

Methods and Techniques Used in Evaluating the Quality and Profitability of a Company

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Abstract

The present study was set to validate and demonstrate the effectiveness and efficiency of quality methods and tools, the optimal correlation between objective and method, to find simple, cheap, fast and efficient tools for quality. The study shows us identifying simple ways for quality specialists, as well as increasing the share of real-time quality detection situations using quality techniques and methods correctly and in the necessary order.

Correlating these quality tools with the impact on the economy and profitability of the company, by decreasing the radius of scrap and rework and by decreasing the risks of complaints and increasing customer satisfaction.

The purpose of this paper is to present the means by which the company ensures that it fully satisfies the purchases made through its products. The quality control system is the main tool for achieving this goal.

Key words: quality management, techniques, decision, continuous improvement, production

J.E.L. classification: M11

1. Introduction

At the base of the management system of the modern organization, competitive on national and international level, there is a complex of principles, rules, requirements that ensure its modeling, corresponding to the precepts of management sciences. (Mittonneau, 1998)

The decision-making system is a component of the management system. It is extremely complex, incorporating a wide variety of decisions and allowing a wide variety of approaches. The decision-making system includes the phases through which the managerial decision is prepared, adopted, applied and evaluated. As an integral part of the company's management, Quality Management has a special role in the decision-making system. This paper aims to demonstrate this through a case study in an SME in Arad.

2. Theoretical background

Quality management makes use of techniques that can be divided into two categories: "7 Basic tools" and "7 New tools". The basic tools were first grouped by Karou Ishikawa, and the new tools were collected by the Union of Japanese Scientists and Engineers (JUSE) in the mid-1970s. The tools used in quality assurance are more and more numerous. It is important to be able to distinguish which one should be used in a given situation, so to have a sufficiently clear image of how the new and traditional instruments are positioned in relation to each other.

If the traditional tools of quality circles serve to solve numerical problems, the tools of the second generation are adapted to the management approach.

3. Research methodology

To conduct this study, an SME enterprise was selected and the impact of Quality Management in managerial decision making was analyzed.

The study was conducted at a small company in Arad (SME), in the plastics industry for the following industries:

- Industrial products: electronic equipment, electrical equipment, agricultural vehicles
- Sports products: sports equipment components, footwear components, boot components
- Consumer products: household products, hood components.

The company also offers additional services:

- Ultrasonic welding;
- Pad printing (plastic, steel);
- Assembly - manual, automated;
- Packaging.

In order to justify the notion of “small enterprise”, we took into consideration the definition given by prof. Univ. Dr. D. Tucu (2016): “enterprises with between 10 and 49 employees (inclusive) and at least one of the indicators: net annual turnover, respectively “total assets”, is lower than the ceiling of 2 million euros (inclusive), equivalent in lei”. Thus, based on the information received from the company's Financial Department, it can be easily seen that it falls into the SME category.

