A review on Quality Management System in Automotive Sector and ISO/TS 16949

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Abstract: Due to the increasing competition in the automobile sector, there is a great need to supply efficient, stable and high quality products. Quality is a vital factor and is defined as values, conformance with specifications, requirements etc. Quality managements is an idealistic set of business processes, procedures implementing ideas from various sources focused on quality and to meet the customer's requirements. ISO TS 16949 was prepared by the International Automotive Task Force and is a widely-followed standard which focuses on process quality and fulfilment of customer needs by avoiding errors rather than discovering it. This standard was made as ISO 9000 and ISO 9001standards were inefficient in many aspects of quality management to be followed by industries. There are various certifications of quality management system in automotive industries. This paper gives a detailed picture of ISO TS 16949 and how it is important and different from other standards. In this review article, 21 research papers from multiple journals have been accumulated and analyzed to obtain the research work that have been already published by the respective authors, and hence to identify the need of Quality Management System (QMS) in automobile sector. Kaizen, Six Sigma, Histogram, Quality Function Deployment etc are some of the quality tools which help to achieve analysis, understanding and solving the problems in an organization and to maintain the quality standards. There are also other tools for quality management which are easy to understand and implement. Thus, the paper summarizes importance of quality management system, different quality standards, and quality tools used in different industries in the current scenario.

Keywords: ISO TS16949, Quality Management System (QMS), Audit, Quality Tools

I. INTRODUCTION

In the present era of economic and social globalization, the biggest actor in the manufacturing world is the automotive sector. There is a vast competition in the automobile manufacturing sector. Thus, for the stable economic growth, keeping low cost man power, low cost manufacturing and high production, the organization needs to produce and supply innovative, improved and efficient products. By this way only a company can survive the competition. Thus, this forces the organization to maintain high quality product under the huge competitive pressure. [3] The automobiles that are designed in one country may be assembled in another. The products or parts that are supplied may be from different source which may have taken parts from the fourth and so on. In this way, a huge chain of organizations plays an important role in the manufacturing of an automobile. Thus, the original equipment manufacturer (OEMs) should control how he is getting the supplies. [16] Despite all this achieving customer's satisfaction is a company's main role and objective. Thus, in this competitive pressure the organization needs to learn faster and maintain their values thus leading to business excellence. To stay competitive, an improvement in organization's quality performance is a must.

Quality can be defined as the value, conformance with specifications, conformance with requirements, fitness for use, loss avoidance, meeting and/or exceeding customer expectation. Quality enhances the efficiency of the product leading it into improved performance. Earlier quality only focused on number of issues. But now it depends on many auditable factors. How a quality can contribute to the performance of an organization and how it can enhance its performance is what every organization is seeking for. To achieve this, all organizations are now aiming for QMS [19].

Quality Management is a set of business process, policies and procedures that brings together ideas from, for example system analysis, operation research, problem solving, statistics, engineering, group dynamics, management science, human genetics, and organizational development focused on achieving quality policy and objectives to fulfil and meet the needs of customer requirement. As Juran described, history of quality can be traced back to the time when the pyramids were built in Egypt. Then with time, the need of quality in the production of parts increased, giving rise to many philosophies and models in quality by many quality gurus. Quality per Crosby, Quality per Deming, Quality per Ishikawa, Quality per Juran, Quality per Shewhart, Mc Call's Quality Model, Boehm's Quality Model, Dromey's Quality Model are some of the main philosophies and models at 90's. Then came Six Sigma, which is being followed now also. Six sigma methodologies are used to identify and control variables that affect the output of a process. Thus, six sigma being the collection of managerial and statistical concepts & techniques focuses on reducing variation in process and preventing deficiencies in product [7]. Then in 1987, International Organization for Standard (ISO) published the quality management system standard ISO 9000. ISO 9000 helped to define many of the elements of sound quality practice, but it did not assure the product goodness or fitness for use, as it only addressed consistency in the process. ISO attempted to convince all the automobile manufacturers to use ISO 9001 quality standards that had been created, but automakers found ISO standards to be insufficient for their industry. Attempts were made to modify ISO 9001 for automobile industry, but since the changes that were needed were not relevant to companies outside auto industry, a new standard, ISO TS16949 was created and released in 1999 [10, 7]

