition that the quality feature is constant. In truth, it's impossible to constantly hit the mark. It varies as a result of noise, therefore the loss function must account for the volatility of numerous parts as opposed to simply one. External and internal noise factors are divided into two categories, with the internal category being further divided into unit-to-unit and degradation.

The temperature control of a refrigerator will be used as an example to assist explain the noise idea. The user's behaviors, such as how frequently the door is opened and closed, how much food is present, the starting temperature, and other factors, contribute to external noise. Internal noise varies from one unit to the next due to production-related differences such seal tightness, control sensor changes, and so on.

Despite the fact that this kind of noise is unavoidable, every effort should be done to reduce it. Noise from deterioration is brought on by refrigerant leaks, mechanical wear of compressor parts, and other factors. The design is mostly at blame for this kind of noise. Noise-related problems lead to departure from the aim, which costs society money. The nominal-the-best loss function and the distribution of the noise factors. The total of the individual loss values and their division by their number can be used to create an equation.

$$L = k\ [\sigma 2 + (y - t)\ 2]$$

Where L _ is the typical or anticipated loss.

The sample standard deviation, s, must be used as a substitute because the population standard deviation, will rarely be known. The value will increase a little as a result of this, but the average loss is still a very low number. By first lowering the fluctuation, and then modifying the average, y _ to bring it on target, the loss can be reduced. The loss function "speaks the language of things," which is the measure used in engineering, as well as money, which is the measure used in management. Examples of performance parameters where the nominal-the-best loss function would be applicable include colour density, voltage, size, and so on.

Other Loss Mechanisms

The smaller-the-better and larger-the-better loss functions are two additional loss functions that are extremely popular. The target value for smaller-the-better is zero, and the performance characteristic has no negative values, as illustrated in the figure. Examples of performance characteristics include microwave radiation leakage, computer response time, automotive emissions, out-of-round holes, etc. The desired value is which results in a zero loss in the larger-is-better scenario. There are no negative numbers, and y = 0 represents the worst-case scenario.

Actually, larger-the-better is the reciprocal of smaller-the-better, and some practitioners prefer to work with the reciprocal due to its difficulty?As a result, the performance

characteristic of meters/second that formerly applied to seconds/meter now applies to meters/second. Adhesive bond strength, weld strength, fuel efficiency of cars, and other performance traits are a few examples.

Application

To improve quality and boost overall organizational performance, Taguchi's Quality Engineering has a variety of uses within Total Quality Management (TQM). The following are some crucial areas where Taguchi's techniques can be used inside the TQM framework:

1. **Designing Products and Processes:** Taguchi's Quality Engineering offers methods and tools for enhancing the creation of products and manufacturing processes. Organizations can identify the critical elements affecting product quality and establish their ideal settings by performing tests utilizing orthogonal arrays and parameter design. This aids in creating reliable goods and procedures that are less susceptible to change and consistently satisfy consumer needs.
2. **Taguchi's Approaches:**Reducing variance in product production is the main goal of Taguchi's approaches, which do this by locating and addressing the sources of variation. This entails enhancing process capability, lowering noise factors, and optimizing process parameters. Organizations can increase product quality, lower faults, and customer happiness by minimizing variation.
3. **Cost Reduction:** Taguchi's Quality Engineering seeks to reduce quality loss as much as possible, which has a knock-on effect on costs. Organizations can decrease scrap, rework, warranty costs, and customer complaints by streamlining the design and manufacturing processes. Organizations can boost productivity and cut expenses overall by streamlining processes and lowering unpredictability.
4. **Enhancing Customer Satisfaction:** Taguchi's strategy places a focus on continuously meeting client expectations and producing products that function well in a variety of settings. Organizations can offer products that meet or exceed customer expectations by implementing solid design concepts and optimizing product characteristics. As a result, there is an improvement in brand loyalty and a competitive edge in the market.
5. **Statistical Analysis and Experimentation:** Taguchi's Quality Engineering uses statistical analysis and experimentation to pinpoint the key variables that significantly affect product quality and process efficiency. Organizations can efficiently run experiments, analyses data, and make data-driven decisions for quality improvement by employing techniques like design of experiments (DOE). Understanding the correlations between variables, identifying important elements, and optimizing process parameters are all made possible with the aid of statistical analysis.

Advantages

Applying Taguchi's Quality Engineering within the context of Total Quality Management (TQM) has a number of benefits. The following are some major benefits of applying Taguchi's techniques in TQM.

1. **Reliability and Robustness:** Taguchi's Quality Engineering places an emphasis on creating reliable goods and procedures that are less sensitive to changes. Organizations can produce goods that consistently operate well under a variety of operating situations by understanding and regulating key factors that influence product quality. As a result, reliability rises and failure rates drop, increasing customer satisfaction and cutting down on warranty expenses.
2. **Cost-Effective Optimization:**Cost-effective optimization is emphasized by Taguchi's approaches, which use orthogonal arrays and parameter design strategies to conduct effective experiments. As a result, businesses can streamline the design and production of their products while using fewer experimentation. The simplified experimental method

aids in cutting down on the expense and time involved in experimentation and optimization, resulting in cost savings and increased effectiveness.

3. **Design that Prioritizes the Needs of the Client:** Taguchi's Quality Engineering places a high priority on minimizing quality loss and meeting customer requirements. Organizations can create products that closely match customer expectations by considering client wants and preferences during the design stage. As a result, there is an uptick in consumer happiness, an enhanced reputation for the brand, and a market competitive edge.
4. **Valid Statistical Principles:**Valid statistical principles are the foundation of Taguchi's approaches. Organizations can make data-driven decisions for quality improvement by utilizing statistical analysis and experimental design methodologies. This aids in locating important quality-affecting variables, comprehending their relationships, and fine-tuning process parameters. Statistical rigor makes ensuring that improvement initiatives are founded on trustworthy data, resulting in efficient and long-lasting quality improvement.
5. **Variability Reduction:** Taguchi's Quality Engineering seeks to do this by locating and managing causes of variation in product output. Organizations can increase process capabilities and tighter process control by optimizing process parameters and lowering noise factors. As a result, there are fewer faults, more consistent products, and higher levels of quality performance.
6. **TQM's Basic Values:**TQM's basic values, such as customer focus, continuous improvement, and staff involvement, are nicely integrated with Taguchi's methodologies. Organizations can promote a culture of quality improvement, include staff in problem-solving and optimization initiatives, and continuously strive for higher standards of quality and performance by integrating Taguchi's Quality Engineering inside the TQM framework.

TQM Exemplary Organization

Building Products Operations, or BPO, is based in Armstrong's corporate headquarters in Lancaster, Pennsylvania, and employs over 2,400 employees, 85% of whom work at the operation's seven production facilities spread across six states. For both residential and commercial interiors as well as industries, BPO manufactures and sells thousands of products. BPO, the biggest producer of acoustical ceilings in the world, made for over one-fourth of Armstrong's sales in 1994. The BPO President is in charge of the organization's ten-member Quality Leadership Team (QLT), which is made up of top executives. The QLT emphasizes leadership and fully delegated to the entire organization its responsibilities for locating and implementing improvement opportunities.In each of the eight market segments covered by BPO, the QLT conducts fact-based evaluations of how it compares to its rivals. The team then establishes BPO's full potential in each segment.

The QLT creates goals and action plans for BPO based on this data as well as additional information, such as the findings of customer surveys, in order for it to develop and realize its full potential. Each of the eight functional groups creates action plans and distributes them to every BPO employee in addition to the overall organization's goals. The numerous incentive plans, which currently encompass more than 93% of hourly and salaried employees, include pertinent BPO targets and supporting process objectives.Over half of the BPO workforce has taken part in the more than 250 improvement teams that are active at any given time in each of the last five years.

Teams may have goals ranging from fixing specific operational issues at a single plant to enhancing crucial business procedures that benefit the entire organization. The Quality Improvement Team, overseen by the facility's senior management at each plant, tracks the

development of all team efforts and provides the QLT with a report on the outcomes. The five key business drivers of BPO are customer satisfaction, sales growth, operating profit, asset management, and high-performance organization. All Quality Improvement Teams must create specific action plans and set goals that will have a measurable impact on one or more of these key business drivers. At least 97% of customers awarded BPO a good or better overall rating across eight market areas in 1994. BPO is cutting operating expenses even as it chases ever-higher standards of client satisfaction. As an illustration, scrap rates have decreased by 38% since 1991. Over the same time period, the manufacturing production per employee increased by 39%, exceeding company objectives.

BPO has made significant expenditures in the past few years to enhance its information gathering and analytical capabilities. In 1994, it conducted 89 benchmarking studies, which is more than twice as many as the year before. The corporation claims that the main benefit of these efforts has been an ever-improving grasp of the dynamics of BPO's markets, rivals' performance, and its own business outcomes. Employees are grouped into natural work teams or business unit teams at each of the seven manufacturing facilities, and each team's members are capable of handling a range of tasks. Six factories were paying employees for learning new abilities and information as of 1995. Additionally, six plants provide profit sharing, which connects. These successes were shared among the staff members. BPO broke safety records for the sector workers worked more than 3 million hours without a lost time injury and paid out the most gain sharing and incentive payouts ever.

CONCLUSION

Taguchi defines quality as a loss to society following the shipment of the product. The quadratic loss function may be used to model quality loss. Taguchi expanded on Fisher's experimental structures by introducing the idea of orthogonal arrays. He also produced interaction tables and linear graphs to help choose the best design for a given goal.Fisher's experimental plan had the aim of maximizing the mean response. In addition, Taguchi introduced the goal of minimizing variation while maximizing the mean. He described the style as strong. He included a statistic called the SN Ratio for analysis and optimization. Six different types of attributes have SN ratio definitions.

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CHAPTER 5

DEVELOPING HUMAN RESOURCES FOR QUALITY MANAGEMENT

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ABSTRACT:

Human resource development and quality control are covered in this chapter of Total Quality Management. The integration of quality management principles and procedures with human resource practices and strategies is referred to as human resource development and quality management. It entails coordinating the management and development of the organization's human resources to support and advance its quality goals and objectives.

KEYWORDS:

Employees, Human, Improvement, Management, Performance, Quality, Training.

INTRODUCTION

A key component of Total Quality Management (TQM) is the development of human resources and quality management. It entails fostering and equipping staff members to effectively contribute to the organization's quality goals and objectives. Here is an overview of how quality management and human resources have evolved within the context of total quality management [1]. Human resources are the foundation of any organization, hence they are crucial. Success of quality initiatives in TQM significantly rely on the abilities, expertise, and dedication of employees at all levels. Employees are accountable for both the initial implementation of quality processes and their ongoing improvement. To establish a staff that is knowledgeable, motivated, and actively involved in quality management, it becomes crucial to invest in human resources development [2].

Training and education programmes are the first step in the development of human resources in TQM. With the use of these programmes, employees' knowledge and abilities in the areas of quality management principles, methodologies, tools, and procedures should be improved. Employees who have received training are better able to comprehend their roles in achieving quality objectives and are more prepared to participate to quality improvement projects [3]. TQM places a strong emphasis on empowering staff members and including them in quality management decision-making processes. Employees who are empowered have the power and duty to take charge of quality improvement, make decisions, and offer their ideas and knowledge. The engagement not only boosts employee enthusiasm and morale but also draws on their varied viewpoints to provide better, more creative solutions.Strong leadership is essential to the growth of both quality and human resource management. To aid in employees' development and promote a culture of quality, leaders should offer those resources, support, and direction. They must support efforts that promote quality, establish clear objectives, and foster a culture of collaboration, learning, and improvement [4].

Organizations must create fair, open, and aligned performance evaluation processes in order to promote the growth of human resources in TQM. These methods ought to assess employee contributions to quality improvement in addition to individual performance. Employee

recognition and rewards for quality management accomplishments strengthen the excellence culture and promote continued growth.In TQM, the process of developing human resources is ongoing. By offering chances for staff development, such as workshops, seminars, mentoring programmes, and cross-functional initiatives, organizations must foster a culture of ongoing learning and progress. Employee skill, knowledge, and expertise development helps individuals to more effectively contribute to quality management and promote continuous improvement [5].

Principle

There is substantial evidence that the approach is perfectly consistent with American values and traditions and suitable for American businesses. If complemented by an effective human resources effort, the strategy offers significant room for improvement. The idea that human elements are the most crucial aspect of improving quality and efficiency is in fact becoming a maxim of excellent management. It's true that people are what create quality.The chief executive officers of some of America's most quality-conscious businesses are eager to point out that engaging and empowering people at all levels is the best method to achieve organizational success. Employee empowerment, according to some, is a revolution that will transform hierarchical corporations into democratic workplaces[6].

Participation: Use of Human Resources as a Central Idea

The Ames Rubber Corporation made the important decision to deploy a TQM strategy as part of its implementation of its resolve to become more competitive back in 1987. The executive committee named its top performers and instructed them to restructure around practical procedures. Each employee has a team or involvement group allocated to them by 1992. Over 1000 readers were polled by the human resource professional publication HR Focus to rank the most important problems they faced in 1993 [7]. 46% of the respondents ranked employee involvement as one of their top three concerns.TQM and customer service came up at 39% and 34%, respectively. The idea of intrinsic motivation-involvement in decision-making lies at the core of TQM. Employee engagement is a procedure that gives employees the authority to solve problems and make decisions that are appropriate for their level in the organization. The reasoning behind this is that if someone has ownership over the improvement process, they will be in the best position to decide how to address a problem or opportunity. In the service sector, where the customer's perception of quality frequently depends on the employee's behavior in a one-on-one interaction with the client, empowerment is just as successful [8][9].

The driver at Federal Express represents the business. He or she is the business and is responsible for handling client issues directly. Quality in an airline is represented by counter staff and flight attendants rather than by CEOs and pilots.The Astronautics Groups at Martin Marietta's Denver, Colorado division (MMAG) was one of the more effective initiatives to empower employees.

A TQM procedure was introduced by the group. The organization abandoned its pyramidal hierarchy of management in favor of a flatter structure and a more participative management style in order to increase employee support. To provide those closest to the task the power to decide how it is done, high-performance work teams have been established. Along with the significant production area reductions, enhanced morale was one of the less obvious advantages. A decrease in cost or cycle time, an increase in throughput, or a reduction in process variation can all lead to improvements in quality[10].

DISCUSSION

Setting Up for Involvement

The failure of human resource programmes to match employee talent with organizational efficiency is generally acknowledged by human resource specialists to be one of their most serious flaws. An organizational vehicle must be used to operationalize an empowerment plan. Despite the fact that many businesses view a suggestion system as an employee involvement program and in many cases, the only program it is clear that it is not the entire solution. Small groups and teams that are effectively managed and run can increase output and quality through incentive. In a functionally based classical structure characterized by a chain of command, territorial conflicts, and local perspectives, they can lessen overlap and poor communication. There is always a risk that functional experts would put their personal interests ahead of the overarching mission or goal of the organization. Being a member of a team, especially one that is cross-functional, lowers many of these obstacles and promotes an integrated systems approach to achieving shared goals those that benefit both the team or group and the firm. Take into account the success stories below:

1. Self-managed work teams at Globe Metallurgical, the first small business to win the Baldrige Award, had a 380% boost in production.
2. Ford used a partnering approach to boost production by 28%, but this new corporate culture of participative management was necessary.
3. Middle management at Decision Data Computer Corporation received training to assist Pride Teams.
4. With the help of performance measurement teams, Martin Marietta Electronic and Missiles Group achieved success.

Employee participation teams come in many different forms, but quality circles may be the most common. They are described as a small team of workers who perform comparable or related tasks and routinely get together to discuss, analyses, and resolve issues with product quality and production as well as to enhance overall operations. White-collar operations have had some success with the idea, but manufacturing's "direct labor" employees have seen the biggest effects, with issues like quality, cost, specs, productivity, and timetables taking center stage. Due to the fact that problem solving is frequently limited to similar job areas, few cross-functional issues are taken into consideration. The standards that were set for quality circles have not been satisfied. The circles of as much as 50% of Fortune 500 corporations have been dissolved. The main cause has been a widespread lack of commitment to the idea of involvement and participation, as well as management's lack of interest.

Quality Circles

Quality circles were seen as a threat to the status quo by many middle managers.A variation of the quality circle idea are task teams. The main distinctions between the two are that task teams can exist at any level, whereas quality circles are typically free to select the issues they will handle.Self-managing teams are an extension of the quality circle concept, although they differ significantly in the following way. Members have the authority to exercise control over their work and improve the efficiency of the entire process rather than just certain parts.All tasks required to complete a job are carried out by team members, including creating work schedules and assigning jobs to team members. The endeavor to change the traditional hierarchical structure of an organization based on a vertical chain of command is represented by cross-functional teams.To design and manage operations that flow laterally, they also involve horizontal coordination. Without the integration of business activities that move horizontally across the organizational chart, the organization devolves into a collection of

islands of specialization if lateral coordination is not achieved. The idea of tying up cross-functional operations is demonstrated.

Education and Development

Increased involvement entails increased responsibility, which calls for higher levels of expertise. The only way to do this is through training. Baldrige Award winners priorities training and provide it with the necessary resources to support it. About $2.5% of Motorola's payroll expenses, or $120 million yearly, are set aside for training, with 40% going to high-quality training. The cost of training is estimated by the corporation to yield around $29 for every dollar invested. Improvements in communications, company culture transformation, and management's commitment to quality are all additional advantages. (Xerox has increased supplier quality training for 30,000 staff members.Quality has been one of Hughes Aircraft's main operating principles since the early 1980s. Continuous measurable improvement (CMI) is the cornerstone of the organization's TQM initiative. In order to maintain its quality and efficiency gains, the company recently championed a unique trickledown training strategy. The managers in charge of attaining improvement are known as CMI (Cascaded Measurable Input) leaders who spread the philosophy and tenets of CMI leadership throughout the company.

Although the sort of training varies depending on the requirements of the specific company and may or may not cover technical topics, issue solving is one topic that ought to be covered in all organizational training programmers. In many, if not most, businesses, problem solving should be institutionalized and internalized. A requirement for broad empowerment would be this. Typically, training comes into one of three categories reiterating the positive message3 and fundamental skill improvement, job skill specifications, and understanding of TQM principles. The latter often encompasses topics outside the scope of traditional occupational skills, such as problem-solving strategies, problem analysis, statistical process control, and quality measurement. If groups or teams are used, instruction on group dynamics and consensus-building is part of the process. According to a Conference Board poll, the best businesses frequently cover the following subjects in high-quality training curricula.

1. Being conscious of quality.
2. Evaluation of quality (performance metrics, cost benchmarking, and data analysis).
3. Process administration and defect avoidance.
4. Teamwork and quality circle instruction.
5. A focus on clients and markets.
6. Data analysis and statistical techniques.
7. Taguchi techniques.

In order to reduce and remove errors early in the work process, Research Testing Laboratories, Inc., a TQM organization that offers clinical research services, encourages staff to propose modifications in processes. 100% client satisfaction is the aim. Employees receive a 25-hour training Programme that teaches them how to solve problems, engage effectively with others, and increase quality in order to accomplish this goal.

The third item above (the TQM principles) may be included in managerial training. Programmes are frequently designed to raise people's awareness of the strategic value of quality, the price of poor quality, and their influence over the quality of goods and services. In the International Quality Study, 584 businesses from four different industries participated.

Over the next three years, it is anticipated that the use of high-quality tools in the American auto sector will expand 1.5 to 6 times. The combination of effective training with other strategies, such as measurement and reward systems, was found to have the biggest impact.

Selection

The exact person to carry out a job must be chosen from a pool of possible employees (or placed from among current personnel). The procedure is easy in theory: Use well-established selection tools (ability tests, personality tests, interviews, assessment centers) as a way to predict a candidate's performance after determining what the job entails and what skills are required. When TQM is involved, the procedure is less straightforward. The qualifications of a candidate can be compared to these standards in order to evaluate whether they meet the requirements for a typewriter, machinist, or even a manager. When a business adopts TQM, a completely new dimension is added. It is typically simple to determine an individual's qualifications for a position and then match them to their skills and talents.