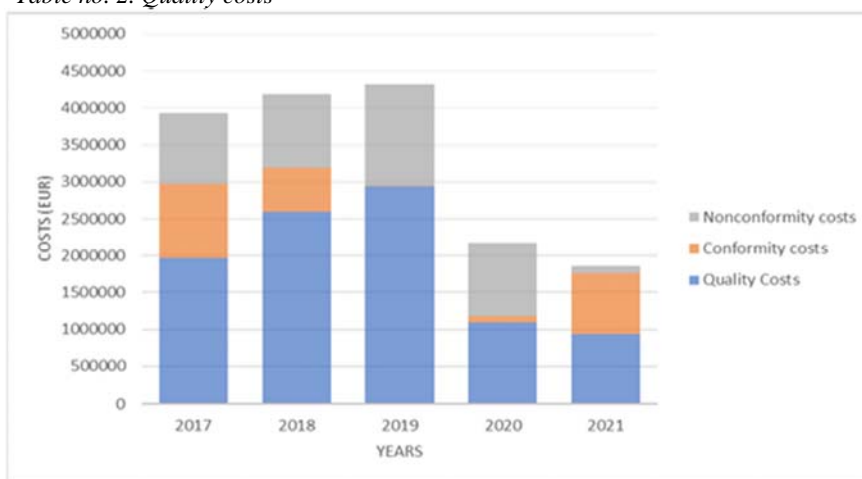
Table no. 1. Economical facts about SME

YEAR	TURNOVER (EUR)	NO. OF EMPLOYEES
2018	231.687	5
2019	476.799	8
2020	699.431	16
2021	1.062.393	26
2022	1.271.846	50

Source: Data taken from the balance sheets

The quality costs were also studied and we noted a fluctuant trend:

Table no. 2. Quality costs



Source: Data taken from the Quality Dept

In order to analyze the quality techniques system, we took as guide the Demming cycle and the steps proposed by C. Ionescu in his book “How to build and implement an Environmental Management System”. (Ionescu, 2000)

Dr. Yury Klochkov (2017) noted that in order to avoid conflicts, these methods and techniques should be carefully chosen, every problem being solved by a certain method.

Figure no. 1. Demming cycle

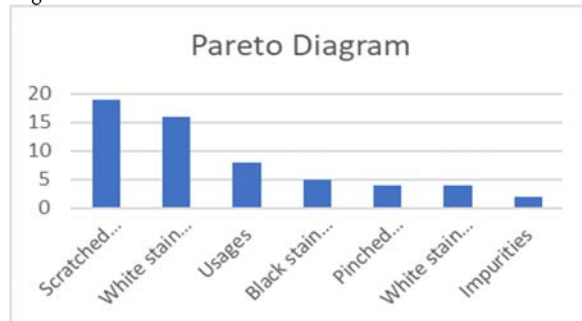


Source: (Ionescu, 2000)

1. Plan

This project enjoyed the full support of the company, which made the decision to apply the new methods to a batch of products returned from the customer as unsatisfactory. The work team consisted of 10 colleagues (5 operators, 2 team leaders, 1 product engineer, 1 quality engineer and was led by the quality manager). The team came to the conclusion that the classical applied techniques needed an improvement due to a hidden error. The main causes of lot return were analyzed and the Pareto chart was generated.

Figure no. 2. Pareto chart



Source: Quality Management Dept of SME

At this moment, instead of following the classic path, modern methods are taken into consideration. This leads to the second step:

2. Do

Performing the initial analysis

- inventory and examination of all new methods and techniques:
 - affinity diagram;
 - relationship diagram;
 - tree diagram;
 - matrix diagram
 - diagram of action decisions;
 - arrow diagram;
 - factor analysis of the data
- choosing the right method after analyzing its strengths and weaknesses

To avoid conflicts between quality management methods we took into consideration Dr. Yury Klochkov’s (2017) approaches:

- Integration of methods.

Plotting a Pareto chart so that important problem causes took a special place or to combine an Ishikawa chart with the data about problem cause frequency. It is important to realize that most frequent causes not always result in the problems important for customers.

- Refusal of control procedures

Sometimes it is reasonable to entrust a task performer with method application rather than to control each result of method application.

A method is an instrument for a task performer, so it is better to create a situation when a performer is interested in a good instrument. In other words, a method provides a possibility to improve a product; therefore, a task performer should be interested in it. That allows him/her to adjust a specific method to real conditions.

- Personnel training.

In the process of personnel training, it is important to emphasize that quality management method is not universally applicable and can induce conflicts. When training future specialists you may want to simulate a role play where participants are trained to resolve conflicts of different method application, to interpret the results and to explain their decisions.

3. Study

Chosen techniques will be implemented, by creating an action plan and based on a strategy. The implementation of the methods is elaborated on the basis of two conditions:

- to contain at least three elements: commitment to continuous improvement, compliance with the rules, a framework for establishing and analyzing objectives.

The implementation decision must be:

- written, updated and communicated to the staff;
- adopted at the management level;
- available for the team.

