Professional MBA
Automotive Industry

Purchasing Tool Ensuring the Conformity of ISO 9001 and Base Automotive Requirements along the Supply Chain with Focus on Tier 2 and Tier 3 Suppliers

A Master's Thesis submitted for the degree of
"Master of Business Administration"

supervised by
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Vienna, 26.9.2017

Affidavit

I, **DANIELA HANZLÍČKOVÁ**, hereby declare

1. that I am the sole author of the present Master's Thesis, "PURCHASING TOOL ENSURING THE CONFORMITY OF ISO 9001 AND BASE AUTOMOTIVE REQUIREMENTS ALONG THE SUPPLY CHAIN WITH FOCUS ON TIER2 AND TIER3 SUPPLIERS", 73 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

Vienna, 26.09.2017

Signature

Acknowledgement

The final part of my two years MBA Automotive Industry study program is this Master's Thesis.

For establishing such a unique international study program and for giving me the opportunity to be a part of the 2015-2017 class, I would like to express my gratitude to the academic directors Univ. Prof. Dr. Ing. Prof. eh. Dr. h. c. DI Wilfried Sihn and Ing. Ján Lešinský, PhD., Assoc. Prof.

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Abstract

In the past two years the quality management standards, especially in the automotive industry, have overcome significant changes in order to capture the needs of the current business environment. Companies are now in the transition period and shall upgrade their quality management standards according new requirements. As the portfolio of suppliers plays crucial role in every company, with possible effects on the entire supply chain, it is necessary to prove and monitor the requirements at every level. Therefore, two main objectives of this Master's Thesis have been appointed.

At first, the base monitoring and evaluating criteria for suppliers had to be defined. In order to extend the new requirements of quality management standard, the relevant automotive standards and the customer specific requirements have been analyzed with the focus on the requirements on the control of externally provided processes, products and services.

Secondly based on the findings a questionnaire tool, that offers a complex purchasing tool for the companies, has been designed. This questionnaire has incorporated the demands on new suppliers, as well as already existing suppliers, enhanced by the latest requirements of the automotive industry in order to ensure the conformity along the supply chain.

There was a survey of 25 companies, Tier 2 and Tier 3, carried out to provide a detailed information about the ability of companies to fulfill the defined criteria.

The results brought by the survey have exposed the strongest areas that the companies are fulfilling on a high level as well as the weak areas. The weak areas need to be addresses by further cooperation through supplier development in order to minimize the risks along the supply chain. Few recommendations were formulated for the development of the companies in weak areas, to increase the fulfillment of the demands of the automotive industry.

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1. Introduction

1.1. Motivation

The business conditions in the recent years have changed significantly. Modern technologies have become indisseverable part of or personal and working life, due to global economy point of view state boundaries do not play significant role anymore and supply chains are more aggregated.

The crises in 2008 in the automotive industry has been a test for many companies on the supplier's side. The well prepared once have strengthen their position due to well adoption to the demands of the market and the fast adaptation to the new requirements of the changing conditions.

In order to be viewed a s a reliable partner a company has to have an efficient quality management system incorporated. In the past two years the standards for QMS have overcome lot of changes to reflect and ensure that the main needs of current business environment are contained and taken into consideration. Companies should update their QMS within a short transition period along with fulfilling their daily tasks, which can be quite a challenge especially for smaller companies with limited resources both human / qualified personnel and information. These companies however also play an important role in the supply chain and quality assurance should be set as a common goal.

Therefore, the main focus of this Master's Thesis will be on the smaller Tier 2+ companies and their QMS, especially on the purchasing side, as I believe many potential risks can be eliminated by proper line up of process of selection, evaluating and monitoring of the suppliers using the complex and effective tool for ranking of suppliers down to raw material providers. Purchasing process has a direct impact on the quality of the products and the fulfillment of contracts with customers throughout the entire automotive supply chain, therefore organizations should pay increased attention to it.

1.2. Definition of a Research Problem

One of the significant factors for reduction of risks in the supply chain is the transfer of procedures for identification and elimination of potential threats to the lower levels. The access to this kind of information and the level of qualification however declines towards the end of the supply chain.

There is no doubt that the information and requirements are passed properly on the OEM – Tier 1 level, unlike Tier 2+ level. In current situation on the markets especially smaller companies are trying to diversify their portfolio of the products to several branches in order to diffuse risk of failure of one industry, however once being with part of the products supplier to the automotive industry, they should be aware of the fact, that they have to comply with the automotive requirements for suppliers.

The base standard for establishing quality policy is the international Standard ISO 9001, which aim is to standardize and secure the comparable quality standards within an organization. This standard has overcome the latest major revision in 2015 and until September 2018 the companies, that are already certified to this standard, have a transition period for upgrading their QMS. Standard provides the information on the new requirements for purchasing departments regarding control of externally provided processes, products and services, however it does not offer the outline of the process itself, this is left to the companies.

On the same time the direct suppliers (Tier1) to OEMs are committed to implement and carry across the requirements of the automotive industry into sub-suppliers QMS. These requirements result from IATF 16949, VDA Standards and Specific Customer Requirements and enhance the base ISO 9001 standard.

The amount of information, looking at the number of all OEMs and main Tier1 suppliers, is enormous. Special requirements are usually described in CSRs. The survey among the OEMs and Tier 1 suppliers revealed that the inconsistency of CSRs, together with QMS and the loss of experience are the critical points impacting quality (Quality 2020, 2014:4).

The main aim of this Master's thesis is to identify the base criteria for suppliers to be paid attention to and to provide a complex tool, questionnaire, for selection, evaluating and monitoring of suppliers on the Tier2+ level that will be based on the ISO 9001:2015 requirements incorporated with the base criteria of automotive industry.

1.3 Main research Questions and Hypothesis

The above mentioned challenges and the impact on many companies worldwide bring us to the main research question of this Master's Thesis.

1. **What are the criteria for suppliers on lower levels (Tier 2+) to be monitored in order to secure the conformity along the supply chain?**

   Aim- identification of the base requirements for control of externally provided processes, products and services according to ISO 9001:2015 and automotive industry requirements

   Hypothesis: Combined criteria for QMS for suppliers will offer better base criteria for reduction of risks on quality of the supplied products

2. **How to outline an effective process of selection, monitoring, re-evaluation of external providers according to ISO 9001:2015 requirements and base criteria of automotive industry for the companies on lower levels in the supply chain?**

   Aim- layout of a process and complex questionnaire tool for selection and monitoring of sub-suppliers, identification of areas of improvement and development

   Hypothesis: Implementation of complex questionnaire tool will offer a complex view on supplier selection criteria even for the companies on lower levels certified only according to ISO 9001:2015, however still supplying to the automotive industry, eliminating the risks in the supply chain and ensuring the conformity with requirements along the automotive supply chain

1.3. Structure of Master's Thesis

This Master's Thesis is divided into 5 chapters. Chapter 1 Introduction clarifies the motivation and defines the research problem together with the research questions and hypothesis. first chapter closes with the brief outline of the overall structure of the Master´s Thesis.

The aim of the Chapters 2, QMS standards and norms applicable in the automotive industry, is to inform about the current state of the art of the main QMS standards in the automotive industry. The description of quality management system, selection of standards relevant for automotive suppliers, their new editions with main changes described for further analyzes in the following chapters.

Chapter 3, Methodology description, provides an outline of the methods used in this Master's Thesis for both theoretical part Chapter 2 and practical, Chapters 4 and 5.

Chapter 4, Base requirements on control of externally provided processes, products and services, focuses more in detail on the common requirements of all the applicable standards. In this chapter, the base criteria in order to secure the conformity along the supply chain are identificated and the outline of the process of selection, monitoring, re-evaluation of the suppliers offering the customized tool, the questionnaire, for evaluating of suppliers is designed.

In Chapter 5, Fulfillment of the automotive requirements by the suppliers in lower levels of the supply chain, the survey among Tier 2+ organizations is presented. The survey has been made in order to evaluate the areas of requirements and the ability of fulfilment of them by Tier 2, Tier 3 level companies. The findings of the survey have been considered for suggestions of the corrective actions to be taken into account for the development process of suppliers.

Chapter 6 provides a Conclusion of the Master's Thesis.

Brief structure of the Master's Thesis is displayed by the Table 1.

Table 1. Structure of Master's Thesis

Chapter	Title
1.	Introduction
2.	QMS standards and norms applicable in the automotive industry
3.	Methodology description
4.	Base requirements on control of externally provided processes, products and services
5.	Fulfillment of the automotive requirements by the suppliers in lower levels of the supply chain
6.	Conclusion

2. QMS standards and norms applicable in the automotive industry

2.1 Definition of Quality Management System

Quality has always been an important part of products and services. Although it has always been taken into consideration it has been a has overcome a long development process to the way it is viewed now.

Already in 1900s H. Ford created a mistake proof assembly concepts, self- checking and in-process inspection. At the same time a sampling methodology as an alternative to hundred percent control was developed by H.F. Doge and H.G. Romig and it was accepted at Bell laboratories together with statistical control chart concept of W.A. Shewhart. (Montgomery, 2009: 25)

The roots of quality management are in Japan and were largely unknown to the rest of the industrialized world (Avery, Zabel; 1997 The Quality Management Sourcebook) In 1946 G. Taguchi began a study and application of experimental designs, continuing with K. Ishikawa cause and effect diagram. (Montgomery, 2009: 25)

After World War II period has shown that statistical methods need improvement and control the quality of a products is inevitable. The American Society for Quality Control was formed in 1946 providing many technical publications, training programs regarding quality.

The expansion of the methods occurred largely in 1970s -1980s, when the US companies realized that the Japanese competitors have been using the designed experiments for process improvement and new process development. (Montgomery, 2009: 25)

The most famous leaders in the field of quality management, in the period from 1940s – 1980s, are W. Edwards Deming, Joseph M. Juran, A. Fegenbaum and P. B.Crosby as well as K. Ishikawa, N. Kano and G. Taguchi. (Breitfels, 2004:12).

Their philosophy and contribution to the Quality Management outlined in table below.

Table 2. Famous leaders in QM and their contribution

Leaders in the Field of Quality Management	
W. E. Deming	Insisted management accept responsibility for building good systems. The employee cannot produce products that on average exceed the quality of what the process is capable of producing. He points out 14 points for implemented quality improvement- Create consistency of purpose, Lead to promote change, Built quality into the product, built long-term relationships based on performance, continuously improve product, start training, emphasize leadership, drive out fear, Break down barriers between departments, stop haranguing workers, Support, help and improve, Remove barriers, institute a program of education and self-improvement, put everybody in the company to work on the transformation
J.M Juran	Strongly believed in top management commitment, support and involvement in the quality effort. He also encuraged to continually raise the quality standards. Juran varies from Deming in focusing on the customer and defining quality as fitness for use, not necessarily the written specifications.
A. Feigenbaum	In his book Total Quality Control defined 40 steps to quality improvement processes. He viewed quality not as a set of tools but as a total field that integrated the processes of a company. His work in how people learn from other's successes led to the field of cross functional teamwork.
P.B. Crosby	Believed that in the traditional trade-off between the cost of improving the quality and the cost of poor quality, the cost of poor quality is understated. The cost of poor quality should include all of the things that are involved in not doing the job right the first time.

Source: Heizer et al. 2016:257

P. Crosby had four absolutes (Oakland, 2014:20):

- definition – conformance to requirements,
- system – prevention,
- performance standard -zero defect,
- measurement – price of nonconformance.

G. Taguchi main contributions to the statistics are Taguchi's loss function, philosophy of off-line quality control and innovations in the design of experiments (Janakiraman, 2006:134).

K. Ishikawa is famous for being a pioneer of the Quality Circle movement in Japan in 1960s. His biggest contribution was in simplifying statistical techniques for quality control:

- Cause-and-Effect Diagram that helps groups in the quality improvement,
- Seven Quality Control tools (K M Ho, 1999: 62).

To define the QMS nowadays following definition can be used.

"Quality Management System *(QMS) is a management system intended to direct and manage the organization in terms of quality."* (Gašparík, 2016: 6). It can be used in any organization.

Current business conditions are very different from the conditions known in the past. Business conditions can be characterized by more complex supply chains, global economy view and also huge technological progress. Despite these significant changes one thing stays constant. Company needs to meet the growing needs of customers in order to be successful.

2.1.1. Purpose and Benefits of QMS

Implementation of the quality management system is a strategic decision, with the main aim of improvement of efficiency of the company.

QMS consists of the activities and instruments, by adopting which the company lays out goals, processes and sources required for achievement of the set targets.

By managing of the cross linked processes, and sources it enables the management to optimize the allocation of resources on all levels and offers the proposals for identification of actions to deal with predictable an unpredictable consequences.

For the fulfilment of the goals of QMS great support within the whole organization is essential. The first steps and layout of the direction of the quality policy is the competence of the top management. However the coordinated effort and engagement of all employees of the organization is required in order to succeed (Gašparík, 2016:6).

Top management supports the QMS and the engagement of people for example by providing adequate human resources, monitoring the processes and results, defining the risks and outlining the opportunities.

The efficiency of the company is depending to a large extent on the way people behave as people are the core resources in the organization. QMS is more effective when all employees understand their responsibilities and the impact of their actions on the fulfillment of the goals of the organization.

QMS has many benefits, among the most important belong, efficiency of the company, satisfaction of the customer, optimalization of the resources and processes, yet they are not the only one.

Some of the other potential benefits for the company are:

- increase of the value for the customer,
- increased reliability,
- improved loyalty of customers,
- improvement of business relations,
- enlarged base of business,
- increased turnover and the share of the market,
- providing product and services that meet customer requirements,
- ability to ensure conformity to specific QMS.

2.2.2. International Standards

Global supply chains emphasize the importance of common international standard.

„The International Organization for Standardization founded in 1947, based in Geneva is issuing ISO 9000 standards pertaining to the QMS" (Gašparík, 2016:6). ISO organization is worldwide recognized and grants following international standards from the ISO 9000 group.

Table 3. ISO 9000 set of Standards

Set of ISO 9000 standards for Quality Management System
ISO 9000:2015 Quality management systems – Fundamentals and vocabulary
ISO 9001:2015 Quality management systems – Requirements
ISO 9004:2009 Managing for the sustained success of an organization - A quality management approach

Source: (Gašparík, 2016 :7)

The more detailed overview of the requirements, principles and the structure of ISO 9001 is provided further in this chapter.

Besides the international ISO 9001 standard, in order to ensure the compliance of the QMS in the automotive industry, also following standards need to be taken into consideration:

- VDA,
- IATF16949,
- Special Requirements of Customers.

The relations and the influence on the QM policy of organization can be illustrated by figure 1.

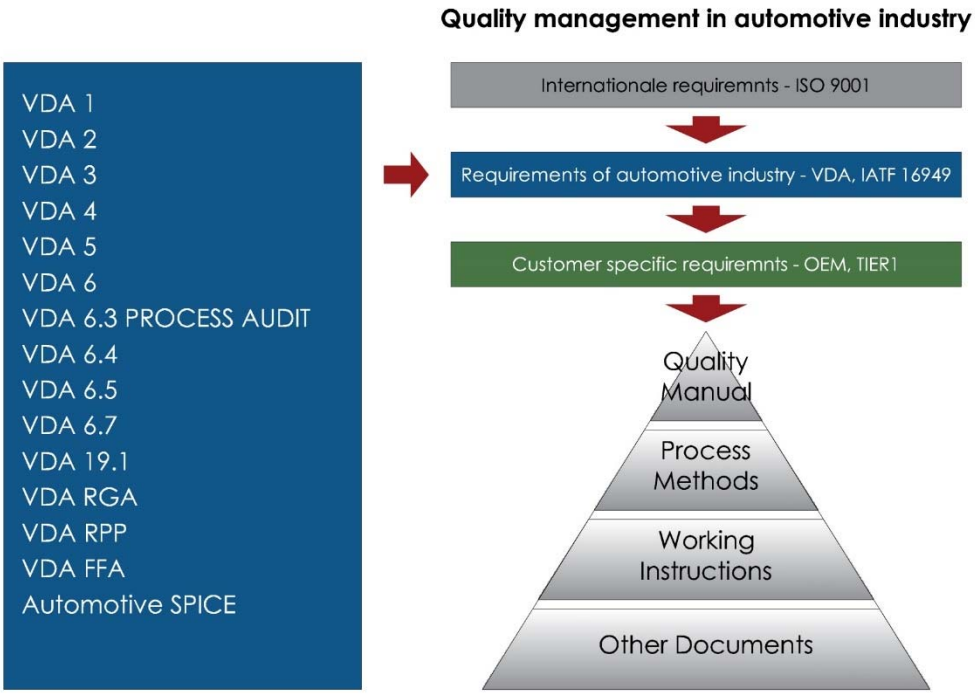


Figure 1. Quality management standards in automotive industry (VDA 6.3 Qualification of Auditor Workbook 2017:3)

VDA

The group of VDA Standards is the set of standards provided by VDA, (Verband der Automobilindustrie, German Association of automotive industry), as an extension of ISO 9001 for the automotive industry required by automotive manufacturers in Germany.

The VDA 6.x certifications and the IATF 16949 have their origin in ISO 9001 QMS. Both standards are being analyzed in more detail in chapters 3.1.1. and 3.2.1.

IATF 16949 together with VDA 6.x has the origin in the ISO 9001:2016 QMS standard and describes the requirements on the QMS in the automotive industry.

CSR broaden the automotive requirements on the QMS and specify each section more in detail.

2.3 Quality Management System according to ISO 9001:2015

As it has been already mentioned before ISO 9001 is a quality management international standard with the aim to standardize and secure the comparable quality of standards within organizations. The QMS shall include all processes in the organization. Beginning with the identification of customer requirements and ending with their satisfaction at every operation interface. (Oakland, 2014:245)

International Organization for Standardization (ISO) issued a new version of ISO 9001:2015 in September 2015. This norm replaced the edition from 2008. Currently many organizations are in the transformation period and have time until September 2018 to get recertified according new edition. After this date, the ISO 9001:2008 will no longer be valid.

ISO standards are being reviewed usually every 5 years in order to stay up to date and to provide the organizations with the latest requirement on quality. The revision in 2000 focused mainly on proper processes in order to improve and increase customer satisfaction. Version 2008 was more accurate regarding the implementation and focused on process approach. The review process for actual 2015 edition took more than three years, engaged were 81 countries and experts from business, government and academic sectors. (Gašparík, 2016:13)

2.3.1 Necessity, reason for a new edition

The world around us is changing at a fast pace in all areas not excluding the business. Main drivers for the new edition of ISO 9001 are technical progress, complex supply chains, global economy and increased expectations of customers.

