ORGANISATIONAL PROCESS MAPPING FOR ISO/TS 16949:2009 CERTIFICATION OF INDUSTRIAL QUALITY MANAGEMENT SYSTEMS

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Abstract: *This article is intended to clarify some important aspects regarding the development of third party audits, in order to certificate manufacturers of automotive parts. The entire audit programme is dimensioned starting from the process map of the audited organisation. Special emphasis will be placed upon the crucial need that this mandatory document be appropriate. Even if the document is compulsory, its exact content is not stipulated in the official documents of IATF. The degree of complexity must assure a clear and concise description of the organisational functioning mode.*

Key words: *quality management systems, manufacturing, ISO/TS 16949.*

1. Introduction

Quality management audits for certification are characterised by extensive sampling, needed to realise an efficient evaluation of the organisational management system. During the time interval allotted according to the rules [5], [7] several activities need to be performed, regarding the evaluation of ISO/TS 16949 implementation.

2. Objectives

The present article is intended to suggest the certification candidates an example of organisational process map correlated with the standard requirements needed to be verified during the audit.

3. The Process Mapping

One of the main aspects concerning the implementation of ISO/TS 16949 is a correct and clear representation of the organisational processes with their interactions [1], [3], [4], [6], [8]. One of the main reasons for achieving the requirements is that it helps to understand the approach of the process with a view to ensure the management system assessment of the audited organisation. A system requires an aim; it has to create something valuable, to yield fruitful results. In order to meet the objectives set, processes are identified and their sequence and (passive/ dynamic) interactions are determined. Once the relationship between processes is known, the criteria and methods for effective operation and control can be developed and documented. Practically, the technical specification implies that the organisation identify the processes for the quality management system and their application throughout the organisation. The objectives have to be set towards accomplishing not only the customers'

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requirements, but also the stakeholders'.

There are two types of processes: business processes and work processes. Business processes deliver business outputs, while work processes deliver outputs required by the former.

The audit (especially the third party audit, for certification purposes) is developed according to the organisational process map. All processes (both main and support) need to have an owner, as well as input and output elements, and at least one objective set. In the process map, it has to be mentioned in a certain way the interactions with the other processes. The simplest manner in which inputs and outputs, as well as interactions, can be underlined is by means of arrows.

The auditors need to evaluate the extent to which, during and between the processes, the following components are managed: human resources (with a focus on skills and commitment), the quality management system documents, the client's quality management requirements, issues regarding health and safety at work, improvement plans, the opened corrective actions, and, obviously, the achievement of the objectives set for both main and support processes.

The difference between the main and support processes is done by the organisation. Practically, there is no hard and fast rule that helps managers make the difference. The Porter's generic approach is [2]:

- support processes: infrastructure, human resources management, research and development, purchasing;
- main processes: internal logistic, production, external logistic, commercial and sells, services.

In order to correlate the already generic processes with those dealt with during the case study, the following classification will be made, with special emphasis on the quality management system:

- support processes: top management, purchasing, human resources management, quality;
- main processes: customer related processes, technical office, production.

Each of these processes have their own sub-processes (see Tables 1 and 2), that can help us understand the way in which the organisation operates.

The process map shown in Figure 1 is simplified for ease of reference and efficiency. Practically, it has to be interpreted in conjunction with Tables 1 and 2 that describe all of the subprocesses. Each sub-process agrees with the P.D.C.A. (Plan - Do - Check - Act) cycle of continuous improvement, which is fundamental for all quality management standards.

In this respect, the first process, "Top Management", is divided into: budget, resources and review. Thus, the role of top management is to dimension correctly the budget, as well as to assure, in the span between two management reviews, the development of the quality management system, according to the quality policy and the related objectives, correlated with both business vision and declared goal. Only by a correct budgeting can there be assured the needed resources. To close the P.D.C.A. circle, the top management need to review the organisation's progress at the end of the specified time interval.

The second process manages the "Customer Related Processes". Among the sub-processes often associated with the ISO/TS 16949 certified organisations, mention should be made of: product quotation (taking into consideration the "client's voice" and the "production's voice"), financial offer analysis and, of course, the client's requirements (with respect to both product and quality management system).