4. Act

Protecting and improvement of the system:

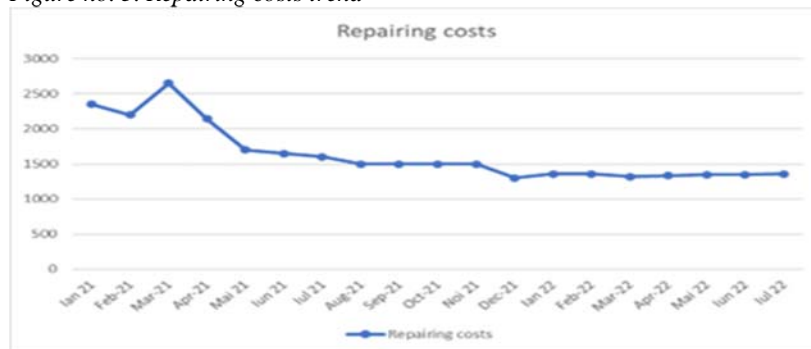
- Internal audit;
- Management analysis;
- Improvement plan;
- Feedback sent to next set of improvements.

4. Findings

Quality Management Techniques play a very important role in the decision-making process of SME Management. The results obtained after their application were remarkable, and we list a few:

4.1. Reduction of production costs, especially those with non-product quality:

Figure no. 3. Repairing costs trend



Source: Quality Management Dept of SME

The chart clearly shows an immediate logarithmic decrease trend, following the software implementing, so that starting with August 2021, the non-quality costs decreased trend.

Making reasonable efforts to prevent it is much more beneficial than spending at the same level to make up for previous mistakes.

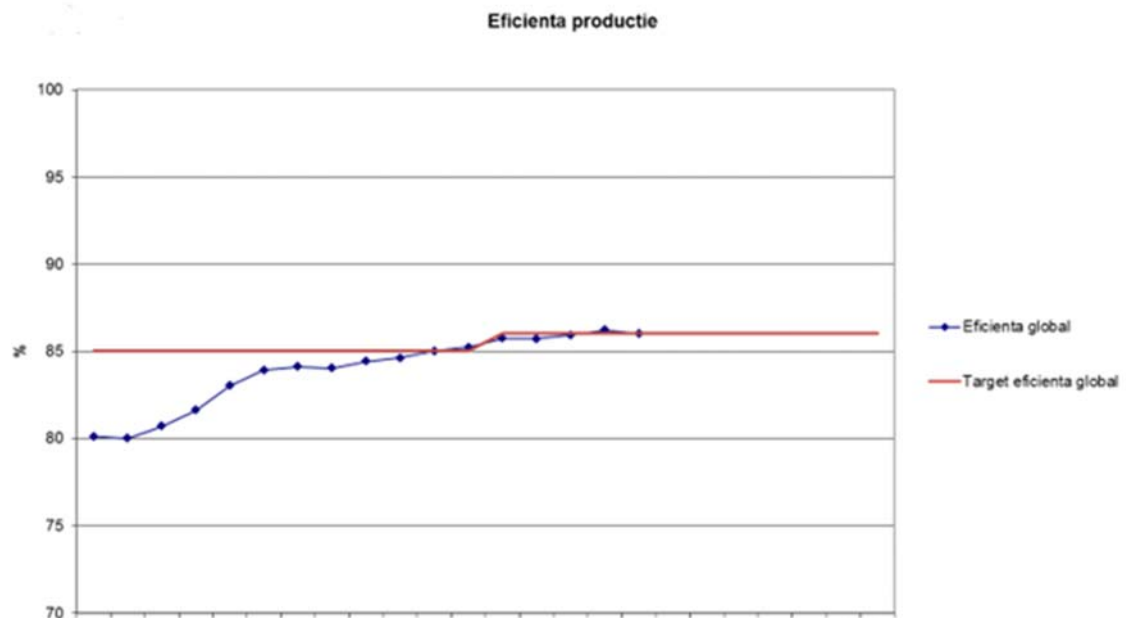
4.2. Better organization of workspaces and storage:

