
PRINCIPLES OF TQM IN AUTOMOTIVE INDUSTRY*Nicoleta Isac****Abstract**

TQM refers to a management process and set of disciplines that are coordinated to ensure that the organization consistently meets and exceeds customer requirements. TQM engages all divisions, departments and levels of the organization. TQM companies are focused on the systematic management of data in all processes and practices to eliminate waste and pursue continuous improvement. The goal is to deliver the highest value for the customer at the lowest cost while achieving sustained profit and economic stability for the company. While every organization should implement its own specialized form of quality management, there are some basic core principles that guide every quality effort. The single most important element of quality management is the focus on the customer. During this quality process, we will strive frequently to hear from our customers. From this basic concept, that the customer is the ultimate determiner of quality, come the other principles of Quality management. All types of automotive industries, have reduced costs increased process efficiency and improved the quality of their products and services by working to meet the needs of the people they serve through the application of total quality management (TQM) principles. Learning the principles and practices of TQM will help achieve outstanding results and enlist the support of top management in advancing this concept within the organization enabling area managers or supervisors to create a work environment that gets the best from its workers. The proof will be reflected in the results deliver to the customer. With growing global competition, quality management is becoming increasingly important to the leadership and management of automotive industry. Quality management principles provide understanding of and guidance on the application of quality management. By applying following quality management principles, organizations will produce benefits for customers, owners, employees, suppliers and society as a whole.

Keywords: management, total quality management, automotive industry

JEL Classification: L15, L62

Introduction

Total Quality Management is a management approach that originated in the 1950's and has steadily become more popular since the early 1980's. Total Quality is a description of the culture, attitude and organization of a company that strives to provide customers with products and services that satisfy their needs. The culture requires quality in all aspects of the company's operations, with processes being done right the first time and defects and waste eradicated from operations.

Total Quality Management, TQM, is a method by which management and employees can become involved in the continuous improvement of the production

* Isac Nicoleta is at the University of Pitești. E-mail: nicoleta_isac2004@yahoo.com.

of goods and services. It is a combination of quality and management tools aimed at increasing

business and reducing losses due to wasteful practices. Some of the companies who have implemented TQM include Ford Motor Company, Motorola and Toyota Motor Company. Today, high quality is absolutely essential to meet customer requirements. The TQM principles express the basic ideas and in this case the specialists have relatively different points of view. J. Juran formulates the following principles: client orientation, competitiveness, continuous quality improvement, client-supplier relations internalization, top management involvement. G. Merli places at the basis of TQM the following principles: clients' satisfaction, quality on the first plan, involvement of the entire personnel, continuous improvement. Analyzing other opinions as well we note nevertheless that the majority of specialists agree with the following principles which are at the basis of TQM:

Table 1: Concepts of TQM Philosophy

Concept	Main idea
Customer focus	Goal is to identify and meet customer needs
Continous improvment	A philosophy of never – ending improvement
Employee empowerment	Employees are expected to seek out, identify, and correct quality problems
Use of quality tools	Ongoing employee training in the use of quality tools
Product design	Quality should be built into the process; sources of quality problems should be identified and corrected
Managing supplier quality	Quality concepts must extend to a company's suppliers

Customer focus

The first and the most important characteristic of TQM is the attention granted by the company to the clients. Within the automotive industry as well, quality must satisfy and overcome clients' expectations. The purpose is the identification, then the meeting of all client's needs. TQM admits that a perfectly built product has a reduced value as long as it is not what the client desires. This is why we say that the quality level is granted by the client. In any case, it is not always easy to determine what a client desires, because the tastes and preferences change. Also, clients' expectations vary from a client to another. For example, in the automotive industry, the preferences change fast, from small cars to four-wheel drive vehicles and then back

to small cars. The companies must gather information constantly, by research groups, market studies, and meetings with clients, in order to remain close to clients' tastes.

