Implementation of quality management system for automotive parts

STAMATE VALENTIN
Department of Technological Engineering
Transylvania University of Brasov
500036 Bvd. Eroilor nr.29 Brasov
ROMANIA
stamate_valentin@yahoo.com

Abstract: Quality management, among others is one of the most important of the issues of the day. The assurance of quality of the product is quite essential. It is very important to solve the tension between customer quality requirements (efficiency, reliability, etc.) and developer quality requirements (maintainability, reusabilility, etc.). In this paper we discuss some approaches of quality management system principles. Also we present a case study concerning the quality management system implementation that we applied for the improvement of both the quality outputs and the efficiency of the processes.

Keywords: quality, automotive industry, implementation of quality management system.

1 Introduction

Quality Management is the assembly and management of all activities aimed at the production of quality by organizations of various kinds. A statement of objectives and policy to produce quality should be made for the organization or department concerned. This statement also identifies the internal organization and responsibilities for the effective operation of the Quality System.

In the past, engineers used the safety factor to "cover" the inadequate designing data and calculations and they took into account the possible exploitation risks.

At present, the safety risk has got a new meaning on a scientific base and given by the reliability theory and practice and by maintainability.

It is not possible to ensure the reliability and maintainability without:

- strict analysis of "what must to be made";
- scientifically establish the mechanical, electrical, chemical, thermal etc. stress;
- using modern methods of designing by taking into consideration the following:
  - interrelation between the energy stored into construction materials due to stress and structure ability to store it;
  - relation between the design and the technical and organization structure possibilities to achieve the certain requirements (technological capability, training and promotion for workers);
  - using reliable components, decreasing structures and diagram modulation;
  - evaluating the economic and environment consequences.
- significant tests in order to show the real reliability and maintainability; building an experimental data bank (informational feedback);
- preparing the manufacturing conditions:
  - technical and material supply according to requests and with strictly following of the quality and reliability specification of these;
  - machines, tools, equipment, adequate meter and control devices;
  - preparing a strict control of the manufacturing steps and the final products;
  - human engineering and environment;
  - intelligible, operational and exact informational system; hierarchy, processing, registering and coding the computerized information.

Quality, simplistically, means that a product should meet its specification. Quality management is particularly important for large, complex systems. The quality documentation is a record of progress and supports continuity of development as the development team changes. For smaller systems,

quality management needs less documentation and should focus on establishing a quality culture.
Quality Management Processes consists of:

- Quality assurance: Establish organizational procedures and standards for quality.
- Quality planning: Select applicable procedures and standards for a particular project and modify these as required.
- Quality control: Ensure that procedures and standards that are followed by the product development team;
- Quality management should be separate from project management to ensure independence [1].

A schematic illustration of relationship between the quality management and product development is shown in Figure 1.
The quality of a developed product is influenced by the quality of the production process. This is important as some product quality attributes are hard to assess.

