NEW QUALITY MANAGEMENT TOOLS

PhD. Assoc. Prof. Daniela Ghelase
PhD. Assoc. Prof. Luiza Daschievici
"Dunarea de Jos" University of Galati,
Romania

ABSTRACT

In order for the decisions made by managers to be correct and to lead to the success of an organization, these decisions must be based on correct, real information received on time, synthesized, analyzed and accompanied by the necessary proposals and recommendations. The use of traditional quality management tools is important but not sufficient in the concept of Total Quality. The seven new tools used in Total Quality Management, along with statistical tools, are presented in this paper.

KEYWORDS: quality management, total quality, quality control, quality tools

1. INTRODUCTION

The quality improvement activity should also have a pronounced preventive character. To achieve this objective, the seven quality management tools are added to the seven quality statistical tools. The latter are characterized by the fact that they:

- are particularly oriented towards management members;
- allow the utilization of both numerical and verbal information;
- allow identifying the problem before data collection and processing.

It should be mentioned that these seven new instruments, made in Japan, have been extensively tested and used on a large scale in this country. Most applications for these tools are made for:

- sales policies;
- work relations;
- after sales service;
- development of a new product;
- improving management.

The use of these new tools must be done at the same time as the use of the seven classic (statistical) tools.

2. RELATIONSHIP DIAGRAM

The relationship diagram (inter-relationship graph) is used when the causes of a problem are found in complex relationships with each other or when it is required to point the elements necessary to achieve a goal.

This diagram logically establishes the connection through arrows between the problems that appear and the factors on which they depend (Fig. 1). As applications for this method, we can mention:

- control of internal policies;
- control of stocks, purchases and inventory;
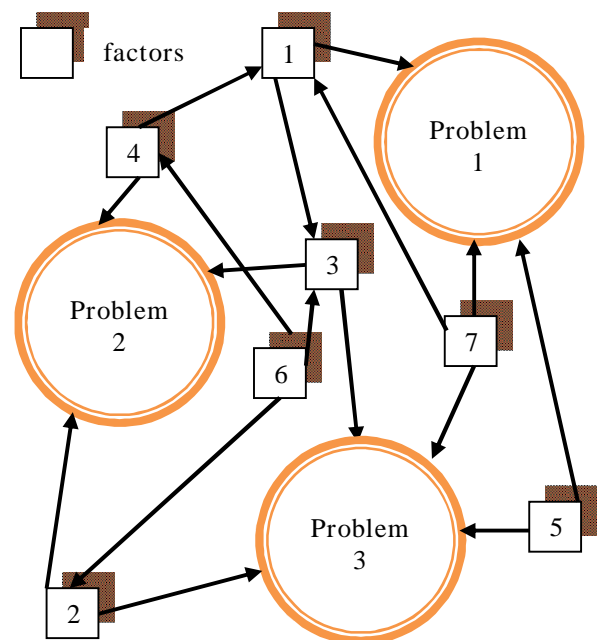- quality control;
- strategies and sales policies.

Fig. 1 Relationship diagram

2. AFFINITY (KAWAKITA JIRO) DIAGRAM

The affinity diagram is based on collecting data and then organizing and grouping them according to natural relationships.

The collected data come from several sources, they are formulated by the participating people and they refer to facts, ideas, opinions, assumptions, observations on confusing situations, broader and more complex issues.

Based on the data found, a diagram is drawn that establishes the relationships and similarities between the data. This diagram is based on teamwork and the following steps are:
• theme selection;
•verbal data collection (individual brainstorming);
• data transformation into files;
• labeling of files;
• drawing the diagram;
• oral or written presentation.
The K. J. method can be used for:
- quality control of cyclical activities;
- marketing analysis;
- design quality;
- process development.

4. TREE DIAGRAM

This diagram systematizes the causes that influence a certain objective. The method also identifies other factors that can influence that objective.

The advantage of this method lies in the fact that it offers the user the opportunity to examine the causes in a logical and chronological sense.

After establishing the pursued goal and the tasks to achieve it, at a certain level, its tasks can become the goal at a lower level (Fig. 2).

In western countries, the tendency is for this method to be developed by a single person, usually a technical expert. The methodology approached in Japan requires a collective effort and a logical approach.

As applications for the tree diagram method, we can list:

- the quality of the design;
- control of internal policies;
- quality assurance;
- process development;
- quality control;
- cost control.

5. MATRIX DIAGRAM

It is the most representative method among the seven new ones. The purpose is to emphasize the relationships and correlations between causes and results, or between methods and objectives, when each of these consists of two or more elements or factors.

Results and causes (or objectives) are ordered in a matrix and the relationships between two elements are identified at the intersection of the line and their corresponding column, by a conventional sign, which also marks the intensity of the correlation between them.

The matrix diagrams were designed in several variants: L, T (Fig.3), Y, X, etc.

Among the advantages offered by the matrix diagram method, it can be mentioned:
• the matrices allow a visual overview of all the relationships between different factors. You can see the areas of the problem and where they are concentrated;
• the verification and evaluation of each relationship between the essential factors allows the development of analyzes that can lead to the elimination of details;
• the matrix allows the analysis of specific combinations, the determination of essential factors and the development of an effective strategy for solving the problem.