ISO is the international organization for the standardization in a worldwide federation of national standards bodies. ISO TS16949 was prepared by the International Automotive Task Force (IATF), with support from ISO TC176, (North America), VDA (Germany), EAQF (France), and AVSQ (Italy) (Chrysler Corporation, Ford Motor Company, & General Motors Corporation, 1998). ISO TS16949 defines the quality management system for production, continual improvement, design and development, emphasizing defect prevention, when relevant, installation and service, and automotive-related products. It is organization strategic decision for the adoption of quality management system. Organization's varying needs, its environment, objectives, products it provides, processes it employs, its structure; all these factors influence the design and implementation of organization's quality management. ISO TS16949 is to improve the process quality and the system to enhance the customer satisfaction, in finding out the risks and problems in the production and supply chain thus eliminating the issues and causes and applying prevention measures for their effectiveness. Thus this standard focuses on avoiding the errors rather than discovering it [9, 10, and 5].

II. REVIEW OF LITERATURE

Table 1: Review of various scientist work in tabular form

S. N.	*Author*	*Year of publication*	*Topic*	*Journal*
1.	Harjeev Kumar Khanna, S.C. Laroiya, D.D. Sharma	2010	Quality management in Indian Manufacturing Organizations	Brazilian Journal of Operations & Production Management
Actual Conclusion and Result: The paper deals with the current practices used in Indian manufacturing organizations. Quality Management is the best way to achieve customer satisfaction. Indian companies see ISO 9000 as the starting point of Quality Management System. Most of the companies which are ISO 9000 certified are from manufacturing industries. Indian organizations are aware of Total Quality Management [1].				

Table 1: Continue…

S. N.	*Author*	*Year of publication*	*Topic*	*Journal*
2.	Dr. Anu Kohli and Mr. Ram Singh	2015	Quality Management Approaches in Indian Automotive Industries	International Journal of Science, Technology & Management

Actual Conclusion and Result:

This paper highlights the tools and techniques used by Indian Industries for quality management approach to meet the global standards. The paper deals with the similarity in implementation of practices like Employee Empowerment, Product Design, PDSA, Six Sigma etc. TQM is the management process and set of rules to ensure that organization meets customer requirements. It is a combination of quality and management tools. ISO TS 16949 certification is provided to companies emphasizing on process oriented quality management system, resulting in prevention of defects, reduction in variations and elimination of waste in Supply chain Quality Control Techniques and Tools: Kaizen refers to continuous improvement in all activities. Employee Empowerment means providing incentives for identifying and helping with the problems. Product Design is the transformation of ideas into a new product. Six Sigma is the statistical technique of process improvement. PDSA stands for Plan-Do-Study-Act Cycle. There are different emerging tools for quality control. Image Analyzer is the production tool which assures the required design, safety and comfort of the vehicle. Computer Numerical Control is the automation process in which various functions of the machines are controlled by numbers, letters etc. It was observed that all companies under observation have ISO 16949 TS and OHS 18001 certifications. Above 90% companies use tools like Kaizen, Employee Empowerment, Six Sigma etc. [3]

3.	Nicoleta Isac	2012	Principles of TQM in Automotive Industries	Romanian Economic and Business Review

Actual Conclusion and Result:

In this paper, TQM is emphasized. TQM is the set of management process and rules that ensure that organization meets and exceeds customer needs.TQM companies focus on the systematic management of data. Almost all automotive industry have reduced costs increased process efficiency and improved the quality of their products and services. TQM is a process by which management and employees can become involved in the continuous improvement of production of goods and services. Concepts of TQM philosophy are Customer Focus, Continuous improvement. Employee Empowerment, Use of quality tools, Product Design, Managing Supplier Quality. Quality must satisfy and overcome Customer's expectations. TQM is concerned with continuous improvement in all work, from high level strategic planning and decision making, to detailed execution of work elements on the shop floor. In TQM, workers are empowered to make decisions relative to quality in the production process. Workers must know how to assess quality by using a variety of quality tools. A useful tool for translating the voice of the customer into specific technical requirements is quality function deployment. TQM extends the concept of quality to a company's suppliers. [17]

