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IMPLEMENTATION OF TQM TOOLS FOR OPTIMAL RESULTS: TOOLS FOR BETTER PRODUCTS

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Abstract

Total quality management (TQM) represents a strategic approach with a goal for better quality of the products through the integration of its techniques and tools for continuous improvement of the processes, increased satisfaction and fulfillment of the customers' expectations. By introducing the TQM, better quality of procucts and services is obtained, costs are redusts, and greater market penetration is enabled. This research is aimed at the appreciation and understanding of the need for introducing TQM tools such as Pareto Chart, Control Charts, Flow Charts, Fishbone diagram, Checksheet, Histogram and Scatter diagram. Also, it evaluates their effectiveness in achieving optimal results in production processes. Additionally, the paper points out organizations which have successfully implemented TQM and its tools demonstrating their ability to deliver defect-free products thereby gaining the loyalty of their customers as well as acquiring new ones. This paper highlighted the importance of TQM implementation through the introduction of best practices and innovative techniques.

Key words: *TQM, tools, customer loyalty, better process*

JEL Classification: L16, L60, M11

INTRODUCTION

Total quality management emphasizes continuous improvement in all organizational departments and levels, encouraging better knowledge about quality, as well as better cooperation among employees. The question of what kind of quality an organization has is increasingly present among management in all spheres of social action. Total quality management is considered as a civilizational response to the postindustrial revolution whose starting goals are productivity and profit as an indicator for quantity, while the negative consequences are the destruction of natural resources, environmental pollution, and the threat to human health and safety. By monitoring and improving quality all functions in the organization should be better aligned, which will contribute to better quality at the end and greater profitability. The key principles of this concept are focus on clients with putting their needs as a primary goal, continuous improvement of the processes, products and services, involvement of all employees enabling them to contribute to providing ideas for quality, process orientation, and ensuring that management actively promotes quality by introducing and supporting quality practices. As customer demands for quality products grow, organizations must adapt to meet their demands and deliver a quality product by improving their processes, as well as adopting innovative approaches. Total quality management techniques offer a practical, yet proven solution for organizations that aim to improve product quality as well as their operational efficiency, from minimizing defects to improving customer satisfaction through effective implementation of TQM tools.

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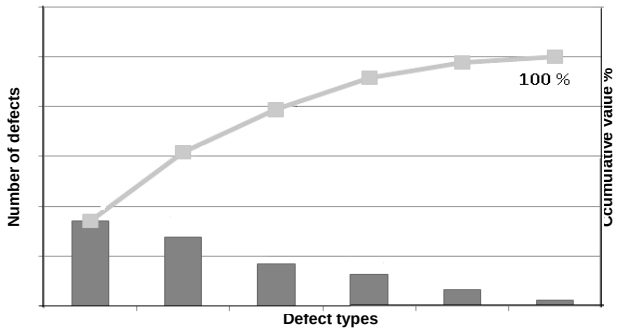
UNDERSTANDING TQM TOOLS

TQM tools are of great help for the organizations when it comes to following and identifying problems, correcting, and improving their quality in the future processes. Total quality management through its basic techniques and methods analyses, follows and improves the quality of services, products and processes. The basic and most used seven tools for total quality management are: Pareto Chart, Control Charts, Flow Charts, Fishbone diagram, Checksheet, Histogram and Scatter diagram.

Pareto chart is a graphical method for defect analysis that reveals the places (operations, process stages) where defects occur in the greatest number of cases. This analysis is used for decision-making that is used to identify and prioritize the most significant factors contributing to the occurrence of defects in processes. Pareto analysis is often called the "80/20 rule" and indicates that 80% of defects come as a result of 20% of the causes or 80% of product defects arise from 20% of the production steps in the processes. This analysis helps organizations focus their efforts on the most impactful problems, reduce defects, and improve quality. Furthermore, pareto analysis is simple yet useful and a powerful tool for decision making, helping companies achieve better efficacy and effectiveness. Pareto analysis begins by defining the problem and collecting data related to the problems or defects, then sorting them by frequency and ranking from least significant to most significant, visualizing them by presenting a Pareto chart (Figure 1), and identifying critical issues with a focus on the less important categories that contribute to most of the problems.

The benefits of applying Pareto analysis are better quality control by identifying the primary causes of defects, analyzing the most common customer complaints, prioritizing areas with the highest potential for improvement through resource allocation, and improving processes by timely detection of deficiencies in production processes.