To meet the demands of the world today, 2015 edition focuses on:

- risk based thinking,
- leadership engagement,
- process approach,
- PDCA cycle application,
- relationship, same core elements with other management standards, (ISO 14001, ISO 22000, OHSAS 18001)
- addressing the supply chain more effectively,
- giving importance to continuous and systematic process improvement.

The main difference in the new edition is the higher emphasis on the fulfilment of the results from individual processes QMS and the result of the system as a whole (Hnátek et al. 2016:21).

Quality Management Principles

Standard ISO 9000 describes the principles of QM and also provides the information why to use the principle and how it is important for the organization (Hnátek et al. 2016:6)

Quality management principles described in this standard are:

- process approach,
- customer focus,
- leadership,
- engagement of people,
- improvement,
- evidence based decision making,
- relationship management.

Table 4. Changeover of principles to current form

ISO 9000:2005/ISO 9001:2008	Proposed ISO 9001:2015
1. Customer Focus →	1. Customer Focus
2. Leadership →	2. Leadership
3. Involvement of People →	3. Engagement of People
4. Process Approach →	4. Process Approach
5. System Approach to Management ↗	.....
6. Continual Improvement →	5. Improvement
7. Factual Approach to Decision Making →	6. Evidence-based Decision Making
8. Mutually Beneficial Supplier Relationships →	7. Relationship Management

Source: Hnátek et al, 2016:16

"ISO 9001:2015 is based on a process approach which includes the PDCA cycle (Plan – Do – Check – Act) with risk-based thinking." (Gašparík, 2016:14)

Process can be called any activity or group of activities that use their resources for the transformation of the inputs into outputs. Understanding and managing of the process as a system helps to achieve defined goals more effectively and efficiently.

The identification of the processes, their managing within the organization and their interaction is known as process approach.

Application of the PDCA enables the organization to broaden the knowledge regarding the processes, plan, incorporate changes and evaluate the results. As no improvement is definite, continual development of all processes is fundamental for securing high quality of products and services.

"Risk-based thinking enables an *organization to determine the factors that could cause its processes and its quality management system to deviate from the planned results, to put in place preventive controls to minimize negative effects and to make maximum use of opportunities as they arise"* (Gašparík, 2016:14).

To follow on the new requirements an organization needs to plan and implement actions to address risks and opportunities. The first inputs have to come from the top management, it has to be set up to which point should be the risks be discussed on each level. On the next levels the employees are provided with specific tasks, that are directly related to the minimalization of risks.

QMS structure according to ISO 9001 is describing the interaction of processes in order to achieve targets, taking into consideration quality policy and strategic direction of the organization is shown on the diagram. Figure 2 explains the process with the link to the PDCA cycle.

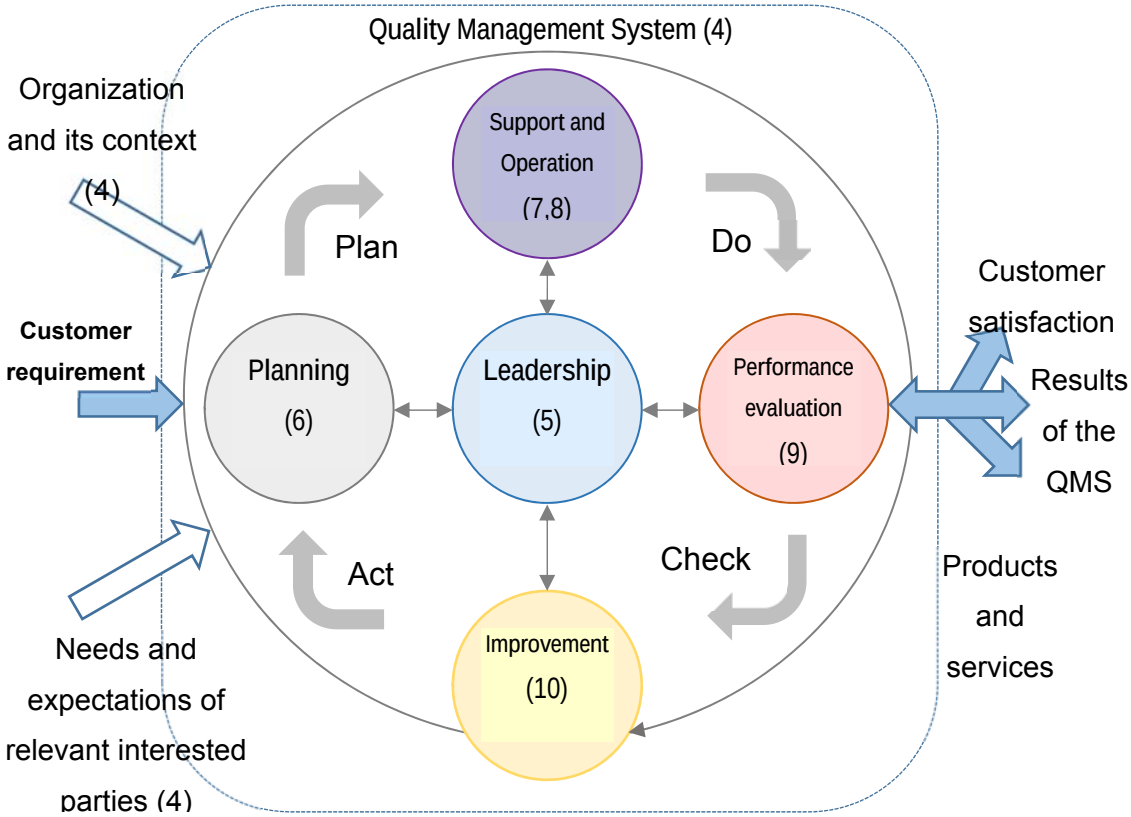


Figure 2. Structure of QMS according the ISO 9001:2015 in PDCA cycle (Gašparík 2016:15)

Conforming to the process approach in the QMS results in (Hnátek et al. 2016:17)

- Understanding and consistency in meeting requirements
- The consideration of processes in terms of added value
- The achievement of effective process performance
- Improvement of processes based on evaluation of data and information

Figure 3 shows a schematic representation of process and provides the explanation of the interactions of elements according to the ISO 9001:2015 standard.

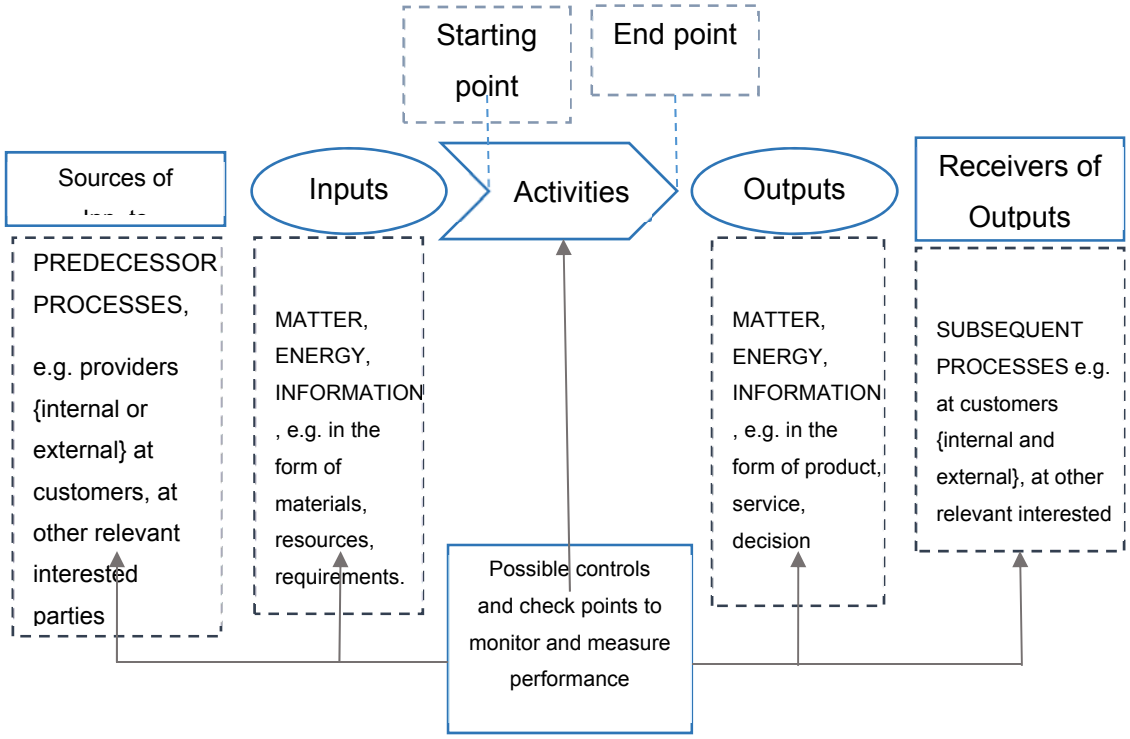


Figure 3. Schematic Representation of Process Elements (Hnátek et al2016:18)

2.3.3 Structure and Requirements of Clauses

To continue with the differences between the 2008 and 2015 edition one of the most visible change is the new structure. Current edition broadens the number of chapters up to 10 and follows the same structure as all ISO standards. Table 5 displays the layout of the new structure.

Table 5. Layout of the new structure of ISO 9001:2015

ISO 9001:2015	ISO 9001:2008
1. Scope	1. Scope
2. Normative references	2. Normative references
3. Terms & definitions	3. Terms & definitions
4. Context of the organization	4. Quality management system
5. Leadership	5. Management responsibility
6. Planning	6. Resource management
7. Support	7. Product realization
8. Operation	8. Measurement, analysis & improvement
9. Performance evaluation	
10. Improvement	

Source: ISO 9001:2008 a ISO 9001:2015

A brief overview of all changes with underlining the main changes in the 2015 ISO 9001 Edition offers the Table 6.

Table 6. Main changes in ISO 9001:2015 standard

Clause 1	Scope	
Clause 2	Normative references	
Clause 3	Terms and definitions	Common terms with other Management System Standards
		More ISO 9001 terms and definitions
Clause 4	Context of the organisation	*Key changes*
Clause 5	Leadership	Enhanced requirements and *key changes*
Clause 6	Planning	Significant changes for risks and opportunities plus change management
Clause 7	Support	Resource management – enhanced requirements
		Knowledge management – new requirement
		Documented information – *key change*
Clause 8		Control of processes – significant changes
		Products – new definition and significant changes
		External provision – enhanced requirements
		Design and development – simplified requirements
		Nonconformance – enhanced requirements
Clause 9	Performance evaluation	Monitoring, measurement and analysis – enhanced requirements
		Performance indicators – additional requirements
Clause 10	Improvement	Nonconformity, corrective action and improvement – enhanced requirements
		Continual improvement – more structured approach

Source: Tricker, 2016:12

Other significant differences between the current and the previous version are listed as follows (Gašparík,2016:17)

- The term preventive actions are left out in the ISO 9001:2015 version. Instead organizations should implement risks and opportunity management.
- Management review is no longer performed once a year. It has become a permanent element and is covered in clause 9- Performance evaluation.
- The responsibilities and tasks of the Quality Management Representative are transferred to the management of the organization.
- Quality manual is not compulsory.
- Standard does not recognize the terms document, record, instead the term documented information is to be used.
- The new 2015 edition contains more requirements, however on the other hand provides more flexibility in meeting of the requirements.

Mandatory documented information

The influence of the technological progress and the dependence on the information technology has influenced also the need for changes in process of documenting the information in organization. Nowadays there is no longer need to store print outs of all the information as they can be stored in digital forms. The application of ISO 9001:2015 sets out the mandatory documented information. (Gašparík, 2016:23)

Requirements of ISO 9001:2015

The structure of the ISO 9001 is now formed into 10 clauses. The following lines provide a brief view of the requirements of all clauses, to consider the standard as whole, in order to keep in mind the integration and connection of all processes.

Closer and more detailed description will be given to the clause 8.4 Control of externally provided processes, products and services to focus on the requirements of suppliers.

Clauses of ISO 9001:2015

1. **Scope** deals with the purpose of the standard (Robitaille,2016:24). This standard has been created in the way to fit any kind of organization with the aim to produce products and services which meet the requirements of the customers.
2. **Normative references** ISO 9000:2015 is the only normative reference for ISO 9001:2015 defining vocabulary and fundamentals of standard.
3. **Terms and definitions** - ISO 9000:2015 also provides the terms and definitions for ISO 9001:2015 standard.
4. **Context of the organization** contains activities that need to be established in QMS. It specifies the need to determine the context of the organization with taking into consideration external, internal issues and interested parties. The scope of QMS and the boundaries have to be determined, processes identified, including the definition of their sequence, control, resources, planning and determines appropriate criteria. (Robitaille, 2016:25).
5. **Leadership** - the top management plays an important role in the standard ISO 9001:2015. The success of the QMS depends on the leadership and employee engagement. Detailed information about the leadership, engagement of people, developing and communication of the quality policy, assignment of roles, responsibilities and appointment of authorities can be found in this section. (Cochran, 2015:10)
6. **Planning** - builds on the information already provided in the section 4 (internal, external issues, interested parties) This section contains actions to address risks, opportunities, quality objectives and the outline on what to do in order to achieve them. It also deals with the planning of the changes to address risks and opportunities.
7. **Support -** covers the activities that enable the core production processes. Resources including people, infrastructure, environment of the operation of processes, monitoring and measuring of resources, organizational, communication and documented information. (Cochran, page 10).
8. **Operation -** is a long section covering all activities stretching from planning to major production processes. It addresses quotations, order processing, purchasing, design, manufacturing, identification, traceability of products and materials, storage, handling of customer owned material, shipping and

aftermarket activities. It also covers the way in which the nonconformities should be controlled in order to prevent unintended use. (Robitaille, 2016:25).

9. **Performance evaluation -** contains requirements to identify processes, activities in order to collect and analyze the data needed for decision making. It also covers the methods to be used to perform the monitoring and measurement activities. This Section begins with customer satisfaction followed by the clause regarding the internal auditing. The final part relates to the managerial review, emphasizing the need to have reliable data and information. Language related to review of the actions to address the risks and opportunities is also included (Robitaille, 2016:26).
10. **Improvement** – describes improvement process, nonconformity handling, corrective actions and continual improvement together with the PDCA cycle (Cochran,2015:10).

After the overview of all of the clauses of ISO 9001:2015 to provide a top view on the standard, the next chapter will explain more in detail the requirements of the section 8.4. Control of externally provided processes, products and services, which is part of the section 8. Operations.

2.2.4 Control of externally provided processes, products and services

Clause 8.4. Control of externally provided processes, products and services

ISO 9001:2015 describes the requirement on the externally provided processes, products and services in 3 sections.

1. General
2. Type and extent of control
3. Information for external providers

Clause 8.4.1- General

The organization should ensure that externally provided processes, products and services conform to requirements.

Organization should state the controls for the externally provided processes, products and services when (Hnátek et al. 2016:93)

a) *Products and services from external providers are to be incorporated into the organization's products and services*
b) *Products and services are being provided directly to the customers in the name of the organization*
c) *Process or a part of a process is provided by an external provider based on the decision of the organization*

The organization shall also determine and incorporate the criteria for evaluation, selection, performance monitoring and re-evaluation suppliers to be able to provide processes, products and services according to the desired requirements. The documented information regarding these activities shall be kept as well as actions arising from the evaluations.

Clause 8.4.2- Type and extent of control

The companies must ensure that the externally provided processes, products and services do not negatively affect the ability of them to consistently deliver conforming products and services.

The organization shall (Hnátek et al. 2016: 95):

a) *Ensure that the externally provided processes correspond to its QMS*
b) *Define the controls applicable for the external provider and the resulting output*
c) *Consider*

- *The potential impact of the externally provided processes, products and services on the constant ability to meet the customer, statutory and regulatory requirements*
- *Effectiveness of the controls by external provider of processes, products and services*

d) *State the verification, other needed activities to ensure externally provided of processes, products and services meet the requirements.*

Clause 8.4.3 - Information for external providers

The requirements shall be prior communicated also down the supply chain to other external providers.
The organization shall communicate the requirements for (Hnátek et al, 2016: 97)

a) *Processes, products and services to be provided*
b) *Approval of:*
- *Products, services*
- *Methods, processes, equipment*
- *Release of products and services*

c) *Competence plus any required qualification of persons*
d) *The interaction of external providers with the organization*
e) *Control and monitoring of the external*
f) *providers performance organization applies*
g) *Verification and validation activities that are used by the organization or its customer at the external provider's premises.*

2.3 International Automotive Quality Management Standards

2.3.1 IATF 16949:2016 Standard

The IATF 16949:2016 standard together with the specific requirements of the customers of automotive industry, requirements of ISO9001:2015 and ISO 9000:2015 defines the core demands for the quality management system for the organizations ensuring the serial production and the production of spare parts for the automotive industry. This standard has to be taken a as supplement of the ISO 9001:2015 and applied together. The IATF 16949:2016 should not be used as a stand alone document.

In 1994 the Big Three U.S OEMs (Chrysler, Ford, General Motors) have organized a working group with the aim of unifying their requirements manuals. They issued QS-9000- Quality System Requirements standard that was aligned with ISO 9000:1994. (Goicoechea & Fenollera, 2012:621). The first edition of ISO/TS 16949 was in 1999

by the International Automotive Task Force (IATF) in order to harmonize different systems for certification used along the automotive supply chain. Since then the following revisions were necessary. One in 2002 and in 2009 were due to the changes in the automotive and revisions of ISO 9001 standard.

ISO/TS 16949 introduced the common set of techniques and methods for products and process development for the automotive production all around the world. Since October 2016 it is the substituted by ISO 16949.

The main purpose of this standard for the automotive industry is the development of a QMS, enabling continuous improvement, emphasizing the prevention of defects, reduction of variation and waste in the supply chain.

Some of the main benefits for the organizations that implement the standard are:

- continual improvement and monitoring of the processes,
- increase of reliability ad market opportunities,
- increased efficiency,
- involvement, engagement of employees.

2.3.2 Requirements of IATF 16949:2016

The IATF standard does not contain the full text of ISO 9001, it only has the additional specific requirements from the automotive industry, the organizations are required to fulfill the ISO 9001 requirements in the first place. It adopted also the structure of ISO 9001 with its 10 clauses to keep consistency.