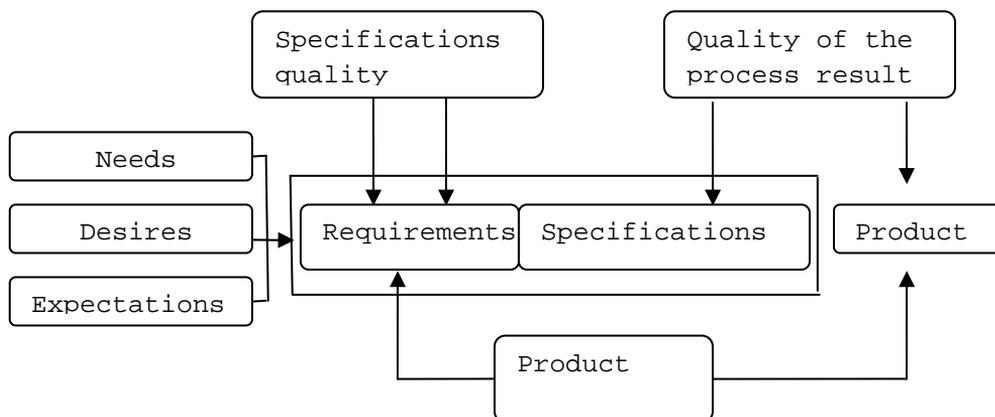


Figure 1. The relation between product quality and specifications quality (Source: Total Quality Management, Marieta Olaru - ASE Bucharest)

In the automotive industry the main benefits for applying this principle are the following:

- Increased revenues and market quota obtained through flexibility and a quick answer related to the market opportunities
- Increased effectiveness regarding the use of the organization resources in order to increase clients' satisfaction
- The improvement of clients' loyalty degree which has as a result repetitive business transactions.

The application of this principle will lead to:

- Researching and comprehending client's needs and expectations
- Assuring the fact that the organization objectives are correlated with clients' needs and expectations
- Communicating these needs and expectations within the organization
- Measuring clients' satisfaction and acting according to the obtained results
- The systematic management of the relation with the clients

Continuous improvement

Customer's expectations are always changing and typically rising as quality management begins to yield results. It is important to remember that when customers are assessing quality, they are not simply comparing us to our performance last year, but to every other organization that is serving their needs; from the Department of Motor Vehicles to the supermarket. (2001 B. Abohmed). TQM is mainly concerned with continuous improvement in all work, from high level strategic

planning and decision-making, to detailed execution of work elements on the shop floor. It stems from the belief that mistakes can be avoided and defects can be prevented. It leads to continuously improving results, in all aspects of work, as a result of continuously improving capabilities, people, processes, technology and machine capabilities. Continuous improvement must deal not only with improving results, but more importantly with improving capabilities to produce better results in the future.

One of approaches that can help companies with continuous improvement: the plan –do– study – act (PDSA) cycle and describes the activities a company needs to perform in order to incorporate continuous improvement in its operation. The circular nature of this cycle shows that continuous improvement is a never-ending process. Let's look at the specific steps in the cycle. **Plan** The first step in the PDSA cycle is to plan. Managers must evaluate the current process and make plans based on any problems they find. They need to document all current procedures, collect data, and identify problems. This information should then be studied and used to develop a plan for improvement as well as specific measures to evaluate performance.

Do The next step in the cycle is implementing the plan (do). During the implementation process managers should document all changes made and collect data for evaluation. **Study** The third step is to study the data collected in the previous phase. The data are evaluated to see whether the plan is achieving the goals established in the plan phase. **Act** The last phase of the cycle is to act on the basis of the results of the first three phases. The best way to accomplish this is to communicate the results to other members in the company and then implement the new procedure if it has been successful. Note that this is a cycle; the next step is to plan again. After we have acted, we need to continue evaluating the process, planning, and repeating the cycle again.