People that are adapted to working in a good climate may needsupplementary traits including attitude, morals, personality type, and analytical skills. To complete the quantitative tasks required by statistical process control, Pareto analysis, etc., employees in a quality setting must have strong problem-solving skills. Personnel must be able to work successfully in groups due to the emphasis on teams and group processes. Motorola asks applicants how they would respond to a specific quality issue after seeing videotapes of problem-solving teams in action. This method presumably promotes self-selection. The emphasis on a quality-oriented organizational culture as the desired outcome of the selection process is potentially different in a TQM context.

Performance Evaluation

The goal of performance evaluation is to act as a diagnostic tool and review process for individual, team, and organizational improvement. Appraisals are used to establish pay scales, validate examinations, advance careers, enhance communication, and simplify comprehension of job responsibilities. Deming lists seven deadly diseases afflicting American industry, with traditional employee assessment techniques being one of them. He claims that short-term goals rather than long-term planning are encouraged by individual performance ratings. They hinder cooperation and promote rivalry among those vying for the same benefits. Furthermore, by focusing on individuals, attention is distracted from the system, which is the primary cause of low quality rather than the employee. Many TQM proponents, including Deming, contend that conventional performance evaluation procedures are attempts by management to shift responsibility for subpar organizational performance to lower level employees rather than the system, which high management is largely accountable for. Should we do away with individual performance reviews, as Deming suggests?

Given the long history and broad usage of this human resource management tool, this is improbable. What can be done, then, to link organizational and individual performance to a complete quality strategy? Performance reviews work best when they are centered on the company's goals, and by extension, those of the person or group being evaluated. Since quality and customer satisfaction are the ultimate goals of any labor, it follows that evaluation should connect in some way to these goals those of the business, the group, and the individual. In other words, a system of performance evaluation should be in line with the idea of shared accountability for quality. You can achieve this by putting an emphasis on the development of the competencies required to perform well and, as a result, directly promote collective responsibility. According to a model employed by the Hay Group, employees are assessed for basic pay based on their capacity for teamwork, communication, and customer

attention. Employee development, group productivity, and leadership are used to evaluate managers. Both receive variable remuneration based on their respective performance. A three-category rating system that includes

1. Not meeting customer expectations.
2. Meeting them.
3. Greatly beyond them is simple to implement because customer attention is an essential component of any TQM endeavor.

Team or Individual Compensation

The organizational structure of a business, in particular its reward and compensation programmes, paints a clear image of its strategic objectives. If a company's remuneration standards are only based on individual performance, it may discover that measures to foster collaboration are unsuccessful. A TQM vision and the guiding principles are unlikely to succeed unless the values upon which they are based are included into the fundamental framework. Target Stores is one of a rising number of retailers who are attaching pay to the success of TQM programmes rather than just using logistics-specific performance measures. Compensation for performance and compensation for quality seem to be entwining more and more in the logistics industry. The American industrial sector offers a variety of compensation systems, including equity ownership, profit sharing, and gain sharing. These are a few of the methods created to give workers a financial incentive to participate in performance enhancements. One of the U.S. industry's most quickly expanding remuneration and participation systems is gain sharing.It is a type of management where an organization strives to perform at better levels through involving and involving its employees. Employees benefit financially when performance increases. Employees are eligible for bonuses at regular intervals on an operational basis under the strategy, which is a team effort. Gain sharing supports TQM in part because it has similar elements like involvement and commitment. Although evidence suggests that these plans' effectiveness is a result of robust communication programmes and widespread staff involvement, the verdict is still out on their efficacy.

Advantages

Organizations benefit in a number of ways from the integration of human resource development (HRD) and quality management within total quality management (TQM). The following are some major benefits of integrating TQM with HRD and Quality Management:

1. **Skills, Knowledge, and Competencies:** HRD programmes give employees these things. Organizations create a workforce capable of implementing quality initiatives, utilizing quality tools and procedures, and promoting continuous improvement by integrating HRD with Quality Management in TQM. A qualified and knowledgeable workforce is produced as a result, which helps to the general success of quality projects.
2. **Employee involvement and Commitment:** Organizations can encourage employee involvement and commitment to quality improvement by integrating HRD and quality management. Employees that are engaged feel appreciated, inspired, and actively participate in quality projects. Employees are more dedicated to achieving and upholding high standards when they are given the freedom to express their ideas, take part in decision-making, and take ownership of quality outcomes.
3. **Better Quality Performance:** Integrating HRD and Quality Management into an organization's operations helps it achieve better quality performance. Employees who have received proper training and competence are better able to recognize quality

problems, analyses data, and put effective solutions into practice. Organizations can minimize defects, improve process efficiency, and reach greater levels of product and service quality through increasing employees' problem-solving talents, statistical analytic skills, and quality awareness.

4. **Organizational learning and Innovation:**Organizational learning and innovation are encouraged by integrating HRD with quality management. HRD programmes promote staff members to advance their education and experience so they may offer fresh perspectives and solutions. Organizations may encourage innovation, adapt to shifting market needs, and spot chances for improvement by fostering a learning culture that emphasizes experimentation and information exchange.
5. **Employee Empowerment:** Integrating HRD with Quality Management enables staff to take a proactive role in efforts to improve quality. Employees are given the power, duty, and resources to decide, carry out changes, and contribute to high-quality results. By increasing employee pleasure, motivation, and sense of ownership, this empowerment fosters a more engaged workforce and produces better results.
6. **Continuous Improvement:** The fundamental tenet of TQM, continuous improvement, is supported by the combination of HRD and Quality Management. Organizations establish a workforce that actively seeks out possibilities for improvement, pinpoints the underlying causes of quality problems, and implements efficient remedial actions by growing employees' skills, knowledge, and competences. Organizations can achieve sustained quality excellence and maintain market competitiveness with the support of this constant commitment to continuous improvement.

CONCLUSION

Executives in human resources are presented with both a difficulty and an opportunity. They are not often regarded as highly as line managers are. According to Philip Crosby, the human resources division is out of date and the HR executive is his or her own worst enemy. On the other side, the department may be essential in creating a comprehensive quality environment that supports a strategic goal. The department must ensure that excellent quality management practices are used throughout its own internal processes in addition to supporting TQM across the organization in order to fulfil this job.

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CHAPTER 6

PROCESS MANAGEMENT FOR PRODUCT IMPROVEMENT

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ABSTRACT:

The Management of Process Quality category looks at the organized procedures the business employs to achieve consistently higher quality and better operational results. Research and development, design, management of process quality for all work units and suppliers, systematic quality improvement, and quality evaluation are all significant components that are considered.The goal of Total Quality Management (TQM)'s management of process quality is to make sure that internal organizational processes constantly meet or surpass quality standards and customer needs.

KEYWORDS:

Control,Inspection, Management, Output,Process, Product Quality, Work.

INTRODUCTION

The necessity for top management to show initiative in establishing the tone.The two alone, however, are insufficient. Exhortations and slogans are unlikely to be effective if they are not supported by action planning and implementation. Nobody is persuaded by a claim like We Are the Quality Company neither the staff nor the clients. In the context of contemporary quality management, the business should be set up for quality assurance. Assume that the national standard for process quality management is accurately represented by the Baldrige Award criteria[1].The goal of Total Quality Management (TQM)'s management of process quality is to make sure that internal organizational processes constantly meet or surpass quality standards and customer needs[2]. The establishment of efficient quality control and improvement methods to maximize process performance is the main goal of process quality management. The following are the main goals of TQM's process quality management strategy:

1. **Consistency and Standardization:** One of the main goals is to create procedures that are uniform and consistent throughout the organization. For each process, this entails specifying precise processes, work instructions, and specifications. Organizations can minimize variance and lower the chance of output flaws or errors by guaranteeing consistency[3].
2. **Continuous Improvement:** Encouraging continuous process improvement is the goal of controlling process quality. This entails locating areas that require improvement, reviewing performance information, and putting corrective and preventative measures into place. Continuous improvement initiatives seek to increase process effectiveness, decrease waste, and provide customers with goods or services of the highest caliber.
3. **Process Capability and Control:** Improving the processes' ability to meet customer requirements is another goal. This entails tracking and controlling process fluctuations by applying control mechanisms, comprehending process capabilities, and measuring process performance. The goal is to create predictable, reliable processes that consistently deliver results that meet the required criteria[4].

4. **Error Prevention and Defect Reduction:** Process quality management tries to prevent errors and reduce output flaws. To prevent or lessen the chance of errors happening during the process, organizations set up error-proofing methods including mistake-proofing techniques. Organizations can reduce expenses connected with rework, scrap, and customer complaints by concentrating on defect avoidance[5].
5. **Data-Driven Decision Making:** To manage process quality, data must be gathered and analyzed in order to draw valid conclusions. The goal is to understand process performance using statistical tools and techniques, find the source of quality problems, and priorities improvement efforts. Organizations can improve process quality by taking proactive actions and making decisions based on data analysis[6].
6. **Collaboration with Suppliers and Clients:** The goal of maintaining process quality goes beyond the confines of the organization. In order to guarantee the quality of incoming materials and components, it entails working with suppliers. Organizations also actively interact with customers to comprehend their needs, criticism, and expectations. Collaboration with suppliers and clients improves the general process quality and client happiness.Empowering and involving personnel at all levels is a goal of managing process quality. Employees are encouraged to spot chances for process improvement, make suggestions, and take part in initiatives to solve problems. Employee involvement promotes a sense of ownership, boosts motivation, and draws on the group's experience and knowledge[7].

It is clear that this definition is closely tied to how effectively all organizational procedures that directly or indirectly contribute to quality as the consumer defines it are managed. Provides an illustration of the idea. Be aware that the quality assurance component of control has switched from controlling output measurement the classic control system to managing process continuous improvement. The inspection of the finished product was the conventional method of quality control, and many businesses still use this method. It is now plainly evident that a product must be created with quality rather than scrutinized into it. In comparison to the lengthy-used final inspection, which will be covered in this chapter, these approaches and processes are both much more sophisticated and efficient. The ideas presented in this chapter have a lot of potential for raising quality, costs, and productivity in practically any organization, even though they are not the pinnacle of contemporary TQM[8].

Quality Control History

The mason who builds a house which falls down and kills the inhabitant shall be put to death, it says. This law is an example of how quality was valued in ancient. The idea of process control may have been developed when a set of standards for stone dressing and quarrying were created for the Egyptian pyramids. To understand how extraordinary this accomplishment is, one only needs to look at the pyramids at Cheops. In terms of military uses, Greek architecture will eventually exceed Egyptian architecture. The shipbuilding industry in Venice developed the first forms of standardization and industrial control hundreds of years later [9]. Quality and process control started to take on some of the qualities that we now know as a result of the Industrial Revolution and the industrial system that it produced. It was necessary due to the factory's specialization of labor. Eli Whitney invented interchangeable components when he produced 15,000 muskets for the federal government. This incident served as a metaphor for the emergence of mass production, when the specialized function of inspection performed by people not directly connected to the manufacturing process took the place of inspection by a competent craftsman at a workbench[10].

It is nothing new to be concerned about process control and product quality. According to historians, the idea originated in Babylonia around 3000 B.C. The Code of Hammurabi, the king of Babylonia, contains references to quality, includingthe publication of Frederick W. Taylor's book Principles of Scientific Management in 1911 marked a significant advancement in the specialization of labor and quality control l.2 the management field has been significantly impacted by this ground-breaking study. The inspector is in charge of the quality of the work, and both the workers and the speed bosses who make sure that the right cutting tools are used, that the work is properly driven, and that cuts are started in the right part of the piece must make sure that the work is finished to suit him. Taylor's philosophy was one of extreme functional specialization, and he suggested eight functional bosses for the shop floor. One of these individuals was given the task of inspection. The best way for this man to complete his work is to develop the skill of doing it swiftly and well [11].

DISCUSSION

A Deming-inspired total quality management strategy for raising service quality has its roots in the unattractive and enduringly unfashionable field of statistics. With the help of Dr. Deming's statistical method for comprehensive quality management, we were able to cut service costs by 35% while maintaining or even raising service quality during the last year. Top management must lead by example in creating the environment and culture for total quality management (TQM). The two alone, however, are insufficient. Exhortations and slogans are unlikely to be effective if they are not supported by action planning and implementation. Nobody is persuaded by a claim like We Are the Quality Company neither the staff nor the clients. In the context of contemporary quality management, the business should be set up for quality assurance. Assume that the national standard for process quality management is accurately represented by the Baldrige Award criteria.

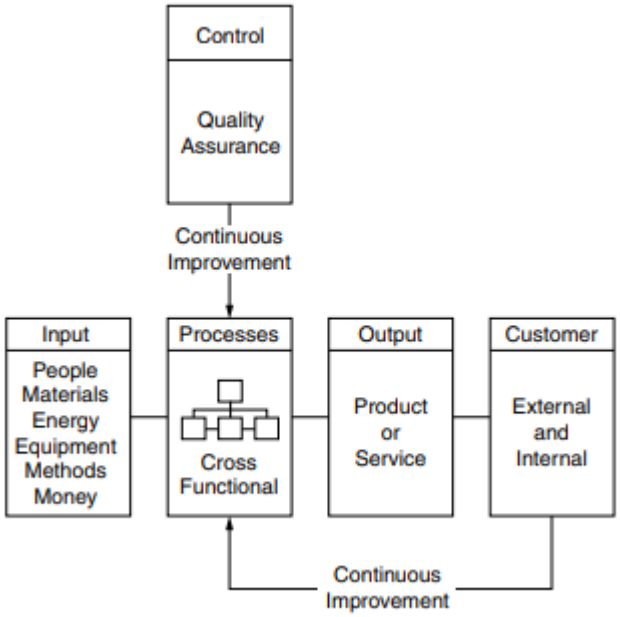

Figure 1: Diagram showing the overview of the System of Management [TQM, Dale H. BesterField].

The Management of Process Quality category looks at the organized procedures the business employs to achieve consistently higher quality and better operational results. Research and development, design, management of process quality for all work units and suppliers, systematic quality improvement, and quality evaluation are all significant components that

are considered. It is obvious that this definition is closely tied to how effectively all organizational procedures that directly or indirectly contribute to quality as the consumer defines it are managed. Figure. 1 provides an illustration of the idea. Be aware that the quality assurance component of control has switched from controlling output measurement the classic control system to managing process continuous improvement. The inspection of the finished product was the conventional method of quality control, and many businesses still use this method. It is now plainly evident that a product must be created with quality rather than scrutinized into it. In comparison to the lengthy-used final inspection, which will be covered in this chapter, these approaches and processes are both much more sophisticated and efficient. Although the ideas in this chapter are not the pinnacle of contemporary TQM, they provide significant potential for enhancing quality, cost, and productivity in virtually any organization.

A Summary of quality control's history

Process control and concern for product quality are nothing new. Researchers have found evidence of the idea dating back to Babylonia about 3000 B.C. In the Code of Hammurabi, the Babylonian emperor, there are numerous references to excellence, includingThe mason who builds a house which falls down and kills the inhabitant shall be put to death, it says. This law is an example of how quality was valued in ancient. The idea of process control may have been developed when a set of standards for stone dressing and quarrying were created for the Egyptian pyramids. To understand how extraordinary this accomplishment is, one only needs to look at the pyramids at Cheops. In terms of military uses, Greek architecture will eventually exceed Egyptian architecture. The shipbuilding industry in Venice developed the first forms of standardizations and industrial control hundreds of years later.

Quality and process control started to take on some of the qualities that we now know as a result of the Industrial Revolution and the industrial system that it produced. It was necessary due to the factory's specialization of labor. Eli Whitney invented interchangeable components when he produced 15,000 muskets for the federal government. This incident served as a metaphor for the emergence of mass production, when the specialized function of inspection performed by people not directly connected to the manufacturing process took the place of inspection by a competent craftsman at a workbench. With the release of Frederick W. Taylor's book Principles of Scientific Management in 1911, specialization of labor and quality control advanced significantly. This ground-breaking work had a significant influence on management theory and practice. The inspector is responsible for the quality of the work, and both the workers and the speed bosses who make sure that the right cutting tools are used, that the work is properly driven, and that cuts are started in the right part of the piece must make sure that the work is finished to suit him. Taylor advocated for eight functional bosses on the shop floor, one of whom was given the task of inspection. Of course, if this man is a master of the craft of finishing work both properly and swiftly, he can accomplish his job best.

Although Taylor eventually acknowledged that high functional specialization has drawbacks, his idea of process analysis and quality control through final product inspection is still prevalent in many businesses today. At the Bell System's Western Electric plant in the middle of the 1920s, statistical quality control (SQC), the precursor to today's TQM or total quality control, got its start. The first iteration of SQC was created by Bell Laboratories physicist Walter Shewhart for the mass manufacture of sophisticated telephone sets and exchanges with zero faults. Shewhart's influential work Economic Control of Quality of Manufactured Product was published in 1931. This chapter offered a clear and quantifiable definition.Of quality assurance and created statistical methods for assessing output and enhancing quality.

The versions used today were independently created during World War II by W. Edwards Deming and Joseph Juran, both former members of Shewhart's group. It is now widely acknowledged that the Japanese owe some of their product leadership to incorporating Deming and Juran's principles. Peter Drucker asserts that American business has been ignoring their contributions for 40 years and is just now implementing SQC. To accomplish statistical process control, the Willimantic Division of Rogers Corporation, an IBM supplier, uses just-in-time methods together with X-bar and R charts for important product qualities. Rework is cut by 40%, scrap is decreased by 50%, and output is raised by 14%.

Versus process control vs. Product inspection

1. Structure comes after planning.
2. Up until a sale is made, nothing takes place.
3. You cannot manage something if you cannot measure it.

These phrases are typical of the catchphrases used by many business functions, such as planning, sales, and accounting. The expression's widespread use usually indicates that some truth can be found in it. The adages don't inspect the product, inspect the process and you can't inspect it in, you've got to build it in are both true in the world of quality management. These two propositions are supported by sound reasoning. It was brought up in the control process discussion that modifying the system's output after the fact was historical action and that there was nothing that could be done to stop the variation once it had already happened. This is control using feedback. The same is true for product inspection. The deviation or flaw has already materialized. A feed forward system that will stop errors and variations is required. Even better would be a system that would enhance the procedure. Process control is based on this (Figure. 1).

What steps are involved? Does it start with design and terminate with delivery to the customer, or does it start with material inspection at the receiving dock and end with final inspection? Does market research come first?And finish with post-purchase support? If we consider a bigger picture, the process might start with the notion of the product idea and go all the way through the product's life cycle until eventual maturity and phase-out. This definition is consistent with the TQM philosophy. It is obvious that according to the TQM philosophy, all corporate operations and functions are interconnected and no one of them stands alone, including engineering, shipping, order processing, and production.

Cross-functional processes are essential to achieving important business goals and achieving organizational success. Furthermore, as environments change, these processes must adapt. It becomes clear that all operations, not only manufacturing, need to use tools and processes in order to achieve meaningful process optimization.

There have historically been two main obstacles to efficient process control. The first has been the propensity to priorities production volume over output quality. Because of the misconception that producing more units results in lower unit costs, the primary goal has been to increase production volume.

Another obstacle is the quality control system, which evaluates goods and services in accordance with a list of internal conformance standards that may or may not be connected to client expectations.

In many instances, the outcome has been subpar items that have been modified or scrapped, or, even worse, things that buyers did not purchase. Poor quality can cost anywhere between 25 and 30 percent of sales revenues. More money can be made via quality improvement than from just producing more subpar goods.

Control of Statistical Quality

The oldest and best-known process control technique is statistical quality control, or SQC. It involves analyzing a work process or its results using statistical approaches, such as control charts. In order to achieve and maintain a state of statistical control predetermined upper and lower limits and to enhance the capability of the process, the data can be utilized to spot changes and to take necessary measures. The most well-known of Deming's innovations is this one. When used carefully, SQC may almost completely stop the manufacture of defective parts. Control can be incorporated into a specific production process by determining the quality that can be anticipated from it.

Additionally, the approach may identify the sources of variances, including incoming materials, machine calibration, soldering iron temperature, and more. Despite the method's maturity and its obvious advantages, many businesses do not fully utilize it. According to a poll, 49% of responding electronic firms said they used SQC methods, but 75% of them also said they continued to utilize 100% traditional inspection. This is in a sector where the production process must be of high quality. SQC has been incorporated into Motorola's corporate culture and is used throughout the whole plant. Characterizing the process, managing it, and changing the process when non-random variations are noticed are all steps in putting a process under statistical control.