4.	Goicoechea, I. & Fenollera, M.	2012	Quality Management in the Automotive Industries	DAAAM International Scientific Book

Actual Conclusion and Result:

This research paper investigates to set a relationship between the different stages of PRP and quality control tools. Bottom line of quality is determined by customers' or stakeholders' requirements. Automobile quality management system is based on ISO/TS standard that focuses on processes. Quality management techniques and tools help to solve specific problems at different organization levels. There are different quality assurance standards such as QS, TS, VDA, EAQF, AVSQ etc UNE ISO/TS 16949 replaces QS 9000 standard. IATF was established to create this standard. ISO/TS 16949 is the useful framework to understand the quality planning of the product in general. Automotive sector's project management follows different phases. Development phase of new vehicles take place at design centers. Many times MAM's include some suppliers in the working team. Most used quality tools are PDCA cycle or Deming, Q7, M7, Planning techniques, Control techniques, and Improvement techniques. Different project stages and quality tools used in these were observed [4].

Table 1: Continue…

S. N.	Author	Year of publication	Topic	Journal
5.	Agnieszka Misztal	2015	Technical Determinants of Success in Quality Management Systems Implementation in Automotive Industries.	International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering

Actual Conclusion and Result:
In this paper, success factors for Quality Management System were observed. Requirements when travel through supply chain level must be clear and transparent. The research was focused on 4 groups of companies- Manufacturing, Services, Service for transport of goods and vehicles and commercial. ISO 9001 is based on process and system approach. The purpose of ISO/TS 16949 aims for the development of quality management system which provides continuous improvement and emphasizing on production of errors [5].

6.	G. CIvcisa and A. Grislis	2014	ISO/TS 16949 among Latvian Production companies focused on Automotive Industry	Agronomy Research

Actual Conclusion and Result:
A system approach is needed by material manufacturers and vehicle spare part to become a part of global supply chain. This can be implemented by developing a quality management system. ISO/TS 16949 can be described as particular requirements for the application of ISO 9001. ISO 9001 is the most well-known standard of certification to quality management system. Customers' requirement is most important in QMS. IN 20112, number of issued quality certificates has increased by 12% in Latvian. The implementation of ISO 9001 and ISO/TS 16949 are also compared. Certification to ISO/TS 16949 in world particularly in automotive industries in the world is widely diffused and is a growing trend. Customer is emphasized in the whole quality management system [11].

7.	Katarzyna Hys	2015	ISO/TS 16949 analysis of the current trend	Zarzdzanie i Finanse Journal of Management and Finance

Actual Conclusion and Result:
There was a huge difference in the execution quality between some cars. In Poland, 80% of independent manufacturers provide use parts. The parts produced by car manufacturers are 20%. Thus, there can be lot of deviations of quality requirements. Technical specification ISO/TS 16949 provides many solutions to these problems. It maintains quality specifications during production and assembly of products. Number of ISO/TS 16949 certifications increase each year all over the world. Thus, this certification obtained a general approval in the entrepreneurs' community in the automotive Industry [12].

8.	Laurentiu Aurel Mihail	2009	Organizational process mapping for ISO/TS 16949:2009 certification of industrial quality management systems	Bulletin of the Transilvania University of Brasov

Actual Conclusion and Result:
A very important aspect regarding the implementation of ISO/TS 16949 is the vivid representation of organizational processes and their interactions. To meet the objective sets, processes are identified and their sequence and interactions are determined. There are two types of processes- Business processes and work processes. According to ISO/TS requirements. 'Human Resources' is a very important aspect regarding the functioning of Quality Management System [13].