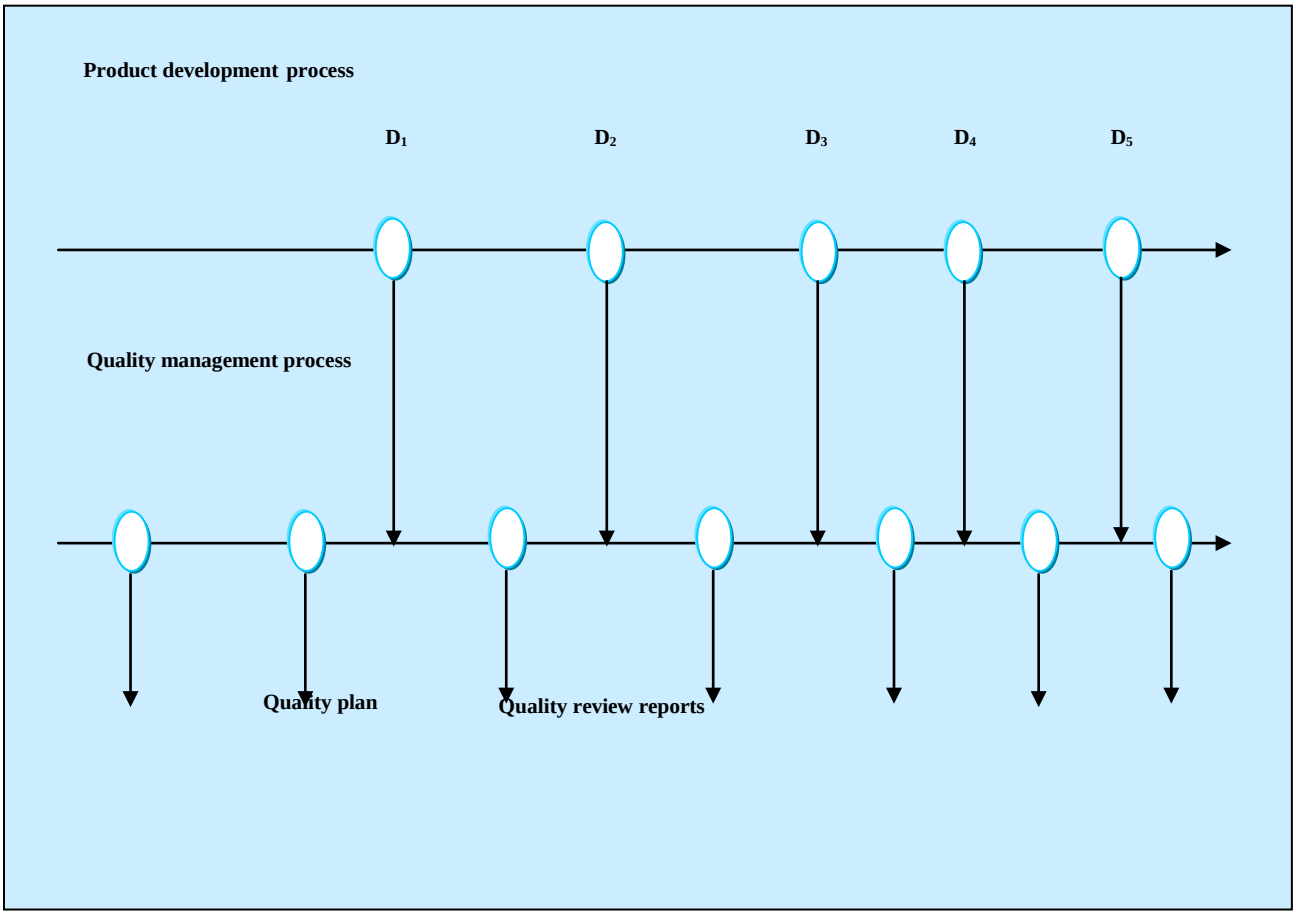

Fig. 1 Quality management and product development

2 Inter-correlated quality management processes

Quality management system contains a number of inter-correlated processes. Interactions between the processes of an organization can be complex and it results an interdependent processes network. An example of interlinked processes network is shown in Figure 2.