The objective is six sigma. SQC's partner is statistical process control (SPC). The name statistical process control might be deceptive because manufacturing operations are so typically excluded, although the techniques can be helpful for enhancing performance in other non-manufacturing areas like sales and staff activities. Additionally, many different activities can apply the techniques.And the roles played by service sectors. It's also important to remember that the only method for SQC that works everywhere is logical reasoning used to enhance a process. Thus, it is a methodical approach to issue solving.

A process is a collection of factors, situations, and actions that make up an activity that converts inputs into outputs. Consider the variety of procedures used in the airline sector, including those for taking and verifying reservations, managing luggage, loading passengers, serving meals, etc. Any combination of people, tools, steps, and circumstances that come together to create an output is referred to as a process. In order to produce an output, the process must add value to the inputs. Productivity is defined as the ratio of output to input, and the goals are to raise this ratio and lessen variance in the process's output. The output is considered within tolerance if the fluctuation is too tiny or negligible to have any impact on the utility of the good or service. By identifying the change that caused the deviation and taking steps to prevent it from happening again, the process can be improved if the output is outside the desired tolerance.

Process Control in the Service Sector

There are numerous industries, as indicated by a review of the U.S. Government Standards Industrial Classification of Industries, where SPC would be acceptable. The use of the approaches is becoming more widespread in sectors like banking, healthcare, and transportation. The service process is, in some ways, more challenging to regulate than manufacturing because quality is frequently assessed at the customer interface, long after it is too late to correct the issue. Consequently, final inspection will always be a step in the process, with the client acting as the inspector. Service failures are comparable to defective parts in manufacturing, and service standards or tolerances can be likened to those in manufacturing. SPC can be used to assess service consistency, identify reasons of deviance from established norms, and pinpoint the reasons for differences. The cause in the realm of

transportation could be missed appointments, refusals, or weekend closures.A variety of First National Bank of Chicago procedures are compared each week to more than 500 customer-sensitive indicators. L.L. Bean, a mail-order business in Freeport, Maine, is well-known throughout the world for its superior distribution network. For that function, it is the best corporation to use as a benchmark. The business examined all crucial procedures and activities, including benchmarking rivals. In almost every product category that is evaluated by outside sources, it is rated first.

Perfectly Timed or Just-In-Case

Just-in-time (JIT) operates under the premise that less is best, whereas just-in-case (JIC) employs buffer or safety inventories. The traditional justifications for why buffer stock is necessary include avoiding concerns of stock outs or supplier failure, obtaining a better price for bulk purchases, or avoiding an anticipated price increase. Due to the excess inventory, there was a greater demand and risk of degradation and obsolescence.For warehouse and factory floor space, as well as by pushing items through the assembly process, promoted several wasteful procedures. Other than their own workstation, operators were unconcerned. There was a shift in perspective to there's plenty more where that came from. When a damaged part was found, there was a propensity to attribute it to an earlier procedure or predict that it would be fixed later on throughout the process or at the rework area.

The man who created Toyota's JIT manufacturing system, Shigeo Shingo, thinks that the push method used in the US results in process-yield imbalances and interposes delays. Kanban, the Japanese name for JIT, translates to visible record. It is a method of guiding parts through the assembly process; production only begins when a worker sees a clear indication that assembly is required for the forthcoming stage. The employee places an order for the product from the prior operation so that it will be delivered when needed. The production line stops if one of the crucial procedures fails to yield a high-quality component. Operators are cross-trained for a variety of duties and act as their own inspectors. The system is being adjusted regularly.

Humanitarian Aspect of Process Control

According to one research, only a very small portion of employees knew what quality was or what their firms were doing to enhance it. The issues in managing streams of processes are organizational and methodological. Peter Drucker comes to the conclusion that SQC has the biggest influence on the social structure of the factory. His main point is that by using statistical tools in production, machine operators rather than non-operators like inspectors, expediters, repair teams, and supervisors are in control of information and, consequently, accountability. Every operator now acts as their own inspector. The fact that operators own the devices gives them the ability to recognize issues and address them. If Drucker is correct, there could be a considerable increase in production, cost, and quality.

There is a drawback, though. Workers and teams may lose the autonomy they previously benefited from strict adherence to rigid processes and procedures, only to have it replaced by the regimentation required by process control. SPC and JIT, by their very nature, demand a focus on the process as a whole, an environment that may be unfamiliar to an operator used to the previously used segmented method. It is nearly commonly acknowledged that the basis for any process's control is measurement against some kind of norm, metric, benchmark, or objective. However, in many organizations, managers and employees operate under two different cultures and with two different sets of objectives. It develops a divide between us and them. Control measures must become the employees' property as we go from inspection to process control. SPC and JIT make this happen. Employees participate in measurements

that they have some control over to track ongoing changes. However, controlling measures alone might not be sufficient. The system's comprehension and participation would improve job satisfaction, a crucial component. In addition, like any process or system, the people who are directly involved are an invaluable resource for enhancing and improving.

CONCLUSION

To attain and maintain high levels of quality in their products or services, organizations must control process quality within Total Quality Management (TQM). Organizations may guarantee uniformity, standardizations, and ongoing process improvement by controlling process quality efficiently. Achieving process consistency, fostering continuous improvement, improving process capability and control, preventing errors and reducing defects, making data-driven decisions, fostering supplier and customer collaboration, and encouraging employee involvement and empowerment are some of the main goals of managing process quality in TQM.

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CHAPTER 7

TOTAL QUALITY MANAGEMENT ORGANIZATION

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ABSTRACT:

Total quality management (TQM) organizing refers to the organizational and structural setups made to successfully execute and maintain TQM concepts and practices within an organization. In order to integrate quality management across all organizational levels and functions, a framework must be put in place.To build a framework and structure that support the effective application and integration of TQM concepts and practices, an organization must organize for total quality management (TQM).

KEYWORDS:

Activities, Chain, Management, Organizational, Quality, Process, Value.

INTRODUCTION

The quality management process needs both structure and time.When an organization decides to pursue quality, it must be ready for a lengthy process. The absence of the structure required for success is one of the early revelations made by organizations pursuing the aim of continuous quality improvement. Every person's work and every operation must incorporate quality values and policies, which is a difficult undertaking that requires the help of an adequate organizational infrastructure[1]. The definition of organizing in all management texts is some variant of the process of creating a structure for the organization that will enable its people to work effectively together towards its objectives. As a result, the approach acknowledges both a structural and a behavioral, or people, dimension. This chapter focuses on the big picture of organization, or the general strategy a business may use to build a reliable infrastructure. The quality department and the responsibilities of the top-quality manager are examples of the micro dimension, which is technical in nature and outside the purview of this book. Deming and Crosby discuss this in depth [2].

In the past, organizations have tended to emphasize the traditional ideas of labor specialization, authority delegation, and span of control. Having a small number of subordinates and maintaining unity of command. In many instances, the outcome was the conventional pyramidal organizational chart, which came with budgets, regulations, rules, and the chain of command hierarchy. In certain circumstances, task specialization was excessive. Thus, the traditional bureaucracy was born. Before total quality management (TQM), which first appeared in the early 1980s, responsibility for quality was nebulous and unclear. Executive management became disengaged from the notion of managing for quality[3]. The company's workforce as a whole had no incentive to raise the caliber of its goods and services. Product specification engineers and process control statisticians, who established acceptable levels of product variability and carried out quality control inspection on the factory floor, had taken over the task of ensuring quality. Two requirements are now widely acknowledged as being necessary for a TQM organization. The first is an attitude of quality that permeates the whole organization. Quality is more than just a niche endeavor under the direction of a senior quality director. This mindset and it mostly presents

difficulties for senior management. An organizational framework to support the ubiquitous mindset is the second requirement. Companies need the tools and the organization to define goals, delegate them to the right people, and turn them into action plans. To complete the required activities, people must be trained and informed of the value of quality[4].

Objective

The goals of organizing for Total Quality Management (TQM) inside an organization are to provide a structure and framework that support the effective application and integration of TQM practices and principles. These goals center on fostering continuous improvement, raising customer happiness, and achieving all-around organizational excellence[5]. Organizing for TQM has the following primary goals:

1. **Promote a Quality Culture:** The main goal of a TQM organization is to promote a quality culture across the board. This entails fostering an atmosphere where quality is valued and everyone in the team is dedicated to driving forward development and exceeding client expectations. Employees are encouraged by a culture of quality to take responsibility for their work, solve problems, and pursue excellence in all tasks and procedures[6].
2. **Continual Improvement:** The idea of continual improvement is emphasized as a key goal by TQM. Creating structures and procedures that support constant improvement across the board is the goal of organizing for TQM. This entails determining areas that need improvement, gathering and analyzing data, carrying out corrective and preventative actions, and fostering innovation. The goal is to make both small-scale advancements and significant ones that increase effectiveness, efficiency, and customer happiness.
3. **Client Focus:** Another goal of the TQM organization is to give the client the utmost importance. Understanding client needs, expectations, and requirements is a necessary step in this process, as is coordinating all processes and activities to meet or exceed those expectations. By planning for TQM, businesses make sure that the needs of the customer come first in all decision-making and that all efforts are focused on providing high-quality goods and services that meet those demands[7].
4. **Employee Involvement and Empowerment:** A goal of organizing for TQM is to engage and empower employee's at all organizational levels. The goal is to establish a diverse and inclusive workplace where staff members are encouraged to provide their opinions, become involved in problem-solving, and take responsibility for high-quality results. Employee engagement and empowerment promote motivation, work satisfaction, and a sense of ownership, all of which fuel attempts to improve quality.
5. **Process Orientation:** To achieve desired results, TQM places a strong emphasis on managing processes. Setting up a process-oriented strategy with well-defined and successfully managed processes is the goal of organizing for TQM. This include appointing process owners, formulating process goals, defining performance metrics, and carrying out process improvement projects. The goal is to streamline procedures, lessen variation, and guarantee that quality is integrated into every facet of organizational operations[8].
6. **Collaboration across Functions:** TQM acknowledges the value of teamwork and collaboration across functions in achieving quality goals. TQM-based planning encourages cooperation and communication between various departments and functions. Silos must be dismantled in order to foster teamwork, knowledge sharing, and cooperative problem solving. Cross-functional cooperation offers a comprehensive approach to quality management and makes it easier to find and fix quality problems[9][10].

DISCUSSION

Systems Approach to Organizing For TQM

An entity made up of interconnected parts that work together to accomplish a goal is referred to as a system. The company is a social structure made up of various parts, including marketing, production, and finance, research, and so forth. These organizational components are actions that might or might not be coordinated. They don't always have goals or work towards achieving goals. As a result, synergism, a crucial component of a well-organized system, may be lacking because one activity has a narrow perspective or functions separately from the others. Under the TQM approach to strategic management, this lack of synergism cannot continue because interdependency between functions and departments is a required prerequisite. Figure. 1 depicts the idea of an organizational structure. Organizational actions transform system inputs into outputs. To add value to inputs and create a product with more value is, in fact, the only reason the organization and each activity inside it exist. This conversion of inputs to outputs has a known measurement

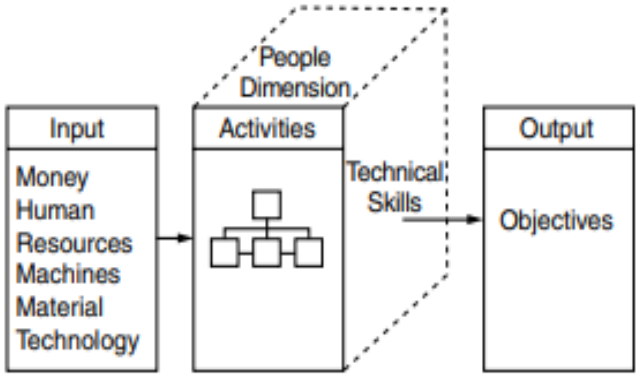

Figure 1: Diagram showing the Organizational System [World Press.Com].

If a system is to endure over time, it must have a good output-to-input ratio, often known as productivity.The organization's activities are both discrete systems and subsystems of the whole, having inputs and outputs that feed into other systems like the customers and other internal activities. Figure. 2 shows the input/output operations in this sequence. Although the idea is straightforward, it frequently fails in practice. Supervisors of activities and those who are involved in activities are unable to characterize their output in terms of measurements or comprehend the goal or outcomes of their subsystem. They will respond, I am responsible for maintenance, I work in finance, or my job is to ship the product, when asked to describe the output of their positions. These are all assertions of activity rather than production, objectives, or anticipated results. The definition of quality output sometimes uses ambiguous phrases like do a good job or keep the customer happy. People are able to explain their activities, but they struggle to articulate their objectives or desired outcomes. Although they may be highly effective at doing the right thing, they may be ineffective at doing the right thing. Both the structure and output of the organization depend on this failure.

With his concept of the value chain, Michael Porter has advanced the systems theory significantly in his excellent book Competitive Advantage. He contends that "looking at a corporation as a whole cannot help one understand competitive advantage. It results from the numerous separate tasks that a company does out to create, produce, promote, deliver, and support its product. The value chain concept will be utilized here to concentrate on the organizational structure for TQM, even though Porter's notion is enlarged to cover any of the numerous sources of competitive advantage.

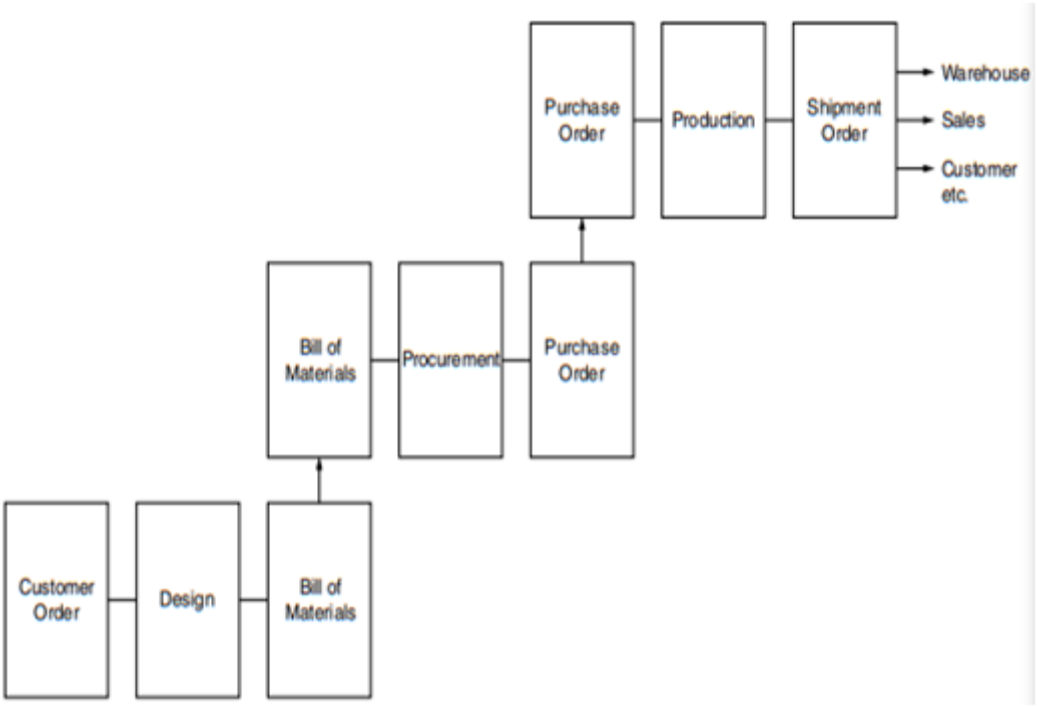

Figure 2: Diagram showing the Chain of Subsystems [World Press.Com].

Depending on the firm's industry and its specific strategy, the core and support activities that make up its organizational functions may or may not differ from those. Presents a selection of chain activity examples from Porter's book. Value chains are shared by customers, distributors, and suppliers, and the firm's output of a good or service becomes an input into the value chain of a client. The way the operations in the company's value chain relate to the requirements of the customer, channel, or supplier determines the firm's difference and competitive advantage. Determine the customer's value chain and how the product or service can add value to the customer's system if quality has been selected as a competitive advantage.

Following this conclusion, the value chain should be divided into the necessary discrete operations, each of which can raise the output's quality to match the demands of the client. Prior to asking what you can do for the consumer, discover what they hope to achieve. The solution serves as the foundation for a top-notch organization. In this regard, it is important to keep in mind that a firm's value chain and its customers' value chains, as well as downstream linkages with channels and suppliers, all exist. Wal-Mart is a great illustration of this, as it was able to gain a significant competitive advantage through the value chain activity of technology development. In Wal-Mart's case, it was the highly developed computer-based information system that enhanced the output of numerous other activities like distribution, purchasing, and warehousing.

A motor home manufacturer, Winnebago Industries, said in a statement, "You must choose the correct distribution network. It is our dealers in this instance. Our dealer network, in our opinion, is what makes us strong. They are our most important, crucial, last, and initial connection to our end user. The first small business to receive the Baldrige Award, Globe Metallurgical of Cleveland, understood the value of suppliers in their own value chain. The management of Globe came to the conclusion that visiting each supplier location with a quality improvement team and training the hourly staff at each location would be the most

efficient way to ensure compliance with statistical process control and quality techniques in the facilities of the suppliers. A crucial component of Globe's quality system is the Programme. The Tulsa, Oklahoma-based architecture business BSQ Group creates and builds Wal-Mart locations. Wal-Mart is the company's direct customer, but they structure their value chain to go downstream with connections to Wal-Mart's consumer: "Many people think that quality is generally subjective. The store's patrons are that beholder in the instance of Wal-Mart. We started our study with them in mind because they are the ones who are assisting us in defining the quality standards that we are currently attempting to convey.

Formulating For the Implementation of Quality

Traditional organizational methods view the process as a mechanical collection of tasks and operations, paying little regard to strategy or desired outcomes. The procedure treats the end result as a given and divides the essential tasks and activities into uniform sections and departments. Peter Drucker has criticized this method of creating an organizational structure, saying that we don't need to know about all the potential tasks that could need to be included. We must understand the structural components that support weight and the major operations.9 the organization's character, its products, and its strategy will all affect the key activities. What is a crucial action in one context could not be in another.

Coca-Cola's value chain may place advertising at the center, while Boeing Aircraft's center of gravity is design. Merrill Lynch may priorities back-office work, while McDonald's does not. Because they have a tendency to organize around the chart of accounts, businesses sometimes struggle to identify or priorities the important activities that make up the value chain. Some businesses concentrate on the operations where cost is the primary factor, not quality or another source of differentiation. By organizing them into uniform divisions and functions, the value chain concept offers a methodical technique to pinpoint the essential tasks required for quality distinction. The most efficient and cost-effective approach to deliver quality and, thus, gain a competitive advantage, is to have an organizational structure that is aligned with the value chain. The quality assurance division is typically not the load-bearing key activity when organizing for TQM, it should be emphasized.

If the company's functions are considered as links in a value chain, quality assurance activities can be found in almost every one of them. Any activity or job function has the potential to differentiate itself in terms of quality. If it only considers a product or service, the vague or elusive word quality may be considered excessively limited.Actions that affect the value chain of the client. A range of staff functions, in addition to those that are typically categorized as line functions, can also be the source of quality in the organizational structure. Take a look at these examples of activities:One can identify the several possible methods for achieving quality differentiation by listing the organization's activities and contrasting them to a value chain. It should be mentioned that these actions can also cut customer costs. When a product leaves the plant, the process of producing quality does not end. The production process includes distribution and customer service.