9.	Laurenţiu-Aurel Mihail	2011	The ISO quality management principles and the EFQM model	Academic Journal of Manufacturing Engineering

Table 1: Continue…

Actual Conclusion and Result:
This research paper provided a useful approach about the 8 correlations that exist between the 8 Quality Management principles, according with the vision 2000 of ISO 9001 standard. This can be useful for implementing and auditing the QMS for automotive sector. EFQM model is used for taking an appropriate approach for organizational excellence. QMS helps in improving the products' intrinsic quality and quality of the related services. The main aim is to minimize the supply chain risks. Success means the products; services and processes fulfill the requirements and customer satisfaction. The 8 Quality Management principles are Customer focus, Leadership, Involvement of People, Process approach, System approach to management, Continual improvement, Factual approach to decision making, Mutually beneficial Suppler Relationship. There is a very close match between these principles and EFQM model. EFQM is based on 8 criteria's to assess the overall strengths of an organization. Quality assurance is based on putting customers on first place. Leadership, process management, seriousness, building partnership is some of the fundaments [16].

S. N.	*Author*	*Year of publication*	*Topic*	*Journal*
10.	Theresé Wangenborn	2010	Design process enhancements	

Actual Conclusion and Result:
Quality assurance was established in the 1960's. Quality should be controlled and assured in each step. Quality management can be defined as correlated activities that manage and controls quality related work within an organization. Quality audit is a tool used within the field of quality assurance to check the quality outcome for the produced products and services. The main purpose with the ISO/TS 16949 standard is to provide a management system for quality in the automotive industry and avoid parallel certification audits for suppliers [14].

11.	Zakuan N. M., Yusof	2007	Implementation of quality management practices in Malaysian automotive industries	Regional Conference on Engineering Mathematics, Mechanics, Manufacturing & Architecture

Actual Conclusion and Result:
Different automotive industries are in different stages of quality movement. The paper studies the relationship between Malaysian and Thailand industries. A conceptual model which uses Structural Equation Modeling has been proposed. It has been observed that quality is the main factor to survive in a global industry. It is also an important measure of economic success of industries. Quality management constructs are also investigated such as quality leadership, Customer focus and satisfaction, Quality information and analysis etc. Quality Management practices enhance organizational performance [2].

12.	V.K. Khanna, Prem Vrat	2006	Usage of Quality Tools in the Indian Automotive Sectors	Journal of Management Research

Actual Conclusion and Result:
This paper studies on different quality tools followed by Indian Automotive industries to achieve Total Quality Management. The paper mainly focuses on 23 key quality tools. Implementation of these tools in Indian automotive industries lack depth. Six Sigma is the weakest of all. TQM focuses on customer satisfaction. Japan's automotive industries adopted these principles and became leader in the market. Research is done using questionnaire to survey 23 key TQM tools. 62% of industries follow TQM as the guiding principle.79% of automotive industries claim to have achieved ISO 9000/QS 9000/ISO 14001 certifications. Most popular quality tools are Run chart and Pareto diagram. The least understood tool is Six Sigma. In automotive industries, a lot needs to be done regarding the implementation of quality tools such as 5S, Kaizen, TPM, BPR, PERT.CPM, QFD and Six Sigma [8].

Table 1: Continue…

S. N.	Author	Year of publication	Topic	Journal
13.	Paulo Augusto Cauchick Miguel	2010	Results from a case study of ISO TS 16949 implementation	XVI International Conference On Industrial Engineering And Operations Management

Actual Conclusion and Result:
The paper studies ISO TS 16949 results and steps followed by automotive industries for its implementation. ISO TS 16949 is specially designed for use in automotive industries. It is based on ISO 9000 standard aiming to develop quality system management. A quality system is a set of processes that function together using various resources to achieve different quality objectives. Resource organization and execution of plan is done after quality planning. IATF prepared a document named ISO TS 16949 specifications. Implementation of technical specifications. Improved quality of final product is achieved by a final indicator called Customer Satisfaction Indicator which is measured in ppm [10].