Matrix diagrams are frequently used in the following applications:
- work relations;
- market analysis;
- quality assurance;
- process development;
- quality control;
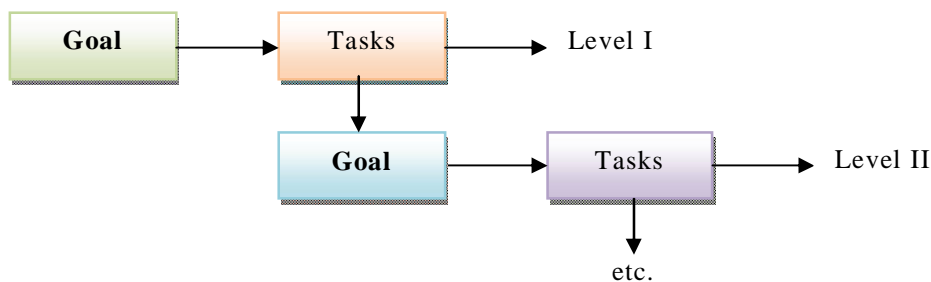- sales policies and strategies;
- after sales service.

Fig. 2 Tree diagrm

Phenomenon / Process		Cause	A	B	C	D	E	F	G
Defect A			*			0		*	Δ
Defect B				0			*		
Defect C			Δ						
Defect D					*		Δ		0
Process I	Processing operation A1		Δ				0		
	Processing operation A2			0					*
	Processing operation A3				0			Δ	
	Processing operation A4				0				
Process II	Processing operation B1			*					0
	Processing operation B2					Δ		0	
	Processing operation B3					Δ			*
Process II	Processing operation C1		0			Δ			
	Processing operation C2			Δ	*		0		
	Processing operation C3		*						Δ

Fig. 3 T- Shaped Matrix

*- strong relationship (3 points), 0- normal relationship (2 points), Δ- weak relationship (1 point).

6. DATA ANALYSIS MATRIX

This tool is used to analyze the data presented in a matrix diagram, so that the strength of the relationships between the variables can be established precisely through numerical assessments.

The initial idea is relatively simple, but the process of understanding and representing the information is complex and it is the only one of the seven methods that involves complex mathematical knowledge. As a rule, the phenomena are influenced by several variables, which interact with each other. Therefore, the method makes use of multi-variable analysis and ideally, requires a specialized computer program.

The fields of application of this method are:
- process development;
- productivity control;
- safety control.

7. PDPC DIAGRAM (PROCESS DECISION PROGRAM CHART)

This quality tool can be used to establish the paths to follow in order to obtain the desired results.

The method is based on drawing up a tree-type diagram from which the branch to be studied is selected, asking for each action the questions:
"what could be wrong in this action?";
"what other way can this action have ?.

The PDPC method follows the causes of undesirable conditions along the course of the action.

Proceed in the same way with all the branches of the tree.

The PDPC method is applied in the following areas:
- control of policies (strategies);
- work relations;
- process development;
- productivity control;
- safety control.

7. PERT DIAGRAM

Its explicit name is Program Evaluation and Review Tehnique and is also known as the Arrow Diagram.

The PERT diagram is used to plan a certain activity (Fig. 4). The method is presented as a network of lines that connect all the known elements for the execution of the plan.

Since it is necessary to know all the steps in the process, in real time, it is necessary to perform a variety of operations. This method presents every work necessary to support the project and its subordinate issues.

The PERT diagram can be used for:
- strategy control;
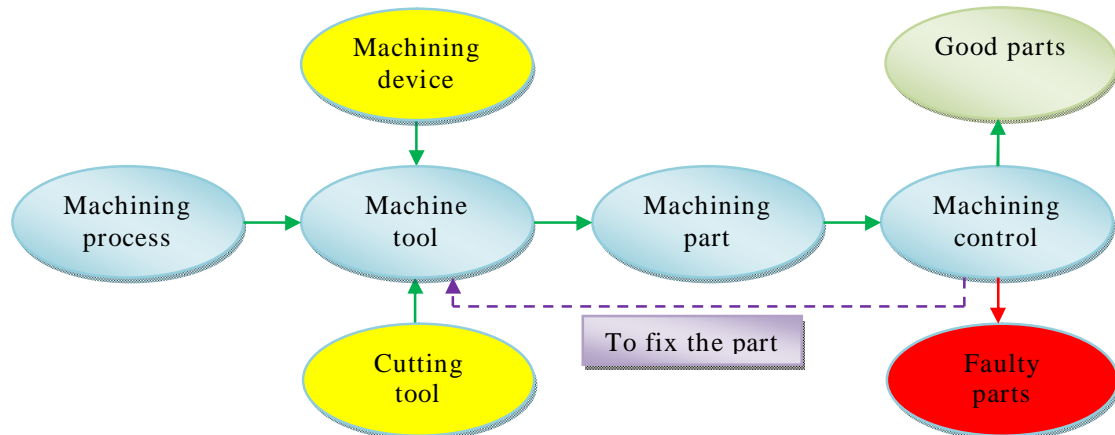- productivity control;
- facility control.

Fig. 4 PERT diagram for machining a part

8. CONCLUSIONS

The paper presents the new quality management tools, used for quality improvement, for preventive purposes. The new tools correspond to each type of problem.

Before having numerical data and quantifying the objectives, according to which the solution to the problem is found, the problem itself must be reported:

But *what is the problem*? (Affinity Diagram, Data Analysis Matrix);

Why did it appear? What are its details? (Relationship diagram);

How should it be solved, with what ideas, with what means? (Tree Diagram);

What is the best way to solve the problem? (Matrix Diagram);

For the future, *when* should our actions be scheduled? (PERT Diagram);

And if something happens by chance, *then* how do we act? (PDPC Diagram).

The field in which these questions lie is mainly that of management. The seven new tools aim to help quality become a management business and help quality management.

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