Numerous other opportunities for quality difference will become apparent through careful client value discovery. Buyers and potential customers, for instance, frequently perceive value in ways they do not fully comprehend or as a result of insufficient knowledge. The numerous ways that both manufacturers and service providers signal subjective, qualitative measurements of quality are immediately discovered by skimming a daily newspaper or magazine. Do you buy Pepsi Cola for flavor or for the name-brand appeal? Do you want a Volvo for its performance or for its durability and safety? Consulting and accounting firms use staff look and assumed professionalism as quality indicators.As a sign of excellence,

banks are known to construct magnificent facilities. I'm not selling cosmetics, I'm selling hope, once declared Charles Reason, a former employee of Revlon. There may be an equal number of actions that turn into essential activities in the development of customer value because there are numerous criteria that the buyer may use to make a purchasing decision. Porter offers various illustrated signaling requirements of which are presented here together with company examples and organizational activities that are crucial to meeting the criteria:

Of course, after a certain criterion has been communicated to customers and potential customers, it is essential to provide as promised, assess the criterion's performance, and maintain open lines of contact with customers regarding their comments to ensure satisfaction. The degree to which the company's numerous activities are coordinated and integrated determines whether or not quality products or services are delivered. The TQM approach is fundamentally based on measuring effectiveness. The next step is to set up for customer feedback, another crucial task that affects various organizational tasks and activities. A crucial but frequently ignored task is measuring client happiness or discontent. What transpires if a client selects a bank's trust department based on the availability of experienced staff only to be sent off to a fresh college grad or ignored by a customer representative? According to research, consumers who are pleased with a bank's quality will often recommend it to three other people, whereas those who are unsatisfied will complain to eight or nine others about the bank's subpar quality. How does a client feel when they return an item for service under warranty only to be treated rudely by a store employee? According to a survey, there are at least 19 other occurrences of a similar nature that were handled by the retailer or the front line without being recorded for every single incident that was reported to corporate headquarters.

The majority of businesses devote 95% of their efforts on managing complaints and only 5% to their analysis.Consumer satisfaction with a company's reaction to issues or inquiries and the likelihood of buying another product from the same business are strongly correlated. However, few customers take the time to file a complaint, and of those that do, very few of them make it to upper management. It is necessary to institutionalize customer service throughout the company as a crucial task that must be completed by everyone. Many businesses lack the activities and enabling policies despite this obvious necessity.Policies and systems that could work against you. Policies that may conflict with the desire to deliver high-quality goods and services include covertly gauging quality by deploying mystery shoppers, hosting motivational sessions that staff members regard as paternalistic and patronizing, and paying for sales rather than service. Employees may find it challenging to maintain a quality-conscious attitude in the face of policies that forbid it.

Participants in Organizational Tqm Transition

Successful organizations' staff members must have a clear grasp of their respective responsibilities during the changeover to a TQM Programme. People at all levels need to be informed about how the new employee involvement concept will affect them. The improvement process entails a collection of complimentary tasks that create an atmosphere that encourages managers and people to perform better. Every level has a function to fulfil. Top management has a crucial role to play. Many of the most prosperous businesses started their programmes by establishing a quality council or steering committee, whose members include the senior management team. A council in each division or strategic business unit is encouraged by several multidivisional companies. The council offers management a strong platform to show that it is leading the quality initiative. At Motorola, the Operating and Policy Committee meets for an entire day twice a quarter under the direction of the CEO,

who also serves as the company's chief quality officer. The best person to oversee or supervise the TQM effort is debatable.

According to one source, a new position that is akin to a financial controller should be created because quality is now a strategic company planning and management function. Others disagree and advise the business not to establish a quality bureaucracy led by a well-known quality director. Everyone agrees that a staff department like HR or quality assurance shouldn't be in charge of it. The procedure ought to be line-led and handed off to the company managers who use it every day. To restate, a non-line manager should not be in charge of quality.

The main adjustments are organizational and strategic, and they are discussed in this and earlier chapters. Top management is now in charge of overseeing the changeover. Middle managers have typically had an integrating role in organizations. They act as a liaison between senior management and front-line staff members, driving quality and serving as the information funnel for change on both a vertical and horizontal level. By connecting unit goals to strategic objectives, they put the top management's strategy into practice. They foster employee growth, enable continual development, and take accountability for subpar performance.

The missing piece of TQM has been identified as front-line supervision. Because the majority of employees at Federal Express, a Baldrige winner, report directly to them, the front-line supervisors are the main target of the communication effort. The business understands that employees are the true quality providers, and open, honest communication is a fundamental aspect of quality.A quality improvement Programme might succeed or fail depending on the supervisors. They are expected to foster an environment that encourages high levels of engagement in both groups and individuals while supporting employee involvement teams. TQM is emerging as the load-bearing concern of company strategy, which brings both good news and bad news for quality assurance and the quality professional. On the one hand, the organization's increasing focus on quality has increased its visibility and, in certain situations, elevated the reporting linkages. On the other hand, when quality becomes more ubiquitous and is managed by line managers, they might now be seen as a staff support function. According to Philip Crosby, a high-caliber professional needs to learn more about the management process. As TQM's more complex methodologies start to permeate all departments and activities, rather than just manufacturing, the limiting tools of inspection techniques and statistical process control have lost some of their significance.

Tqm Teamwork

In earlier chapters, the various TQM approach subsystems or components were discussed. Employee involvement is the most important of these elements, and the management structure for TQM should be built around it. In addition to being the most complex, it is also the most crucial part of TQM. Think about the iceberg as an example. An iceberg has a 10% visible portion and a 90% concealed portion. Consider how an iceberg would look on the organizational chart. Top management and functional management make up the visible 10%. Frontline supervision and non-management staff make up the 90%, which is where the true potential for quality lies.

Does it not make sense to draw from the 90%, which offers a pool of concepts for enhancing quality and productivity? A team of some kind serves as the means to accomplish this. Over 80% of all businesses, according to a 1989 General Accounting Office assessment, had some sort of employee involvement Programme in place. However, the number is inaccurate since the responding organizations viewed an employee involvement Programme as a suggestion

system, which is hardly a systems approach or a linking vehicle. Additionally, the techniques that covered the smallest percentage of workers are the ones that are most likely to have long-lasting benefits.

Advantages

Organization's that implement Total Quality Management (TQM) benefit in a number of ways. It entails the systematic application of quality practices and concepts at all levels and across all job functions, enhancing output, boosting client satisfaction, and fostering organizational excellence as a whole. A few major benefits of planning for TQM are listed below:

1. **Organizations:** Enhancing the organization's overall quality performance is one of the goals of the TQM movement. Organizations can improve the quality of their products and services by putting TQM ideas and practices into practice.
2. **More Satisfied Customers**: TQM organizations place a great emphasis on the needs of the consumer. By structuring their operations around TQM, businesses can better comprehend consumer feedback, better satisfy their wants and expectations, and more actively engage with their customers.
3. **Improved Process Efficiency and Effectiveness:** TQM organizations emphasize a process-oriented strategy, focused on optimizing processes to achieve desired outputs.
4. **Employee Engagement and Empowerment:** TQM organizing promotes employee engagement and empowerment. Employees are given opportunity to contribute ideas, take part in decision-making, and take ownership of quality outcomes, and they are actively involved in attempts to improve the quality of their work.
5. **Improvement:** TQM organizations actively promote a culture of continuous improvement. Organizations can find areas for improvement and conduct corrective and preventive actions by setting up systems for tracking performance, gathering information, and analyzing outcomes.

CONCLUSION

In order to successfully apply and integrate TQM principles and practices inside an organization, a framework and structure must be created. This is where organizing for Total Quality Management (TQM) comes in. Organizations can obtain a variety of advantages through TQM planning that enhance their overall competitiveness and success. Improved quality performance, higher customer satisfaction, improved process efficiency and effectiveness, employee empowerment, a culture of continuous improvement, data-driven decision making, supplier collaboration, and a competitive advantage in the market are some of the main benefits of organizing for TQM.

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CHAPTER 8

QUALITY AND PRODUCTIVITY IN TOTAL QUALITY MANAGEMENT

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ABSTRACT:

Productivity is a method for measuring how efficiently an organization operates based on the ratio of output produced to inputs utilized. In this chapter discussed about the productivity and the quality of the total quality management. Productivity is impacted by a number of variables, including technology, plant layouts, machinery, and equipment.

KEYWORDS:

Increase,Labor, Management, Productivity, Quality, Technology.

INTRODUCTION

Productivity is a method for measuring how efficiently an organization operates based on the ratio of output produced to inputs utilized. As a result, operations managers must regularly analyses each of these aspects in order to both maintain and increase productivity. As the largest sector of the industrialized world's economy, the service sector, this growth has significantly increased the necessity of maximizing productivity excellence in service organizations. Quality and productivity are essential elements of operational strategies for organizations. At both the macro and micro levels, productivity is crucial. Productivity is used by businesses as a micro level performance indicator to benchmark against best-in-class organizations and to pinpoint best practices[1].

Particularly in emerging businesses characterized by supply chain, e-commerce, and virtual enterprise environments, quality management has grown to be a significant component of management culture. Consistency in an organization's products and services is maintained via quality management. In order to attain more consistent quality, quality management essentially involves quality assurance and control of both processes and products.Chances for interactions that produce value co-creation for service providers and clients, also known as win-win or benefit-benefit interactions [2]. This intensifies the spotlight on service science, a new field that is very relevant to both practice and academia and encourages the study of service systems from multiple disciplinary perspectives.

Systematic research into managerial, technical, and social challenges is necessary for comprehending, developing, managing, and delivering successful services. Businesses often operate at their peak efficiency when staff productivity is at its highest. Productivity declines for a variety of causes, many of which are related to poor motivation and poor communication[3]. When management does little to boost corporate productivity, it may encourage a workplace where mediocre work output is accepted. In order to maintain a desired degree of perfection, all activities and tasks must be under the control of quality management. Determining a quality policy, developing and putting into practice quality planning, assurance, control, and improvement are all included in this. The term total quality management (TQM) is another name for it. Quality management typically concentrates on

The President's Council for Management Improvement struggled with Ronald Reagan's required productivity plan in the middle of the 1980s.The president was urged by corporate chief executives to abandon systems that prioritized production and shift the emphasis to quality [4].

The Malcolm Baldrige Award was established as a result of these events, and total quality management (TQM) has since gained prominence in American industry. In Chapter 1, the relationship between quality, market share, and profitability was investigated. It was found that higher quality increases both profits and market share. Now, the following inquiries come to mind: Are quality and productivity related? A coin has two faces, or the other? You may I have both? Naturally, the answer is yes. There is a misperception that productivity and cost must be sacrificed in order to increase quality, despite mounting evidence to the contrary[5]. The Institute of Industrial Engineers discovered that the general consensus among its members in 1990 was that competitiveness can only be improved when productivity and quality are taken into account jointly. Although it may have some basis in reality, those who priorities production above quality appear to hold the idea that higher quality equates to lower productivity. It is said that a quality-improving Programme results in delays and interruptions thatdecreased production. Even while this might be the case in the immediate future, it typically is not the case over a longer time frame. Such an argument frequently falls flat when the costs of low quality are taken into account [6].

Deming presented the case for a beneficial relationship, basing it on the decreased production brought on by quality flaws, rework, and scrap. "Improving quality transfers waste of man-hours and machine-time into the manufacture of good products and better service," he said in his conclusion. Feigen Baum contends that there is a specific "hidden" and underutilized plant that is used to rework and fix returns and defects; if quality were to improve, this underutilized plant would be made available for greater production [7]. These arguments are simple; by definition, an increase in productivity results from every quality improvement that lowers defects. Of course, the same can be said about services and businesses that provide them. Rarely do the expenses associated with quality improvement outweigh the savings from enhanced production. It would be oversimplified to argue for or against quality improvement solely on the basis of output or defect reduction. The benefits of TQM that have been demonstrated can be used to make a stronger argument[8].

When the big picture is taken into account, it can be demonstrated that raising quality also raises productivity, and the two have a mutually reinforcing effect. More output for the same or less money is now considered to be productive. When properly applied, TQM embraces a broader idea and can be seen as embracing the advantages of productivity. Productivity has evolved into a tactical, short-term strategy linked to cost-cutting, increased efficiency, better resource utilization, and organizational restructuring. Since TQM is more long-term and comprehensive, it is concerned with cultural transformation as well as developing visions, missions, and values[9]. Numerous TQM-related productivity increases include the following.

The Internal Revenue Service's processing facility in Ogden, Utah, was led by Joseph Juran and adopted quality as a core principle while simultaneously achieving efficiency gains of $11.3 million through team and management initiatives. The Productivity Improvement and Quality Enhancement (PIQE) Programme at NASA has developed into a multi-program strategy that includes TQM both within the organization and among the contractor work force, which makes up around 60% of the entire workforce at NASA. At Monsanto Chemical's Fibers Division, the adoption of computer-integrated manufacturing (CIM), along with TQM and self-directed work teams, led to a 50% improvement in productivity.

Productivity and Quality Leverage

What are the financial effects of productivity improvement if quality has a leveraging impact on market share and profitability? Three fictitious income statements will show how, when the illustration is limited to the issue of profitability leverage, small (10%) gains in productivity will produce far higher outcomes than a comparable increase in sales.

	I	*II*	*III*
	Before	*Sales up 10%*	*Productivity improved 10%*
Sales	$100	$110	$100
Variable costs	70	77	63
Fixed costs	20	20	20
Profit	$10	$13 (+30%)	$17 (+70%)

Figure 1: Diagram showing the Productivity and Quality Leverage data [Word Press.Com].

Sales of $100, variable expenses of $70, and fixed costs of $20 result in a profit of $10 in scenario I. In case II, a 10% increase in sales results in a 30% rise in profit, while case III displays a 70% profit increase with no increase in sales. A lower and more practical return on sales results in even more leverage (Figure. 1). Additionally, there may be potential companion advantages that are of higher caliber. Once more, TQM and the ongoing development of all processes hold the key to the solution[10].

DISCUSSION

Technology vs. Management systems

We have been taught that labor specialization and mechanization were the solutions to economic growth and productivity ever since Adam Smith's seminal 18th-century book The Wealth of Nations. This was demonstrated throughout the Industrial Revolution. Even today, economists generally agree that changes in real capital relative to labor play a significant role in determining the pace of productivity increase. The reindustrialization of U.S. industry, or supply-side economics, as it became called during the administrations of Ronald Reagan and George H. W. Bush, is still a topic of discussion in Washington. These administrations' main domestic goal was to boost American industry's productivity by promoting higher savings and, consequently, capital stock investment. It was claimed that modernizing American technology was necessary for competitiveness. The prevailing consensus was that Japan's superior quality and productivity were a result of its advanced technologyIt would be incorrect to just attribute Japan's success to technology, and it would be equally incorrect to believe that technology is the only way to increase American quality and productivity. Instead, than replacing existing labour, better processes are required. Why, for instance, would a business spend money on cutting-edge computer hardware to upgrade a problematic information system or an outdated manufacturing procedure?

In the first scenario, technology will speed up the delivery of inaccurate information, enabling hasty decisions. In the second scenario, switching out the process labor can result in a rise in lead times, inventory turns, or quality costs. A lot of people associate technology with automation, mechanization, machines, computers, semiconductors, and new innovations, but the phrase actually refers to much more. It is a technique for converting inputs into results. Technology thus encompasses processes, methods, and strategies that permit this transition. It encompasses both tools and techniques. It bears repeating: technology

encompasses techniques that enhance operations to enhance the output/input ratio. Firm after firm has increased quality and productivity dramatically while making little to no investment in the hardware side of technology.

Nobody can make a credible case against using hardware-based technology to raise quality and productivity. Automation and machines present a challenge because they demand resources like time and money, both of which are in short supply. Systems for managing resources require little of both and might even be more efficient. Prior to implementing technology, the system the process must be improved. Despite investing more on automation than the gross domestic product of several nations, General Motors produced automobiles that were uncompetitive due to the lengthy cycle time between market research and manufacturing. Honda took half as long to launch a more competitive automobile as GM did to develop the Saturn, which took eight years to complete. Honda did this by regulating cycle times and procedures. The inclination is to concentrate on technology in order to cut labor costs while ignoring the higher quality that may be attained by streamlining related procedures and utilizing the full capability of the workforce. Good businesses invest in technology to enhance operations, shorten lead times, improve quality, and promote flexibility. Although capital spending in the service sector has skyrocketed, productivity and quality have barely increased.

According to Jonathan M. Tics, president and chief executive officer of Loews Hotels, manufacturing productivity is increasing five times more quickly than the service industry. In the late 1950s, the industry standard was for us to need one person for every four occupied rooms. There is currently an average of one employee for every two rooms nationwide. Therefore, productivity is only half of whatit once was. Despite the invention of the computer and the proliferation of other supposedly labor-saving gadgets. Labor productivity has been a priority in both the manufacturing and service sectors, but for the majority of enterprises, capital intensity does not boost labor productivity sufficiently to maintain return-on-investment beyond the cost of capital. Even if productivity increases normally, businesses that grow more capital-intensive in relation to sales experience a loss in return on investment.

United States Productivity

The United States has a poor track record of productivity. As the United States' labor productivity continues to lag behind the rest of the industrialized world, Japan and the top Western European countries have surpassed us in their capital-intensive industries, which are the birthplace of the assembly line, production planning, and computer. For both the country and specific businesses, it is a crucial issue.

The Causes of Slow Growth

Every economist, businessman, and government official appears to have a favorite culprit when it comes to determining the roots of what has been dubbed the productivity crisis. The following problems are some of the most common justifications.Management negligence Malcolm Baldrige, the former secretary of commerce of the United States who passed away in 1987 and for whom the Baldrige Award is named, once said we now too frequently do a second-rate job of management, compared to our foreign competitors. One poll by management consultants A.T. Kearney, Inc. came to the conclusion that improved management, not ongoing efforts to create more pounds of vehicle per person, is the key to productivity. It is well known that senior management turned away from productivity, quality, and growth during the 1980s in favor of leveraged buyouts, restructuring, downsizing, and frequently executive bonuses and golden parachutes.

Short Term Gain

Gain in the short term Focusing on short-term financial ratios has been the norm rather than taking steps to ensure long-term productivity and growth.11 No one would advocate ignoring financial data, yet this kind of data has the same flaws as all accounting data. Additionally, financial data frequently favors capital productivity while ignoring the other inputs of labor, materials, and energy.

Direct Labor

Historically, the one variable expense that financial control systems have been built on has been direct labor. Currently, the direct labor portion of overall manufacturing expenses ranges from 8 to 12%. Some businesses include these costs in overhead or general and administrative costs, which are usually disregarded when looking for ways to increase output and quality. Savings are a major factor in the building of capital stocks. However, it appears that American workers are spending more and saving less, leaving less money for capital formation.

Research and Development

Although the United States spends more on research and development than any other country, our international competitors are increasing their investment faster than we are. There are differing views on how R&D affects productivity. According to certain data, investment is going towards product enhancement rather than productivity enhancement. This is both positive and expected. However, many high-quality investments also increase productivity, as was previously mentioned. Political developments in the former Soviet Union and Eastern Europe may result in an R&D peace dividend as funding shifts from defense to programmers in industry. Is the rise in prices a direct cause of the reduction in productivity, or is it a byproduct of it?

Inflation

It is almost probable that inflation occurs when reduced productivity and higher pay are combined. There can be no doubt that these are investment deterrents to the extent that inflation results in increased relative cost of plant and equipment as compared to labor and the relative cost of operating capital. Other arguments put out for the poor track record of American productivity include government regulation, the transition to a service economy, and the absence of goals and programmes. Although significant, the cumulative effect is difficult to assess.

Estimation of Productivity

Since quality is determined by the consumer and might be fragmented and illusive, evaluating productivity is somewhat simpler than measuring quality. However, productivity can also be challenging to quantify because it is based on the results of numerous functions or activities, many of which are equally challenging to describe. What are the quantifiable results of market research, training, design, and quality control? Despite these challenges, there is a need for metrics for each action and, in most circumstances, for each front-line supervisor specifically. Standards are required for comparison with prior performance, competitor experience, and as the foundation for improvement action plans. A productivity measurement pioneer who has spent many years working on the creation of a measurement system is Carl G. Thor, president of the American Productivity and Quality Centre in Houston. He follows the following measurement guidelines for both productivity and quality:

1. Fulfil the requirements of the user, the client. The clientele could be internal or external.
2. Highlight direct input to the employees participating in the process being measured.
3. The primary performance indicator ought to capture what matters. The conventional cost control report may not reflect this.
4. Those being measured should be able to control and comprehend the measurements. The involvement of individuals being measured could improve this principle.
5. Ground policies in available data. Apply cost-benefit analysis if it isn't already done before creating new data. Rarely is information worth more than what it costs to acquire it.Basic indicators of productivity include the output-to-input ratio:

Total factor, which may be defined as follows, is the broadest measure of output to input.