The key requirements of all clauses are listed below (Standard IATF 16949:2016):

1. **Scope** - this clause defines more detailed the scope and for whom is it applicable.

2. **Normative references** - ISO 9000:2015 is set as normative reference for vocabulary and fundamentals.

3. **Terms and definitions** - with the base set in ISO 9000:2015. This section also contains explanation of additional terms and definitions applicable for the automotive industry.

4. **Context of the Organization** - this section begins with the reference on the ISO 9001 determination of the context of the organization, identifies the internal and external issues that have impact on the organization, identifies interested parties, established the scope of QMS. Supplements the determining of the QMS, conformance of product and processes. Products safety is new part providing the list of documented processes for management and manufacturing of product -safety related products.

5. **Leadership** - defines the requirements on top management and its involvement in QMS, emphasizes engagement of people. Supplement has been made regarding the process effectiveness and efficiency, corporate responsibility and assign of the personnel with responsibility and authority to ensure customer requirements are met.

6. **Planning -** this clause enhances the actions to address risks and opportunities, quality objectives and planning of the changes according to ISO 9001. Organizations should have measurable quality objectives, risk analysis, preventive actions and contingency plans. Top management should ensure that the quality objectives meet customer requirements. being addressed and taken in to consideration at every level of the company.

7. **Support -** covers the assurance of appropriate resources in order to implement, manage and continually improve the QMS. This section provides supplemental information regarding statutory and regulatory, plant, facility equipment specifications and environment requirements. Enhances measurement traceability, calibration and verification, laboratory requirements. Supplement appears in the area of competence and on-the-job training, internal auditor competency and second-party competency as well as on awareness of employees regarding the impact of their actions on the quality of the product, employee motivation and empowerment. Towards the end the clause specifies supplemental information for records retention and engineering specification.

8. **Operation -** this clause covers major production processes. Supplement to ISO 9001 has been made in the operational and control planning, customer communication, determining the requirements for products and services- where they should include recycling and environmental impact. Design and development, prototype programs, product approval process have been strengthened, highlighting the record retention, outsourced products and services, regulatory requirements. Section 8.4 Control of externally provided processes, products and services has also new sub clause, and will be examined in more detail in following chapter as being the main focus on this thesis. Last section of this clause Production and Service Provision has supplements on identification, traceability and preservation.

9. **Performance evaluation -** contains the requirements on monitoring, measurement activities, data analyses, evaluation. New additions are in the section customer satisfaction, that is to be monitored through continual evaluation of internal and external indicators. Requirements on the audits provide more information about internal, QMS, manufacturing process audit and product audit. Managerial review is enhanced by the supplement defining frequency of them, their inputs and outputs.

10. **Improvement -** clause dealing with improvement, nonconformity, corrective actions has been enhanced by more detailed requirements on problem solving, error-proofing and warranty management system. New addition is also in the section customer complaints and field failure analyses and continual improvement that requires a documented process.

2.3.3 Chapter 8.4 Control of externally provided processes, products and services

The clause 8.4, as found in the standard IATF 16949: 2016, provides the supplements and the additional requirement of the automotive industry on the control of externally provided processes, products and services.

Changes and requirements compared to the ISO/ TS 16949:2009 are pointed out in the comparison table 7 below.

Table 7. Comparasion of ISO/TS 16949:2009 and IATF 16949:2016

Clause	IATF 16949 :2016	ISO/TS 16949 : 2009
8.4.1 General	Detailed criteria on slelection process of supplier	address the supplier seletion according to ISO 9001:2008
	Supplier selection process -assement of risk to product conformity, secure uninterrupted supply, relevant quality an ddelivery performance, assesment od software development capabilities, if applicable. Other criteria - financial stability, required technology, adequate resources, manufacturing capacity, contingency plans, customer service, logistic process	Supplier selection process has no detailed description
	All requirements of ISO 9001:2015 are applicable to the organization directed sources	
8.4.2 Type and extend of control	organizations shall have a documented process to indentify outsourced processes and select types of control on external providers of products and services -proess shall include criteria, types of control, development activities based on customer performance	The organization shall have a process to assure the quality of purchased product , utilizing one or more of the following methods:- receipt of, and evaluation of, statistical data by the organization;- receiving inspection and/or testing, such as sampling based on performance;- second- or third-party assessments or audits of supplier sites, when coupled with records of acceptable delivered product conformity to requirements;- part evaluation by a designated laboratory;- another method agreed with the customer.
	Supplier QMS - implement ISO9001:2015, objective to implement automotive QMS standards	Perform supplier QMS development in conformity with ISO/TS,
	Product related software -request to suppliers to implement and mantain a process for software quality of products	Not included
	Supplier monitoring- documented process and criteria to evaluate in ordert to ensure the conformity alonf the external providers. Minimum to be monitored: a) delivered product conformity to requirements;b) customer disruptions at the receiving plant, including yard holds and stop ships;c) delivery schedule performance;d) number of occurrences of premium freight.	Supplier shall be monitored through the following indicators:- delivered product conformity to requirements;- customer disruptions, including field returns;- delivery schedule performance (including incidents of premium freight);- special status customer notifications related to quality or delivery issues.The organization shall promote supplier monitoring of the performance of their manufacturing processes.Supplier monitoring through - delivered product conforming to requirements, -
	Second party audits- shall be included in supplier management approach for folowing, e.g. - supplier risk management, - supplier monitoring, - QMS development, -product process audits	Not inluded
	Supplier development- priority, type, timing of suppliers development should be determined. Inputs to include - performance issues, audit findings, 3rd party certification, risk analysis	Organization shall have a process to ensure the quality of purchased product by following methods :- evaluation of statistical data ;- receiving inspection and/or testing, sampling based on performance;- second- or third-party assessments or audits of supplier sites, delivered product conformity to requirements;- part evaluation by a designated laboratory;- another method agreed with the customer.
8.4.3 Information for external providers	The organization shall pass down all applicable statutory and regulatory requirements and special product and process characteristics to their suppliers and require the suppliers to cascade all applicable requirements down the supply chain to the point of manufacture.	Not inluded

Source: IATF 16949:2016 and ISO/TS 16949:2009

The standard also states the list of mandatory documentation related to the 8.4, that has to be maintained:

- supplier selection process,
- process to identify and control externally provided processes, products and services,
- process to ensure compliance with statutory and regulatory requirements of purchased processes, products and services,
- process and criteria for supplier evaluation,
- records of second-party audit reports.

ISO 9001:2015 and IATF 16949 are not the only standards to be focused on when speaking about the quality management in the automotive industry. Figure 1 shows the top view of all standards to be taken into consideration. First two, the core once have been already described on the previous pages. To follow the structure of VDA standards will be explained in more detail on following pages.

2.3.4 VDA Standards

After introduction of ISO 9000 in 1987, it was necessary to integrate and optimize the general ISO 9000 standards to the context and environment of the automotive industry. The VDA working group has taken on this role of consolidating the most useful standards into a common QMS package that could be used in German automotive industry. (Clarke, 2005:50). The German Association of the Automotive Industry- VDA (Verband der Automobilindustrie) is a German interest group of the German automobile industry, automobile manufactures and automobile component suppliers.

2.3.5 VDA 6.x series

VDA 6 series should be taken as a specific customer requirement that improves the auditing system in organization. It provides special criteria on determination of audit range, qualifying the analyzed system/ process effectiveness and establish requirements for auditors (Šurinová, 2013:23).

The first issue of VDA Volume 6 Quality Management Series, based on the ISO 9001 standard, was in 1991. Since August 1997 are these Standards administrated by VDA QMC – Quality Management Center, it is responsible for continuous update and translation of ISO context. Since September 1997 BMW, Volkswagen and Daimler Benz require their European OEM to be certified according to this Standard with the aim of ensuring the continual improvement of processes, prevention of problems and elimination of critical factors in the production (Clarke, 2005:52).

VDA 6.x series standards are usually co-integrated together with the ISO/TS 16949 standard.
Figure 6 provides brief comparasion of both above mentioned norms (Šurinová, 2013:28). The clear differences only confirm that they should not be taken as substitutes.

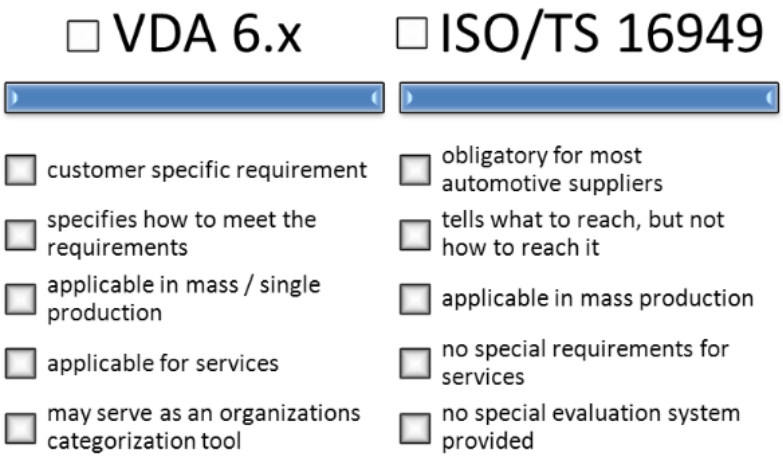


Figure 4. Differences between VDA 6.x and ISO/TS 16949 (Šurinová, 2013:23)

Technological progress, customer expectations, new production technologies lead to increase of requirements along the entire customers and supplier chains. In line with the revision of international standard ISO 9001:2015 for QMS in September 2016 VDA also revised the VDA standard Volume 6 containing the certification requirements. Certifications of previously issued VDA Standards 6.x series become invalid after 14th September 2018.

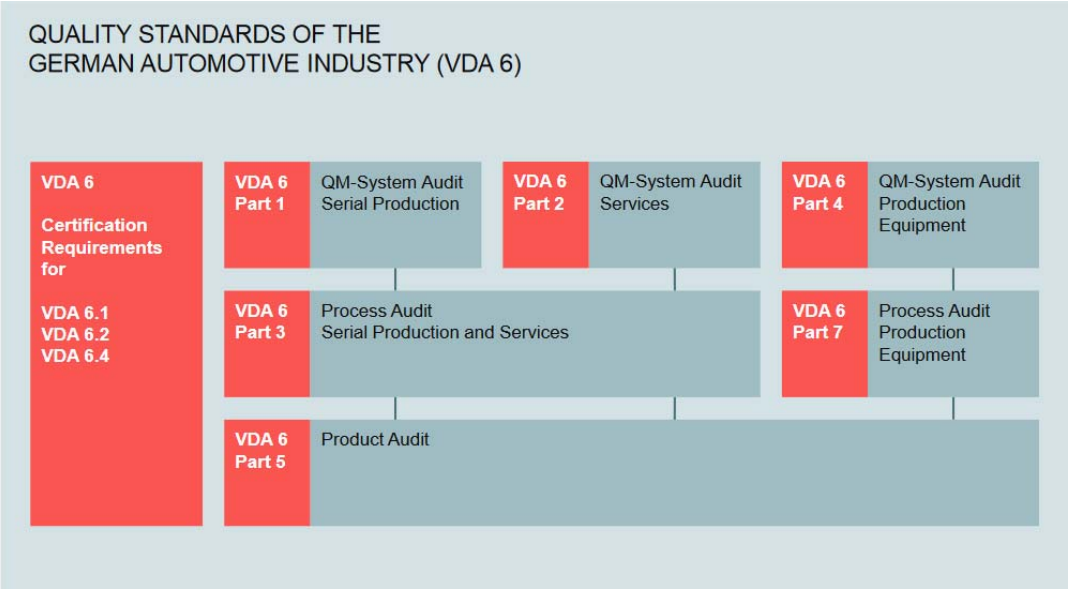


Figure 5. The Basic Structure of the 6.x Series (Transition Strategy for VDA 6.x Series, 2017:2)

6.1 Quality Management System Audit

Concentrating on the automotive industry the manufacturers primarily certify according to VDA 6.1 System Audit (Clarke, 2005:54) VDA 6.1 is divided into two parts:

- Process Audit Serial Production and Services,
- Product Audit.

For the analysis of the processes focused on suppliers Section 6.3 Process Audit should be considered as it is an excellent tool process audits (Šurinova, 2013, 24). Serving as a guideline for performing audits, providing information on the scope of process audit through the entire product life cycle. Determining the audit process, criteria for evaluation, and it also describes the methods for identification of risks and opportunities.

The 2016 edition brings the strengthened interaction of VDA 6.3 with other VDA publications. Requirements for process are given and distinction between process and system audit has been made more visible. The questionnaire has been also revised as for the content and its structure changed. Calculation of results has been

modified, all questions are now being weighed equally. Generic approach is no longer used and the A, B, C classification system, reliable downgrading rules and provision for * questions remain. (VDA 6.3, 2016:11)

2.3.6. VDA 6.3. Process Audit – Section 7 Supplier Management

The document VDA 6.3 Process Audit offers among others also more detailed information on the supplier management.

Section 7.5 Supplier Management focuses on topics in order to ensure that:

- only the approved, released suppliers, that are quality capable are used,
- customer requirements are taken into consideration, throughout the entire supply chain,
- target performance agreements have been agreed on and integrated within organizations,
- necessary releases and approvals for out-sourced products, processes and services are available,
- quality of the out-sourced products and services is ensured,
- incoming goods is being stored appropriately,
- personnel is qualified for their work tasks and the responsibilities are defined.

VDA 6.3 provides more detailed information in order to emphasize the requirements on suppliers (VDA 6.3 Requirements for auditors 2017:124):

a) Only the approved suppliers for the serial production, that have been released and are quality- capable are used

    - For serial production only approved suppliers are used
    - Evaluation of qualification capability must be available
    - Evaluation of quality performance of existing suppliers has to be considered using defined criteria
    - Risks in the supply chain are identified, evaluated and reduced using proper measures

b) Customer requirements are taken into account in the supply chain

- Communication of customer requirements must be regulated and traceable
- Customer requirements also include drawings, components, software or QM agreements or other applicable standard
- Change management also to be considered during serial production
- Identified and secured interfaces

c) Target performance agreements have been agreed upon and integrated

- Target agreements have to be made, verified, implemented with all suppliers through supply chain
- Supplier performance have to be checked and evaluated within defined time frame
- In case of deviations, actions to be defined and implementation including deadlines should be monitored

d) Necessary releases/ approvals for sourced products and services are available

- A release must be available for all out-sourced products before serial production of new/ changed/ processes
- If not specified otherwise the supplier for the supply of modules has full quality control responsibility for all individual components

e) Quality of the out-sourced products and services is ensured

- For monitoring of quality regular checks must be carried out, documented and evaluated
- Deviations from supplier quality are to be processed through complaint process
- Verification checks are to be performed based on the requirements of customer
- Inspection, test and measurement equipment is stored appropriately and work stations must be organized

f) Incoming goods is being stored appropriately
    - Incoming materials must be stored according with the release status in order to avoid damage or mix up
    - Storage conditions must be defined for materials that might be damaged by temperature, humidity, vibration, so the quality of final product is kept
    - Terms of transport should be defined for critical materials
    - Suspect/quarantined products must be stored securely to prevent access to them
    - FIFO and traceability must be secured
    - Material stock figures in inventory documentation correspond to the actual quantities in stock
    - Storage conditions conform with the product requirements

g) Personnel is qualified for their tasks and the responsibilities are defined
    - Description of roles, responsibilities, tasks and authority of employees must be given
    - Qualification requirements of employees must be defined and carried out in relation to their tasks
    - The information about previous complaints are available or purchasing the products and services

Additionally to the VDA 6.3 Process Audit there are also additional guideline documents that need to be taken into consideration regarding joint quality management in the supply chain:

1) Product creation, manufacture and delivery - Minimizing the risks in the supply chain
2) Product creation - VDA Structure Component Requirement Specification
3) Specific Requirements of Customers on the quality system

1) **Product Creation, manufacture and delivery - Minimizing the risks in the supply chain**

Its objective is the description of a procedure for preventive detection and elimination of qualitative risks along the entire value creation chain. More detailed peak into the product creation process provides the figure 8.

As a minimum, the use of this guideline is recommended (VDA, 2011:10):

- for products identified A risks,
- along the critical path.

Critical path is the central element in the minimizing of risks and independently from customer requirements any supplier can specify the critical path in his supply chain in cooperation with suppliers.

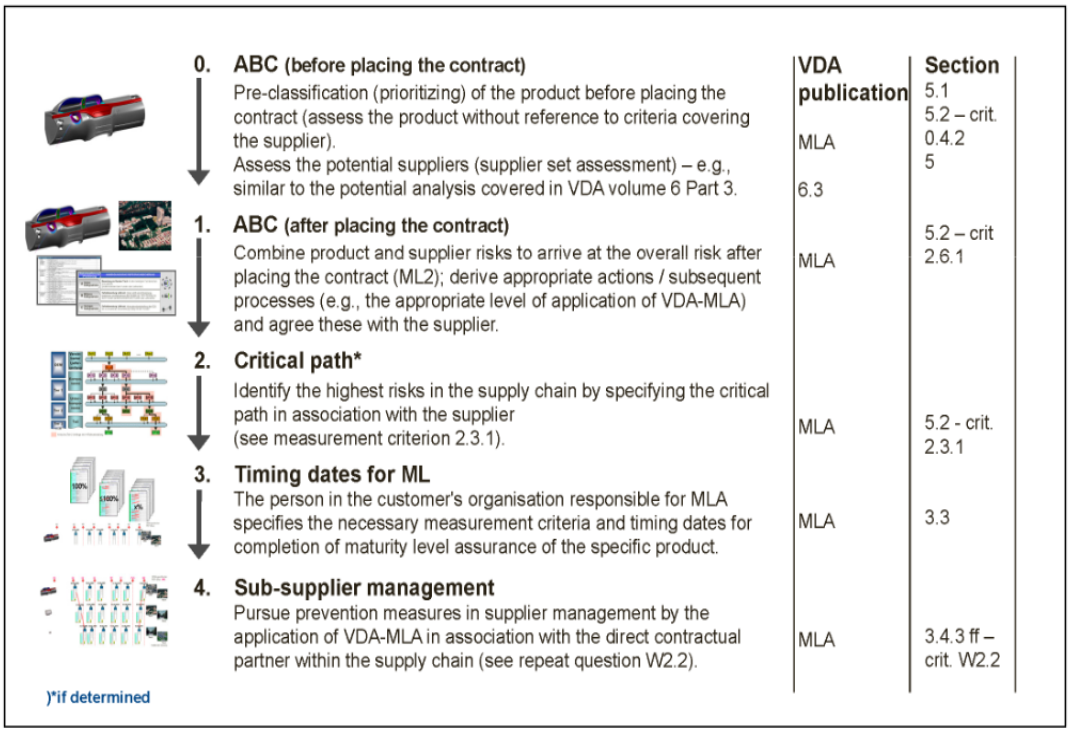


Figure 6. Minimizing risk in the product creation process (VDA Joint QM in the Supply Chain, 2011:10)

2) Product creation - VDA Structure Component Requirement Specification

This book describes the structure of requirements on components agreed upon with the OEMs and the suppliers. The main goal is, by systematic examination of all requirements on product, to obtain the maximal possible and definite clear profile for product and its production process. This structure should be used between customers and suppliers along the entire supply chain.