Picture 1. Pareto diagram

Source: https://asq.org/quality-resources/pareto/

Control Charts are a graphical tool that shows the difference between normal (random) and abnormal (assigned) variations, helping to maintain consistent quality in order to monitor process performance and detect certain variations with processes. Process quality control is performed by checking the quality of semi-finished products, while they are in the process of transforming raw materials. When the quality control determines that the characteristics of the process are deteriorated, the process is stopped and the cause is investigated. Afterward, when the reason for deterioration is identified, the process is corrected and the production continuous. There are several types of control charts, but they all belong to two types of control charts: control charts for measurable characteristics and control charts for attribute characteristics. Control charts provide answers when the process should not be

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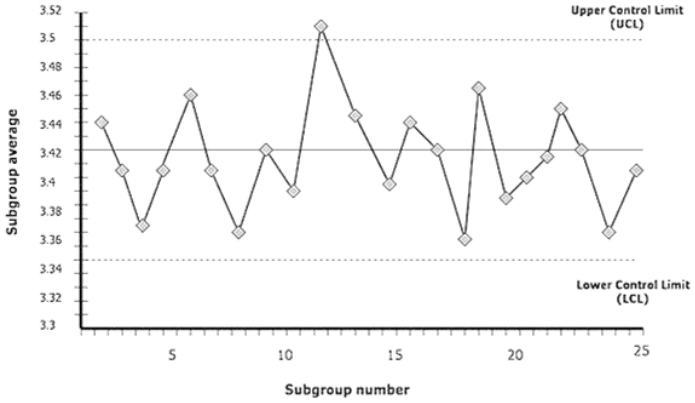
intervened in, because it is stable and capable, when the process should be intervened in, because the action can make it "more capable", to reduce variations, and when production should be stopped immediately, because a poor quality product will be produced (defective production). The control card has a central line (CL) which represents the average or mean of the process data, upper control line (UCL) or the maximum acceptable variation in the process, and a lower control limit (LCL) or the minimum acceptable variation in the process. The Y axis is plotted with the measurement value, i.e. the statistical indicator of the property being controlled, and the X axis is plotted with the time of sampling (Figure 2). When the measurement data are within the control limits, the process is stable, but if they are at or outside the control limits, corrective measures need to be taken.



Picture 2. Control card

Source: https://byjus.com/maths/control-charts/

Flow Charts represent the process or workflow using standardized symbols that show the sequence of steps. They help to make the process easier to understand, analyze, and improve by identifying inefficiencies, defects, and duplication of work activities. The key components of Flow Charts are symbols and steps as an individual activities or tasks needed for the accomplishment of the process, presented in detail as on picture 3. The symbols used are oval represents start and end of a process, rectangle represents an action, task, or operation, diamond represents a decision point and arrow shows the flow or direction of the process. Flow Charts are used to document workflows, for order processing or inventory management, in manufacturing to map steps in production to identify inefficiencies and to improve process quality through visualization of processes for detecting and eliminating defects, by standardizing the training and documentation process. These charts are widely used in various industries to simplify processes and encourage their continuous improvement, they also help in process optimization and quality improvement.

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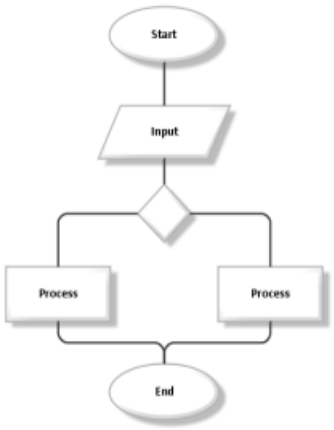

Picture 3. Flow Charts

Source: https://httpwanda.wordpress.com/2018/11/07/flowchart/

Checksheet e simple and easy tool for collecting and organizing data during production processes. It serves to systematically record information, identify patterns, and analyze data to improve processes. Each checklist has a description of the purpose, why, how, and what is being monitored, the data is divided into categories, there is a table with graphic structures, and data that is recorded during the process. This tool is easy to understand and use, suitable for all levels of employees, helps in discovering patterns, trends or problems, provides a quick and direct way to collect data and provides archiving of data for future analysis, i.e. documentation.

Scatter diagram is a graphical tool used to analyze and display the relationship or correlation between two variables. They help identify patterns, trends, and potential relationships in data, making them essential for quality control and troubleshooting when implementing total quality management. This tool shows whether there is a correlation between two factors (for example, strong positive, negative, or no correlation), provides a clear picture of how variables are related, helps identify areas that need improvement in production processes or systems, and identifies irregularities or defects. A Scatter diagram shows a positive correlation when the two variables increase together in an upward direction, when one variable increases and the other decreases or decreases in a downward direction, it is a negative correlation, and when there is no recognizable relationship, then we say that there is no correlation between the observed and measured variables.

Fishbone diagram is popular in the literature due to its shape as a fish skeleton or as a diagram of cause and effect (Cause and Effect, CE). The Ishikawa diagram helps the manager find and fix the causes of defects, reduce time losses, etc. It is constructed by drawing a main axis and defining the problem or goal to be solved on the right. The goal should be clear and precise. The auxiliary axes are added laterally, on which the factors, the main causes of the problem, are listed, while the auxiliary axes are added to the side axes, on which the causes of the main causes should be listed. In this way, a branching diagram or Ishikawa diagram is obtained, shown in Figure 4. This tool can be applied in three phases with a problem statement, root cause analysis, and diagram construction. The fishbone diagram is used in many industries to improve processes, encourages group collaboration and idea generation, provides a structured way to analyze problems, and simplifies complex problems.