Total output/ Labour + Materials + Energy + Capital

This measurement takes into account all facets of manufacturing goods and services, not just how many units are produced or how many letters are typed. Consequently, this measurement is focused on the overall plant or company's efficiency. For the partial factor of labour, partial factor measures are defined as ratios of total output such as the number of cars, patients, depositors, students, widgets, etc. to one or more input categories.

Total output/ Labour input

The same holds true for materials, money, and energy. Every measure is a ratio of two quantities. Although some ratios can be described quantitatively, such as the number of units produced per man-hour, others require the combination of several input quantities, such as tonnes and gallons of product, employee hours, pounds, kilowatt hours, etc. This issue can be resolved by combining unlike quantities using a set of weights that represent the relative value of the individual things. Although various weighting systems like "man-hour equivalents" can be employed, base period prices are the preferred weights to be used for computing total production.

Model for Total Productivity Measurement (TPM)

Total output divided by total input, which includes labour, material, equipment, energy, and capital, is known as productivity.The organisation is more likely to gain from functional and departmental metrics than from an attempt to implement thorough, company-wide coverage. Even though these data take into consideration the effects of taxes, depreciation, inflation, and the previously described arbitrary accounting cost allocations, most businesses rely heavily on budgeted dollar accounting data to analyse their operations. It is desirable to construct measurements that reflect output and input in more realistic terms because these accounting figures typically have no substantial relationship to the activity or process under examination.

It is proper to deflate financial metrics to a base benchmark when they are employed. The delivery of productivity and quality as well as the enhancement of processes occur inside these organisational units, making it crucial to define function and activity metrics. The design and control of processes take place here.

The basic goal for quality and productivity development through individual action planning is provided by individual measures to the supervisor and employee. Only when improvement is compared to some benchmark goal, yardstick, standard, objective, or expected result can it be said to have occurred.

Black-Collar Productivity

White-collar employees' productivity is just as crucial as that of those working in direct labour or the manufacturing industry. In fact, staff and non-production personnel far outnumber production employees in terms of both numbers and costs. The issue with output measurement, however, is more difficult to solve. The measurement of units built per man-hour is not particularly challenging, but the most challenging of all measurements managerial productivity is the question of how many reports an accountant should produce. It is typically the least known, least analysed, and least managed of all factors of productivity, according to Peter Drucker.18 White-collar workers are only productive around 50% of the time, according to research. The remaining time is wasted and can be attributed to individual delays (15%) and poor management (35%). Time-wasting factors include:

1. Inadequate planning.

2. Delayed start and stop times.

3. A lack of coordination among the many functions.

4. Overload of information.

5. Lack of staff.

6. Inadequate assignment communication.

7. Ineffective conference calls and meetings.

The Service Activity's Measurement

Although time standards, time studies, and work sampling have been used for decades to assess the manufacturing worker a person who physically alters the product, it is more difficult to define standards for the non-manufacturing employee or the service activity. It is doubtful that measurements could be made in the same way that industrial workers are. However, a method can be developed to describe an individual's productivity.

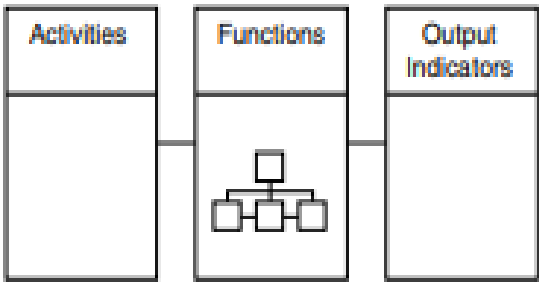

Figure 2: White-Collar Activity Measuring in figure [Word Press.Com].

Establish a baseline for evaluating ongoing improvement over time by looking at activity at a certain moment in time. The approach is best suited for small businesses operating within an industry as well as Multiplan or multidivisional businesses offering comparable goods or services.The foundation of a measuring system begins with the organization's current functions and operations. Every action is a part of a specific function. For instance, hiring falls under the category of the human resources function, accounts receivable falls under the category of accounting, and so forth.

One hundred or more activities that can be divided into ten or more functions may be identified by the average organisation. Figure. 2 illustrates this idea. The following stage is to determine whether output indications drive or cause work in the activities. In other words, the

activities wouldn't be as necessary if it weren't for the labour that the indicators create or that follows from them. Employee interactions, for instance, wouldn't be necessary if nobody was employed. Vendor invoicing would not be required if there were no purchases. Therefore, a dependent variable of the purchasing function is the resources used in the activity of vendor invoicing. In other words, if the indicators are the output and the activities are the input in the productivity ratio of output to input, then the indicators are the input.

Productivity Improvement

The output of goods and services produced divided by the input required to produce them must be improved. Therefore, increasing the output, decreasing the input, or doing both will increase the ratio. Figure. 3 shows this idea as well as a selection of methods and actions for enhancing the productivity ratio. The productivity wheel could be used to describe this.In the past, efforts to increase productivity have been concentrated on capital investments intechnology and equipment to lower the cost of labour. Higher production wastypically believed to be susceptible to increasing output through the use of industrial engineering techniques like work flow, methodologies analysis, etc. Although the current tendency is towards making better use of the potential offered by human resources, both of these strategies are still appropriate.Each employee can act as their own industrial engineer, or mini-manager. By enabling and encouraging individuals to innovate in one or more of the five ways listed in the next section, this potential can be realised. Employee suggestions can increase productivity, which is typically accompanied by an increase in quality as well.

Figure 3: Diagram showing the Productivity Wheel [Word Press.Com].

CONCLUSION

Quality and productivity are intimately correlated, therefore if quality improves, productivity will also improve. Simply said, production and quality are directly inversely correlated, or they are both inversely correlated.Productivity and quality are quite different things. Even while people may strive to be productive and wish to do so, this does not guarantee that their efforts will yield high-quality outcomes. Sometimes, despite activity, there won't be any quality because the timing is off.

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CHAPTER 9

SEVEN ESSENTIAL TOOLS FOR PRODUCT MANAGEMENT

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ABSTRACT:

To educate quality control methods and procedures to Japanese workers, Dr. Kaoru Ishikawa authored a book titled Gemba no QC Shuho in 1968. It was intended to be used in Japanese workplaces for self-study; training of employees by foremen or in QC reading groups. The initial presentation of the seven fundamental quality control tools was made in this chapter.The seven QC tools are essential tools for enhancing process efficiency and product quality. They are used to assess the manufacturing process, pinpoint the main problems, regulate quality variations, and provide remedies to prevent future flaws.

KEYWORDS:

Check Sheet, Pareto Charts, Quality Control, Seven, Vital.

INTRODUCTION

To educate quality control methods and procedures to Japanese workers, Dr. Kaoru Ishikawa authored a book titled Gemba no QC Shuho in 1968. It was intended to be used in Japanese workplaces for self-study training of employees by foremen or in QC reading groups. The initial presentation of the seven fundamental quality control tools was made in this book.Dr. Ishikawa did not refer to them as the core seven quality control instruments. This description was added afterwards. The Asian Productivity Organization released an English translation of Dr. Ishikawa's book, Guide to Quality Control, in 1971[1][2]. When applying the seven fundamental tools, this book has been used extensively and continues to be helpful. The initial list of Dr. Ishikawa's seven fundamental quality control instruments includes:

1. A check list.
2. The graphs.
3. The histogram.
4. Pareto diagrams.
5. Diagrams of causes and effects.
6. Schematic diagrams.
7. Control graphs.

Because these are the ones that are described in Dr. Ishikawa's book, these seven are regarded as the traditional tools. The flowchart, on the other hand, is regarded as being equally valuable as another fundamental tool. The flowchart can often take the place of a less popular tool like scatter plots because it is such a valuable tool.Schematicsamong the seven. Depending on the book or article you read, a list of the seven fundamental tools might omit one or more of the tools mentioned above and instead include one of the author's own favorites[3]. The primary need is that the tool be an organized method for gathering and analyzing data, regardless of which tools are mentioned.

The rest of this chapter introduces and explains the fundamentals of using the conventional seven tools. Because flowcharts are so common, a section on them is also given[4]. These

tools can be broken down into three different areas for easier understanding: tools for identifying, tools for prioritizing and communicating, and tools for analyzing. The flowchart and the check list serve as the identification tools.

Both are employed to aid in locating and quantifying the problems that are present. The prioritizing tools can be applied once a problem area has been determined. The tools for prioritizing include graphs, Pareto charts, and histograms[5]. These tools support the user in organizing, comprehending, interpreting, and presenting the collected data.

With this knowledge, the user may now priorities which issues to focus on and how to approach them. These tools can also be regarded as the group's main communication tools because they offer simple-to-understand charts and graphs. The analyzing tools can be applied once a specific issue has been found. The cause-and-effect diagram, scatter diagram, and control charts are the analytical tools histograms can also be regarded as analytical tools. These instruments are utilized to look into and research the root causes of the issue. They may also make suggestions for potential corrections. It should be highlighted that check lists, Pareto diagrams, and cause-and-effect diagrams can be used to solve 70 to 80 percent of all issues[6].

Control Sheets

Forms called cheese sheets are employed to compile data in a methodical manner. They provide a place to start for the user a key roadblock for some and a framework for gathering the data. Additionally, they help the user organize the data for subsequent use. The information acquired on a check sheet can be used to create control charts, Pareto charts, histograms, etc. Check lists' main advantages are that they are simple to use, comprehend, and may paint a clear picture of the situation.

A core principle of overall quality management, speaking with facts is primarily made possible by check sheets. Check sheets come in a variety of varieties that can and are utilized. Here, the three main types are discussed: check sheets for defect-location, tally checks, and check sheets for defect-cause[7][8].

Sheets for Defect-Location Checks

The sketch, drawing, or photo of the finished product is typically included on the defect-location check sheet. The figure indicates the location and type of issues or flaws. Which depicts a sketch of a vehicle door, serves as an illustration. The sketch is not accurate to scale, it should be mentioned. The fact that it accurately depicts the component under study and makes stratifying the flaws possible is crucial.

The paint defects on a car door were examined using this check sheet. This check sheet revealed that the lower right corner of the painting has the greatest number of paint flaws. Investigation revealed that the programming for the spray cannons had not been correctly altered and that this door's shape was different from that of the door on the prior model. Using a check sheet like this usually prompts prompt correction[9][10].

DISCUSSION

1. Test Sheets

Data collection forms called cheese sheets are employed consistently. They give the user a place to start a major roadblock for some and give the data collection a framework. They help the user organize the data for later usage as well. Building histograms, Pareto charts, control charts, etc. can be done using the information acquired on a check sheet. Check sheets have

several advantages, but their ease of use and comprehension and ability to paint a clear image of the situation are their main advantages. Check sheets effectively let the user communicate with facts, which is a core principle of total quality management. Check sheets can and are used for a wide variety of purposes. Here, the three main categories of check sheets are discussed: defect-location check sheets, tally check sheets, and defect-cause check sheets.

Sheets for Defect-Location Checks

The sketch, drawing, or photo of the finished product is typically included on the defect-location check sheet. The figure shows the location and type of issues or flaws. Figure 1, which depicts a sketch of a vehicle door, serves as an illustration. The sketch is not accurate to scale, it should be mentioned. The fact that it accurately depicts the component under study and makes stratifying the flaws possible is crucial. The paint defects on a car door were examined using this check sheet. This check sheet revealed that the lower right corner of the painting has the greatest number of paint flaws. Investigation revealed that the programming for the spray cannons had not been correctly altered and that this door's shape was different from that of the door on the prior model. Using a check sheet like this usually prompts prompt correction.

Check Sheet for Tally

The tally check sheet is used to count the instances of various kinds of flaws. It is possible to lower the overall amount of flaws by taking the proper action by understanding the most common types of defects. An illustration of a tally check sheet for gathering data isin Figure. 1.

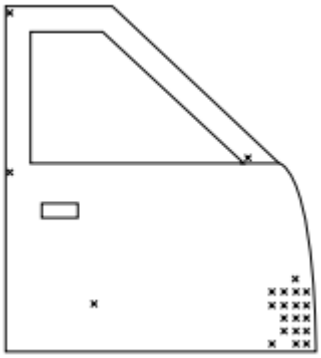


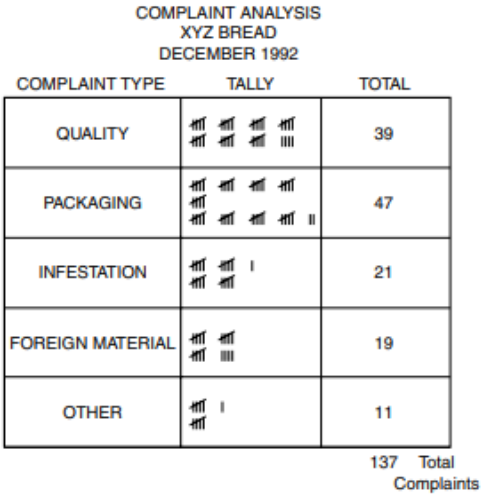
Figure 1: Diagram showing the Defect-Location Check Sheet [World Press.Com].

On what causes customers to complain about a certain brand of bread. The check list implies that packaging was the primary reason for complaints. Because the data were gathered within a brief period of time, the team believed that this was an inaccurate depiction of the issue. The team made the decision to gather data for the prior six months in order to confirm the primary cause. This was very simple because the customer service division had kept extremely accurate data on all complaints received during the previous year. Figure. 2, a summary tally check sheet for this six-month period, shows that the bread's quality was actually the main issue.

Flowcharts

Flowcharts are visual depictions of a process that show the sequential order of the component’s materials, equipment, and operations that go into it. They are a great way to communicate information to everyone and record what is happening in a process. The use of flowcharts has various advantages. It first distinctly specifies the parts of a process. This aids

all involved in the process in understanding their roles and the overall goal. Second, it can also be utilized as a training tool for existing employees who move to different areas within the process or for new employees who are brought into it. Thirdly, it might act as a guide for locating issues or potential improvement zones inside the procedure. It also aids in determining where and when measurements can be conducted during the procedure. Fourthly, as shown in Figure, it can be utilized to record an easy activity like a cash sales transaction. A flowchart can also be used to explain a difficult idea, like how a business is run. The method will be understood uniformly by all parties if it is applied consistently, which is the final and most crucial factor. In other words, everybody will be monolingual.


COMPLAINT ANALYSIS
XYZ BREAD
DECEMBER 1992

COMPLAINT TYPE	TALLY	TOTAL
QUALITY	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 IIII	39
PACKAGING	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 II	47
INFESTATION	𝍸 𝍸 I 𝍸 𝍸	21
FOREIGN MATERIAL	𝍸 𝍸 𝍸 IIII	19
OTHER	𝍸 I 𝍸	11

137 Total Complaints

Figure 2: Diagram showing the Tally Check Sheet [World Press.Com].

Graphs

Graphs are graphic representations of data that are used to arrange and compile data. They are frequently the simplest and most effective method of data analysis, comprehension, and communication. As a result, it is simple to utilize them to illustrate the current situation, point out a problem area, or show how things have changed for the better. Graphs come in a wide variety of forms, from the straightforward to the complicated. The line graph, bar graph, and circle graph are the three main types of graphs that are most frequently employed.

Line Diagram

A line graph is a graphic representation of a data pattern. It is primarily employed for data comparison, problem identification, and data pattern analysis. A typical line graph outlining the permitted employee exposure duration for a variety of noise levels. The run chart is a unique sort of line graph. A run chart displays the relationship between a given variable and time. This kind of graph is highly helpful since it demonstrates how a variable's variability changes over time. Patterns like trends and cycles can be found with adequate data. Remember that the run chart just shows the type of data. This type of chart cannot be used to draw any statistical inferences. Figure 3offers an illustration of a run chart by showing the annual average of airline fatalities from 1982 to 1994.

Histograms

The variety of a product or process is visually represented by the histogram, a form of bar chart. It displays the various central tendency measures (mean, mode, and average). By placing the specifications on the histogram, it is possible to demonstrate whether the product specifications are being satisfied. A histogram can also be used to examine and pinpoint the

variable's underlying distribution. The histogram only serves to depict the type of distribution. It does not, by itself, offer statistical evidence supporting a specific distribution.

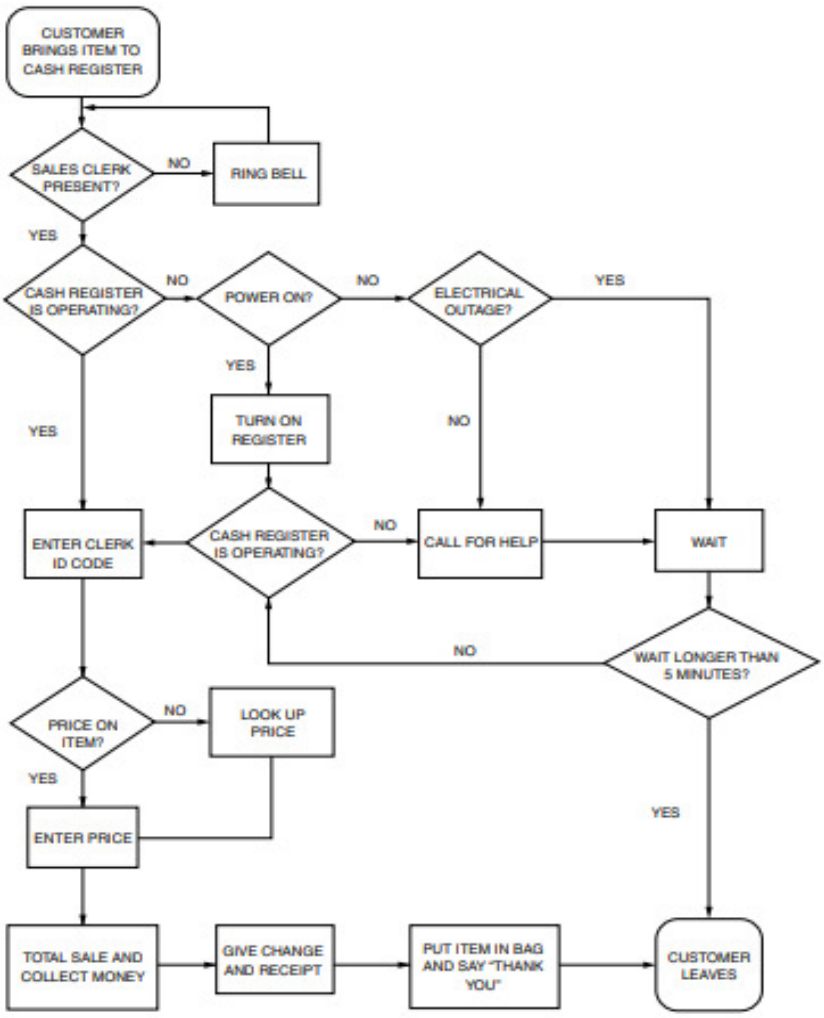


Figure 3: Diagram showing the flow sheet for a cash sale [World Press.Com].

Charts Pareto

Dr. Joseph M. Juran first described the Pareto principle in a 1950 essay. As a young engineer researching quality flaws in the 1920s, Dr. Juran made note of a phenomenon he named "the vital few and the trivial many." He found that only a small number of these faults accounted for the majority of the defectiveness when quality defects were ranked according to frequency of occurrence. He again found in later works that accident causes, employee absenteeism, and other managerial areas were all affected by a similar phenomenon. While on a short-term assignment at General Motors in the late 1930s, one of the executives informed Dr. Juran that same phenomena also occurred in other industries. Dr. Juran learned about Wilfredo Pareto's work at this time, a 19th-century economist who had conducted in-depth research on the unequal distribution of income. Only 20% of the population, according to Pareto, possessed 80% of the wealth. To measure this unequal distribution, Pareto created a number of mathematical models. Comparable to Juran's observation was Pareto's about economics.

Dr. Juran realized in the late 1940s that the idea of the vital few and the trivial many was in fact universal in nature and applied to all aspects of management. He was the first to capture these ubiquitous phenomena in writing. In order to express the idea of misdistribution, he

coined the term "the vital few and the trivial many and called it the Pareto principle. He referred to this notion by its shorthand term, the Pareto principle, in the first edition of his Quality Control Handbook, and writers who eagerly promoted it with the incorrect name picked up on the idea's universality and exploited it. Later, Dr. Juran was had to acknowledge that he had erred in putting so much credit on the 19th-century economist Pareto and that his work merely addressed the unequal distribution of income. Additionally, Dr. Juran admitted that the cumulative frequency distribution curves It should have been Lorenz rather than Pareto who developed the Seven Basic Quality Control Tools 261, which were utilized in the first edition of the Quality Control Handbook.4 Dr. Juran changed his expression to "the vital few and the useful many" when he realized that all problems were serious and warranted treatment.