3) Specific Requirements of Customers on the quality system

This document provides helpful instrument for formation of Customer Specific requirements. It is oriented on ISO/TS 16949 (or IATF 16949) which guarantees that the structure of this technical specification will be ensured.

2.3.6 Customer Specific Requirements

Definition of Suppliers – Types of Suppliers

Customer Specific Requirements are additional requirements associated with the quality management system valid besides the general requirements for certification IATF 16949 with the aim to ensure the stability of processes between the customers and the suppliers and to minimize risks and costs. They are being created at every level of supply chain.

Suppliers that provide the products, services directly to OEMs are called **Trier 1** suppliers. Suppliers to the Tier 1 but with no direct supply to OEM are called **Tier 2** and so on. The pyramid on the figure 9 illustrates the definition of Tier suppliers.

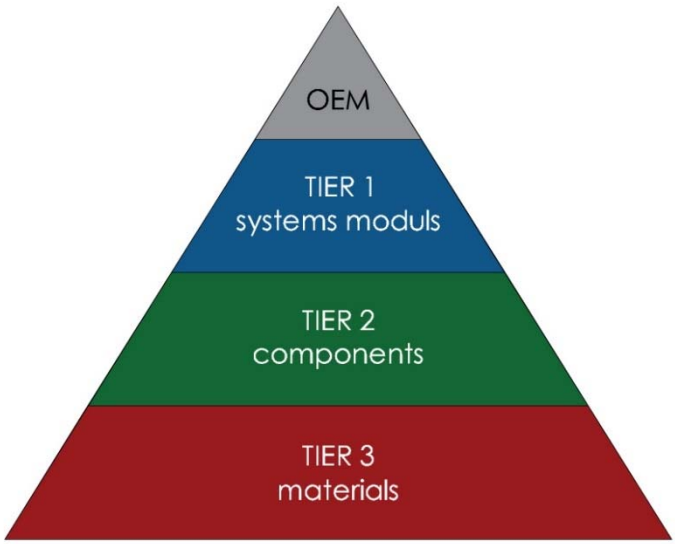


Figure 7. Hierarchy of Tier Suppliers

In this Master's Thesis the main concern is on the Tier 2 suppliers and the suppliers down the supply chain and the improvement of their quality management processes with the focus on Control of externally provided processes, products and services especially selection, monitoring, evaluation and reevaluation of them.

Since beginning of 2017 due to the new IATF 16949 :2016 standard the OEMs are publishing their updated versions of CSR. The new editions that are available on the International Automotive Task Force have already incorporated the IATF 16949:2016 standard and its requirements. The structure follows the structure of ISO 9001 and also IATF 16949 which allows better alignment and orientation.

Not only the OEMs are issuing the new Customer Specific Requirements also the Tier 1 companies are currently in the transition period and incorporating the changes of ISO 9001:2015 and IATF 16949 :2016 into their requirements.

Closer and more detailed analyses of the Customer Specific Requirements of selected OEMs and Trier 1 suppliers on Tier 2 suppliers is provided in the Chapter 4. Referring to the IATF 16949 Clause 8.4.*3.1 suppliers are required to cascade down the supply chain to their suppliers all applicable requirements*, therefore the following chapter also provides the summary of the requirements to be taken into consideration in order to ensure the conformity along the supply chain.

3. Methodology description

This Master's Thesis was conducted to focus on the current requirements of international standards and automotive industry on the suppliers in order to ensure the conformity along the supply chain.

Target group are the smaller Tier 2+ companies, supplying not directly to the OEMs, therefore, the standard IATF 16949 is not an obligatory requirement for them. Despite their not direct supply to OEMs, they supply to Tier1 and their impact on the final product is significant.

"Up to 40% of field returns caused by problems in the supply chain are before the Tier 1 suppliers" (VDA: Joint QM in the supply Chain, 2011:7)

Suppliers on the lower levels face many challenges like:

- resource of information issue,
- leadership support,
- lack of supplier quality expertise,
- lack of trainings in quality,
- insufficient number of qualified personnel.

Taking into account the above mentioned challenges, the main aim of this thesis is to offer the Tier 2 suppliers, or even partial suppliers, a complex tool for rating of their suppliers with ISO 9001:2015 and the base automotive requirements incorporated, in order to be able to secure the conformity along the supply chain.

3.3. Methods of research applied

Theoretical part

For gathering the information on the current standards and norms applicable for automotive suppliers a literature research methodology was utilized. In the theoretical part of the Master's Thesis, Chapter 2, main changes have been introduced and all relevant documents summarized. The present status related to the control of externally provided processes, products and services has been stated

Available literature sources have been found as standards, norms, books, studies, journals, company documents (CSR) and surveys. The core standards have been selected for more detailed analyses in the practical part of this Master's Thesis starting with Chapter 4.

Practical part

Fist part of the thesis of this chapter defines the base criteria for automotive suppliers on lower levels than Tier1, which have been formed based on the methods of:

- Step 1 – analyses
- Step 2 – synthesis

To capture the demands on all levels of the supply chain the analyses starts with detailed look into the international standards following the Figure 1, Quality management in the automotive Industry, with the focus on the requirements on suppliers.

Specific requirements of customers are to be also divided into 2 group for deeper analyses and in order to be able to capture the complex requirements on external providers:

- OEM CSR requirements
- Tier 1 suppliers CSR requirements

Utilizing the method of synthesis with emphasis on interactions and connections a comparable table of requirements will be introduced providing the base information for the research instrument – the questionnaire.

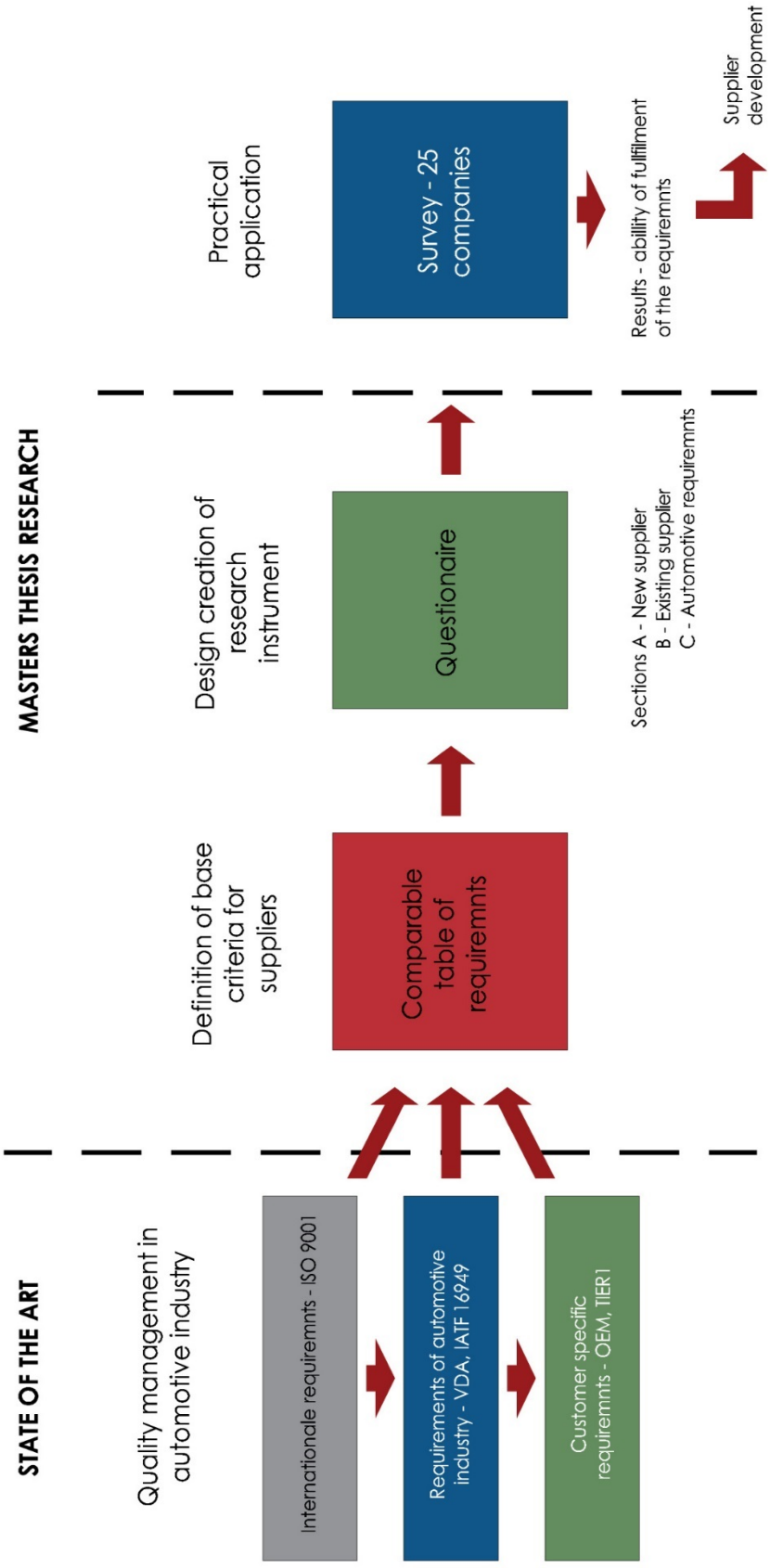


Figure 8. Methodology Description of Master's Thesis

3.4. Research Instrument - Questionnaire

The aim is to provide a complex with fundamental requirements (ISO 9001:2015) on suppliers enhanced by specific requirements of automotive industry, that can be used by any Tier 2+ organization.

The questionnaire will be divided into 3 sections:

Section A – Criteria for New Suppliers

Section B – Criteria for Existing Suppliers

Section C - Criteria of Automotive industry

First the outline is to be set up, following by the specific questions, methodology of evaluation and evaluation of the results criteria.

3.5. Practical application

The questionnaire can be used for any Tier 2, Tier 3 company. Section A and B would be better evaluated on the actual business case as they are general for all suppliers and provide the questions on the general check of the suppliers.

Section C is to verify the practical application and fulfillment of the automotive requirements. For this purpose of the questionnaire will be distributed to Tier2, Tier3 companies. The method of synthesis will be used again to assess the best and the worst performed areas. The results obtained by the survey will be further analyzed in order to determine the areas for development of suppliers, which is the closing process of control of externally provided processes, products and services.

4. Base requirements on control of externally provided processes, products and services

In the chapter 2 the international quality standards and automotive publications regarding the requirements on suppliers have been stated. This chapter offers deeper analyses of the criteria to be applied for selection, evaluation and re-evaluation of suppliers.

4.3. Requirements of ISO 9001:2015, IATF 16949:2016 and VDA

To provide more comparative information the Table 8 below provides cumulative overview on the requirements of the new editions of international standards and VDA requirements related to Clause 8.4 Control of externally provided processes, products and services according to ISO 9001:2015.

Table 8. Cumulated Requirements on Clause 8.4.1. General

8.4.Control of externally provided processes, products and services	Requirements of ISO 9001:2015	Requirements of IATF 16949:2016	Requirements of VDA
8.4.1. General	Ensure that the externally provided processes, products and services correspond to the requirements	Include all processes the affect customer requirements	Requirements of supplier process section 7 shall be included
	Controlled criteria should be set up when: products and services are becoming part of the organizations products/ services ; are being directly provided to the customers; process or a part of a process is provided by external provider (supplier)	Documented supplier selection process and outsources processes, that includes: assessment of risks, quality and delivery performance, evaluation of QMS of supplier, assessment of software and development capabilities	Supplier management: only approved suppliers, customer requirements to be taken into consideration, target performance agreed upon and integrated, necessary approvals, ensured quality of outsourced products, services,
	The criteria should be set up for evaluation, selection, monitoring, re-evaluation of suppliers	Financial stability, product, material complexity, available resources	Incoming goods stored appropriately
	Documented information shall be retained	Business continuity-contingency planning, logistics process, customer service	Personnel qualified, responsibilities defined
		Documented processes to identify outsourced processes, criteria, actions of escalation, supplier performance, risks	Critical path identification of products defined A risk products

Second part of the Clause 8.4 -Type and extent of control and the additional requirement of the automotive industry based on the international are gathered in the Table 9.

Table 9. Cumulated Requirements on Clause 8.4.2 Type and Extend of Control

Clause **8.4.Control of externally provided processes, products and services**	**Requirements of ISO 9001:2015**	**Requirements of IATF 16949:2016**	**Requirements of VDA**
8.4.2. Type and extent of control	Requirement on ensuring the consistency of deliveries, suppliers products/ processes should not have a negative affect	QMS according to ISO 9001:2015, automotive requirements, certification to IATF 16949:2016	
	externally provided processes should correspond to QMS, define criterial of control for suppliers and delivered products/ services	Supplier monitoring, supplier audits- product, process audits, QMS audits, supplier risk assessment	Detailed description of process and product audits
	Consider impact of supplied processes and services on customer requirements and the effectiveness of controls	Supplier development/ defined performance issues, risk analyses, audit findings	
	Define verification and activities needed to ensure supplied products / services meet requirements		

The last part of the Clause 8.4 Information for external providers requirements are summarized together with the requirements of VDA in the Table 10.

Table 10. Cumulated Requirements on Clause 8.4.3 Information for External Providers

Clause **8.4.Control of externally provided processes, products and services**	**Requirements of ISO 9001:2015**	**Requirements of IATF 16949:2016**	**Requirements of VDA**
8.4.3 Information for external providers	Quality Requirements should be cascaded and communicated throughout the entire supply chain: for processes, products, approvals and release of products, processes, equipment	Quality Requirements shall be applicable requirements to suppliers and require their suppliers to cascade them down along the supply chain	

The international standards requirements and VDA requirements are however not the only one to be taken into consideration. In order to secure the conformity along the entire automotive supply chain following the Figure 10 structure also the requirement of the organizations on the upper level in the supply chain (OEM, Tier1) should be incorporated. These information are to be found in the CSR documents.

4.4. Customer Specific Requirements from the OEM level

Although the main focus is on the Tier 2+ organizations for more complex analyses of the criteria and due to the fact that unlike OEMs some of the Tier1 companies have their CRS based still based on the ISO/TS 16949 standard the OEMs customer specific requirements will be also analyzed.

The IATF group of automotive manufacturers has a section for Customer Requirements of the OEMs. The requirements related to control of externally provided processes, products and services have been analyzed in order to find out the common demands and interactions. The summary of this findings is gathered in the following Table 11.

Table 11. OEM CSR Requirements on Control of externally provided processes, products and services

Corresponding clause ISO 9001:2015 and IATF 16949:2016	Customer Specific Requirements of OEMs
8.4.Control of externally provided processes, products and services	
8.4.1. General	Documented process for selection, evaluation, monitoring and re-evaluation of suppliers
	Assigned personnel to monitor and manage performance of suppliers
	Financial assessment evaluation
	On site audits, list of approved suppliers for each commodity, raw material, component, technology
	Monitoring and approval of sub-tier suppliers
8.4.2. Type and extent of control	Incoming product quality measures to be used for indicator for sub-tier supplier QM
	Criterial for definition and evaluation of suppliers according to ISO 9001:2015 and IATF 16949:2016,
	Automotive QMS requirements
	Supplier development process in place
	Measurement monitoring
	Self certification documented information
	Suppliers not certified ISO9001:2015 and IATF 16949:2016, should have a documented quality process
	Process audits, PPAP, incoming inspections of materials
	Suppliers development required
8.4.3 Information for external providers	Quality Requirements should be cascaded and communicated throughout the entire supply chain

The group also offers the Minimum automotive QMS requirements for Sub-Tier Suppliers document, however the latest version available was issued in August 2014. Therefore it does not reflect the changes and new requirements of the current editions of ISO 9001:2015 neither the IATF 16949:2016 standards related to the control of externally provided processes, products and services.

4.5. Customer Specific Requirements from Tier 1 level

For the analyses of the demands from Tier1 level the Customer specific requirements of 4 top Tier 1 suppliers to the EU according to the Top Suppliers report (Top Suppliers, 2016:9) have been used. The requirements are gathered in the Table 12:

Table 12. Summary of CSR on Tier 1 level

Corresponding clause ISO 9001:2015 and IATF 16949:2016	Customer Specific Requirements on Tier 1 level
8.4.Control of externally provided processes, products and services	
8.4.1. General	Documented process for selection, evaluation, monitoring and re-evaluation of suppliers
	Minimum requirement ISO 9001, environment ISO 14001, plan to achieve IATF16949, constant improvement of QMS
	Financial situation analyses
	Audits by suppliers, monitor and develop performance of sub suppliers,
	List of sub-suppliers available
8.4.2. Type and extent of control	Material FIFO approach, traceability all the way to the raw materials/ purchased parts
	Risk management -evaluation of external and internal risk
	Personnel -quality and qualification monitoring, development
	Supplier management process in place Internal audits, list of internal auditors, qualifies auditors
	Supplier shall perform audits by sub-suppliers. Checklist of questionnaire to be used at audits
	Process and product FMEA, APQP, PPAP, incoming inspections of materials, laboratory approval on material
	Suppliers development process, all suppliers must fulfill the requested criteria
8.4.3 Information for external providers	Suppliers must cascade all applicable requirements to their supply chain

The full picture of all requirements the related standards and customer specific requirement provides the Annex 1.

Referring to the survey results where the inconsistency of CSRs, together with QMS and the loss of experience were defined as the critical points impacting quality (Quality 2020, 2014:4), the upcoming chapter using the method of synthesis offers the outline of the supplier ranking process, questionnaire with common base requirements of automotive suppliers incorporated requirements of ISO 9001, IATF 16949, VDA and Customer Specific Requirements.