14.	Yulia Surinova	2013	Review of special standards in Quality Management Systems Audit in Automotive Production	Faculty of Materials Science and Technology in Trnava, Slovak University of Technology in Bratislava

Actual Conclusion and Result:
Quality management system in automotive industries is different from other Industrial branches. Customers have requirements including quality audits. Audits are one of the main tools for quality management aiming to make the PDCA cycle work. The ISO TS 16949 is specifically for automotive industries for customer satisfaction. VD6 series have some advantages in comparison to ISO 16949 standards [6].

15.	Chin-Hung Liu	2009	Effect of ISO/TS 16949 on Six Sigma: The empirical case of Taiwanese automobile and related industries	Total Quality Management

Actual Conclusion and Result:
The automobile and other related industries implements quality management systems. Motorola in the USA developed concepts and methods called Six Sigma in 1985.Six Sigma helps in delivering near-about perfect products and services. The questionnaire was sent out to survey 90 firms [7].

16.	Tsu-Ming Yeh, Fan-Yun Pai and Kai-I Huang	2013	The critical factors for implementing the quality system of ISO/TS 16949 in automobile parts industry in Taiwan	Total Quality Management

Actual Conclusion and Result:
This study focuses on the auditors of ISO 16949 as the primary concern. This study first utilizes Kano's model, then utilizes fuzzy analytical hierarchy process and finally introduces the quality function deployment relation matrix. ISO/TS 16949 is a set of technical standards accepted worldwide. It has already impacted other quality standards. ISO/TS are created based on ISO 9001 following the operation of overall continuous improvement. And circulation of PDCA. Kano's model makes classification on essential factors orientation of customer [9].

17.	Marta Kucerova, Jaromira Vanova, Helena Fidlerov	2009	Important Aspects of Continuous Quality Improvement in Slovak Industries	Faculty of Materials Science and Technology In TRNAVA, Slovak University of Technology in Bratislava

Table 1: Continue…

Actual Conclusion and Result:
This paper studies quality management system and its implementation in Slovak Industries. The scope of quality improvement in this enterprise is discussed. Continuous improvement is an important factor [15].

S. N.	*Author*	*Year of publication*	*Topic*	*Journal*
18.	Komsan Sanongpong	2009	Automotive Product Realization; A Process-Based Management	IMECS

Actual Conclusion and Result:
This paper is mainly a literature review and set scope for the automotive process based management analysis. It has mainly taken the case of Automotive Suppliers is Thailand to explain the product realization process (PRP). Within the context of ISO/TS 16949:2002, proposed that the PRP should be mainly focused on metrics and controls [18].

19.	S. Avakh Darestani, M.Y. Ismail, N. Ismail, R.M. Yusuff	2010	Quantifying supplier's product quality: An exploratory product audit method	South African Journal of Industrial Engineering

Actual Conclusion and Result:
This paper highlights Product Quality Audit Score (PQAS) as a prominent method to check the quality of raw material and supplied products from supplier. The paper present this statistical method for measuring the quality of supplied products and presents its advantages and disadvantages [19].

S. N.	*Author*	*Year of publication*	*Topic*	*Journal*
20.	Vasile Alexa	2011	Using the quality improvement tools in the innovation process for developing and manufacturing high quality products for the automobile industry	Annals of faculty engineering hunedoara-International journal of engineering Tome IX

Actual Conclusion and Result:
This paper highlights the quality of Dräxlmaier Group. This paper also highlights the basic tools of the quality for the improvements and explaining two of its prominent tools- planning tools PDCA & pareto chart [20].

21.	D. M. Lascelles and B. G. Dale	1988	A study of quality management methods employed by U.K. automotive suppliers	Quality and reliability engineering international

Actual Conclusion and Result:
This paper is the result of the questionnaire survey of 1160 questionnaires about quality management system out of which 366 completed questionnaires were obtained. Based on this paper it is evident that during those years many suppliers do not understand the needs of the quality management system. It was the hypothesis that small company lacks awareness could not take external expertise for assistance compared to larger companies [21].