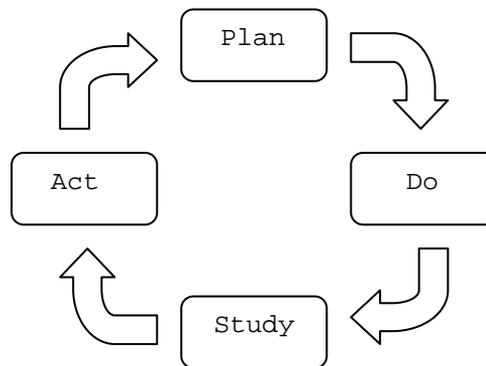


Figure 2. Plan - Do - Study - Act

The main benefits in applying this principle in the automotive industry are:

- The alignment of the improved activities, at all levels, with the strategic intentions of the organizations
- The flexibility to react rapidly at the occurrence of any opportunities

The application of this principle will lead to :

- The existence of a consequent approach at the level of the entire organization for the continuous performances improvement
- The assurance for the organization employees of an adequate training regarding the methods and instruments for the continuous improvement
- The establishment of specific objectives able to guide the continuous improvement and of certain actions able to provide the continuous improvement follow-up

Employee empowerment

Employee involvement evolved out of business's need to improve performance. The impact of human resources in the organization depends on the kind of empowerment given to them. In TQM, the role of employees is very different from what it was in traditional systems. Workers are empowered to make decisions relative to quality in the production process. They are considered a vital element of the effort to achieve high quality. Their contributions are highly valued, and their suggestions are implemented. In order to perform this function, employees are given continual and extensive training in quality measurement tools.

Making the decisions within the organization represents a process of logic activities by which you chose a variant of action from several possible. According to this principle, the effective decisions are underlain on complete and safe information, which are analyzed logically and intuitively.

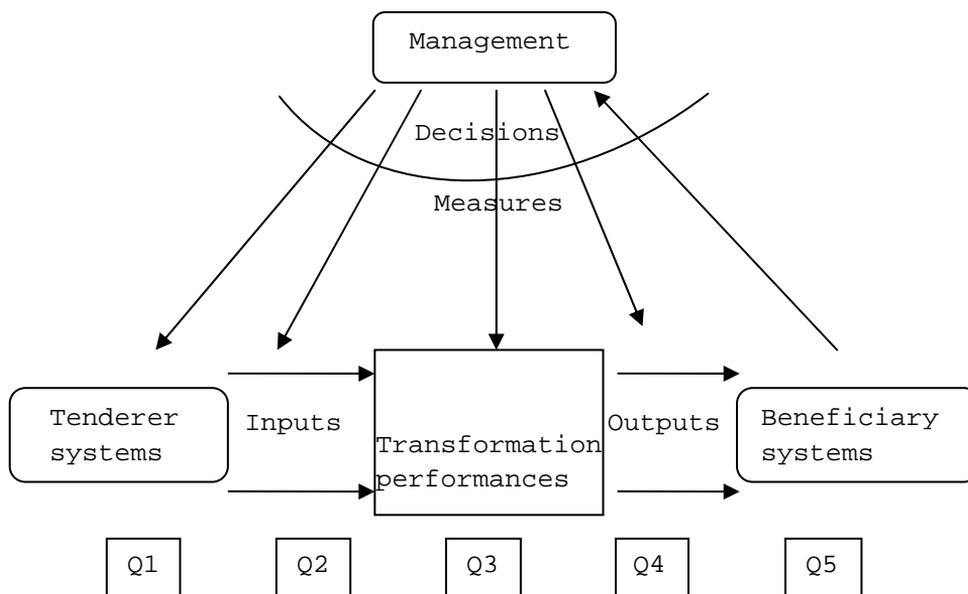


Figure 3. Key Quality Checkpoints (Source: Total Quality Management, Marieta Olaru - ASE Bucharest)

The perception (comprehension) of clients' needs and their complete reflecting in the finished products quality (Q5), must constitute the basis of the decisions and measures in all the other points of the system (Q1...Q4).

The main benefits of this principle application are :

- Decisions based on information
- An increased ability to demonstrate the effectiveness of the previous decisions by reference to real records

Use of quality tools

TQM places a great deal of responsibility on all workers. If employees are to identify and correct quality problems, they need proper training. They need to understand how to assess quality by using a variety of quality control tools, how to interpret findings, and how to correct problems. These are sometimes called the seven means for quality control (cause and effect diagrams, Scatter diagram, flowcharts, Pareto chart, Histogram, Control charts, checklist).They are easy to understand and at the same time extremely useful in the quality problems identification and analysis. Sometimes, the employees use one mean, but often, the use of a combination of means is of greater help. We will further refer to three of the seven means of quality control, namely the cause and effect diagram, the checklist and the control charts.