4.6 Process of ranking of suppliers

The previous chapters have provided gathered information from the standards and the requirements of the customers (OEMs, Trier 1) on their suppliers that should be carried across along the entire supply chain.

In Chapter 4, using the method of analyses, the criteria to secure the conformity along the supply chain have been selected and now will be incorporated into the complex questionnaire for suppliers on lower levels. The aim of this questionnaire, section C, is to evaluate the ability to fulfill the criteria of the automotive industry, however this is not the only part of evaluation of the suppliers for a company.

The outline of complete process of purchasing and evaluation of suppliers taking into consideration the requirements of ISO 9001:2015 and the base requirements of automotive industry will be also described more in detail.

4.6.1. Requirement for selection, evaluation and re-evaluation of suppliers

The new edition of ISO 9001:2015 standard, Table 7, sets out the requirement on the monitored process of selection, evaluation and re-evaluation of the suppliers. However, the standard does not prescribe the methodology of the selection and evaluation of suppliers. This is left to the companies to define the criteria that will be most suitable for the organization and that will provide most valuable information for the companies about their suppliers.

We can distinguish between:

- new supplier selection,
- evaluation, re-evaluation, monitoring of existing suppliers.

In both cases the main aim of the process of selection and evaluation is to obtain the most information on the suppliers in order to judge their ability to conform to specific requirements defined by the business case.

4.6.2. Criteria for selecting New Suppliers

As the new purchase need is defined or the portfolio of already existing suppliers has been re-evaluated and the need for new suppliers has arisen, the organization should have the basic key criteria defined in order to select from the suppliers on the market.

Such criteria may include the evaluation of:

- stability of the suppliers company,
- terms of payment,
- price,
- available capacity,
- product complexity,
- delivery conditions.

Stability of the Supplier Company – in this area mostly financial situation and personnel situation should be checked, which are also the requirements of CSR. If the supplier finds himself in the financial problems or the lack of personnel it usually has a big impact on the fulfillment of the deliveries or the quality of products.

Example points to be evaluated in this area can be:

- the supplier is in a good financial situation,
- supplier has stable and qualified personnel,
- number of employees is being monitored and kept to the satisfactory level covering the needs of suppliers organization.

Terms of payment- an important task of the purchasing department is the negotiating of good payment conditions with the suppliers. Together with the task of

the sales department, negotiating the payment terms with the customers, it is crucial for the cash flow of the company. The longer the payment terms with the suppliers the more working capital that can be used for e.g. investments.

Areas to be monitored:

- deferred payment 90/60/ 30 days,
- does/ does not the supplier require the payment in advance,
- payments are being carries out in Euros.

Price - a significant and one might think one of the most important points. However nowadays not the only parameter that determines the selection of a supplier. More and more important becomes the complex view on the supplier.

Points to be evaluated:

- the offered price corresponds to the price on the market,
- the offered price is below to the price on the market,
- the suppler is able to reduce the price with the increasing volume.

Available capacity - being able to guarantee the capacity for the upcoming purchase orders or even the potential for increasing the capacity of production is promising and beneficial for both sides especially for long term cooperation:

- the supplier has enough free capacity for the whole RFQ amount,
- the supplier has the ability to increase his production capacities.

Product complexity – the suppliers that can offer larger portfolio of products suitable for the company are usually preferred as well as the once that can offer additional services e.g. transportation, logistics:

- the supplier offers various products suitable for company,
- the supplier can offer additional services/ outsources services.

Delivery conditions – more variety in the area of logistics brings many advantages and cost savings, especially when talking about partial lots and consignment stocks:

- the supplier offers also other Delivery terms that EXW according to Incoterms,
- the supplier is able to deliver also partial lots,
- the supplier agrees on having a consignment stock.

All the areas mentioned above with corresponding questions on the suppliers are summarized in the Table 13.

Table 13. Questionnaire for New Suppliers – Section A

		N/A	yes	partially	no	Comments
1. Stability						
1.1	The supplier is in a good financial situation					
1.2	Supplier has stable and qualified personnel					
1.3	Number of employees is being monitored and kept to the satisfactory level covering the needs of suppliers organization.					
2. Terms of payment						
2.1	Deferred payment 90 days					
2.2	Deferred payment 60days					
2.3	Deferred payment 30 days					
2.4	The supplier does not require the payment in advance					
2.5	Payment are being carries out in Euros					
3. Price						
3.1	The offered price corresponds to the price on the market					
3.2	The offered price is below to the price on the market					
3.3	The suppler is able to reduce the price with the increasing volume					
4. Available capacity						
4.1	The supplier has enough free capacity for the whole RFQ amount					
4.2	The supplier has the ability to increase his production capacities					
5. Product complexity						
5.1	The supplier offers various products suitable for company					
5.2	The supplier can offer additional services/ outsources services					
6. Delivery conditions						
6.1	The supplier offers also other Delivery terms than EXW according to Incoterms					
6.2	The supplier is able to deliver also partial lots					
6.3	The supplier agrees on having a consignment stock					

The evaluation example and the rating method will be explained more closely further in this chapter.

4.6.3. Criteria for evaluating of existing suppliers

Not only the evaluation of new suppliers is important. The suppliers should be rated also throughout the entire cooperation.

In addition to the already mentioned criteria for new suppliers the following criteria are to be added in case of existing suppliers. Tables 13 and 14 provide the additional points to be verified then monitoring and evaluating already existing suppliers. The full formular of questionnaire for evaluation of already existing suppliers contains Annex 2, Section B.

Quality of delivered products and services is certainly one of the top criteria, yet not the only one to be taken into consideration. Points to follow up on in this section:

- products are being delivered in requested quality,
- does the PPM rating correspond to the determined level,
- products are being delivered on time,
- the supplier addresses the complaints on quality and provides explicit step in order to solve the complaint / prevent from happening again,
- the deliveries contain proper documentation.

Table 14. Additional Criteria for Existing Suppliers -part 1

		N/A	yes	partially	no	Comments
4. Quality of delivered products/services						
3.1	Products are being delivered in requested quality					
3.2	Does the PPM rating correspond to the determined level					
3.3.	Products are being delivered on time					
3.4	The supplier addresses the complaints on quality and provides explicit step in order to solve the complaint / prevent from happening again					
3.5	The deliveries contain proper documentation					

Overall cooperation - this area is supposed to provide a feedback on the communication and the relationship with the suppliers.

- the communication with supplier is on good level,
- the suppliers feedback, responses are prompts.

Table 15. Additional Criteria for Existing Suppliers -part 2

		N/A	yes	partially	no	Comments
8. Overall cooperation						
6.1	The communication with supplier is on good level					
6.2	The suppliers feedback, responses are prompts					

Annex 2, Section A and B gathers the basic demands on the suppliers to be monitored and evaluated. However In order to ensure the conformity along the supply chain, even though being only partial supplier to the automotive industry, the suppliers on the lower levels should understand and take the responsibility to implement and carry across the requirements of the automotive industry which have been defined in Chapter 4, table Annex1.

4.6.4. Criteria of the automotive industry

Annex 1, summary tables defined in chapter 4 has served as a core source of information for preparing the questionnaire, joining the requirements of ISO 9001:2015, IATF 16949:2016, VDA documents and customer specific requirements.

These criteria have been divided into 11 sections and will be now more closely described, emphasizing the interaction of the question and the requirements in Annex1.

Section 1. - Certification refers to the demands on the certification, where ISO 9001:2015 have been defined as a minimum standard, followed by certification or at least the incorporation of the IATF 16949:2016 requirements and other specific automotive requirements. Growing importance on the environmental responsibility represented by certification for ISO 14001 should neither be left out.

Table 16. Summary Questions for Section Certification

	N/A	Complete	Almost completed	Not completed	Comments
1. Certifications					
1.1 Do you have certified management system according to ISO 9001? If yes, please attach a valid certificate and continue with question 1.4					
1.2 If no, do you plan to ensure the certificate and when?					
1.3 Do you have internally established quality management system?					
1.4 Do you have certified management system according to ISO/TS 16949 or IATF 16949? If yes, please attach a valid certificate					
1.5 If no, do you plan to ensure the certificate and when?					
1.6 Do you have a certified environmental management according to ISO 14001? If yes, please attach a valid certificate					
1.7 If no, do you plan to ensure the certificate and when?					

Section 2. Suppliers points out the requirement for documented process of suppliers selection, monitoring, evaluation and development, including the list of approved suppliers and outsourced processes. Last two questions address the requirement for onsite audits by suppliers and critical path outline for significant suppliers.

Table 17. Summary Questions for Section Suppliers

	N/A	Complete	Almost completed	Not completed	Comments
2. Suppliers					
2.1 Is the list of approved suppliers available?					
2.2 Is there a process for Suppliers evaluation?					
2.3 Is there a process for Monitoring of Suppliers					
2.4 Is there a process for Suppliers development?					
2.5 Is there a list of outsourced processes available?					
2.6 Are the supplier audits carried out?					
2.7 Are the most significant suppliers identifies? Is there a critical path in place for these suppliers?					

Section 3. Customers – measurement and setting the goals for customer satisfaction in an important tool for linking the expectations of customers with the supplier organization and must be paid attention to.

Table 18. Summary Questions for Section Customers

	N/A	Complete	Almost completed	Not completed	Comments
3. Customers					
3.1 Is the customer satisfaction measured?					
3.2 Are the goals for improvement of customer satisfaction set up?					

Section 4. - Product and Process covers the request of mainly CSR where it has been specified that APQP, PPAP, process and product FMEA, control plan, written technical documentation, MSA, calibration and control of devices should be implemented by supplier.

Table 19. Summary Questions for Section Product and Process

	N/A	Complete	Almost completed	Not completed	Comments
4. Product and process					
4.1 Is there a process for quality planning implemented? (APQP)					
4.2 Are you able to realize initial samples according to PPAP?					
4.3 Is there a written technical documentation available?					
4.4 Is FMEA being implemented for design?					
4.5 Is FMEA being implemented for process?					
4.6 Does a control plan for products exist?					
4.7 Is measurement system analysis for all equipment implemented?					
4.8 Are the measurement devices controlled and calibrated?					

Section 5. - Internal Audits- based on the ISO 9001, IATF 16949 and CSR the questions related to internal audits and list approved auditors have been included.

Table 20. Summary Questions for Section Internal Audits

	N/A	Complete	Almost completed	Not completed	Comments
5. Internal audit					
5.1 Are internal audits being carried out?					
5.2 Is there a list or internal auditors available?					

Section 6. - Traceability – following the demand of CSR for trace back of all products suppliers must set up a process to allows identification of outputs down to raw materials

Table 21. Summary Questions for Section Traceability

	N/A	Complete	Almost completed	Not completed	Comments
6. Traceability					
6.1 Do you have a traceability system in place?					
6.2 Is the product suitably identified in each production step?					
6.3 Can you trace back all outputs down to raw materials?					

Section 7. - Nonconformity, very important for the supply chain is the ability of each organization to detect the nonconformities and to isolate them as soon as possible. The quality tools demanded are mostly 8D report and Ishikawa diagram. Tracking of customers complaints and a process for corrective and preventive actions should be also incorporated.

Table 22. Summary Questions for Section Nonconformity

	N/A	Complete	Almost completed	Not completed	Comments
7. Nonconformity					
7.1 Are the products that identified by quality control as non- conform being isolated?					
7.2 Is there a process for defective products determined?					
7.3 Is there a system to analyze defective materials returned by customers to initiate and monitor corrective action and preventive action?					
7.4 Does the organization track and trend customer complaints?					
7.5 Do you use any quality tool for nonconformity solving? Please, mention					

Section 8. - Incoming quality inspection – CSR and VDA specify the demand on this section more in detail underlining the importance of control of incoming materials.

Table 23. Summary Questions for Section Incoming Quality Inspection

	N/A	Complete	Almost completed	Not completed	Comments
8. Incoming quality inspection					
8.1 Do you ensure the quality of incoming material/ products by:					
initial quality control					
laboratories material sample testing / quality certificates					
Initial sample testing					
supplier audits					
8.2 Does your company require a test certificates for raw material at every delivery?					
8.3 Is there a written documentation on receiving / storage of incoming materials in place?					
8.4 Is the FIFO principle implemented?					

Section 9. - Final quality inspection – base step is to have a proper end of product specifications available, so each employee is aware of the demands of the customer. Quality of products should be also checked on several stages during the production process and FIFO principle implemented.

Table 24. Summary Questions for Section Final Quality Inspection

	N/A	Complete	Almost completed	Not completed	Comments
9. Final quality inspection					
9.1 Are the end product specifications available?					
9.2 Quality of products is being supervised / documented by					
Operator self-inspection					
Inspection of quality department					
Inspection of outgoing products					
9.3 Is there a Certificate of analysis supplied with the product?					
9.4 Is the FIFO principle implemented?					

Section 10. - Risk management- referring to the request of all mentioned documents regarding the risk management in order to unsure the business continuity and ability of uninterrupted deliveries organizations should identify internal and external risks to the manufacturing processes and equipment.

Table 25. Summary Questions for Section Risk Management

	N/A	Complete	Almost completed	Not completed	Comments
10. Risk management					
10.1 In case of unexpected production/ delivery interruption can you guarantee supply with alternative production, sources?					
10.2 Is there a supplier risk management determined?					
10.3 In case of need, is product-recall process implemented?					

Section 11. - Human resources- VDA and also CSR also require the continual checks on qualification, requalification of personnel and clearly assigned and communicated responsibilities of workers.

Table 26. Summary Questions for Section Human Resources

	N/A	Complete	Almost completed	Not completed	Comments
11. Human resources					
11.1 Is there documented data available regarding qualification and responsibilities of personnel?					

4.6.7 Grading of suppliers

After defining of the areas to be evaluated next step is to define the rating criteria.

The designed questionnaire is divided into 3 Sections:

- **Section A** – section with questions evaluating new supplier
- **Section B** – section for evaluation of already existing suppliers
- **Section C** – section with base automotive requirements on the suppliers

Regarding the evaluation of all three sections the grading of the each individual category following formula can be used:

$$\text{Evaluation of each category (\%)} = \frac{\text{sum of all the reached points}}{\text{sum of the all possible reached points}}$$

Table 24 provides a filled in example of one section. The questions are being evaluated by:

- 10 points when the answer is completed
- 5 points for almost completed
- 0 points for not completed

Each question has the same weight.

Table 27. Example of evaluation of single category of questionnaire

2. Suppliers						Points
	N/A	completed	almost completed	not completed	Comments	
2.1 Is the list of approved suppliers available?		x				10
2.2 Is there a process for Suppliers evaluation?		x				10
2.3 Is there a process for Monitoring of Suppliers		x				10
2.4 Is there a process for Suppliers development?		x				10
2.5 Is there a list of outsourced processes available?			x			5
2.6 Are the supplier audits carried out?		x				10
2.7 Are the most significant suppliers identifies? Is there a critical path in place for these suppliers?		x				10
					TOTAL	93%

For the total rating of the supplier the following formula is to be applied for capturing the results of all categories:

$$\text{Total rating of supplier (\%)} = \frac{\text{Sum of Evaluation of each category (\%)}}{\text{Sum of all possible points}} \times 100$$

An example of the entire filled out questionnaire is presented in Annex 3.

The total supplier category than determines the selection followed by the approval of the supplier:

Table 28. Categories of Suppliers based on the rating

Category A	
90% and more	Potential Preferred
Category B	
80%-89%	Satisfactory
Category C	
70%-79%	Improvement needed
Category D	
69% - 0%	Unsatisfactory

A list of approved suppliers is then to be created serving as a database for the purchasing needs of the company addressing the requirement of ISO 9001:2015 and VDA 6.3 that only the approved suppliers are released and used.

5. Fulfillment of the automotive requirements by the suppliers on lower levels in the supply chain

5.1 Results of the survey

As it has been mentioned in the previous chapters of this Thesis the Control of externally provided processes, products and services comprises of three sections (ISO 9001:2015):

1) selection,
2) monitoring and evaluation,
3) development of suppliers.

Process of selection and monitoring and evaluation has been covered in the Chapter 4 by introduction of the complex questionnaire tool and criteria for rating.

To address also the third closing part of the process, development of suppliers, the performance of the suppliers needs to be evaluated.

Due to the fact that this Master's Thesis focuses on the basic automotive requirements in order to ensure the conformity along the supply chain, a survey has been made in order to obtain more information on the level of incorporation and fulfillment of the new standards editions and corresponding CSR requirements in Tier 2+ organizations.

The sample of 25 companies has been evaluated on the Section C of the questionnaire Annex 2. The group of evaluated suppliers contained the Tier 2 companies – suppliers of components as well as Tier 3 companies – raw material suppliers.

The ability of fulfillment was evaluated by the following steps as shown on the Figure9.