III. DISCUSSION OF VARIOUS SCIENTISTS RESULT

Quality Management system now in this era has become very popular in all the automotive manufacturing companies. Their development is associated with their requirements and demands. To follow a same standard has become an important aspect in OEM's and the automotive supplier industry. Some of the certifications of Quality Management System in automotive industries are [5]:

Table 2: Different certifications of QMS in automotive industries

Production Towards OEM's	• ISO/TS 16949 • QS 9000 • VDA 6.1 • AVSQ • EAQF
Services towards OEM's	• ISO/TS 16949 • QS 9000 • VDA 6.1
Goods Transport	• ISO 9001 • ISO 9001 + EN12798
Passenger Transport	• ISO 9001
Maintenance and repair services	• ISO 9001
Sale of Motor Vehicles and auto parts	• ISO 9001

ISO TS16949 was prepared by the International Automotive Task Force (IATF), with support from ISO TC176, (North America), VDA (Germany), EAQF (France), and AVSQ (Italy) (Chrysler Corporation, Ford Motor Company, & General Motors Corporation, 1998). ISO/TS 16949 is a consequence of the requirements in standardization process in the scope of quality management for the automotive sector replacing those certifications. It establishes detailed requirements concerning the quality management system during the production process as well as assembling and maintenance of products connected with the automotive industry. This standard focuses on avoiding the errors rather than discovering it. Over the years, a positive trend is obtained all over the world with increase in the companies adopting and certifying to ISO/TS 16949. This increase in trend is encouraging all the world-wide manufacturers and suppliers to certify thus forming standardization [12].

There are many aspects that an organization should focus for implementing ISO/TS 16949 and get certified. One of the main aspects of implementing of ISO/TS 16949 is a correct and clear representation of the organizational processes with their interaction. There are many aspects, regulations, norms that an organization should adopt, adapt and change into, to implement ISO/TS 16949. Changing a lot is not easy. But internal audits can have used to assure the conformity of the QMS. By applying the organizational process mapping, the audit programs can have been optimized, assuring an efficient manner of scheduling and implementing the audit activities [13].

In ISO/TS 16949, when an idea of a new product is conceived, investigated, taken though design, manufactured, marketed, it should properly follow the Product Realization Process (PRP) under the norms of ISO/TS 16949. PRP is a dynamic process driven by continuous improvements. PRP should be adapted and specifically managed for the organization following ISO/TS 16949. Involvement of both the customer and supplier in PRP plays a very important part [18].

The Quality of the new product or the supplied product from the suppliers should also be of the certain quality for the OEM's to maintain their final products. Thus, it has become the norm that vehicle manufacturers require their suppliers to measure product quality and service with a product audit method. Measuring quality of product is emphasized by ISO/TS16949. Quality and delivery are the two main signs of the supplier performance. That is why it has now required by all the OEM's that their suppliers should also be ISO/TS 16949 certified. And thus, quality of the suppliers' material can be monitored using Product quality audit score. Quality Audit is method of evaluating a system, product, or process performance against the specified criteria. It is evaluation and assessment process. ISO/TS 16949 states that the organization in the supply chain of the automotive industry should audit the supplied goods at different level of the supply. Because of the competitive market, the superiority

of the organization depends on the quality of the finished product. Thus, product quality audit score becomes a great asset [19].

EFQM and VDA are some other standards that are some basic and important standards used in Europe and Germany. ISO/TS 16949 was prepared with support of these two also. But the 8 EFQM fundamental concepts and the 8 quality management system principles are unnumbered and they have no order of sequence, weight or importance. It all depends upon the organization how they want to use them and where he wants to take his organization too. Which of the principles is important to pursue, all depends upon the needs of the organization. There is VDA standards which are required in Germany. Audit contributes to the achievement of business goals and it has more positive than negative effects on business performance. Audits are used to assure the conformity of the QMS. Thus, according to needs and requirements audits should be performed to verify and validate [16] [6]. For example, the reference [11] shows how the Latvian production company started adopted ISO/TS 16949. Many conclusions are drawn and the needs and requirements are shown. Similarly, many studies are done comparing QM practices and organizational performance like studies done in Taiwan and Malaysian automotive industries. Many conceptual models have been proposed to understand the relation between QMS and organizational performance. Studies also showed how the ISO/TS 16949 significantly affects the success rates of Six Sigma. Many analyses done between them implies how the central ideas of ISO/TS 16949 and Six Sigma improvement programs have obvious similarities for implementing processes for 'management' and 'execution', and the promotion of operation performance [9, 7, 2].