The simplicity with which the Pareto chart can be understood and the way in which it exemplifies the Pareto principle give it its potency. Essentially, a Pareto chart is a bar graph with the bars ordered in ascending height order from left to right. This picture clearly illustrates the vital few issues that need to be addressed initially. As a result, it helps in prioritizing and identifying what needs to be done.

Additionally, it creates a shared understanding based on facts rather than assumptions, which encourages everyone to work together. There are many uses for Pareto charts. They not only offer a way to research and enhance quality, but also a way to study and enhance efficiency, material waste, energy conservation, safety concerns, cost savings, etc. A Pareto chart can help a team with practically any topic they want to research. Analyzing the data can demonstrate a solid use case for the Pareto chart. In, the Pareto chart created using these data is displayed. The most prevalent issue, as shown by the chart, is concerns pertaining to the category quality.

Currently, more data is required before improvements can be made because quality covers such a wide range of topics. The quality category is stratified. The vital few sections on this chart are stale and burned. The group chose to focus on "burned" initially because it was an internal issue. Note that although this was not the main quality issue, the team could directly address it and it would have a significant overall impact. Figure. 3 displays the outcomes and compares the before- and after-improvement Pareto diagrams to demonstrate the overall improvement. This is possible since the relative time frames for the before and after diagrams were the same, namely six months.

Be aware that the undercooked" issue was resolved along with the "burned" issue. The bread appeared to be the biggest quality issue at that point. The current team was disbanded and a new team formed to address the new quality issue because this problem included vendors and other departments not represented on the team. In other words, the improvement cycle started over from scratch thus, continuous improvement, another TQM tenet.

Diagrams of Cause-And-Effect

Dr. Kaoru Ishikawa of the University of Tokyo created the cause-and-effect (CE) diagram while discussing a process in the summer of 1943. How different aspects can be sorted out and connected, to some engineers at the Kawasaki Steel Works. This diagram is also referred to as the Ishikawa diagram for this reason. The reason for its third moniker, the fishbone diagram, is that a finished diagram resembles the skeleton of a fish. The CE diagram's main objective is to demonstrate how an effect and all of its documented causes are related. Any particular impact often has a number of important causes. Therefore, a CE diagram aids the team in identifying gaps in knowledge, gathering and organizing potential causes, coming to a consensus on the issue.

Diagram of the Causes and Effects of Dispersion

The effect or quality attribute being researched is the dispersion. Damaged gowns are the dispersion. It should be highlighted that the standard six that is, manpower, machines, procedures, materials, measurements, and environment correspond to the six main bones" or causes. Clearly designed for the production environment, these six. Employees, equipment, processes, regulations, and the workplace can all be considered as general causes when doing an analysis in a service or office setting. Any combination of causes may be utilized; these two sets are merely starting points for the team. The question why does this cause produce this dispersion? Must be asked repeatedly when constructing a dispersion analysis CE graphic. For every significant cause, this query is asked once more. The team pondered this question when coming up with the employee reason in for instance. Inadequate training and a lack of experience served as the major cause categories bones or subcases. This is carried out until every significant cause has been treated. This kind of CE diagram helps organize and connect the components of the dispersion, which is its main advantage. Additionally, it gives team talks or brainstorming session's structure. Its potential failure to recognize small causes is a significant negative this is frequently caused by the team's personnel.

Cause-and-Effect Diagram for Production Process Classification

The primary line, often known as the backbone, in this kind of graphic sequentially depicts the process flow. The main bones serve as a representation of the process' many phases. Any element that affects the outcome during a particular process step is depicted as a bone on that stage. The process categorization diagram for the issue with the damaged gown. The bones are constructed using the same kind of inquiry for instance, "Why does the cutting stage produce damaged gowns? Another option for this kind of CE diagram is to make it look like an assembly line. Depicts what would have seemed like if the assembly line method had been applied. The main advantage of this kind of diagram is that it is simple to put together and comprehend because it follows the process flow. The main disadvantage is that repeating causes are problematic. Note that the phrase production is typically eliminated from the type name because this sort of diagram can be utilized in settings other than manufacturing.

CONCLUSION

The Total Quality Management (TQM) seven fundamental instruments for quality control offer useful methodologies and procedures for examining and enhancing processes in order to raise the quality of products or services. These instruments, sometimes referred to as the Seven Quality Control (QC) Tools or the Seven Basic Quality Tools, were created and made well-known by the Japanese quality specialist Kaoru Ishikawa.An approach to managing quality in organizations known as total quality management (TQM) places a strong emphasis on ongoing improvement, client satisfaction, and staff involvement. The seven traditional TQM tools are frequently employed for process and problem improvement.

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CHAPTER 10

EXPLORING TOTAL QUALITY MANAGEMENT SYSTEM AND ITS APPLICATIONS

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ABSTRACT:

An international set of standards known as ISO 9000 outlines the specifications for a quality management system (QMS). It is a crucial component of Total Quality Management (TQM) and offers organizations a framework for setting up and maintaining efficient quality management practices. In this chapter discussed about the ISO 9000.The objective of ISO 9000 is to support organizations in continuously enhancing their performance and processes in order to better fulfil the needs of their customers.

KEYWORDS:

Businesses, Certification, ISO Standards, Series, Quality Management, United States.

INTRODUCTION

According to Robert Caine, president of the American Society for Quality Control (ASQC), ISO 9000 has essentially become the price of admission for doing business in Europe. The Quality Management and Technology Centre at DuPont's Kimberly Hackman concludes Ask any company person who has given up trying to access the European market what stopped him, and he's likely to answer in code ISO 9000. These professionals are only a few of the numerous ones advising American businesses to seriously consider the ISO Series standards[1].Even if a company does not already conduct business in Europe or does not have any plans to do so, it should not disregard the quickening transition to international standards. The movement is spreading throughout the world as well as numerous governmental and private sectors in the United States, as will be addressed [2]. The ISO 9000 series of five international standards establishes criteria for the management of quality. These standards, as opposed to those for products, apply to quality management systems. The countries of the European Union are using them to offer a common framework for quality assurance, principally through a system of internal and external audits.

The goal is to confirm that a certified business has a quality management system in place that will allow it to adhere to its specified quality standards[3]. The ISO standards are universal in the sense that they apply to all roles and sectors, from banking to chemical manufacture. The "one size fits all" norms have been used to describe them.A quality management system (QMS) must meet the criteria outlined in the ISO 9000 set of international standards. It is a crucial component of total quality management (TQM) and offers organizations a framework for establishing and maintaining efficient quality management practices[4]. The objective of ISO 9000 is to support businesses in continuously enhancing their processes and overall performance while also assisting them in constantly meeting client needs. Among the numerous standards in the ISO 9000 series, ISO 9001 is the most well-known and widely used. Organizations of all sizes and in all industries can use ISO 9001, which outlines the

requirements for a QMS. It lays forth a methodical approach to quality management, covering topics like management, planning, process control, resource management, and performance assessment[5].There are several steps involved in implementing ISO 9001, including:

1. **Organizations:**Organizations should familiarize themselves with the ISO 9001 standard's requirements in order to comply with it. This includes being aware of the concepts of continuous improvement, customer focus, and quality management.
2. **Gap Analysis:**Gap analysis is the process of carefully examining the organization's current quality management procedures in order to find any shortcomings or potential areas for development in relation to the ISO 9001 standard.
3. **Designing the QMS:**Designing the QMS entails creating and preserving a quality management system that complies with ISO 9001 standards. To ensure that goods or services are consistently delivered and fulfil customer expectations, processes, roles, and procedures must be defined[6].
4. **Implementation:** Making the planned QMS operational across the entire organization. This entails educating staff members, developing efficient lines of communication, and incorporating quality management procedures into regular business operations.
5. **Monitoring and Measurement:** To make sure the QMS is working effectively and to find areas for improvement, regular monitoring and measurement of its performance is required. Internal audits, data analysis, and customer and stakeholder feedback are all required for this.
6. **Improvement:** Continuous improvement is the process of looking for chances for growth and acting to address non-conformities and increase the effectiveness of the QMS. This entails periodically examining and revising processes, policies, and procedures[7].

Application of ISO 9000

The ISO 9000 standards are applicable to a wide range of businesses and organizations. Here are a few typical uses for ISO 9000. As a way to show their dedication to quality management, many organizations look to obtain ISO 9000 certification. Customers, suppliers, and regulatory authorities frequently demand or prefer certification. The company's reputation and credibility in the marketplace can be improved by receiving ISO 9000 certification[8].ISO 9000 offers a framework for creating and putting into practice a QMS. The standards can be used by organizations as a reference to create efficient quality management processes, procedures, and controls. This promotes continual client satisfaction and high-quality goods and services.ISO 9000 places a strong emphasis on customer focus and satisfaction.

Organizations can better understand customer requirements, gauge customer satisfaction, and respond to consumer feedback by using ISO 9000 standards. Improved customer retention and loyalty result from this [9]. ISO 9000 encourages a culture of ongoing development. The standards can be used by organizations to pinpoint areas in need of development, establish goals, and put in place procedures for performance monitoring and evaluation.

This makes it possible for businesses to streamline processes, lower error rates, and boost overall effectiveness.The organization's supply chain management might be governed by ISO 9000 standards. Organizations can make sure that their suppliers have effective quality management systems in place by requiring them to satisfy ISO 9000 standards. This promotes constant quality along the whole supply chain [10].

DISCUSSION

Robert Caine, president of the American Society for Quality Control (ASQC), asserts that adopting ISO 9000 has essentially become a must for conducting business in Europe. Ask any business person who has given up trying to enter the European market what stopped him, and he's likely to answer in code: ISO 9000, says Kimberly Hackman of Du Pont's Quality Management and Technology Centre. These specialists are only a few of the numerous professionals pleading with American businesses to seriously consider the ISO Series standards.Even if a company doesn't already conduct business in Europe or doesn't have any plans there, it should still pay attention to the swiftly advancing shift to international standards. As it shall be explained, the movement is spreading over the world as well as into a variety of public and private sectors in the United States. In order to manage quality, a set of five international standards known as ISO 9000 must be followed. These guidelines are for quality management systems, as opposed to product guidelines. Through a system of internal and external audits, they are being used by the countries of the European Union to create an all-encompassing framework for quality assurance. The aim is to make sure that a certified company has a quality system in place that will allow it to satisfy its specified quality criteria. Since all functions and industries, from banking to chemical manufacture, are covered by the ISO standards, they are universal. As one size fits all criteria, they have been called.

The ISO in the World

15 countries make up the European Union (EU), including Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, the United Kingdom, Austria, Finland, andSweden. The creation of a unified internal market devoid of all trade restrictions is the aim of the EU. Regardless of whether they are produced in one of the EU countries or in a non-EU country like the United States, there must be assurance that the goods and services fulfil specific standards in order for trade to remain free. The standards are being used by the EU to guarantee the quality of goods and services across international borders and to establish a common framework for quality assurance. The International Organization for Standardization (ISO) is a specialized international organization for standardization, and it now consists of the national standards organizations of 91 different nations.

The U.S. member organization is called the American National Standards Institute (ANSI). Approximately 180 technical committees make up ISO. Each technical committee is in charge of one of many specialized fields, ranging from zinc to asbestos. To enable the interchange of goods and services internationally and to foster collaboration in intellectual, scientific, technological, and economic activities, ISO works to further the development of standardization and related global activities. The ISO 9000 Series is one of the technical outputs of ISO that has been published as an international standard. The United States verbatim adopted the ISO 9000 Series as the ANSI/ASQC Q-90 Series in 1987. Usage of either of these series is therefore identical to usage of the other. A variety of businesses in more than 50 nations throughout the world that have supported the ISO standards are adopting them. In Britain, the criteria had been established and more than 20,000 institutions had obtained certification by 1992. In addition to adopting the standards, Japan has launched a significant national campaign to register its businesses. In 1989, the EU adopted ISO 9000 to unify the varied technical standards and requirements of its member states. In Europe, hundreds of product safety laws, governing everything from medical devices to telecommunications equipment, all included ISO conformity by 1991.

At the time, barely 15% of EU commerce consisted of such products, but the list is expanding. The adoption of the standards is promoted by entire industries. The requirements of Siemens, a major German electronics company, provide one illustration of the impact. 50% of the contracts with its suppliers must be ISO compliant, and the corporation is pushing all other vendors to follow suit. This action's main defense is that it does away with the need to test parts, saving time and money while establishing uniform standards across all markets.The ISO standards are becoming into a de facto market requirement for doing business with other EU businesses, even for businesses whose products are not regulated. In the event that two vendors are vying for a deal or has recognized its quality processes under ISO 9000 has a distinct advantage. The widespread use of the ISO 9000 Series, which has grown to be the best-selling series in ISO history the organization whose guidelines these standards were developed reflected the effect of these standards. Even the widely used and established international weights and measurement standards were outsold by ISO 9000. To reiterate, ISO 9000 is a set of guidelines for the functioning of a quality management system rather than standards for products.

A 9000 in the U.S.

Despite the fact that 30% of the nation's exports go to Europe, American businesses have been hesitant to adopt these global norms. Additionally, more exports will be impacted if and to the extent that the standards are accepted globally. If a company fails to comply with the requirement or fails to obtain certification, additional markets, both domestically and abroad, may be closed to them. Du Pont, now a pioneer in embracing the standards, only started its ISO push in 1989 after losing a significant European contract for polyester film to a British company that had obtained ISO certification. Some people think ISO 9000 is an obstacle to competitiveness or perhaps a scheme to keep American businesses out of Europe. This viewpoint is obviously incorrect, yet unless the standards are understood well, a barrier may still exist. The standards are being incorporated into the specifications for companies that produce goods for a number of U.S. government agencies, including NASA, the Department of Defense, the Federal Aviation Administration, and the Food and Drug Administration, as additional evidence of their growing acceptance.

Suppliers to the governments of Canada, Australia, and the United Kingdom must currently be registered with ISO 9000. In the late 1980s, American pioneers Du Pont, Eastman Kodak, and others adopted ISO 9000 to prevent being shut out of European markets. They later discovered that the standards had a similar impact on their quality. Baldrige award winners like Motorola, Xerox, IBM, and others are currently pressuring suppliers to adopt ISO. The number of businesses adopting the standards may increase geometrically if the movement gains traction and suppliers to suppliers are forced to join in. The frequently used description of the market as having a worldwide scope may have additional meaning as a result of this effect.Despite the overwhelming body of evidence pointing to the necessity of adopting ISO 9000, it appears that many American businesses have not done so and do not have any plans to do so. The good news is that obtaining ISO 9000 certification is not that difficult for businesses, especially if they already have a quality initiative under way. In fact, organizations employing total quality management (TQM) have already achieved more than half of their goals. Certification would be a reasonably easy process for Baldrige award holders. What effects does ISO 9000 have on service sectors and manufacturing companies whose goods don't fall under the purview of regulated goods? ASQC provides the response.

The value of ISO 9000 certification as a tool for the competitive market outside of regulated product categories varies from industry to industry. For instance, in some industries, European businesses could make it a requirement for suppliers to certify that they have an

approved quality system in place before they can be paid. Any business contract could contain a clause like this. In high-tech industries where high product reliability is essential, ISO 9000 registration may also be used to distinguish between classes of suppliers. In other words, if two suppliers are vying for the same contract, the provider that has ISO 9000 certification can have an advantage over the other in the eyes of some clients. Aerospace, automobiles, electronic components, measuring and testing equipment, and other industries and product categories are those where customers are most likely to exert pressure for ISO 9000 registration. In product categories where liability or safety are issues, ISO 9000 registration may also be a competitive advantage. The adoption of ISO 9000 by the EU has drawn criticism from some American manufacturers, who claim the standards are subpar compared to those employed in the US. Additionally, it is asserted that forcing American businesses to follow the requirements will result in higher production costs for them.

The opposing claims assert that the standards will do away with the patchwork of standards that currently exist in different parts of the world and that the production costs will be more than offset by other cost savings as well as the rise in productivity and quality. Despite criticisms and ignorance about ISO 9000, there is evidence that American businesses are beginning to accept the standards. According to one figure, registration grew by 500% from 1992 and 1993. Naturally, this rise is calculated from a 1992 base that was somewhat smaller. It's interesting to observe that the experience in Japan is comparable to that in the U.S. The initial resistance was mainly overpowered by pressure to comply with the standards of the global market. Professional and trade organizations seem to be becoming more involved as businesses within a specific industry work together to investigate the best ways to satisfy ISO regulations. This initiative has been spearheaded by the chemical industry. Professional engineers, utilities, software providers, and information technology manufacturers are a few of the organizations making organized efforts. Some people have established a network of help groups.

ISO 9000

Technical Committee 176 was created by ISO in 1979 with the goal of creating a general set of quality system management standards. 14 observers and 20 participants made up the initial committee. This committee used the British standard BSI 5750 as a major reference for creating the ISO 9000 family of standards. In 1987, the first set of ISO 9000 standards was released. In 1994, a revised edition was released. The ISO 9000 family of standards has been translated into several languages and is referred to by several names across the globe. Be aware that the majority of national versions have a code number that starts with 9000 or 90. Also take notice that EN 29000, the European Community's version of the standard series, has been adopted.

ISO 9000 Standard Series Components

The ISO 9000 Series of standards is designed to offer a generic set of quality system requirements that may be used across a wide range of business and economic sectors. They do not serve as product standards. Rather, they serve as guidelines for quality management systems. As a result, while organizations comply with ISO 9000 requirements, products do not.The ISO 9001, 2000 standard has now taken the role of the outdated ISO 9001, 1994 standard. The outdated ISO 9002, 1994, and ISO 9003, 1994 quality standards have also been dropped. In a nutshell, ISO 9000 serves as a guidance for choosing which certification level (9001, 9002, or 9003) to pursue. These standards are ISO 9001, ISO 9002, and ISO 9003. They apply to each individual certification level. Among management models is ISO 9004.

Site-based certification for ISO 9000 is carried out. In other words, a business cannot obtain an ISO 9000 certification for all of its locations and facilities. Every site and facility must be independently certified by the company. There are three levels of certification available: 9001, 9002, or 9003. The ISO 9001 accreditation is the series' highest level of recognition. At this level of certification, adherence to the standard's 20 functional categories is required. 19 out of the 20 functional areas must be in compliance for ISO 9002 certification. 16 items must correspond to ISO 9003.

Management Obligation

Any significant cultural or operational change must have the support and participation of top management to succeed. The same is true of ISO 9000 and the Baldrige system. The following series samples demonstrate ISO's preoccupation with managerial accountability.

1. **Quality Control:** The management of the supplier must specify and record its quality commitment, goals, and policy. The provider is responsible for ensuring that this policy is recognized, followed, and upheld throughout the organization.
2. **Management Evaluation:** The management of the supplier must periodically examine the quality system it has implemented to comply with the standard's requirements to ensure that it remains appropriate and effective. Such reviews must be documented and kept on file.
3. **Internal Quality Inspections:** To ensure that quality activities adhere to predetermined plans and to assess the efficiency of the quality system, the supplier must implement thorough system of planned and documented internal quality audits. The status and importance of the activity will be taken into consideration when scheduling audits. The audits and subsequent actions must be performed in accordance with established protocols. The findings of the audits must be recorded and shared with the staff members responsible for the area under audit. The management team in charge of the area must move quickly to address any flaws identified by the audit.

Accreditation: The Third-Party Audit

Many managers view any form of audit as a necessary but relatively low-priority bureaucratic task. When it is revealed that obtaining ISO 9000 certification can take anywhere between six and twelve months of preparation and that two out of every three people attempt it and fail, this unfavorable attitude may become even more pronounced. But certification requires a third-party audit as a requirement. Deming said, you don't have to do this survival is not compulsory in reference to certification. The buyer-seller relationship, where the buyer audits the supplier, is the foundation of the conventional two-party quality audit system. Both parties are burdened by this.