Cause-and-effect diagrams are charts that identify potential causes for particular quality problems. They are often called fishbone diagrams because they look like the bones of a fish. A general cause-and-effect diagram is shown in Figure . The "head" of the fish is the quality problem, such as damaged zippers on a garment or broken valves on a tire. The diagram is drawn so that the "spine" of the fish connects the "head" to the possible cause of the problem. These causes could be related to the machines, workers, measurement, suppliers, materials, and many other aspects of the production process. Each of these possible causes can then have smaller "bones" that address specific issues that relate to each cause. For example, a problem with machines could be due to a need for adjustment, old equipment, or tooling problems. Similarly, a problem with workers could be related to lack of training, poor supervision, or fatigue. Cause-and-effect diagrams are problem-solving tools commonly used by quality control teams. Specific causes of problems can be explored through brainstorming.

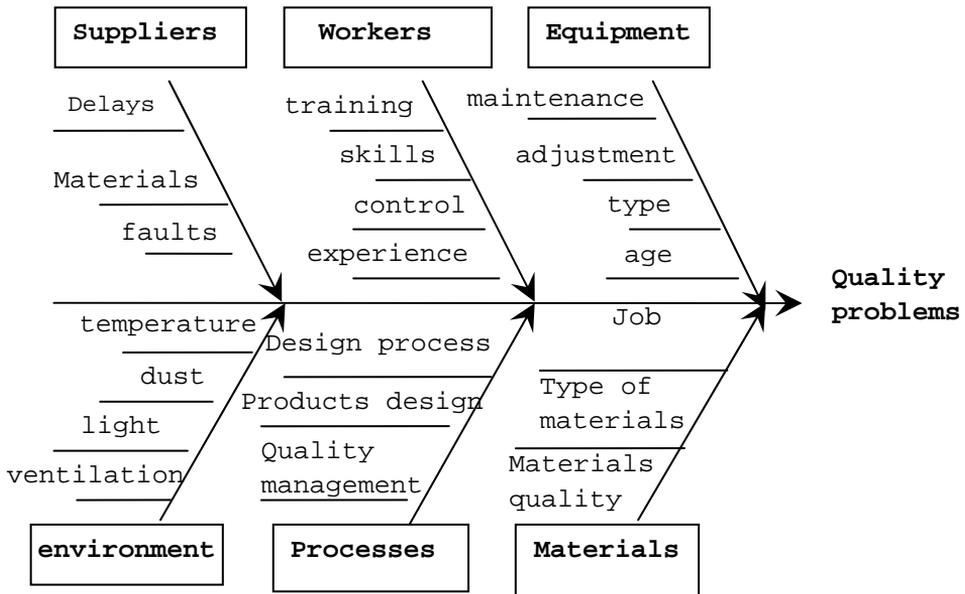


Figure 4. Cause-and-effect (fishbone) diagram (Source: www.wiley.com/college/sc/reid/chap5)

Checklist - In automotive industry checklist facility owners, and technicians, determined there was a need for compliance assistance to automotive repair shops to help them attain or remain in compliance with applicable environmental regulations.

Control charts - These charts are used to evaluate whether a process is operating within expectations relative to some measured value such as weight, width, or volume. For example, we could measure the width of a tire. When the production process is operating within expectations, we say that it is “in control”.

To evaluate whether or not a process is in control, we regularly measure the variable of interest and plot it on a control chart. The chart has a line down the center representing the average value of the variable we are measuring. Above and below the center line are two lines, called the upper control limit (UCL) and the lower control limit (LCL). As long as the observed values fall within the upper and lower control limits, the process is in control and there is no problem with quality. When a measured observation falls outside of these limits, there is a problem.