The third process defined is "Purchasing", including the following sub-processes: supplier's selection, commercial treaties, the orders for needed materials/activities,

supplier management/incoming (acceptance) controls. The choice of suppliers should be done according to a specific procedure, and based on particular criteria. One of them should be the quality management system certification according to ISO/TS 16949 technical specification for tier 1 suppliers and at least ISO 9001 (and the customer specific requirements) for tier 2 suppliers (in this case, the supplier's quality management system has to be assessed by second parties audits, developed by the direct customer representatives). Practically, the supply chain management for the automotive sector is done according to the principles of the "customer managed organisation" approach [1].

The next process, especially important for production plants, is "Production". The subprocesses that relates to this main process are: machines equipments, the validation of production initiation, production and maintenance. To return to the principle of continuous improvement within each process, it should be mentioned that the above sub-processes comply with all P.D.C.A. steps. All the machines that form the flow chart of a plant need to be equipped in an appropriate manner, with material resources (tools, work pieces, devices, gauges etc.) and with all the necessary documents (the production planning and the quality assurance documents) - especially with the control chart, work instructions, control instructions etc. The maintenance is very important, since by implementing preventive and predictive maintenance, product flow bottlenecks are avoided, and the production will be leaner, thus assuring the accomplishment of all the indicators concerning the parts supplied.

According to chapter 6.2 of ISO/TS 16949 requirements, the "Human Resources" is a very important aspect regarding the functioning of the quality management system. The most frequently encountered sub-processes in automotive industry are: the definition of human resources necessary, the employee recruitment, the employee insertion and integration, and the training (both initial and continuous, throughout the work within the organisation).

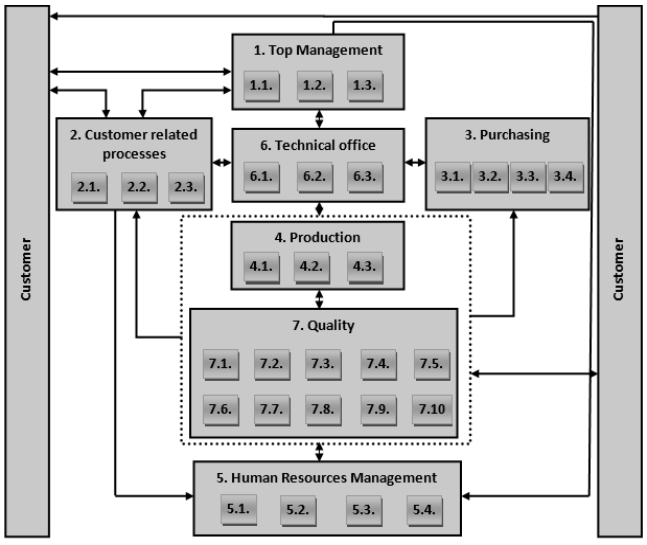

Fig. 1. *The process map for an automotive industry supplier*

The sub-processes of the first 4 identified organisational processes Table 1

1. TOP MANAGEMENT	**2. CUSTOMER RELATED PROCESSES**	**3. PURCHASING**	**4. PRODUCTION**
1.1. Budget	2.1. Product quotation	3.1. Supplier's selection	4.1. Machines equipments
1.2. Resources	2.2. Financial offer analysis	3.2. Commercial treaties	4.2. The validation of production initiation
1.3. Review	2.3. QMS client's requirement	3.3. The orders for needed materials/activities	4.3. Production
		3.4. Supplier's management/ Incoming controls	4.4. Maintenance

The sub-processes of the last 3 identified organisational processes Table 2

5. HUMAN RESOURCES MANAGEMENT	**6. TECHNICAL OFFICE**	**7. QUALITY**	**7. QUALITY** (*continued*)
5.1. The identification of the necessary resources	6.1. Development planning	7.1. Documentation	7.6. Root cause analysis
5.2. The employee research	6.2. First part development	7.2. Control	7.7. The corrective actions
5.3. The employee insertion	6.3. The demand to approve the first (trial/master) parts	7.3. Audit	7.8. The improvement actions
5.4. Training		7.4. Client's analysis	7.9. The improvement validation
		7.5. Non-conformities analysis	7.10. The preventive actions

ISO/TS 16949 top management process requirements Table 3

Organisational Process	**ISO/TS 16949 Requirements**
(1)	**(2)**
1. Top Management	5.1. Management commitment 5.2. Customer focus 5.3. Quality policy 5.4. Planning 5.5. Responsibility, authority and communication 5.6. Management review 6.1. Resources supply 8.2. Monitoring and measurement