Figure 9. Example of evaluation of fulfillment of one category

Step 1

Nonconformity	Average Points reached	Highest possible points	Company evaluated																								
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
7.1 Are the products that identified by quality control as non-conform being isolated?	9,0	10	10	10	10	10	-	10	10	10	10	10	10	10	10	10	10	10	10	-	10	10	10	10	5	10	10
7.2 Is there a process for defective products determined?	9,2	10	10	10	10	10	-	10	10	10	10	10	10	10	10	10	10	10	10	-	10	10	10	10	10	10	10
7.3 Is there a system to analyze defective materials returned by customers to initiate and monitor corrective action and preventive action?	8,5	10	10	10	10	10	-	10	10	10	10	10	10	10	10	5	10	-	-		10	10	10	10	10	10	10
7.4 Does the organization track and trend customer complaints?	8,4	10	10	10	10	10	-	10	10	10	10	10	10	10	10	10	10	-	-	-	10	10	10	10	10	10	10
7.5 Do you use any quality tool for nonconformity solving? Please, mention	7,6	10	10	10	10	10	-	10	10	10	10	-	10	10	10	10	10	-	-	-	10	10	10	10	0	10	10
Fullfilment of this category by company			100%	100%	100%	100%	0%	100%	100%	100%	100%	80%	100%	100%	100%	90%	100%	40%	40%	0%	100%	100%	100%	100%	70%	100%	100%
Average fullfilment of the category	85%																										

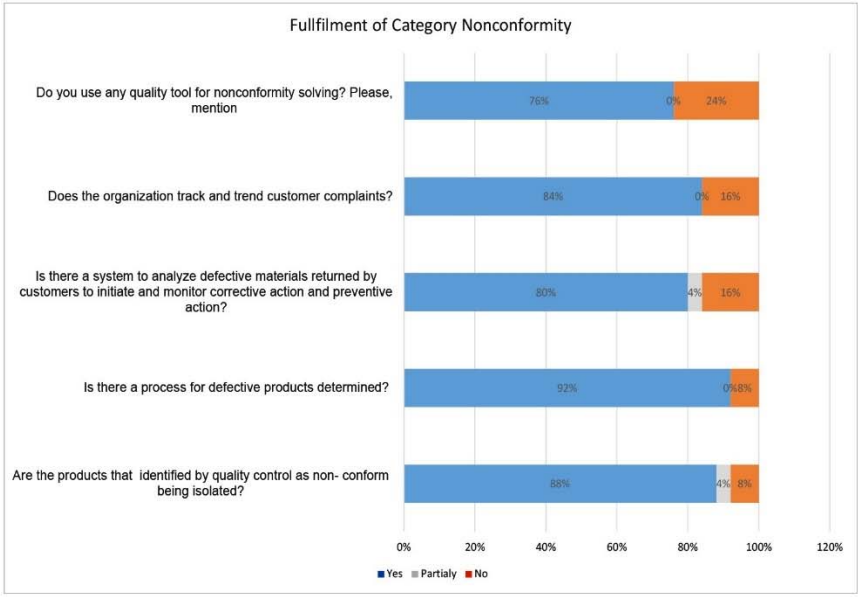
Step 2

Number of companies that answered the question:	YES	Partially	NO
Are the products that identified by quality control as non-conform being isolated?	22	1	2
Is there a process for defective products determined?	23	0	2
Is there a system to analyze defective materials returned by customers to initiate and monitor corrective action and preventive action?	20	1	4
Does the organization track and trend customer complaints?	21	0	4
Do you use any quality tool for nonconformity solving? Please, mention	19	0	6

Number of companies evaluatec	25

Fullfilment of the corresponding questions in %	Yes	Partialy	No
Are the products that identified by quality control as non-conform being isolated?	88%	4%	8%
Is there a process for defective products determined?	92%	0%	8%
Is there a system to analyze defective materials returned by customers to initiate and monitor corrective action and preventive action?	80%	4%	16%
Does the organization track and trend customer complaints?	84%	0%	16%
Do you use any quality tool for nonconformity solving? Please, mention	76%	0%	24%

Step 3



Steps of the procedure

Step 1 – filled in questionnaires have been gathered together in a summary sheet for each category. The responds of companies have been evaluated by the method described in Chapter 4, Table 27. The average value has been calculated based on the percentage of fulfillment of requirement by each company, used for the Figure 11.

Step 2 - Depending on the responses of the companies included in the survey, a table gathering the number of responses Yes, Partially and No on each requirement have been created and recalculated to provide the results in the form of percentage evaluation.

Step 3 - In order to provide a visual documentation of the results, the stacked bar chart has been chosen as the most suitable to capture the level of fulfillment corresponding to the requirements in the questionnaire.

The Figure 10 represents the summary of average level of fulfillment classified by scope of ISO and automotive requirements.

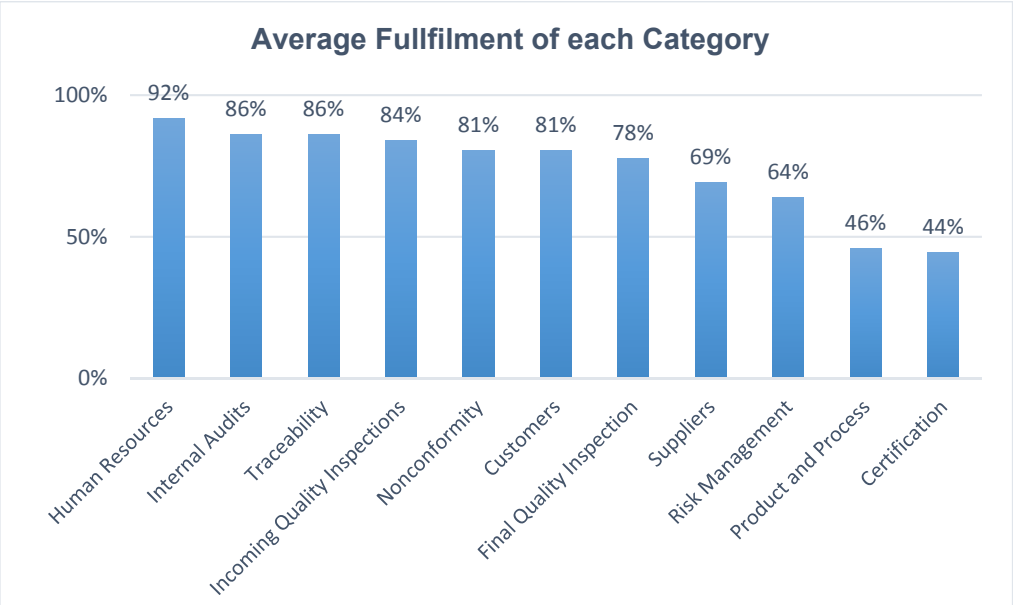


Figure 10. Average Fulfillment by Categories

The worst results were scored in the categories:

- risk management 71 %,
- products and processes 55%,
- certification 44%.

On the other side, the best results were obtained in the categories of:

- human resources 92%,
- internal audits 86%,
- traceability 86%.

In order to be able to deliver more accurate information, all categories were analyzed in more detail, following the structure of the questionnaire Annex 2, Section C.

Certification - the average number of points reached for the question regarding certification of ISO 9001, as this has been defined as a minimal certification standard for suppliers, was 8,8 out of 10 possible points to reach. Meaning that 88% of the questioned companies are fulfilling this condition. Score 3,6 out of 10 was reached for the ISO 14001 which shows that only 36% are ISO 14001 certified. The 64% of the companies questioned does not fulfill the requirement of CSR of Tier 1 for an environmental certification. Only 0,4 point out of 10 was reached regarding the IATF (ISO/TS 16949) certification, proving that the Tier 2 companies, as not being the direct suppliers are not certified according to this standard, however still need to implement the base automotive requirements in order to ensure the conformity along the automotive supply chain.

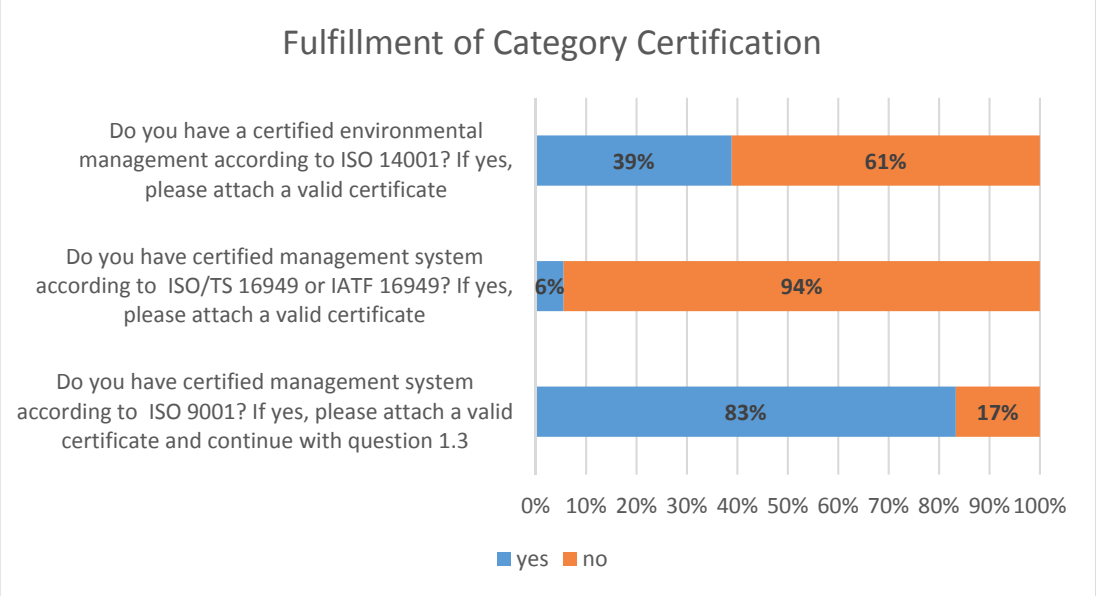


Figure 11. Fulfillment of Category Certification

Suppliers - summarizing the results from this section the lowest average points were reached by questions:

Development of suppliers, where only 48% of companies have already implemented process for development of suppliers which is defined as a requirement already in the core international standard ISO 9001:2015. More about the development of suppliers is provided in the following chapter 5.2.

On site audits of the suppliers are carried out only by 56% of companies. Almost a half of the questioned companies does perform the audits by their suppliers or only partially.

Only 48% of the companies have a list of outsourced processes, 28% answered that they have a partial list available and 24% responded that they do not have this list. Currently the organizations are in the transition period and based on the results achieved, they do not have the new requirement of ISO 9001:2015 incorporated yet. After their recertification to the new edition of the standards, more positive results are expected to be achieved related to this requirement.

On the other hand list of approved suppliers is available in 88% of companies, however only 60% of them have the critical path for significant suppliers defined. Process for monitoring and evaluation of suppliers is determined in more than 80%.

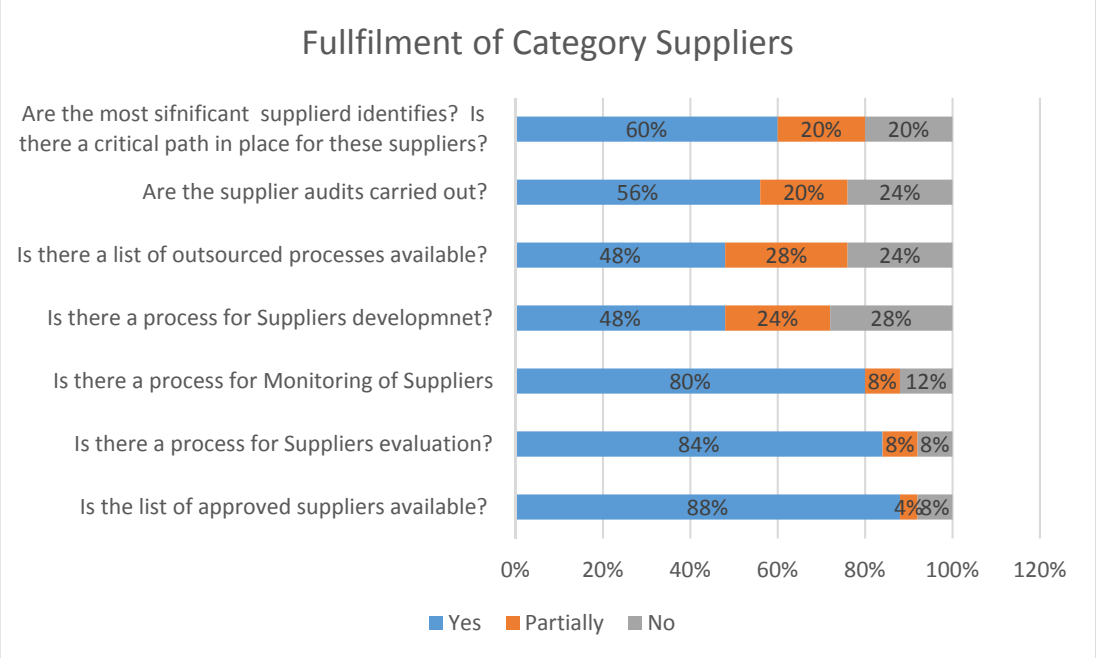


Figure 12. Fulfillment of Category Suppliers

Customers - for this section better score has reached the question regarding customer satisfaction measurement (88%) than for defining of goals for improvement (80%). The results obtained are satisfactory by both questions. It shows that the organizations are aware of the importance of the evaluation of the customer satisfaction indicator. However they should more focus on the identification of goals as this area has impact on the future business relations.

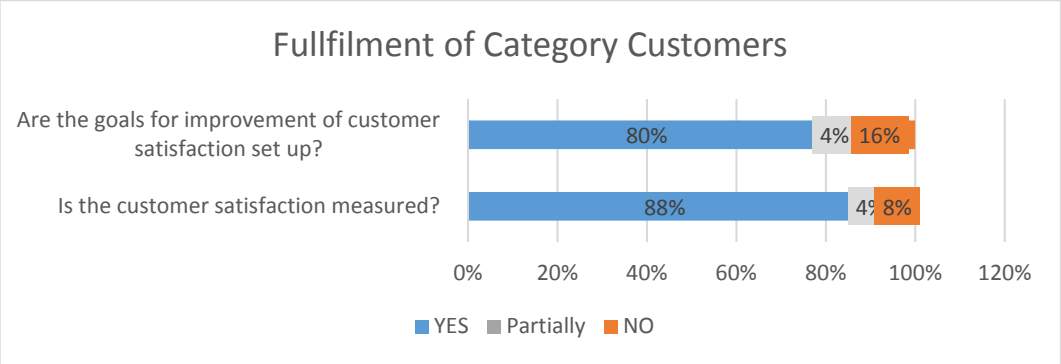


Figure 13. Fulfillment of Category Customers

Product and Process – this section belongs among the three lowest fulfilled categories. The lowest were rated the questions regarding the implementation of APQP process and PPAP. Only 20% of the companies have APQP implemented and are able to deliver the samples according to the PPAP. As these two areas reached the lowest score, they will be also addressed in the chapter 5.2 Supplier Development. Process FMEA is implemented only by 60 % and design FMEA only by 32% of companies. About one third of suppliers has a control plan for products. MSA is implemented only by approx. 56% of companies. The question regarding measurement devices calibration and control was fulfilled with the highest score 96% by the companies included in the survey.

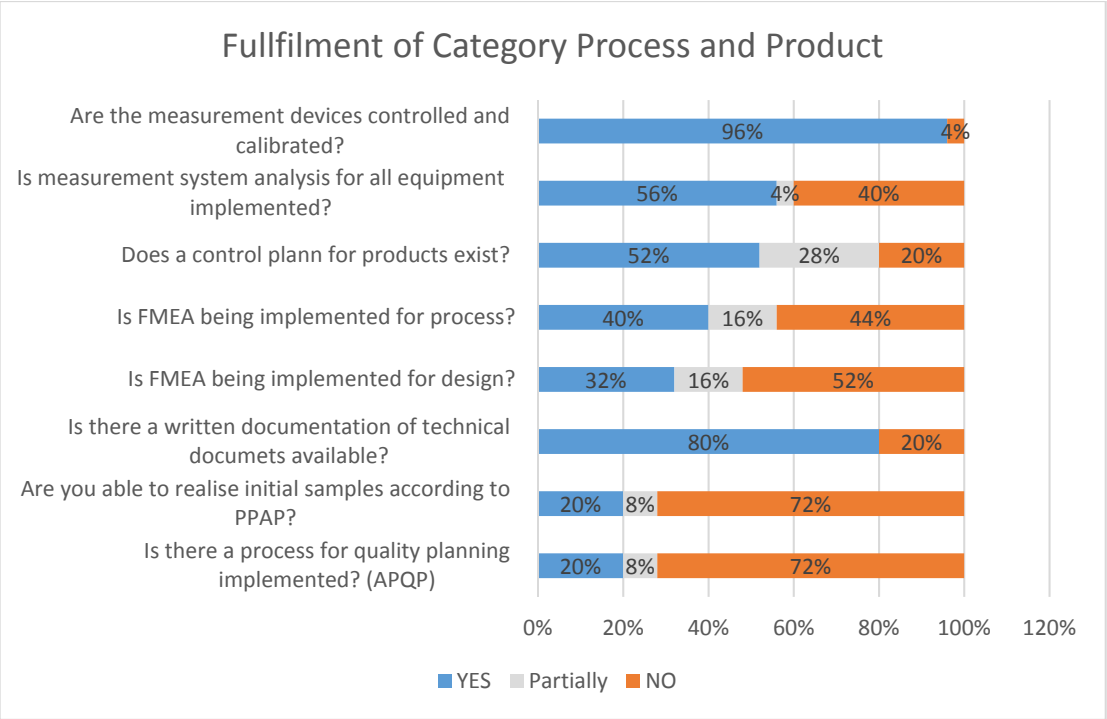


Figure 14. Fulfillment of Category Product and Process

Internal Audits - reaching 8,8 points in average out of 10 possible, 88% of the companies answered that they are performing internal audits in their organization. This result corresponds also to the result of the certification of ISO 9001. All certified companies perform internal audits. However only 80 % of them have a list of internal auditors available. Some of the companies have outsourced the process using external auditing companies, so they also cover the ISO 9001:2015 and CSR requirements.

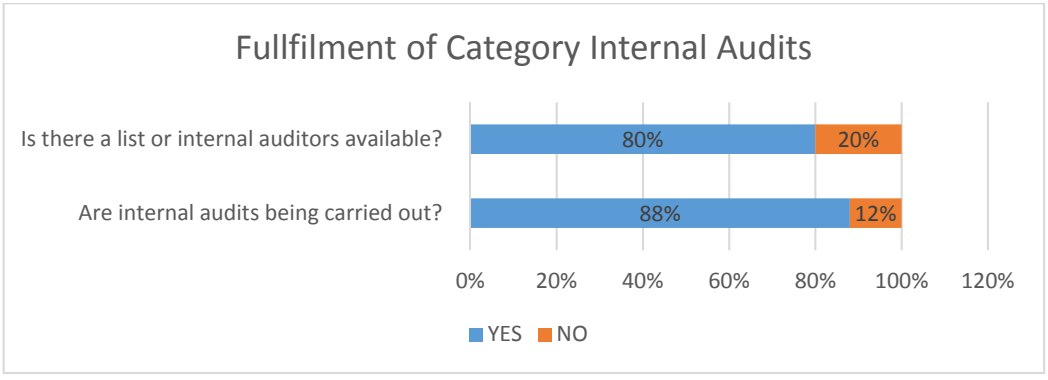


Figure 15. Fulfillment of Category Internal Audits

Traceability section have been among three highest fulfilled categories. Traceability system is place by 96% out of the questioned companies and only 4% responded that they do not have it. Out of the questioned organizations 76% of respondents are able to trace back their products down to raw materials, 8% partially and 16% not at all. Products are being identified at every production stage by 76% and partially by 20% of organizations, 4% does not have the product identified in each step. Companies are aware of the influence of the traceability of products/ materials on process control and final quality of products.