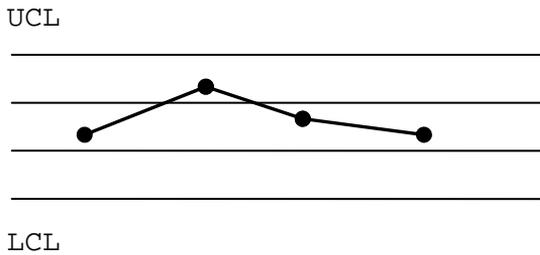


Figure 5.: Control Diagram

Product design

A critical aspect of building quality into a product is to ensure that the product design meets customer expectations. This typically is not as easy as it seems. Customers often speak in everyday language. For example, a product can be described as “attractive,” “strong,” or “safe.” However, these terms can have very different meaning to different customers. What one person considers to be strong, another may not. To produce a product that customers want, we need to translate customers’ everyday language into specific technical requirements. However, this can often be difficult. A useful tool for translating the voice of the customer into specific technical requirements is quality function deployment (QFD). Quality function deployment is also useful in enhancing communication between different functions, such as marketing, operations, and engineering. QFD begins by identifying important customer requirements, which typically come from the marketing department. These requirements are numerically scored based on their importance, and scores are translated into specific product characteristics. Evaluations are then made of how the product compares with its main competitors relative to the identified characteristics. Finally, specific goals are set to address the identified problems. The resulting matrix looks like a picture of a house and is often called the house of quality.

QFD enables us to view the relationships among the variables involved in the design of a product, such as technical versus customer requirements. This can help us analyze the big picture—for example, by running tests to see how changes in certain technical requirements of the product affect customer requirements. An example is an automobile manufacturer evaluating how changes in materials affect customer safety requirements. This type of analysis can be very beneficial in developing a product design that meets customer needs, yet does not create unnecessary technical requirements for production. Figure 5 displays three important production system design objectives: productivity, flexibility and quality. In traditional production system design, the sole objective was productivity in terms of cost-per-unit or worker-hours-per-unit. Recently, the value of flexibility has been recognized and often takes an explicit role in production system design.

First, to refute the theory that quality is wholly determined by product design, we present two pieces of evidence from the Ford Motor Company that demonstrate that the production system affects quality. Later exhibits will more specifically address production system design.

Jaguar

After Ford acquired Jaguar, Jaguar's quality improved rapidly. Smith (2001) attributes this quality improvement to Ford adopting Toyota's production process at the Jaguar plant. These improvements were not due to product design changes, but to production system changes, which indicates that the production system affects quality.

Designing production systems for quality

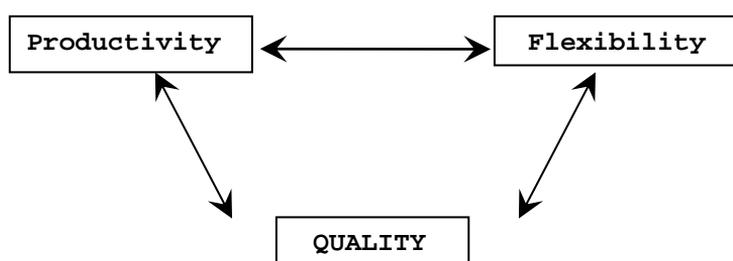


Figure 5. Competing objectives in production systems design (Source: Designing production systems for quality: research opportunities from an automotive industry perspective)

Ford parts suppliers

Wilson and Sedgwick (2002) report that Ford analysed incidents when defective purchased parts caused Ford to halt shipments of vehicles, and that Ford concluded that 'manufacturing problems caused 83 percent of these incidents, while design problems caused 17 percent.'

Proces management

According to TQM a quality product comes from a quality process. This means that quality should be built into the process. Quality at the source is the belief that it is far better to uncover the source of quality problems and correct it than to discard defective items after production. If the source of the problem is not corrected, the problem will continue. Quality at the source exemplifies the difference between the old and new concepts of quality. The old concept focused on inspecting goods after they were produced or after a particular stage of production. If an inspection revealed defects, the defective products were either discarded or sent back for reworking. All this cost the company money, and these costs were passed on to the

customer. The new concept of quality focuses on identifying quality problems at the source and correcting them.