ISO/TS 16949 requirements for processes no. 2, 3, 4, 5 and 6 Table 4

Organisational Process	**ISO/TS 16949 Requirements**
(1)	**(2)**
2. Customer Related Processes	4. Quality management system 4.1. General requirements 4.2. Documentation requirements 5.2. Customer focus 5.5. Responsibility, authority and communication 5.6. Management review 6. Resource management 6.1. Resources supply 6.3. Infrastructure 7. Product realisation 7.1. Planning of product realisation 7.2. Customer-related processes 7.3. Design and development 7.4. Purchasing 7.5. Production and service provision 7.6. Control of monitoring and measuring devices 8.2. Monitoring and measurement 8.3. Control of nonconforming product 8.4. Analysis of data 8.5. Improvement
3. Purchasing	7. Product realisation 7.1. Planning of product realisation 7.2. Customer-related processes 7.3. Design and development 7.4. Purchasing 8.4. Analysis of data
4. Production	7.1. Planning of product realisation 7.3. Design and development 7.5. Production and service provision
5. Human Resources	6.2. Human resources 6.4. Work environment 7.5. Production and service provision 7.6. Control of monitoring and measuring devices
6. Technical Office	4.2. Documentation requirements 6.4. Work environment 7.1. Planning of product realisation 7.3. Design and development 7.4. Purchasing 7.5. Production and service provision 7.6. Control of monitoring and measuring devices 8.2. Monitoring and measurement 8.5. Improvement

ISO/TS 16949 requirements for quality process Table 5

Organisational Process	ISO/TS 16949 Requirements
(1)	**(2)**
7. Quality	4. Quality management system 4.1. General requirements 4.2. Documentation requirements 5. Management responsibility 5.1. Management commitment 5.2. Customer focus 5.3. Quality policy 5.4. Planning 5.5. Responsibility, authority and communication 5.6. Management review 6. Resource management 6.1. Resources supply 6.2. Human resources 6.3. Infrastructure 6.4. Work environment 7. Product realisation 7.1. Planning of product realisation 7.2 Customer-related processes 7.3. Design and development 7.4. Purchasing 7.5. Production and service provision 7.6. Control of monitoring and measuring devices 8. Measurement, analysis and improvement 8.1. General 8.2. Monitoring and measurement 8.3. Control of nonconforming product 8.4. Analysis of data 8.5. Improvement

Another process is assured by the "Technical Office" specific activities. This approach is also valid for the production plants that do not design the products, this task being the client's duty. The technical office's main duties (or Engineering Department, as it is known by some suppliers) are to plan and to validate the production flow. Practically, mass production will only start after completing the validation sub-process, in which the following parts are involved: the customer's employees (or at least the customer quality engineer, also referred to as quality supplier representative, as well as the buyer, if necessary) and the supplier organisation's employees (or at least the production responsible, the engineering responsible and the quality management system representative). The validation must always be done at the place of production, and the analysis of the

produced master parts can be done by the customer in his plant.

The final process defined is "Quality". From the viewpoint of quality management system, this process may be considered the most important one, as it establishes a direct relationship with production, customer, technical office, customer related processes, and human resources management. Therefore, it may be perceived in close connection to the "Top Management" process. The sub-processes that fall under the "Quality" process are as follows: documentation, control, first and second part audit, client analysis, nonconformities analysis, problems root cause analysis, corrective, preventive and improvement actions.

It is obvious that the proposed process map follows neither the organisational structure (materialised by the network of departments), nor the ISO/TS 16949 requirements, as presented by the structure of the technical specification (quality management system presentation, management responsibility definition, resource management description, product realisation and measurement, analysis and improvement, the final chapter of the technical specification, which closes Deming's wheel).

In Tables 3, 4 and 5 are shown all the ISO/TS 16949 requirements that cover the seven processes described in the process map (see Figure 1). Actually, it is obvious that all the audible requirements of the technical specification are covered. For each process, the corresponding requirements are only presented until the second order of imbrications and some of the requirements are more relevant than others for the specified process. This table may be very useful in doing the audit schedule and balancing the team members' activities, as well as in developing the system's audit properly.

4. Conclusions

This study is very important for the practitioners in the industrial sector, involved in the implementation, maintenance and audit of quality management systems, as well as for the industrial plant managers. Therefore, the key feature of this study is to propose a regulation for this important organisational document. Due to rather strict page constraints, this article is by no means exhaustive. For an in-depth study, further reference should be made to the specialist literature, with particular focus on the involvement in practical activities.

By applying the proposed organisational process mapping, the audit programmes have been optimised, assuring an efficient manner of scheduling and implementing the audit activities.

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