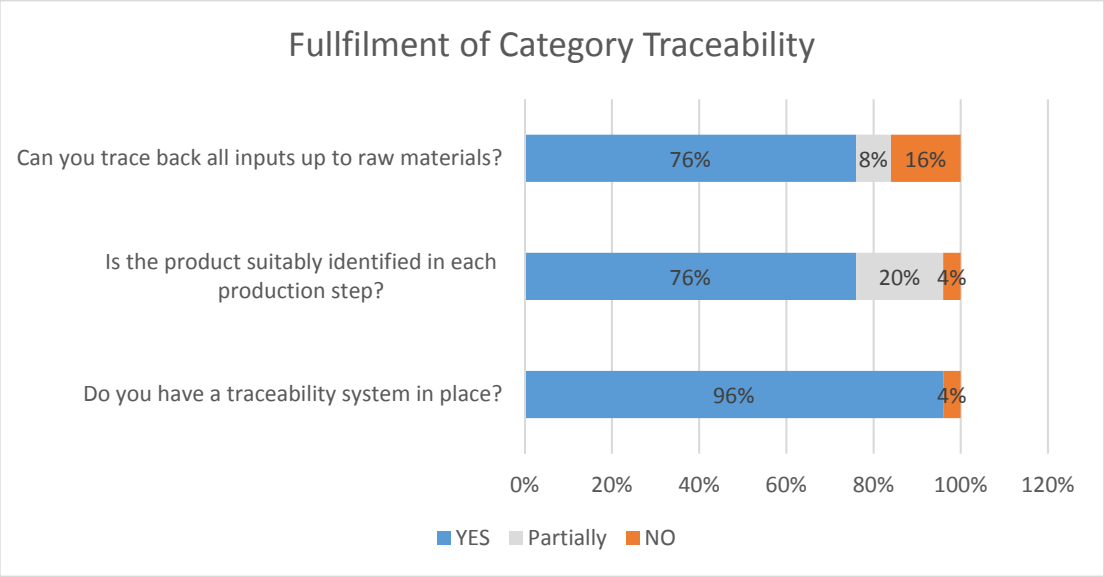


Figure 16. Fulfillment of Category Traceability

Nonconformity – this section was fulfilled by the respondents on the average level of 81%. This result indicates that the companies are aware of the importance of the process for detection, analyses, documenting and the fastest possible isolation of the nonconformities in case they occur. Out of the questioned companies (92%) have implemented a process to deal with defective products including their isolation. The Tier2 and Tier3 suppliers however seem to be lacking the information on the quality tool method to be using as 24% responded they do not use a quality tool. The information and the proper education regarding the most common quality tools is not sufficiently transferred to the suppliers on lower levels in the supply chain.

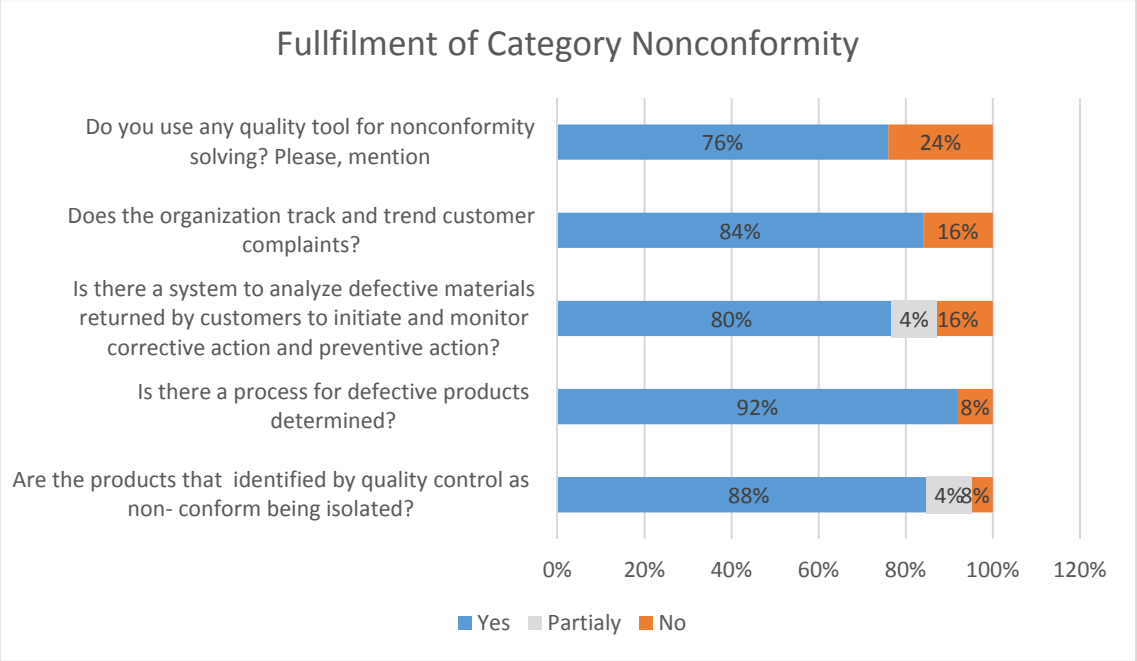


Figure 17. Fulfillment of Category Nonconformity

Incoming quality inspection - organizations also reached sufficient score in this category, meaning 88% of organizations have a written documentation in place and 92% are using different methods to ensure the incoming quality of goods as well. Together with 84% of the companies requiring the certificates for every delivery of raw materials it creates a good base for detecting the nonconforming raw materials right at the beginning of the supply chain.

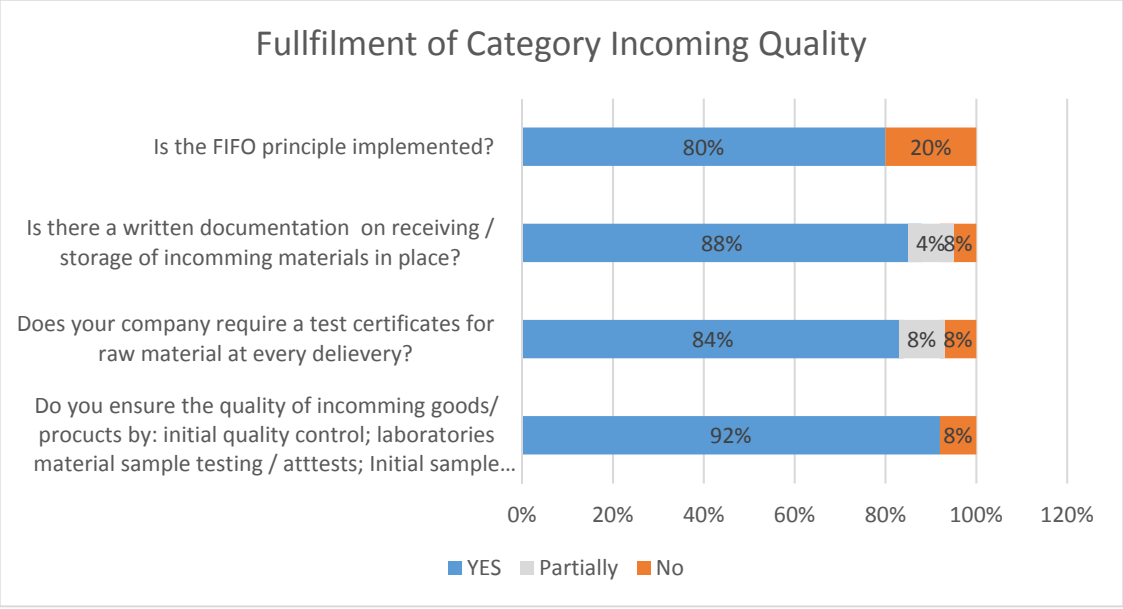


Figure 18. Fulfillment of Category Incoming Quality

Final quality - category has been rated in average at 78%. FIFO principle of final products, materials are ensured by 72% of companies. The 28% of evaluated organizations are not able to ensure proper FIFO and in case of nonconformity can create a high risk. Product control certificate is issued by 68% of monitored companies. The 32% of organizations have implemented this requirement partially or not at all. Product specification is available by 80% of monitored Tier 2+ companies. The highest score (96%) was rated by the ability to document the quality of products on several stages during the production process.

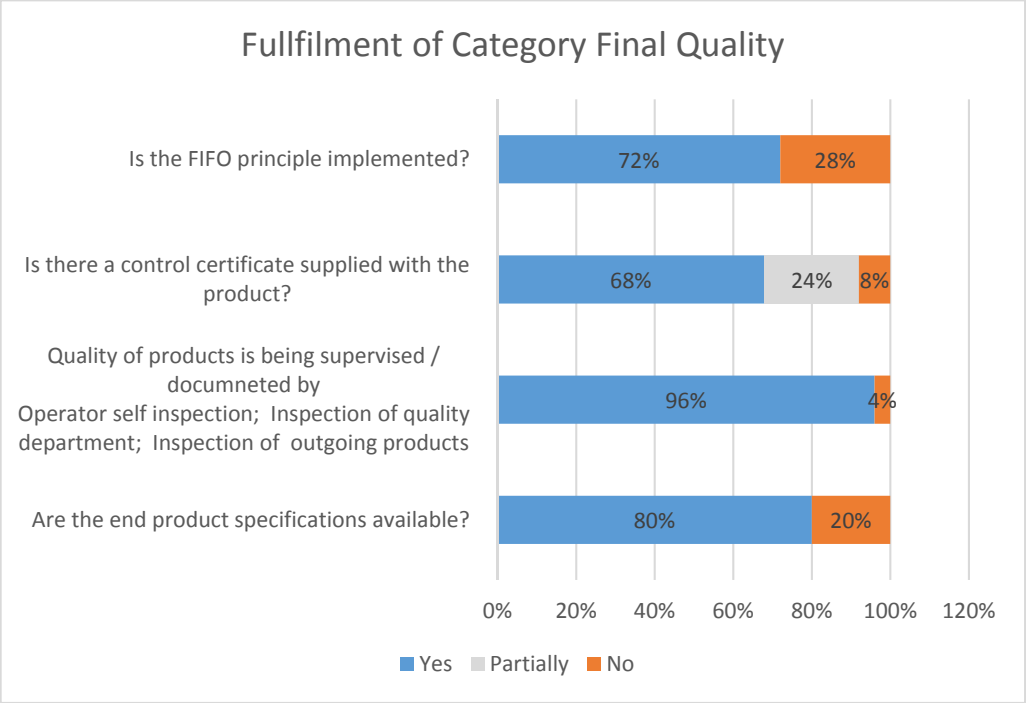


Figure 19. Fulfillment of Category Final Quality

Risk Management - with the average score of 64%, this category belongs among the worst rated, mainly because it is the new requirement of ISO 9001:2015 and the companies do not have this yet implemented in their QMS. The companies need to work on the contingency plans incorporation as well as on the supplier risk management determination. This section is further addressed in the chapter 5.2.

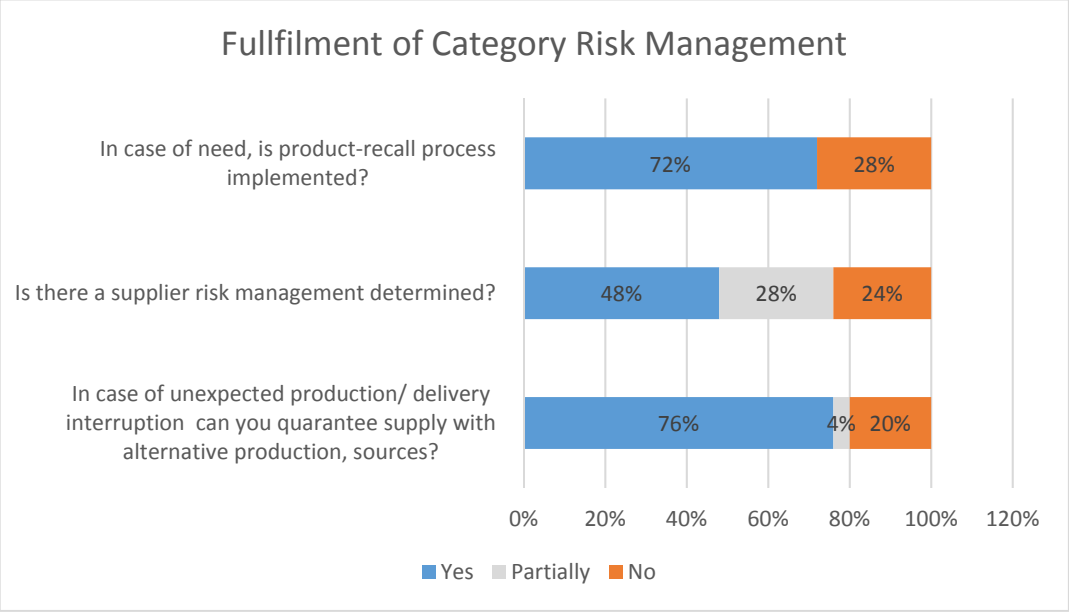


Figure 20. Fulfillment of Category Risk Management

Human resources category with request on documented data on qualification, proper training and responsibilities assignment was fulfilled by 91% of the respondents confirming companies are aware of the importance of the qualification of personnel and proper assignment of the responsibilities.

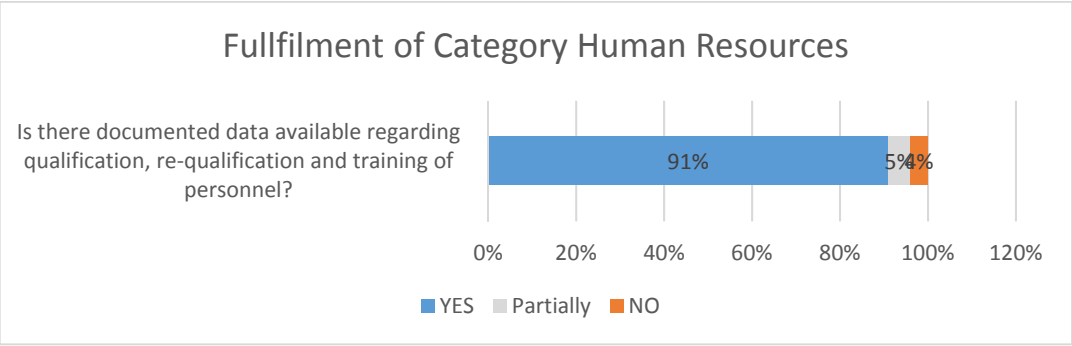


Figure 21. Fulfillment of Category Human Resource

5.2 Supplier development

The direct requirement of ISO 9001:2015 as well as automotive standards and norms is to have a process for supplier development implemented. If the organization wants to be successful, the quality on the incoming goods, depending on the maturity level of suppliers, has to be ensured. Therefore, the continuous development of the supplier base is fundamental for further cooperation and bilateral favourable business relations.

The scope of the executed survey was to find out more about the ability of fulfillment of the requirements identified for the suppliers in the automotive supply chain. The strengths and the weaknesses of implemented QMS have been pointed out on Figure 12.

The proposed measures for the worst evaluated categories will follow. The common recommendation for all three areas is to increase the education of the top and middle management regarding the requirements in these areas.

1) **Risk Management -** this new direct requirement of ISO 9001:2015 arose from the impacts of the economic crises in 2008. The organizations shall evaluate the risks coming from internal and external influences to secure their business.

   It includes:
   - determination of proper methodology,
   - identification of the processes, that are critical for the organization, perform the risk analyses,
   - define the frequency,
   - it should be executed cross the entire organization.

   More information on this topic also provides the standard ISO 3100: 2009 Risk Management issued by ISO organization or the companies can also develop their own risk management process, that will cover at least the main processes.

2) **Product and Process –** APQP and PPAP, FMEA are the requirements on top of the requirements of ISO 9001:2015. They are very complex and impose requirements on the product and processes from the process of design to the serial production.

   The proposed measures in this area are:
   - insist upon FMEA quality tool in case of nonconformities/ claims,
   - enhancement of the level of education in this area can be done also by allocation of residents within the supplier organization as it is applied by OEM by Tier 1 suppliers,
   - when assigning new project be particular about the transfer of the requirements APQP and PPAP into the contract with the supplier. This also applies for the Process FMEA and Design FMEA.

3) **Certification** the average results of this section, 44%, are to be taken into account only partially. The question regarding the automotive standard certification according to IATF 16949 was included on purpose to verify the targeted group, the Tier 2, Tier 3 companies only ISO 9001 certified. This has been confirmed as only 4% of the organizations responded they are ISO/ TS 16949, IATF 16949 certified.

   More attention has to be payed to the low representation of the organizations certified according to ISO 14001:2015 Environmental Management Systems. As seen in the Annex 1 it is a requirement of Tier 1 companies. The suppliers should also fulfill the compliance obligations such as environmental permissions for production and required information regarding the contain of chemical substance in products. If a supplier is certified by ISO 14001:2015 these aspects are regularly proven and there is lower risk on the nonconformity of the product from the supplier.
   Environmental certification may also offer a competitive advantage for Tier 2, 3 suppliers. The Tier 1 will choose preferably the supplier with the ISO 14001:2015 certificate because of its objectives and environmental policy incorporated.

6. Conclusion

Business conditions and the way supply chains operate have changed significantly in recent years. This created the need for new editions of the main quality management standards. The companies on all levels in the supply chain are currently in the, so called, transition period, which has started in September 2015 by issuing the new edition of ISO 9001:2015, the minimal standard for ensuring the level of quality management system in the suppling organization required by OEMs. The updated edition of this base standard was followed in 2016 by new edition of VDA requirements as well as IATF 16949 standard.

Addressing the issue with great amount of information to be monitored as an effect of all new editions of the main standards applicable in the automotive industry, the insufficient access to the information on lower levels in the supply chain and decreasing level of expertise on the QM requirements for control of externally provided processes, products and services, following research questions have been stated.

1. **What are the criteria for suppliers on lower levels (Tier 2, Tier3) to be monitored in order to secure the conformity along the supply chain?**

The aim of this Master's Thesis was to provide the suppliers companies on the lower levels of the supply chain with the complex tool and information on requirements relevant for the control of externally provided processes, products and services in order to reduce the risks in the supply chain.