This was achieved after implementing 5S technique, inspired from the Japanese quality management. In this sense, the Japanese have developed the 5S concept, the objective of which is to lay the foundations for continuous learning and improvement in the workplace. This concept is also applied in everyday life, with its help establishing the correct behavior and preventing anomalies on the spot. Factory management starts with 5S. To be effective, in areas where visual management is applied, processes must be clearly identified and controlled. First of all, there is a need for order, cleanliness and rules for maintaining cleanliness. The name comes from five Japanese words starting with the letter S, respectively Seiri, Seiton, Seiso, Seiketsu and Shitsuke. Jobs without seiri and seiton cannot produce good quality. Almost always, workplaces with low morale are disorganized and lack discipline. Full implementation of seiri and seiton is the first step in creating a good workplace. 5S is a structured program to systematically achieve: organization, cleanliness and standardization in the workplace, thus contributing to improving productivity and reducing quality and work safety issues.

The 5S process includes 5 stages:

1. Sorting (seiris)
 2. Setting in order (seiton)
 3. Cleanliness (seiso)
 4. Care (seiketsu)
 5. Discipline (shitsuke)
 6. last but not least, a new S: Security in work
- 4.3 An increase of the production efficiency

Figure no. 4. Production efficiency



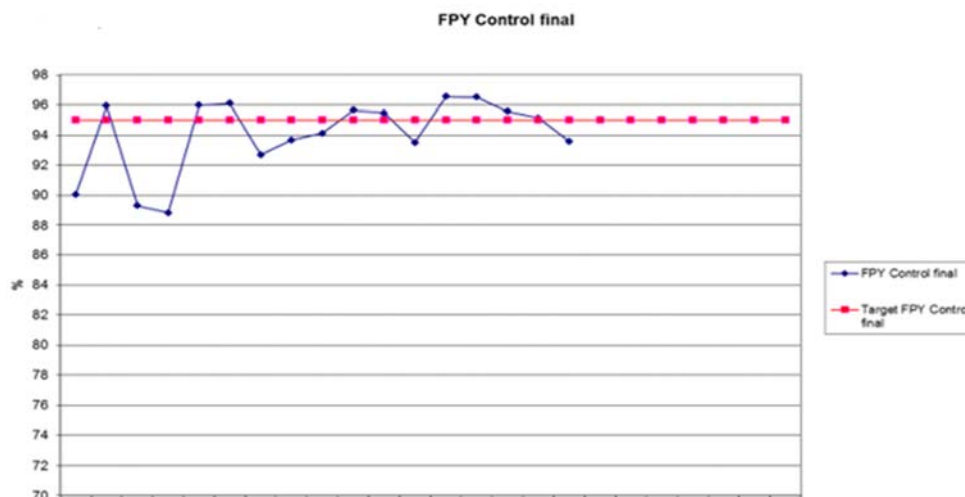
Source: Quality Management Dept of SME

The non-compliant products were blocked at source, no need for further sorting and stopping machines until sorting, known nonconformities being prevented, and the few affected products being immediately repaired.

Costs due to time lost with sorting nonconform goods after being manufactured, have been also reduced. Re-checking batches involves resources allocation for unproductive stuff; this generates non-quality costs by allocating human resources paid from own funds, by inactivity of machines and by waiting times until the products are sorted and the error is remedied. The time lost with sorting is reflected in the overall efficiency of production; a reverse proportionality with sorting time is noticed.