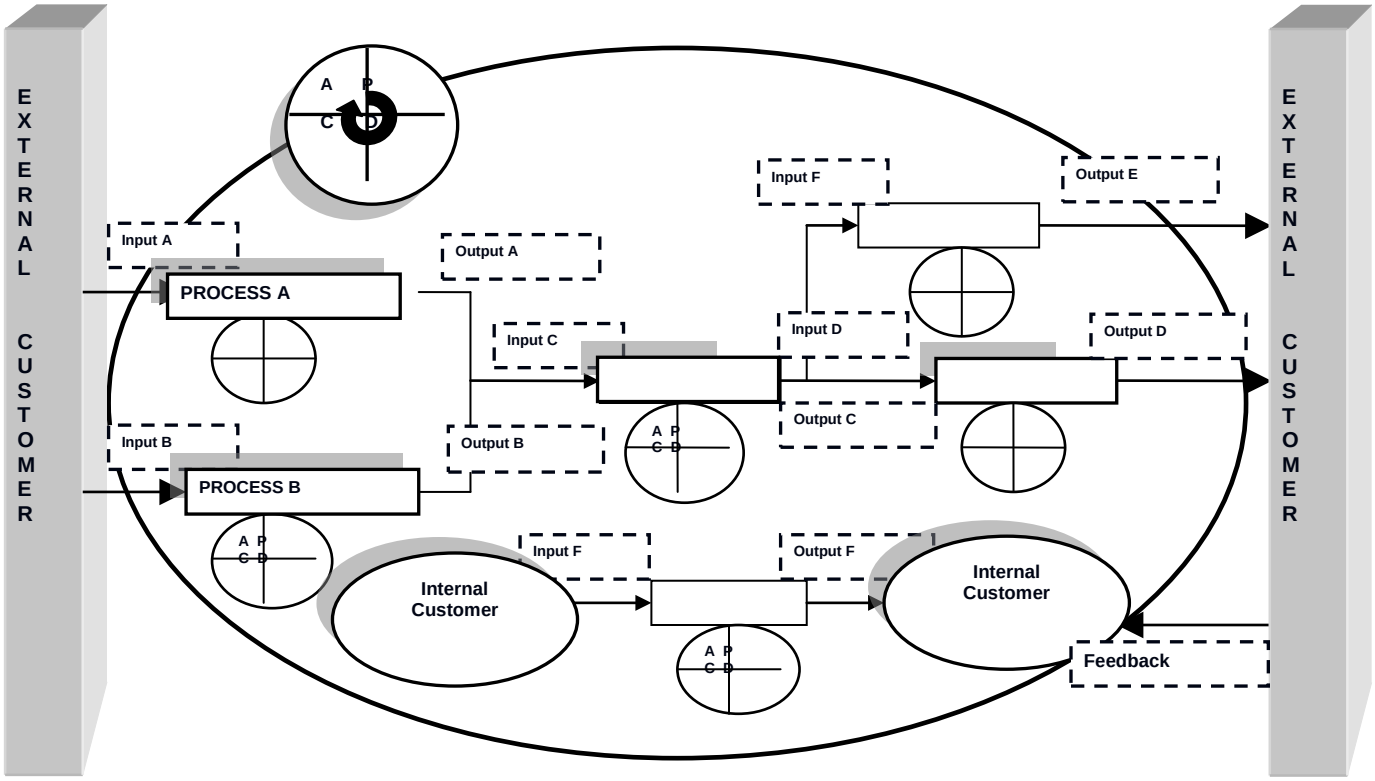

Fig. 2 Interlinked processes network

Inputs and outputs of these processes can be correlated with internal and external customers. The processes network model illustrates the fact that the customers play a significant role in requirements definition as input data. Customer's feedback is an essential input of continuous improvement process of the quality management system.

It mentions that PDCA Cycle can be applied to each process and to all process networks. Some significant processes of the quality management system can't be in direct interaction with customer.

3 Reliability estimation

Probability of well-functioning, meaning the reliability R(t) and its three criteria: the malfunction ratio $\lambda(t)$, average of well-functioning time WFTA, reliable life V_R or the fractile p, meaning the time of p=1-R malfunctioning. It is calculated while designing (preview reliability), estimated by prototype tests and zero series in developing phase (probable reliability) and it is practically verified by functioning during the working lifetime of equipment (operational reliability).

Facing the requests above, the use of the statistical and mathematical methods for planning, analyze and construing of the informational data of quality and reliability domain is a sine-qua non-criterion for modern technology and due to economic, market optimization and manufacturing management reasons.

4 Principles to estimate the risk in quality and reliability

Risk estimation means a chain of logical steps that allow to systematic examination of risk for industrial systems. Risk decrease follows this estimation every time is necessary and repeating this procedure, when possible, leads to a two-ways process in risks exclusion and implementing the safety measures.

The process of risk estimation includes:

- risk analysis
  a. define the limits for pressured vessels
  b. define hazard
  c. risk estimation
- risk evaluation

Risk analyses supply the necessary data to evaluate the risk and allow estimating the safety of industrial systems.
Sensible decisions are the base for risk analysis. These decisions must be supported by quality methods completed as possible with quantity methods. Quantity methods are especially adequate when there are high risk and loss ratio.
To compare alternative safety measures and to find the one that ensures the best protection there are used quantity methods.
Risk estimation must be made thus to be possible to confirm through documents the followed procedure and the obtained results.
All data regarding risk estimation and any quality and quantity analysis must consist in:

- limits of industrial systems;
- requests for industrial systems;
- construction specification or any other documents to define the industrial systems;
- antecedents of any accident and incident;
- any data regarding health and environment damages.

5 Conclusion

Implementing a Quality Management System within an organization needs to be a decision by top management. The objective of the quality system needs to be clearly defined so that the system can be effective.
The design and implementation of a quality management system will vary depending on the type, size and products of the organization. Each company will have its own objective, however most companies' objective is to increase profitability.
A Quality Management System will assist by:

- managing costs and risks;
- increasing effectiveness and productivity;
- identifying improvement opportunities;
- increasing customer satisfaction.

A well-managed quality system will have an impact on:

- customer loyalty and repeat business;
- market share and industry reputation;
- operational efficiencies;
- flexibility and ability to respond to market opportunities;
- effective and efficient use of resources;
- cost reductions and competitive advantages;
- participation and motivation of human resources;
- control on all processes.

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