Consider a supplier who serves 100 or more distinct clients, each with their own unique needs. It would be advantageous from the perspective of the consumer if all suppliers could be evaluated using the same set of standards. The third-party audit gives quality systems, a crucial component in the EC, a lot of weight.

The independent third-party registrar attests that the quality system complies with ISO 9000 standards. Why would a third party audit be necessary? Financial results are assessed using financial accounts, whereas the quality of the outputs from products and services is assessed. Why not do a similar audit of quality systems if an unbiased third-party audit is required for financial systems? This is especially crucial for ensuring quality across international borders.

Post-Certification

If successful, the third-party audit and subsequent certification should be seen as a tool rather than an objective to be reached. The value of certification preparation is found not so much in the certification itself as in the quality system that emerges from the effort required to obtain it. Any endeavor to get ISO 9000 certification without client communication can be a time waster and jeopardize any system that may follow because the customer is the ultimate benefactor of the quality system. The certification process is just the beginning. It is advised to continuously evaluate, receive feedback, and adjust. After certification, who will conduct this internal and ongoing audit? Top management is, of course, accountable. If there is one, the internal auditor's role is unclear. Should the job involve meeting post-certification criteria, getting ready for certification, or both? Internal auditors may have a chance because the function is not clearly defined.

Selecting a Registration Service that is accredited

When quality managers choose to establish an ISO 9000 system, they must consider two connected questions: how to implement the new system most effectively and how to guarantee that certification will be accepted by customers. If certification is acknowledged by trustworthy accrediting organizations, the latter problem will typically be resolved. The several accrediting agencies in Europe are typically used by American businesses there. Many are authorized by the government, such as the National Accreditation Council for Certification Bodies (NACCB) in the UK and Raad voor de Certificate (RvC) in the Netherlands. The Application Business Systems Division of IBM was the first American-based company to get all of its business lines accredited. Following an inspection by Bureau Veritas Quality International, certification was obtained.

In the United States, there is no one well-established registrar-accredited authority recognized, and it is unclear who is responsible for accrediting auditors. The Registrar Accreditation Board (RAB), an ASQC subsidiary, and ANSI have collaborated to provide accreditation standards for ISO 9000 auditing firms doing business in the United States. Most reliable source of reliable registrants with U.S. bases is the ANSI/RAB accreditation Programme. The selection of a registrar should be influenced by a number of factors, including the registrar's expertise in a particular industry and in the auditing of quality systems, the number of companies that are similar to it that it has registered, the turnaround time for audit results, the frequency of re-audits, and, most importantly, accreditation. Since the cost of an audit is minimal in comparison to the whole cost of the registration endeavor, it is generally not a good idea to shop around for the best deal.

Services and ISO 9000

The standards cover not just the manufacturing process but also post-sale support and service divisions inside the manufacturing company, like design. The standards also apply to the service industry: They particularly cover both production and service quality management systems. In fact, ISO 9000, a distinct guideline, was released to clarify ISO requirements in terms of particular service industries. Standards are employed by educational institutions, banks, legal and architectural firms, and even trash collectors in the United Kingdom. In order to decrease complaints about lost cargo and damaged items at London's Heathrow Airport, British Airways PLC embraced ISO standards. A in the US is an increasing number of shipping firms won't transfer hazardous materials unless the shipper has ISO certification. There is some evidence that service organizations in the U.S. are more interested in the ISO 9000 Series than those in Europe. There is interest from consulting, purchasing, and materials

management service companies. Some people think that because ISO 9000 is seen as a market differentiator, U.S. service firms are more interested than other countries are.

The Certification Fee

The question How much does certification cost? Is one that is commonly posed? This is a valid issue, albeit it might also be followed with the query what is the payoff? How much it will cost and how long it will take have no fixed answers. Each business is unique. The answer relies on a number of variables, including the size of the business, its product offering, how far along the quality continuum its current systems are, if consultants are hired, and the implementation approach chosen. A small business may pay $2000 to $25,000 in consultancy fees to receive guidance on creating a quality system. Additionally, and potentially the biggest expense, employee time was used to create the system. The primary factor is a firm's starting point. It may just take a few days to register a plant or business if a company has recently achieved a Baldrige Award. But if the system needs to be built from scratch, it may take a year and cost $100,000 or more.

The Baldrige Award against ISO 9000

Aren't the Baldrige Award, Deming Prize, etc., equivalent or better "standards" than the ISO Series? Is one of the most commonly asked questions about the ISO Series, according to the ASQC? The solution, according to ASQC, is rather straightforward: "If you aren't already applying the ISO 9000 (ANSI/ASQC Q-90) standards in your business, you can't hope to achieve the requirements of any of these programs. These standards offer the framework on which you may construct your quality assurance and management systems, allowing you to finally reach a high level of success. Furthermore, the only system that is recognized internationally is the ISO 9000 Series. Compared to ISO 9000, The Baldrige is a far more extensive Programme. Unlike the ISO Series, which has a considerably more constrained scope, it is a true TQM system.

It is a fundamental need that is valued between 200 and 300 points under the Aldridge Programme. In this case, it doesnot take into account the human resource component, like the Baldrige does. However, a business that follows the Baldrige criteria is in a much better position to follow the ISO requirements. The Baldrige standards are far more detailed. The standards provide clear language that outlines what is required. The ISO Series, in contrast, is intended to be inclusive rather than exclusive. It does not require the use of one strategy over another. You can register your system as long as you can say what you do and do what you say. The standards' broad nature can be both a source of emancipation and irritation. ISO may serve as a starting point for businesses whose quality systems are at the low end of the TQM continuum in their quest to eventually implement a TQM system. The benefit of certification is that it gives a company a level playing field with competitors around the world.

Setting up The System

Despite the fact that the series offers guidance on the qualities that the quality system must have, the standards do not specify how to put them into practice. The following crucial actions will enable successful change after it is decided to accept the standards and apply for certification. Acknowledge the need for change and secure upper management's support. Use quality as the cornerstone of difference in the strategic plan. Create and adopt a comprehensive quality policy statement that complies with ISO standards. Obtain the cooperation and dedication of all managers. Establish the extent of the enterprise that needs certification. Will it be a certain procedure, related facilities, a location, or the entire business? Conduct an internal audit to ascertain the current quality system's status. Define

the distance between your current situation and the steps needed to close it. Calculate the time and financial investment required, then organize the required action steps to carry out the strategy.

Advantages of ISO 9000

The use of ISO 9000 standards by organizations has a number of benefits. The following are some of ISO 9000's main benefits. Understanding and meeting client requirements are highly valued principles of ISO 9000. Organizations can enhance their capacity to consistently deliver goods or services that satisfy consumer expectations by putting ISO 9000 standards into practice.A stronger quality management system (QMS) can be implemented using the organized framework provided by ISO 9000.The ISO 9000 standard encourages the implementation of best practices and ongoing process improvement. Organizations can optimize resource use, minimize waste, and streamline processes by putting ISO 9000 standards into practice.

CONCLUSION

ISO 9000 is a key component of Total Quality Management (TQM). It provides a number of advantages and benefits that help an organization's quality management initiatives succeed.By putting a strong emphasis on customer focus and addressing their needs, ISO 9000 increases customer happiness. Organizations may improve the quality of their products and services, better understand consumer needs, and forge deeper relationships with their customers by putting ISO 9000 standards into practice.

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CHAPTER 11

SELF-ASSESSMENT FOR ONGOING SYSTEMATIC EVALUATION

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ABSTRACT:

Self-assessment is a thorough, systematic, and ongoing evaluation of an organization's performance in comparison to the EFQM Excellence Model. The organization can clearly identify its strengths and areas for improvement through the self-assessment process, which leads to planned improvements that are then tracked for success. In this chapter discussed about the self-assessment.The goal of self-assessment is to give organizations a thorough grasp of their current quality management procedures. It assists in identifying the organization's areas of strength, where it is functioning effectively, and its areas of weakness, or improvement possibilities, where work is needed.

KEYWORDS:

Improvement, Management,Organization, Quality, Self-Assessment, Self-Evaluation.

INTRODUCTION

A complete, systematic, and ongoing evaluation of an organization's performance in comparison to the EFQM Excellence Model is known as self-assessment. The self-assessment process enables the organization to clearly identify its advantages and areas for improvement. It concludes with a planned change that is then tracked for success. In Total Quality Management (TQM), the process of assessing an organization's own quality management practices, performance, and capabilities is referred to as self-assessment. It entails methodically evaluating and reflecting on numerous organizational operational aspects to pinpoint strengths, flaws, and improvement opportunities[1].Self-assessment in comprehensive quality management is primarily used to review an organization's performance and pinpoint opportunities for development. It entails methodically evaluating the organization's systems, practices, and procedures to determine its efficacy and efficiency. Self-assessment aids in identifying one's strengths and flaws, encourages introspection and learning, and directs decision-making for ongoing development[2].

The effectiveness and efficiency of an organization's quality management systems, processes, and procedures are evaluated by that organization. Examining the application of quality standards, documentation, training courses, and quality control procedures is part of this.To examine the organization's quality performance, self-assessment entails gathering and analyzing pertinent performance data and indicators. Customer satisfaction, defect rates, process cycle times, and other key performance indicators (KPIs) particular to the organization's goals may be included in this.Finding possibilities for improvement: Self-assessment aids in pinpointing areas where an organization can improve its performance and quality management practices [3]. This may entail identifying ineffective processes, limitations in personnel abilities or expertise, or failures to live up to consumer expectations.Comparing performance to industry standards or accepted best practices is what benchmarking versus best practices is all about for businesses. Companies are able to learn

about cutting-edge techniques and pinpoint places where companies may adopt or modify tried-and-true tactics to enhance their quality management systems as a result [4].

Engaging employee's at all organizational levels is a common part of self-assessment. Based on their involvement in quality management activities and their expertise, employees offer their opinions, feedback, and suggestions. This encourages a culture of worker ownership and engagement in the improvement process.Self-evaluation leads to the creation of action plans to address identified areas for improvement. In order to implement changes and improve the organization's quality management practices and performance, these plans specify the precise activities, roles, dates, and resources needed [5]. Self-assessment is a procedure that is continually monitored and reviewed in TQM. It entails reevaluating performance, finding new areas for improvement, and periodically analyzing and tracking the success of improvement initiatives. This guarantees a constant cycle of reflection, education, and improvement in terms of quality management practices.Organizations can use self-assessment in TQM to better understand their quality management procedures, spot areas for development, and spearhead initiatives for ongoing improvement. It encourages a proactive and introspective approach to quality management, assisting businesses in aligning their operations with client expectations and achieving higher standards of quality performance [6][7].Introduction length can be as per the nature of the topic. Hence it can be prepared as per the discretion of the author.

Application

1. **Evaluation of Performance:** Through self-assessment, organizations can compare their performance to set benchmarks and quality standards. Setting goals for performance development allows organizations to identify areas of success and those that need improvement.
2. **Self-evaluation:** Self-evaluation assists in locating inefficiencies, bottlenecks, and gaps in processes and systems, which leads to process improvement. Organizations can create plans to streamline processes, lower errors, and increase productivity by analyzing and evaluating these areas[8].
3. **Customer Feedback:** Customer feedback is gathered from customers, and their levels of satisfaction are evaluated as part of the self-evaluation process. Organizations may produce better products and services and boost customer satisfaction by knowing the requirements and expectations of their customers.
4. **Employee Involvement:** Self-assessment entails involving staff members in the evaluation procedure and encouraging their active contribution. This develops teamwork, fosters a sense of ownership and responsibility, and raises employee morale and engagement[9].
5. **Learning and Development:** Through self-assessment, organizations are prompted to consider their advantages and disadvantages as well as areas that need improvement. It encourages a culture of continual improvement and offers chances for training and skill development to fill up any gaps that are found.Self-evaluation offers useful information and insights that promote wise decision-making. It assists in setting priorities for improvement projects, effectively allocating resources, and making strategic choices based on impartial assessments of performance[10].

DISCUSSION

If a process of continuous improvement is to be sustained and its pace increased, organizations must periodically examine which activities are succeeding, which have stalled, what needs to be improved, and what is lacking. Using the structure that self-assessment

provides, this form of feedback regarding an organization's continuous improvement plan can be generated. Self-assessment in comparison to a quality award/excellence model, which can serve as the foundation for evaluation and diagnostics, is currently receiving a lot of attention from organizations all over the world.A comprehensive and holistic management model that takes into account all of its many activities, practices, and procedures is one of the qualifications for these prizes. They also provide a method for determining a points score that may be used to assess an organization's current state of TQM development. Conti and Hillman are just two authors that have provided definitions of self-assessment; however, the European Foundation for Quality Management (EFQM) provides a thorough.As a management philosophy, total quality management (TQM) is becoming more popular. Implementing TQM is frequently guided by criteria like those found in the Malcolm Baldrige National Quality Award (MBNQA).

Nevertheless, reports suggest that fully evaluating TQM efforts is challenging and that employing specialists to assist with this work is expensive. An appealing alternative to comprehensive assessment is the use of survey tools. Few instruments particularly address TQM evaluation, despite the abundance of articles on organizational performance assessment that are available. Furthermore, none of the TQM evaluation tools have undergone thorough validation; as a result, conclusions gained through their use can only be reasonably confident. This article suggests a quick and affordable tool a straightforward questionnaire to aid organizations in carrying out self-evaluations of their TQM initiatives. The suggested instrument was created in collaboration with the Excellence in Missouri Foundation, which oversees the Missouri Quality Award (MQA), and is based on the seven categories of the MBNQA criteria. This article focuses on how survey results can direct future TQM implementation efforts.

Self-assessment

Quality accomplishment, which was once a strictly technical issue, is now a significant management issue that involves organizing, planning, coordinating, controlling, analyzing, forecasting, and optimizing activities. The Japanese term KANRI for TQM, which means management and continuous improvement, is the equivalent. TQM is referred to as full quality management (GIQ) in France and Canada. Deming believed that allowing workers to conduct quality control on their own was the only way for a product to be of better quality. Quality, according to him, is mostly a result of people's dedication. We are in a self-evaluation scenario. Deming also created a thorough management approach based on the tenet that "a company must never stop improving its products or services and must have customer satisfaction as its only goal."

According to Deming, an organization must adopt and apply this principle at every level, thus changing the entire culture of the business, in order to be successful. Deming stated that one of the main goals of the quality Programme should be to establish a culture of quality. Top management must initiate and drive change. After the failure of the final control was discovered, the significance of self-evaluation increased. In a system that integrates efforts on design quality, quality of achievement, and improving the quality of various functions of an organization to be able to ensure the economic level of production and services, total quality, full control, and self-monitoring or self-assessment emerged as a result. With the purpose of satisfying customer demands Total quality management (TQM) is rising in popularity as a management philosophy.

The Malcolm Aldridge National Quality Award (MBNQA)'s criteria are commonly used as a guidance while implementing TQM. Nevertheless, reports indicate that fully assessing TQM

efforts is difficult and that hiring experts to help with this process is expensive. Utilizing survey tools is an attractive substitute for thorough assessment. Despite the wealth of papers on evaluating organizational performance that are available, few instruments specifically address TQM evaluation. Furthermore, none of the TQM evaluation tools have been subjected to extensive validation as a result, judgments drawn from their use can only be moderately confident. This article provides a quick, low-cost tool a simple questionnaire to assist businesses in conducting self-evaluations of their TQM programmers. The suggested instrument was developed in conjunction with the Excellence in Missouri Foundation, which is in charge of administering the Missouri Quality Award (MQA), and it is based on the seven MBNQA criteria areas. This article focuses on how survey findings can guide subsequent TQM implementation initiatives.

Self-assessment is the process of comparing an organization's operations and results to the EFQM excellence model in detail, systematically, and over time. The organization can clearly identify its strengths and potential growth areas through the self-assessment process. The role of institutional self-assessment in education is rising. It is a critical component of quality improvement and represents a shift away from inspection towards the institution assuming ownership of its own quality, which is a crucial indicator of organizational maturity. It is a crucial component of the continuous improvement culture. It is the method by which educational institutions critically evaluate their own performance and utilize the results as the basis for enhancing their services in the future. An organization that takes self-evaluation seriously is more likely to succeed. The secret to better serving the needs of students is self-assessment.

Self-Evaluation

The first diagnostic step on the way to overall quality is the use of self-assessment or quality audit. The existence of a self-assessment checklist provides the institution with a benchmark to which it can compare itself. It offers a foundation for developing a quality understanding. It enables the organization to identify its assets and weaknesses and, using this information, to choose the best course of action for improvement. As a result, self-assessment serves as a motivator for raising standards and advancing education. An organization can use this information to create an action plan for its future growth. Such checklists can also be used to track progress and assess success and failure on a regular basis. There are numerous self-evaluation frameworks accessible. The TQM self-appraisal approach developed by the European Foundation for Quality Management (EFQM) is one of the most complex. According to the EFQM, self-assessment is a stimulus for advancing performance.

EFQM Definition of Self-Assessment

Self-assessment is a thorough, systematic, and ongoing evaluation of an organization's performance in comparison to the EFQM Excellence Model. The organization can clearly identify its strengths and areas for improvement through the self-assessment process, which leads to planned improvements that are then tracked for success (EFQM, www.efm.org).

Utilizing a Self-Evaluation Checklist

Many self-auditing checklists have the drawback of appearing intimidating. They create an impossible-to-attain perception of perfection by listing every conceivable criterion for greatness. This chapter's checklist was created as a straightforward tool. It focuses on the most crucial topics while covering the essentials. Its scope and objectives are adaptable. It serves as a tool to support policy and decision-making. It can serve as an effective road map for what is good and what needs to be improved. It can serve as a springboard for the creation

of crucial success elements and an action plan for improvement. It is crucial that instructors apply the self-assessment process in a thorough and efficient manner. This entails:

1. Making sure that adequate attention is paid to the quality of teaching and learning.
2. Making sure that action plans are constructed in such a way that they lead to demonstrable improvements that build on strengths and reduce weaknesses.
3. A Striving For Objectivity When Making Judgments. Educators must be realistic about the performance of their institutions.

The senior management team of an institution can use a checklist to rate their impressions of how the institution performs. This is fine, but it should also be applied to the staff and, at the very least, a representative sample of various client categories. It can be really illuminating to compare how various groups perceive things. Additionally, it can cause the ranking of a company's strategic priorities to shift. Establishing an audit team is another approach to use such a tool. This group would be tasked for gathering the proof to back up the inferences made from each piece of information. Focus groups would be used to make contact with staff and students as part of the evidence-gathering process.

Senior management, teaching and support staff, students, and possibly an external client, such as a representative from the employer, should all be included on the audit team. The proper institutional decision-making panels would then receive a report from the team. Such an audit technique is significant since the actual process of gathering the evidence serves as both a developmental and an evaluation exercise. It is crucial to understand that this kind of quality auditing is developmental in nature rather than judgmental. Instead of pointing out flaws, it is important to emphasize effective strategies and demonstrate places where advancement and change will be advantageous. It serves as a manual for planning and improvement.

Putting together the Action Plan

The goal of self-evaluating quality is to get better. This is accomplished by properly and impartially evaluating the standard of the provision against each indicator, then deciding what steps should be taken to enhance the procedure. Action planning is the practice of putting improvements into motion. The action plan is a written document that lists timeframes, performance indicators, and specific people for each suggested course of action. The action plan needs to be a dynamic document that the entire organization owns.

The Markers of the Self-Evaluation's Quality

This checklist replaces the one from the first version of the book and takes into account some of the suggestions and changes made by Martin Barlosky and Professor Steve Lawton in their incredibly helpful book Developing Quality Schools. This self-assessment has been designed specifically for education and incorporates key areas, such as teaching and learning and services to students that are lacking in the generic checklists. This is in contrast to other audit devices such as the European Quality Management Foundation or ISO9000 that are generic in nature. Of course, institutions can alter the checklist to meet their particular needs.

There are 10 quality markers on this self-evaluation checklist. To demonstrate their relative relevance in the quality process, these have been weighted. Leadership and efficient teaching and learning are given the most weight. Because excellent leadership is a fundamental component of high-performing educational institutions, as demonstrated by multiple studies, leadership is of utmost importance. Good managers motivate their team members and foster a desire for continuous growth. People working there, especially management, have a clear awareness of standards and what has to be done to meet them in places with high student

success rates. 35% of the final score is made up of the leadership, teaching, and learning components. The following are the metrics for the institutional quality self-assessment.