In order to identify the base requirements to be monitored for purpose of control of externally provided processes, products and services first the main relevant standards have been stated in chapter 2. To enhance the requirements for suppliers certified according ISO 9001:2015 deeper analyses of the automotive requirements (IATF 16949, VDA requirements, CSR OEM and Tier 1) was performed. The summary table with incorporated requirements from automotive standards and ISO 9001:2015 is represented by table Annex 1.

Having gathered the criteria from all levels of the supply chain gives a better foundation for reduction of risks on the quality of the supplied products, as it provides more specified information for the suppliers to automotive industry in order to ensure the conformity along the supply chain.

Among the requirements of ISO 9001 also the documented process of selection, monitoring and re-evaluation of external providers is stated. The standard itself however does not perscribe the process, methodology. This is left to the companies and leads to the second research question.

2. **How to outline an effective process of selection, monitoring, re-evaluation of external providers according to ISO 9001:2015 requirements and base criteria of automotive industry for the companies on lower levels in the supply chain?**

To follow the complex information regarding requirement on suppliers within automotive supply chain and to offer a practical application of the findings, purchasing tool - the questionnaire, for ranking of the external providers and methodology of evaluation was proposed in the Chapter 4.

The questionnaire was designed as an excel spreadsheet, for compatible and user friendly utilization for companies. It enriches the primar criteria, Annex 2- Section A, B, by the demands of automotive standards and the customers from automotive industry, Annex 2- Section C. By application of this tool even the companies certified only according to ISO 9001:2015, however still supplying to the automotive industry, can eliminate the risks in the supply chain and ensuring the conformity with requirements along the automotive supply chain.

The second outcome of the application of the questionnaire was brought by the survey that included 25 companies on Tier 2, Tier 3 level. The categories monitored and the ability of fulfillment of the requirements is represented by Figure 10.

The results of the survey have showed that the weak areas are mainly certification, process and product control and risk management. These areas ask for more attention and supplier development, as they pose risks for the supply chain. Chapter 5.2 adverts the proposed measures for improvement in these areas in order to eliminate the risks along the supply chain. By fulfillment of all of the criteria required by the standards and analyzed in this thesis can the external providers minimize the risks and gain better preferable position on the market in the automotive industry.

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VDA Vznik produktu, výroba, dodávanie. Product creation, manufacture and delivery (2011). 1st ed., ČSJ, Prague

List of Tables

List of Figures

List of Abbreviations

Approx.	Approximate
APQP	Advanced Product Quality Planning
BMW	Bayerische Motoren Werke
CSR	Customer Specific Requirements
EXW	Ex Works
FIFO	First in First out
FMEA	Failure Mode and Effect Analysis
IATF	International Automotive Task Force
IATF 16949	International Automotive Task Force 16949 Standard
ISO	International Organization for Standardization
ISO 14001	Environmental Management Standard
ISO 31000	Risk Management- Principles and Guidelines
ISO 9000	Quality Management System- Fundamentals and Vocabulary
ISO 9001	Quality Management System- Requirements
ISO/TS 16949	Quality Management System in Automotive Industry
MSA	Measurement Systems Analysis
OEM	Original Equipment Manufacturer
OHSAS	Occupational Health and Safety Assessment Series
PDCA	Plan-Do-Check-Act
PPAP	Production Part Approval Process
PPM	Parts per Million
QM	Quality Management
QMC	Quality Management Center
QMS	Quality Management System
Tier 1	Suppliers of System Modules
Tier 2	Suppliers of Components
Tier 2+	Suppliers on lower levels in the supply chain
Trier 3	Suppliers of Raw Materials

US	United States
VDA	Verband der Automobilindustrie, German Automotive Industry Association
VDA 6.x	Quality Management System Audit

List of Annex

Annex 1

Automotive requirements on control of externally provided processes, products and services

Corresponding clause ISO 9001:2015 and IATF 16949:2016	ISO 9001:2015	IATF 16949:2016	VDA requirements		Customer Specific Requirements on OEM level	Customer Specific Requirements onTier 1 level
8.4 Control of externally provided processes, products and services						
8.4.1. General	Ensure that the externally provided processes, products and services correspond to the requiremetns	Include all processes the affect customer requirements			Documented process for selection, evaluation,monitoring and re-evaluation of suppliers	Documented process for selection, evaluation,monitoring and re-evaluation of suppliers
	Controled criteria should be set up when: products and services are becoming part of the organiyations products/ services ; are being directly provided to the customers; process or a part of a process is provided by external provider (supplier)	Documented supppliier selection process and outsources processes, that includes: assesmetn of risks,quality and delivery performance, evaluation of QMSof supplier, assesment of software and development capabilities	Requirements of supplier process section 7 - Supplier management: only approved suppliers, customer requirements to be taken into consideration, target performance agreed upon and integrated, necessary approvals, ensured quality of outsourced products, services,		Assigned personnel to monitor and manage performance of suppliers	Criteria: minimum requirement ISO 9001, enviroment ISO 14001 , plan to achieve IATF-16949, constant improvement of QMS
	The criteria should be set up for evaluation, selection, monitorinfand re-evaluation of suppliers	Financial stability, product, material complexity, available resources	Incomming goods stored appropriatelly		Financial assesment evaluation	Financial situation analyses
	Documented information regarding this shall be retained	Business continuity- contingency planning, logistics process, customer service	Personnel qualified, responsibilities defined		On site audits, list of approved suppliers for each comodity, raw material, component, technology	Audits by suppliers, monitor and develop performance of subsuppliers ,
		Documented processes to identify outsourced processes, criteria, actions of escalation, supplier performance, risks	Critical path identification for products A risk		Monitoring and approval of sub-tier suppliers	List of sub-suppliers available
8.4.2. Type and extent of control	Requirement on ensurinng the consistency of deliveries, suppliers products/ processes should not have a negative affect	QMS according to ISO 9001:2015, automotive requirements, certification to IATF 16949:2016			Incomming product quality measures to be usedfor indicator for sub-tier supplier QM	material FIFO approach; traceability all the way to the raw materials/ purchased parts
	externally provided processes should correspond to QMS, define criterial of control for suppliers and delivered products/ services	Supplier monitoring, supplier audits-product, process audits, QMS audits, supplier risk assesement	Detailed description of process and product audits		Criteria for definition and evaluation of suppliers according to ISO 9001:2015 and IATF 16949:2016,	Risk management -evaluation of external and internal risk
	Consider impact of supplied processes and services on customer requirements and the effectiveness of controls	Supplier development/ defined performance issues, risk analyses, audit findings			Automotive QMS requirements	Personnel -quality and qualification monitoring, development
	Define verification and activties neeses to ensure supplied products / services meet requirements				Supplier development process in place	Supplier management process in place
					Measurement monitoring	
					self certification documented information	internal audits, list of internal auditors, qualifies auditors
					Suppliers not certified ISO9001:2015 and IATF 16949:2016, should have a documented quality process	Supplier shall perform audits by sub-suppliers. Checklist of questionaire to be used at audits
					Process audits, PPAP, incomming inspections of materials	process and products FMEA, APQP, PPAP, incomming inspections of materials, laboratory approval on material
					Suppliers development required	Suppliers development process, all suppliers must fulfill the requested criteria
8.4.3 information for external providers	Quality Requirements should be cascaded and communicated throughout the entire supply chain: for processes, products, approvals and release of products, processes, equipment	Quality Requirements shall all applicablerequirements to their suppliers and require their suppliers to cascade them down along the supply chain			Quality Requirements should be cascaded and communicated throughout the entire supply chain	Suppliers must cascade all applicable requirements to their supply chain

Annex 2

Supplier Questionnaire – Section A, New Supplier

Supplier questionnaire Section A

General information
Company name:
Contact person:
e-mail:
Phone:
Address:
web:

		All fields to be avaluated by the company				
		N/A	yes	partially	no	Comments
1. Stability						
1.1	The supplier is in a good financial situation					
1.2	Supplier has stable and qualified personnel					
1.3	Number of employees is being monitored and kept to the satisfactory level covering the needs of suppliers organization.					
2. Terms of payment						
2.1	Deffered payment 90 days					
2.2	Deffered payment 60days					
2.3	Deffered payment 30 days					
2.4	The supplier does not require the payment in advance					
2.5	Payment are being carries out in Euros					
3. Price						
3.1	The offered price corresponds to the price on the market					
3.2	The offered price is below to the price on the market					
3.3	The suppler is able to reduce the price with the increasing volume					
4. Available capacity						
4.1	The supplier has enough free capacity for the whole RFQ amount					
4.2	The supplier has the ability to increase his production capacities					
5. Product complexity						
5.1	The supplier offers various products suitable for company					
5.2	The supplier can offer additional services/ outsources services					
6. Delivery conditions						
6.1	The supplier offers also other Delivery terms thatn EXW according to Incoterms					
6.2	The supplier is able to deliver also partial lots					
6.3	The supplier agrees on having a consigment stock					

Supplier Questionnaire – Section B, Existing Supplier

Supplier questionnaire Section B

General information
Company name:
Contact person:
e-mail:
Phone:
Address:
web:

All fields to be avaluated by the company - Purchasing department

	N/A	yes	partially	no	Comments
1. Stability of suppliers company					
1.1 The supplier is in a good financial situation					
1.2 Supplier has stable and qualified personnel					
1.3 Number of employees is being monitored and kept to the satisfactory level covering the needs of suppliers organization.					
2. Payment conditions					
2.1 Deffered payment 90 days					
2.2 Deffered payment 60days					
2.3 Deffered payment 30 days					
2.4 The supplier does not require the payment in advance					
2.5 Payment are being carries out in Euros					
3. Price					
3.1 The offered price corresponds to the price on the market					
3.2 The offered price is below to the price on the market					
3.3 The suppler is able to reduce the price with the increasing volume					
4. Quality of delivered products/services					
3.1 Products are beeing delivered in requested quality					
3.2 Does the PPM rating correspond to the determined level					
3.3. Products are beeing delivered on time					
3.4 The supplier addresses the compaints on quality and provides explicit step in order to solve the compaint / prevent from happening again					
3.5 The deliveries contain proper documantation					
5. Product complexity					
5.1 The supplier offers various products suitable for company					
5.2 The supplier can offer additional services/ outsources services					
6. Available capacity					
4.1 The supplier has enough free capacity for the whole RFQ amount					
4.2 The supplier has the ability to increase his production capacities					
7. Delivery conditions					
6.1 The supplier offers also other Delivery terms thatn EXW according to Incoterms					
6.2 The supplier is able to deliver also partial lots					
6.3 The supplier agrees on having a consigment stock					
8. Overall cooperation					
6.1 The communication with supplier is on good level					
6.2 The supppliers feedback, responses are promt					

Supplier Questionnaire – Section C, Requirements of Automotive Industry

Supplier assessment questionnaire

General information
Company name:
Contact person:
e-mail:
Phone:
Address:
web:

Mark "X" if fitting

	N/A	Complete	Almost completed	Not completed	Comments
1. Certifications					
1.1 Do you have certified management system according to ISO 9001? If yes, please attach a valid certificate and continue with question 1.4					
1.2 If no, do you plan to ensure the certificate and when?					
1.3 Do you have internally established quality management system?					
1.4 Do you have certified management system according to ISO/TS 16949 or IATF 16949? If yes, please attach a valid certificate					
1.5 If no, do you plan to ensure the certificate and when?					
1.6 Do you have a certified environmental management according to ISO 14001? If yes, please attach a valid certificate					
1.7 If no, do you plan to ensure the certificate and when?					
2. Suppliers					
2.1 Is the list of approved suppliers available?					
2.2 Is there a process for Suppliers evaluation?					
2.3 Is there a process for Monitoring of Suppliers					
2.4 Is there a process for Suppliers developmnet?					
2.5 Is there a list of outsourced processes available?					
2.6 Are the supplier audits carried out?					
2.7 Are the most sifnificant supplierd identifies? Is there a critical path in place for these suppliers?					
3. Customers					
3.1 Is the customer satisfaction measured?					
3.2 Are the goals for improvement of customer satisfaction set up?					
4. Product and process					
4.1 Is there a process for quality planning implemented? (APQP)					
4.2 Are you able to realise initial samples according to PPAP?					
4.3 Is there a written technical documetation available?					
4.4 Is FMEA being implemented for design?					
4.5 Is FMEA being implemented for process?					
4.6 Does a control plann for products exist?					
4.7 Is measurement system analysis for all equipment implemented?					
4.8 Are the measurement devices controlled and calibrated?					
5. Internal audit					
5.1 Are internal audits being carried out?					
5.2 Is there a list or internal auditors available?					
6. Traceability					
6.1 Do you have a traceability system in place?					
6.2 Is the product suitably identified in each production step?					
6.3 Can you trace back all outputs up to raw materials?					
7. Nonconformity					
7.1 Are the products that identified by quality control as non- conform being isolated?					
7.2 Is there a process for defective products determined?					
7.3 Is there a system to analyze defective materials returned by customers to initiate and monitor corrective action and preventive action?					
7.4 Does the organization track and trend customer complaints?					
7.5 Do you use any quality tool for nonconformity solving? Please, mention - 8D , ……					

8. Incoming quality inspection

8.1 Do you ensure the quality of incomming material/ products by:					
initial quality control					
laboratories material sample testing / quality certificates					
Initial sample testing					
supplier audits					
8.2 Does your company require a test certificates for raw material at every delievery?					
8.3 Is there a written documentation on receiving / storage of incomming materials in place?					
8.4 Is the FIFO principle implemented?					

9. Final quality inspection

9.1 Are the end product specifications available?					
9.2 Quality of products is being supervised / documneted by					
Operator self inspection					
Inspection of quality department					
Inspection of outgoing products					
9.3 Is there a Certificate of analysis supplied with the product?					
9.4 Is the FIFO principle implemented?					

10. Risk management

10.1 In case of unexpected production/ delivery interruption can you quarantee supply with alternative production, sources?					
10.2 Is there a supplier risk management determined?					
10.3 In case of need, is product-recall process implemented?					

11. Human recources

11.1 Is there documented data available regarding qualification, re-qualification and training of personnel?					

Completed by:	
Position:	
Date:	
Signature:	

Annex 3

Supplier Questionnaire – filled in and evaluated example

Supplier questionnaire

General information
Company name:
Contact person:
e-mail:
Phone:
Address:
web:

Mark "X" if fitting

		N/A	completed	almost completed	not completed	Comments	Evaluation
1. Certification							
	1.1 Do you have certified management system according to ISO 9001? If yes, please attach a valid certificate and continue with question 1.3		x				10
	1.2 If no, do you plan to ensure the certificate and when?			-			-
	1.3 Do you have internally established quality management system?						
	1.4 Do you have certified management system according to ISO/TS 16949 or IATF 16949? If yes, please attach a valid certificate				x		0
	1.5 If no, do you plan to ensure the certificate and when?			-			-
	1.6 Do you have a certified environmental management according to ISO 14001? If yes, please attach a valid certificate		x				10
	1.7 If no, do you plan to ensure the certificate and when?			-			-
						TOTAL	67%
2. Suppliers							
	2.1 Is the list of approved suppliers available?		x				10
	2.2 Is there a process for Suppliers evaluation?		x				10
	2.3 Is there a process for Monitoring of Suppliers		x				10
	2.4 Is there a process for Suppliers developmnet?				x		5
	2.5 Is there a list of outsourced processes available?		x				10
	2.6 Are the supplier audits carried out?		x				10
	2.7 Are the most sifnificant supplierd identifies? Is there a critical path in place for these suppliers?		x				10
						TOTAL	86%
3. Customers							
	3.1 Is the customer satisfaction measured?		x				10
	3.2 Are the goals for improvement of customer satisfaction set up?		x				10
						TOTAL	100%
4. Product and process							
	4.1 Is there a process for quality planning implemented? (APQP)					x	0
	4.2 Are you able to realise initial samples according to PPAP?		x				10
	4.3 Is there a written documentation of technical documets available?		x				10
	4.4 Is FMEA being implemented for design?					x	0
	4.5 Is FMEA being implemented for process?					x	0
	4.6 Does a control plann for products exist?		x				10
	4.7 Is measurement system analysis for all equipment implemented?					x	0
	4.8 Are the measurement devices controlled and calibrated?		x				10
						TOTAL	50%
5. Internal audits							
	5.1 Are internal audits being carried out?		x				10
	5.2 Is there a list or internal auditors available?		x				10
						TOTAL	100%
6. Traceability							
	6.1 Do you have a traceability system in place?		x				10
	6.2 Is the product suitably identified in each production step?		x				10
	6.3 Can you trace back all inputs up to raw materials?		x				10
						TOTAL	100%
7. Nonconformity							
	7.1 Are the products that identified by quality control as non- conform being isolated?		x				10
	7.2 Is there a process for defective products determined?		x				10
	7.3 Is there a system to analyze defective materials returned by customers to initiate and monitor corrective action and preventive action?		x				10
	7.4 Does the organization track and trend customer complaints?		x				10
	7.5 Do you use any quality tool for nonconformity solving? Please, mention		x				10
						TOTAL	100%
8. Incoming quality inspection							
	8.1 Do you ensure the quality of incomming goods/ procucts by:						
	initial quality control						
	laboratories material sample testing / atttests		x				10
	Initial sample testing		x				
	supplier audits		x				
	8.2 Does your company require a test certificates for raw material at every delievery?		x				10
	8.3 Is there a written documentation on receiving / storage of incomming materials in place?		x				10
	8.4 Is the FIFO principle implemented?		x				10
						TOTAL	100%
9. Final quality inspection							
	9.1 Are the end product specifications available?		x				
	9.2 Quality of products is being supervised / documneted by						
	Operator self inspection		x				
	Inspection of quality department		x				10
	Inspection of outgoing products		x				
	9.3 Is there a control certificate supplied with the product?			x			5
	9.4 Is the FIFO principle implemented?				x		0
						TOTAL	38%
10. Risk management							
	10.1 In case of unexpected production/ delivery interruption can you quarantee supply with alternative production, sources?		x				10
	10.2 Is there a supplier risk management determined?		x				10
	10.3 In case of need, is product-recall process implemented?		x				10
						TOTAL	100%
11. Human recources							
	11.1 Is there documented data available regarding qualification, re-qualification and training of personnel?		x				10
						TOTAL	100%

10	completed
5	almost completed
0	not completed
-	N/A

Final evaluation of vendor's survey 85% x 100

A	
90% and more	Potential Preferred
B	
80%-89%	Satisfactory
C	
70%-79%	Improvement needed
D	
69% - 0%	Unsatisfactory