Management supplier quality

TQM extends the concept of quality to a company's suppliers. The philosophy of TQM extends the concept of quality to suppliers and ensures that they engage in the same quality practices. If suppliers meet preset quality standards, materials do not have to be inspected upon arrival. Today, many companies have a representative residing at their supplier's location, thereby involving the supplier in every stage from product design to final production.

In order to obtain certain relations reciprocally advantageous we must analyze the following steps :

- Establishing the fields in which reciprocally advantageous relations could be developed between the suppliers and the organization;
- Creating a list with the potential partners;
- Identifying the persons with decision powers within the suppliers organization ;
- Forming a team responsible for the development of new relations ;
- Developing the mission and objectives which underlie the partnership;

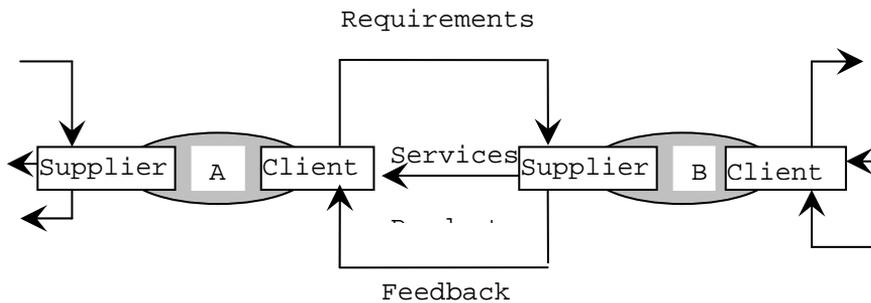


Figure 6. – Internalizing the relation client - supplier (Source: Total Quality Management, Marieta Olaru - ASE Bucharest)

The main benefits of applying this principle :

- Increased ability to create value for both parties
- Flexibility and speed of the common answer to the market changes or to the clients' needs and expectations modifications.
- The optimization of costs and resources

The application of this principle will lead to :

- The establishment of relations able to balance the short term profits with the long term considerations

- The use of the expertise and resources together with the partners
- The identification and selection of the key suppliers
- The establishment of a clear and open communication system
- The communication of information and future plans
- The establishment of common development actions and of certain improvement activities
- The suggestion, encouragement and recognition of suppliers' improvements and accomplishments.

Conclusion

The principles of Total Quality Management are to seek to satisfy the external customer with quality goods and services, as well as your company internal customers; to satisfy your external and internal suppliers; and to continuously improve processes by working smarter and using special quality methods.

TQM encourages participation amongst shop floor workers and managers. There is no single theoretical formalization of total quality, but Deming, Juran and Ishikawa provide the core assumptions, as a "...discipline and philosophy of management which institutionalizes planned and continuous... improvement ... and assumes that quality is the outcome of all activities that take place within an organization; that all functions and all employees have to participate in the improvement process; that organizations need both quality systems and a quality culture."

References

- Gilbert, G. (1992). *Quality Improvement in a Defense Organization. Public Productivity and Management Review*, 16(1), 65-75. Introduction and Implementation of Total Quality Management (TQM) by Khurram Hashmi;
- Olaru M. *Total Quality Mngement*, ASE Bucuresti 2000;
- G. Merli „*TQM as a business tool*" (ISEDI/Italy, 1991)
- Abohmed B., *Identifyng some management approaches to total quality management (TQM) within induserial organizations*, University of Wisconsin-Stout ,May, 2001;
- Zairi M., Baidoun S., *Working paper series Understanding the Essentials of Total Quality Management: A Best Practice Approach – Part 1*, Working Paper No 03/03 January 2003
- Inman R., Blumenfeld D., Huang N., Li j., *Designing production systems for quality: research opportunities from an automotive industry perspective*, INT. J. PROD. RES., vol. 41, no. 9, 1953–1971, 2003
- Wilson, A. and Sedgwick, D., 2002, *Quality quandry. Automotive News*, 3 June, p. 8. ISO 9001
- www.ccar-greenlink.org/vshops/FinalAutoGuide_092503.pdf
- www.wiley.com/college/sc/reid/chap5.pdf