The study has also shown that if the organization adopts the strategy to identify their work and resources and conduct preliminary audits to identify and correct possible cause, it is easier for them to get the certification. Each organization with quality management system is responsible for identifying the faults, correcting them and thus going towards continuous improvements. As quality improvements, will be understood and maintained, the activities and job will go in whole new level. The effects will also be visible in the profit. And it was observed that implementing ISO/TS 16949 brought substantial benefits to the organization [10, 15].

A Quality Management system is the set of activities to analyse, understand and solve the problem involving the employees, with the support of management under proper administration. To achieve this, different quality control techniques and tools are used. The PDCA (PLAN-DO-CHECK-ACT) technique is mainly used by the quality improvement teams to solve problems. To know and understated the problem and find the feasible solution, first planning is done. Improvement actions and corrective actions are well planned and concrete actions are taken in Do step. The result of the actions is analyses and then tested. The results are further studied and further scopes of improvements are found [20, 4].

Kaizen refers to continuous and ongoing improvement from product development to industrial relation management to total product maintenance and ultimately to customer satisfaction. Six Sigma is a long-term forward-thinking initiative designed to fundamentally change the way corporations do business. Six Sigma is empirical and statistical technique. Poka Yoke stands for mistake or error proof process. It is a mistake proofing technique to eliminate the human error. The key factor of Six Sigma program depends upon taking decisions based on facts and figures. Histogram thus helps in understanding the dispersion and central tendency of the process. Quality Function Deployment is a five-stage process that takes a design from customer requirements into a plan and schedule. Total Product Maintenance is the tool that maintains the optimum relationship between the people and their respective machines. It aims at making the most effective use of the existing product structure [3, 8].

There are seven basic tools that are widely used for quality management. They are easy tools to understand even for people with little knowledge in statistics. They are: [4]

- Check sheet
- Flow charts
- Fishbone Diagrams
- Control Charts
- Histograms
- Pareto Charts
- Scatter Plot

These above-mentioned tools are easy to understand and are very effective. Control Chart tools are used to understand process variation and help achieve statistical control. Fishbone diagram being old are still used. Leading cause can be filtered from a variety of possible causes using the Pareto chart. Thus this helps to remove the unimportant causes and helps us to focus only on the important ones thus saving lots of time and money. Some other Quality tools used in QMS are MSA, Process Mapping, BPR, Failure mode and Effect Analysis, PERT/CPM, DOE, Benchmarking, TPM, 5S, 5F, Suggestion Scheme etc. [20, 4, 8].

II. CONCLUDING REMARKS

The need of Quality Management System in automotive sector has gone a way high. Every organisation needs to have quality management system to sustain in the future. Not only that the quality of the new product or the supplied product from the suppliers should also be of the certain quality for the OEM's to maintain the quality of their final products. For this standardization for QMS among the OEM's and their suppliers is a must. Thus, ISO TS16949 plays a vital role for this. Now, it is required by all organization to be certified to ISO TS 16949. To implement ISO TS16949, an organization should adopt, adapt and change into many aspects, regulations, norms. But for maintaining their positions it is required. Internal Audits helps in doing so. Implementing ISO TS16949 not only standardized QMS thus quality of products between OEMs and suppliers but helps in continuous improvement.

Every organization in automotive sector aims to ensure that defects are not created, built or shipped. Thus, it is required that quality is built into their manufacturing process. An organization always dreams to advance forward and keep continuous improvements. It always wants to move forward to a challenging target. Thus, to achieve this, an organization should also have their own Internal Quality Management System with the standardized QMS. ISO/TS 16949 brings substantial benefits to an organization. But if a company has its own internal QMS along with ISO/TS 16949, it can provide better quality with minimum waste and in minimum cost.

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