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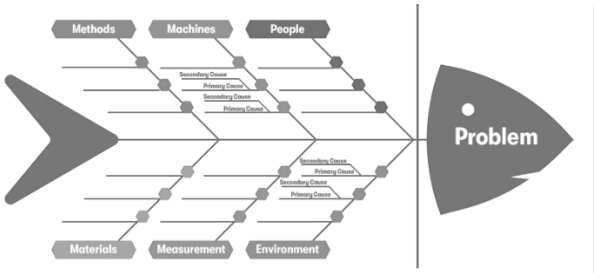

Picture 4. Ishikawa diagram

Source: https://purplegriffon.com/blog/fishbone-diagram-ishikawa

Histogram is used to visually display the distribution of numerical data. It shows the frequency of data points within specified intervals, making it an effective tool for analyzing patterns, trends, and variations in processes or data. It provides data distribution, helps identify trends, highlights irregularities, and provides insight into variation and consistency. In histograms, the data distribution can be normal when the data is evenly distributed, then more data points are concentrated on the left or right side - skewed distribution, uniform distribution when we have equal frequency across all intervals and when there is clustering of the data or bimodal distribution.

CASE STUDIES

The TQM approach is focused on continuously improving the quality of products and services in order to exceed customer expectations. This paper presents several successful examples of organizations that efficiently and effectively cultivate the TQM methodology.

Toyota's Approach to Quality Management is a synonym for quality, reliability and innovation with quality improvement and the application of TQM tools and techniques, which have been key in establishing its position in the market as a global automotive leader. Toyota is known for its system for production management with the use of few key tools or systems like Toyota Production System (TPS) which focuses on two main principles: producing only what is necessary, when it is necessary and in the necessary quantity with which the waste will be minimalized and the costs decreased Just-In-Time (JIT) и Jidoka (Automation with a Human Touch). This means that the machines are designed to stop automatically when a problem arises in order to prevent a defective product to be made. Toyota also fosters a culture of continuous improvement, where employees at all levels are encouraged to propose and implement changes no matter how small in order to improve processes and product quality or continuous improvement (Kaizen). Inspired by TPS, Poka-Yoke is a technique for preventing errors by designing the process in such a way that errors are impossible or immediately detectable. Toyota does not only focus on its own quality management, but they work closely with suppliers, ensuring that parts meet their strict quality standards, thus ensuring consistency throughout the production chain.

Motorlola adopted the TQM methodology to better overcome defective products, increase customer satisfaction, and improve loyalty for purchasing their products. Motorola used Six Sigma, a process to improve quality and applied the DMAIC method (Define, Measure, Analyze, Improve, Control). By introducing this method, it was possible to find the root causes of defects and make important changes to improve quality, reduce costs and increase customer satisfaction. By introducing Six Sigma, employees created a culture of continuous improvement, supporting change, and managing large amounts of data. The TQM methodology also contributed to improving quality and efficiency with more competitive and profitable products and decisions.

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McDonald's applies TQM principles to ensure consistent quality globally. It uses TQM principles, but also lean principles to improve efficiency and reduce waste. To ensure consistent quality, McDonald's uses process mapping tools, and to reduce errors, it applies Six Sigma's DMAIC framework. Mistake-proofing techniques or Poka-Yoke are used to ensure food quality and prevent errors. Through the Kaizen principle, employees propose small, timely, and ongoing process improvements, and the Just-in-time principle is used to minimize storage costs and food waste. To reduce costs, Lean Six Sigma is also applied, through root cause analysis that identifies waste, and full productive operation keeps equipment operating efficiently, reducing downtime and repair costs. Standardization and standard processes enable the maintenance and improvement of product quality, which keeps McDonald's a leader in the fast-food industry. The advancement of lean processes ensures efficiency, effectiveness, and safety. McDonald's also places emphasis on customer focus, as the company prioritizes customer satisfaction by providing high-quality food, excellent service, and a clean environment.

BENEFITS OF TQM IN IMPROVING QUALITY

Total quality management provides numerous benefits to industries, employees, and consumers alike. By focusing on customer needs and expectations, TQM ensures higher quality products and services, leading to greater customer satisfaction and loyalty. TQM encourages a culture of continuous development of processes, products and services, i.e. continuous improvement by reducing defective products. It invests in employees and through training and their involvement in processes and problems motivates them to give initiatives to improve quality and their productivity. Standardized processes ensure that products and services meet required quality standards, thereby reducing waste, defects, and rework, reducing costs, and increasing quality and profitability. By ensuring superior quality and reliability, organizations gain a greater competitive advantage, attracting and retaining more users of products and services.

CONCLUSION

The introduction of TQM tools and techniques is key to achieving optimal results and producing better products. With their full implementation, organizations can identify the places where defects occur as well as weak production processes and focus on their elimination and their continuous improvement. This methodological approach fosters a culture of employee involvement, data-driven decision-making, and customer-centric approaches that ensure consistent quality and innovation. TQM tools and techniques improve coordination between departments, fostering a unified effort to efficiently and effectively achieve quality and product goals. Industries that apply this methodology stand out from the rest because they offer quality products and services, build loyalty, increase operational efficiency, lead to leadership and long-term competitiveness in the market. Their consistent use builds trust with customers, positioning the organization as a reliable supplier of high-quality products and services.

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