1. Access (5%).
2. Customer services (5%).
3. Initiative (15%).
4. The resources and physical environment (5%).
5. Efficient instruction and learning (20%).
6. Pupils (15%).

The Rating System

Score 1 for excellence on this checklist, and 5 for subpar performance. Making the self-evaluation objective in this exercise is crucial, so be sure to back up each grade with supporting details. It is crucial to assign grades for each indicator individually as well as an overall institutional grade that reflects the caliber of the entire institution. Each score is based on the following factors.

Educational Institutions

A useful tool for self-auditing and enhancing educational quality is self-assessment by educational institutions. Self-assessment enables educational institutions to evaluate how well they are meeting defined educational norms and criteria. It aids organizations in determining where they meet or exceed standards and where they need to improve.Curriculum development through self-assessment, institutions can assess their curricula and teaching methods. It assists in determining if the curriculum supports efficient teaching and learning, satisfies student needs, and is in line with educational objectives.Student performance, learning outcomes, and teaching strategies are all evaluated during self-assessment. It fosters the adoption of research-based teaching methodologies and aids in identifying effective instructional tactics and areas that require improvement.

Educational institutions examine their infrastructure, settings, and resources through self-assessment. This evaluation shows where there is need for improvement or more investment while also ensuring that the physical environment promotes efficient teaching and learning.Part of the self-assessment process is assessing the accessibility and efficacy of student support services like academic support, career counselling, and counselling. It assists institutions in identifying support service gaps and putting solutions into place to improve student achievement.Self-assessment means including faculty, staff, parents, and students in the evaluation process. This encourages openness, teamwork, and a sense of responsibility for raising educational standards.Self-Evaluation is a motivator for ongoing progress. It aids organizations in setting objectives, tracking results, and putting improvement plans into action. Institutions are able to adapt to changing requirements and uphold high standards of quality thanks to routine cycles of self-evaluation. Self-evaluation in Total Quality Management (TQM) has a number of benefits, such as:

1. **Enhanced Organizational Learning:** Self-assessment encourages an organizational culture of ongoing learning and development. Employees are encouraged to review their work, exchange ideas and best practices, and work together to improve organizational performance as a whole.Self-assessment gives organizations the ability to proactively identify areas for development. Organizations can see problems and take corrective action before they worsen by routinely analyzing their processes, systems, and performance.
2. **Employee Empowerment and Engagement:** Self-assessment includes participation from staff members across the organization. Employee motivation, job satisfaction, and

dedication to quality improvement projects all rise as a result of this involvement, which develops a sense of ownership, empowerment, and responsibility among staff members.

3. **Customer Focus**: Self-evaluation aids organizations in better comprehending and meeting the wants and expectations of their clients. Organizations can determine areas where they can enhance the quality of their products or services and promote customer loyalty and retention by evaluating customer satisfaction levels and feedback.
4. **Data-Driven Decision Making:** Self-assessment gives businesses useful information and insights to use in making data-driven decisions. It facilitates organizations' decision-making processes by assisting them in making well-informed choices based on unbiased assessments and analyses of performance measures.
5. **Resource Optimization:** Organizations can uncover inefficiencies, duplications, and wasteful areas in their operations by conducting a self-assessment. Organizations can optimize resource allocation, lower expenses, and boost overall operational efficiency by recognizing and addressing these areas.Self-assessment gives organizations the ability to continuously enhance their quality standards, procedures, and levels of client satisfaction. Organizations can obtain a competitive advantage in the market, draw in more clients, and set themselves apart from rivals by continually improving their performance.

CONCLUSION

Self-assessment is a thorough, systematic, and ongoing evaluation of an organization's operations and outcomes in comparison to the EFQM excellence model. The organization can clearly identify its strengths and areas for progress thanks to the self-assessment process.Self-assessment is increasingly used as a foundation for assessing progress towards and achievement through complete quality, and like many efforts, there are some fundamental guidelines for success. Provides a self-assessment procedure and some dos and don'ts for success while examining the application of the EFQM Model as a framework. Additionally, it lists a few advantages and offers a doable foundation for organizing subsequent actions.

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CHAPTER 12

TOTAL PRODUCTIVE MAINTENANCE FOR PRODUCT QUALITY IMPROVEMENT

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ABSTRACT:

Total productive maintenance (TPM) is the process of using machinery, tools, personnel, and auxiliary procedures to preserve and enhance the reliability of systems and the integrity of output. Implementing a TPM Programme can have a significant long-term influence on your overall equipment effectiveness (OEE) because the purpose of TPM is to increase productivity by reducing downtime. Preventive maintenance needs to be everyone's top priority in order to do this.In this chapter discussed about the total productive maintenance of the total quality management. One of the largest benefits of implementing a TPM Programme is switching from reactive to predictive maintenance

KEYWORDS:

Equipment, Maintenance, Management, Staff, Work.

INTRODUCTION

A profitable manufacturing system depends on proper maintenance try running a production line with broken machinery. Total Productive Maintenance (TPM), which involves collaboration throughout the entire organization, aims to maintain the current plant and equipment at its highest level of productivity. Usually, the initial job is to persuade maintenance and production staff to collaborate by removing their conventional barriers.Peak performance or total productivity is the goal that people working together without respect to organizational structure, using their abilities and innovation, can achieve[1][2]. This strategy does not imply that fundamental methods like predictive and preventative maintenance are not employed; on the contrary, they are crucial to laying the groundwork for a successful TPM environment. Preventative maintenance is the process of regularly completing tasks on the equipment, such as lubrication, to keep it operating, whereas predictive maintenance is the process of using data and statistical methods to predict when a piece of equipment will fail.

The goal of the entire maintenance function should be to get rid of unforeseen equipment and plant maintenance. The goal is to develop a system that enables all maintenance tasks to be planned so that they don't obstruct the manufacturing cycle[3]. Equipment failures that are unexpected shouldn't happen. Prior to the development of computer-aided manufacturing, certain organizations' operators were in charge of their equipment and took a certain amount of pleasure in it. Operators spent a portion of their workday maintaining their equipment with the assistance of maintenance personnel. More tools are now available to us thanks to recent technological advancements for the maintenance function[4].When TPM is broken down into its three words, we have:

Total=Total refers to everything when manufacturing and maintenance personnel collaborate.

Productive=Producing goods and services that meet or surpass customers' expectations is referred to as being productive.

Maintenance=Equipment and plants should always be kept in as good as or better than their original state.

The main objectives of TPM are:

1. Preserving and enhancing equipment capacity.
2. Lifelong equipment maintenance.
3. Obtaining assistance from all divisions of the operation.
4. Encouraging feedback from all staff members.
5. Making use of teams for ongoing development.

Without also paralleling the principles (Programme in) total quality management, organizations that apply the principles (Programme in) failure mode effect analysis, employee involvement, continuous improvement, just-in-time manufacturing, statistical process control, and experimental design, to name a few, cannot succeed. How can a corporation apply just-in-time production, for instance, when equipment downtime and failures are not frequent? Or, how can businesses encourage problem-reporting from machine operators or staff members of the maintenance department if they are not included on the team [5][6][7].

Principles

The eight TPM pillars are primarily concerned with preventive and proactive methods for raising equipment reliability:

1. Operators performing autonomous maintenance employ all of their senses to find potential sources of loss.
2. Using a scientific approach to issue solving to decrease factory losses.
3. Professional maintenance tasks carried out by skilled engineers and mechanics.
4. A scientific and statistical method for locating flaws and removing their causes.
5. Early/Equipment Management: The scientific introduction of equipment and design ideas that reduce losses and make it simpler to produce goods without defects quickly.
6. Support for ongoing management and employee knowledge growth through education.
7. Using total productive maintenance tools to enhance all plant support functions, such as production scheduling, materials management, and information flow, as well as boosting employee morale and giving out rewards to deserving staff members for doing so.
8. circumstances for environmental health and safety[8]

The Scheme

Finding the present operational parameters is the first step in any performance review. Right now, where are we? What systems do we employ, and how do they function? What state are the machinery and plant now in? Do we have functioning systems that merely need to be enhanced, or are we beginning from scratch? The theory of total quality management (TQM), known as total productive maintenance (TPM), is extended to the maintenance function. To start moving an organization towards TPM, follow these simple steps:

1. The new philosophy is taught to management.
2. The new ethos is promoted by management.
3. All employees within the company receive funding for and development of training.
4. The need for improvement in certain areas is noted.
5. Performance targets are developed.

6. A plan for implementation is made.
7. Independent work teams are created [9][10].

DISCUSSION

New Philosophy

Change is one of the hardest things for senior management to handle. They must educate themselves about TPM and how it will impact their business. There are numerous successful examples, but there are also lots of businesses that have tried and failed at various performance-improving strategies. Benchmarking against a prosperous organization will yield insightful data. Management must make a special effort to facilitate cultural transformation on an ongoing basis from top to bottom. The simple solution is to embrace the positive performance metrics of today and ask, why change? The solution is to improve profitability and gain a competitive edge. Many of an organization's rivals are probably making improvements, and they will likely surpass other organizations that don't change in the future by a wide margin. Additionally, the idea that "I am the chief, I know more than those who work here" exists in management. TPM only aims to make use of an underutilized resource the intellect and problem-solving skills of every employee of the company. So, it's essential to give people the power to decide. This strategy is not permissive management because management is still in charge of the organization's performance. But it does indicate a distinct approach to management.

The fad-of-the-month method to modifying management techniques has been used by many organizations. Employees now question the credibility of this strategy. When management is replaced, the new manager instead of building on prior successes creates a new system that is intended to address all of the organization's issues. It appears that a lack of ownership contributes to low morale and managerial unhappiness. Ownership should be based on what is best for the client and the staff members that assist the client. Understanding what needs to be done is aided by an examination of Southwest Airlines or Hewlett Packard's operating procedures. These businesses, as well as others, place a strong emphasis on the empowerment of their employees. It is challenging to contest their performance metrics. In the beginning, management will have to put in more effort. It will eventually result in less work as everyone begins to address their own issues.

Encouraging the philosophy

Senior management must devote a lot of time to system promotion. The idea must be sold, and quality control must be allowed. Employees are aware of their unwavering dedication to the company's success. Similar to TQM or any other significant organizational transformation, top-level commitment is required. Positive outcomes won't occur until there is dedication to and believe in the new mindset. Lip service to a new idea is given far too frequently. This behavior is typically motivated by the expectation that the new technology will provide a quick payback on investment and resolve certain pressing issues. A sustained dedication to the new philosophy is necessary. Other companies have demonstrated that it is a better method of conducting business. Management should set an example by putting the new ideology into practice. Organizations that are struggling can partially be attributed to false leadership. Simply starting to practice the new philosophy is one of the best methods to incorporate it. Start granting the maintenance and manufacturing staff more independence, in other words. Employees typically react as soon as they sense that management is committed to changing the organization's course for the better. When TPM is introduced with great hoopla, employees tend to dismiss it as the newest trick to persuade them to work more. The first step in management's credibility-building process is to change first and set the example.

Training

Teach the philosophy to all levels of managers. Senior management should come first, followed by first-line supervisors. Teach the WHY in addition to the HOW. The implications of implementing this ideology within an organization must be thoroughly explained to senior management. Is top management committed to making the long-term sacrifices necessary to get results? Some managers might need to be replaced or forced to retire early because they won't alter their interpersonal communication style. It's important to identify the managers who adopt the new philosophy easily. Middle management needs to understand how to work in teams and understand how small autonomous work groups operate. This organizational level appears to be the one that is having the most trouble with the transition. Middle managers have been hurt by downsizing in recent years. Of fact, management in this area has historically been exaggerated. The management structures that are created by the TPM and TQM principles are flatter. When you give people the freedom to choose for themselves, you don't need as many levels of management making sure that workers are performing their duties properly.

First-line managers must become familiar with their position in what will probably be a new environment. Supervisors who are accustomed to leading their teams will find the adjustment simple. The era of the dictatorial manager is over. This will be challenging for supervisors who have been giving employees explicit instructions. Supervisors will give up some of their authority, even though it might just be apparent. A workforce with a high level of education does not accept that management style. In actuality, a manager is only as good as their capacity to develop their staff. As members of an autonomous work group, employees must get familiar with the numerous instruments utilized in carrying out their duties. There should be some instruction on the duties performed by production and maintenance personnel. The exchange of ideas between production and maintenance personnel is a significant advantage of TPM.

Enhancement Needed

There are generally a few machines that seem to be about to malfunction or need a lot of maintenance. More than anyone else in the company, employees who regularly use the equipment are better equipped to recognize these circumstances. Allowing operators and maintenance personnel to inform management of which equipment and systems require the most attention is a smart starting step. This process must be coordinated by an implementation team of operators and technicians. By doing this, the organization will establish credibility and begin its transition to TPM. The team's initial task is to determine the present situation. What, therefore, is the starting point? The following metrics were created by the Japanese and are widely used today. It is necessary to gauge and monitor six primary loss areas:

Losses from Downtime

Scheduled events include:

1. Start-ups.
2. Shift changes.
3. Coffee and lunch breaks.
4. Scheduled maintenance shutdowns.
5. Minimized Speed Losses.
6. Idling and brief halts.
7. Delays and Losses of Low Quality.

8. Process incompatibilities.
9. Scrap.

These losses can be broken down into three metrics and summed up into a single metric for equipment effectiveness. Here are the equations for these measures. Equipment availability is used the equation to calculate downtime losses.

$$A = (T/P) .100$$

A = accessibility where,

T stands for operation time (P D)

P = planned operational time D = downtime

Tracking performance effectiveness with the equation allows for the measurement of reduced speed losses.

$$E = (C.N/T) 100$$

Where E = performance efficiency

C = theoretical cycle time

N = processed amount (quantity)

Goal

After identifying the areas that require development, objectives should be developed. Establishing a timetable for solving the top priority issue is an excellent initial objective. Because it causes them more issues on a daily basis, technicians and operators will likely want it done sooner than management. The process of getting the organization to work as a team starts with identifying needs and creating goals.

Making Plans

First, create and carry out a comprehensive training strategy for all staff. Plans for creating the autonomous work groups should be made during the training phase. To tackle extremely challenging issues, prepare to operate in teams of maintenance operators and technicians. To address some of the fundamental issues, management can establish priorities and commit resources. The formation of independent work groups, which are teams established for everyday activities, will be facilitated by the use of the team method. Employees should now have a say in how these autonomous teams are set up. The idea that independent work groups would evolve over time should be considered during some of the planning. The organization's overall structure will alter as processes and procedures are enhanced. It would be absurd to expect independent work groups to remain static.

Workgroups that Operate Independently

Based on the organic flow of activity, autonomous work groups are created. Make the operator accountable for the machinery and the level of maintenance that he is able to handle. Determine the maintenance staff members who are skilled in particular fields or who work in those areas next. An independent work group is created by combining operators and maintenance staff. These organizations must have the power to decide how to keep the machinery in top working condition. Depending on the application and industry, autonomous work groups will have a distinct organizational structure.

Employee Involvement, gives the details required to choose the structure. The operations staff consults with maintenance technicians as well. They instruct operators on how to perform certain operations including oiling, minor troubleshooting, and setups. The autonomous work group's principal objective is to lessen the need for maintenance work. Freeing up highly qualified maintenance technicians from the more boring everyday activities is an added benefit. Major overhauls and helping with problem-solving that the autonomous work group cannot solve are handled more efficiently by skilled experts.

Exemplary organization for TQM

36 upscale hotels are managed by The Ritz-Carlton Hotel Company, a separate business unit of Marriott International, Inc., in the Americas, Europe, Asia, Australia, the Middle East, Africa, and the Caribbean. The Mobil Travel Guide has awarded all of them four or five stars, while the American Automobile Association has given them diamond ratings. More than 85% of the 17,000 staff members who make up The Ladies and Gentlemen of The Ritz-Carlton work in hotels. The corporation supports employees' advancement within the company by providing possibilities for professional growth and extensive training programmers.Horst Schulze, president and chief operating officer of Ritz-Carlton, started off as a waiter's trainee in a hotel in Europe. To be the premier global provider of luxury travel and hospitality products and services, reads the organization's mission statement. The Gold Standards, which include the company's Motto, Credo, Employee Promise, Three Steps of Service, and The Ritz-Carlton Basics basically a list of performance expectations and the protocol for interacting with customers and attending to their needs are distributed to each employee in the form of a wallet-sized booklet.

These are emphasized throughout the company's incentive and recognition Programme, daily five- to 10-minute briefings, and the company's 250-hour training Programme for front-line staff.The Ritz-Carlton is meticulous on every level. Standards are created for all processes, methods of data collecting and analysis are reviewed by outside specialists, and steps for all quality-improvement and problem-solving procedures are documented. Additionally, key procedures are broken down to locate potential error-prone areas. The Ritz-Carlton has implemented a customer customization strategy that depends on extensive data collection and makes use of the capabilities of cutting-edge information technology in order to foster customer loyalty. An over one million file database houses the data that is consistently entered throughout various forms of client encounters, such as responses to service requests made by overnight visitors or post-event reviews done with meeting planners. The database, which is available to all Ritz-Carlton hotels worldwide, enables hotel staff to anticipate needs of returning customers and to take action to assure a high-quality experience.

99% of respondents to an unaffiliated study said they were pleased with their overall experience, and more than 80% said they were extremely satisfied. Any employee may spend up to $2,000 to deal with a problem or complaint right away. Managers and staff members receive 250–310 hours of training their first year. The state of the economy's finances is improving as well. Since 1995, total fees, earnings before income taxes, depreciation, and amortization, and pre-tax return on investment have all increased by almost double. Return on investment rose from 5.3% in 1995 to 9.8% in 1998. Revenue per available room, the industry's benchmark for market share, is still increasing and is now more than 300% higher than the sector average. Ritz-Carlton was chosen as the Overall Best Practices Champion in 1998 research by Cornell School of Hotel Administration and McGill University from a group of 3,528 nominees.

Advantages

The benefits of Total Productive Maintenance (TPM) in Total Quality Management (TQM) include:

1. **Organizations:**TPM places a strong emphasis on reducing equipment failure rates and raising equipment reliability. Organizations can improve overall productivity, decrease unplanned downtime, and boost equipment availability by using proactive maintenance practices.
2. **Increased Equipment Efficiency Overall:** TPM attempts to increase the efficacy and efficiency of the equipment. Organizations can increase production efficiency by employing preventative and predictive maintenance strategies that optimize equipment performance, decrease cycle times, and minimize waste.
3. **Employee Engagement and Empowerment:** TPM entails educating and enabling staff to take charge of equipment upkeep and improvement tasks. Employee participation and sense of responsibility are encouraged, which improves job satisfaction and promotes teamwork and collaboration.
4. **Improved Product Quality:** TPM concentrates on preventing equipment-related flaws and problems that could affect product quality. Organizations may decrease variations, errors, and rework by keeping their equipment in top shape, which will increase product quality and customer happiness.
5. **Cost Reduction:** By implementing effective maintenance procedures and reducing breakdowns, TPM aids organizations in lowering maintenance expenses. Additionally, it enables businesses to slash overall operational costs, optimize inventory levels, and cut spare parts and maintenance-related expenditures.
6. **Culture of Continuous Improvement**: TPM encourages staff members to locate and take care of equipment-related problems in order to foster a culture of continuous improvement. Cross-functional teams, problem-solving strategies, and frequent improvement activities are all used to foster a culture of ongoing improvement.
7. **Integration with TQM Principles:** TPM is consistent with TQM's guiding principles, including employee involvement, continuous improvement, and customer focus. By ensuring that equipment performance and dependability contribute to the supply of high-quality goods or services, it helps the overall quality management system.

CONCLUSION

TPM is a TQM extension for maintenance tasks. Managing the change requires management to show commitment, get involved, promote the philosophy, provide resources, and support training, just like managing any other improvement Programme.Finding and quantifying the six major losses on a single essential machine, which call for the most care and attention, is one of the first tasks for the teams. Goals are chosen and an action plan is created based on the situation as it stands right now. The formation of autonomous workgroups should occur during the training phase. As part of this procedure, the operator is held responsible for the routine maintenance tasks for which he or she is qualified, and the maintenance worker with the required degree of ability is assigned to the independent work group. TPM has been effectively deployed globally in a large number of organizations.

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