4.4. Improvement of FPY parameter

Figure no. 5. FPY Parameter

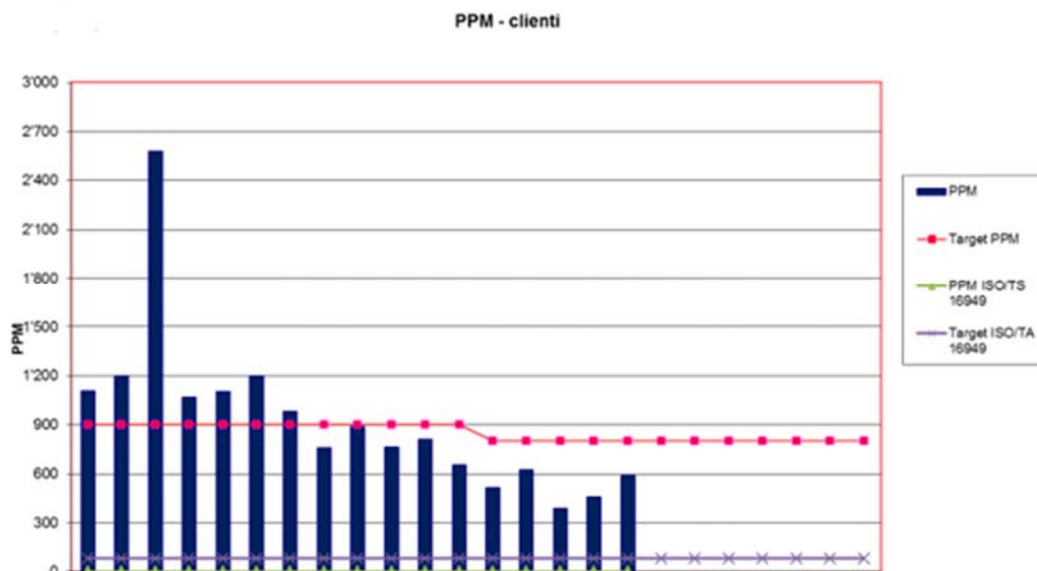


Source: Quality Management Dept of SME

The FPY parameter from final quality check has shown an improvement. Nonconformities identification as well as the immediate corrective action were improved based on records made during the intermediate quality check and statistics views.

4.5. Improvement in PPM indicator

Figure no. 6. Evolution chart for PPM CUSTOMER



Source: Quality Management Dept of SME

The recording system allowed a fast provision of data which allowed the objective evaluation of the effectiveness of corrective and preventive actions taken following a complaint; therefore, additional / new improvement measures were taken as a result. The records showed that internally - as a result of the controls - the occurrence of the product with a certain nonconformity decreased significantly or was permanently eliminated. For example, after the actions were taken, a certain kind of nonconformity hasn't been detected anymore for one month. Also, 5 consecutive batches have passed the Final Quality Check. The first sign of improvement of the indicator was observed in August 2022, when the company managed to meet the target of having a PPM of less than 900. Nowadays, there have not been any cases in which the PPM target has not been met.

5. Conclusions

This project was possible thanks to a creative company, opened to new ideas, with a good management team. The type of management in the company is the democratic one, which proved to be superior, both from a socio-human point of view and in terms of productivity. He is sensitive to human relations, consults collaborators, is cooperative with the opinions of others, stimulates dialogue and exchange of ideas. Working time is used efficiently, regardless of the presence or absence of the manager. This type of management requires very good leaders, able to detect, mobilize and amplify the potential of the micro group of execution and leadership of which they are part. Also, the ability to lead a team involves close collaboration with subordinates and the widespread use of staff consultation, group decision-making, based on democratic procedures. The result of the qualities, knowledge and skills, talent and training of managers, regardless of hierarchical level, is the managerial ability or leadership. The type of management in the company is the democratic one, which proved to be superior, both from a socio-human point of view and in terms of productivity. He is sensitive to human relations, consults collaborators, is cooperative with the opinions of others, stimulates dialogue and exchange of ideas. Working time is used efficiently, regardless of the presence or absence of the manager. Leadership is defined as the ability of a person, group, or organization to influence or guide another person, group, or organization as a whole. John Maxwell said: “Leadership means influence. That's it. Neither more nor less. My favorite saying about leadership is, who thinks he is a leader and has no disciples to follow him is just walking.” (Maxwell, 1990)

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