Quality Transformation to Improve Customer Satisfaction: Using Product, Process, System and Behaviour Model

V Poornachandrika* and M Venkatasudhakar
Department of Mechanical Engineering, Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Chennai, Tamilnadu, India.

*Email: Poornachandrika.vasu@yahoo.com

Abstract. In recent years automotive manufacturing industries systematically improved its quality parameters principally through strategies with in supply chain. However the current performance not enough, industry dynamics and new technology development require a major quality transformation. Implementation of various quality improvements is the aim of achieving customer delight in many companies. Despite the marked improvements that have come from quality management, quality process and information technology system, without a transformation within an organizations culture, quality management will continue to suffer. This paper presents a case study on application of behaviour model of quality blue box with Plan, Control, Assure concept through Veto right approach, Process model of robust process automation in customer claim handling and system model of mature audit tool. This work is carried out in a leading automotive commercial vehicle control system manufacturing company. This case study illustrating to get zero defect by applying behaviour, process and system model. After implementation there is significant change in reduction of customer claims.

Key words: Veto right, Quality blue box, Robust process automation, Quality transformation

1. Introduction

Any transformational strategy is about making drastic and significant changes within a business to change the course of its short and long term viability. It is a process of developing a strategic plan for modifying an organization business process through the focus of quality by fixing various rules, policies, procedures and processes to move an organization from current state to future state.

Current role of quality environment, where quality is not always appreciated. Quality not invited into decision making as quality is seen as blocking point. Moderator of the failure resolution process, reactive and high share of trouble shooting (fire fighting) not heard when problems are raised or perceived as undermining. As for quality improvement it is well understood and described in literature. With reference from Julia Madrid,(2017) delivering value to the customer through superior quality is one of the greatest challenges for manufacturing enterprises today. The success of the product on the global market can be achieved only with the fulfilment of customer requirements. In the premium and luxury segment of the automotive industry, these challenges take another dimension with the constant battle against cost pressure and shortening the production lifecycle. Thus successful premium vehicle design characterized by excellence as a combination of both manufacturing and perceived quality. The proposed integrated quality framework incorporates manufacturing quality with the perceived quality. It can serve as a basis for quality department by combining the sub quality function for seamless communication with in quality to break the silos within department for better feedback throughout the
flow of future methods development that incorporates customer’s holistic quality perception.

Om Prakash Yadav et al. (2006), proposed a comprehensive framework for target planning for customer satisfaction driven quality improvement efforts in the product development process. This framework facilitates a link between corporate decision making and engineering decision making by integrating best practices and structuring technical activities. Potential vehicle attributes are classified and prioritized for further improvement using Kano model and quality function deployment. With that it is concluded in general approach quality function deployment is used to convert the customer needs or requirements and translating them into specific plans to produce products to meet those needs. The “voice of the customer” is the term to describe these stated and unstated customer needs or requirements. Here it is linked into Kano model to bring the metric for satisfaction to achieve them. Here it is limited to only capturing the customer satisfaction on new product stage. Therefore the main focus on any automotive manufacturing industry in a dynamic environment is to sustain their performance in all aspect. Not only on component level or any other particular functional level also.

Daniel Tuic (2016) states that, a new method of using TRIZ methodology for the validation of the corrective permanent action during complaints in completion of the 8D [8 dimension] report in the automotive industry. It focuses on complaints which appear in the development phase. During the production, specific methodologies regarding the complaints management for control and analysis are defined, then in the development phase these become more sensitive. Therefore a new method of using TRIZ in validation of corrective permanent actions, before being implemented on the product.

According to Anderson et al. (1994 articulated integrative theory of quality management to describe and explain the process and effectiveness of adopting the Deming management method. In their theory development, he identified and defined seven constructs as forming the theoretical blocks for describing, explaining, and predicting the organizational performance impact of quality management adoption. The results of this paper helped the organization to streamline the cross cultural quality management. Eight hypotheses were identified and tested, framed questionnaire where measured to get the real insight of gaps for adoption of quality management. Finally it is concluded organizational culture to be more supportive of quality management.

Transformational Change and Leader Character with reference from Gerard H Seijts et al. (2017) shows, collaboration and accountability is the key leadership skill for cultural transformation. This research talks about the clear top down demonstration of leadership quality to bring transformation across organization.

Deming out of crisis which was published in 1982 during post second world war. The crux of the book was identifying and explaining Deming fourteen points for quality management. But the current scenario was not effectively followed in any of the industries. There are three major insights take ways from the book are, first one is “Leadership should be focused on the system which is exactly part of this transformation journey”, second one is “statistical control required to have any hope of achieving improvement” and third one is “focus on quality first, throughput will follow”.

Edosomwan J.A. (1996), stated transformation journey is the organizational transformation process creates pains, change, risk, uncertainty and, most importantly rewards that are beneficial to individual and organizations. Transformation is a wakeup call in a competitive environment. This is an exciting time in a world with fewer economic boundaries and increased competition in both the public and private sectors. Trends show that organizations are waking up to the challenges. Many organization realizing that the old bureaucratic business structures can no longer respond to the new customer driven market economy.

Teng et al. (1996), briefly that organizational transformation was being done by changing business process and organizational change frame work. Reengineering and organizational change, lessons from a comparative analysis of company experiences by Alessio Ascari et al. (1995) demonstrates that culture, people, process and structure change will bring the result to achieve the breakthrough results in the dynamic environment.

Total quality management and socio technical system approaches organizational change, A.B.Rami Shani et al. (1996), states that unique integration of management principle brings the radical change in
the organization which helps them to achieve the desired results and maintain their performance in competitive business environment.

Process reengineering and the dynamic balance of the organization, as per John Hendry (1995), three dimensions was brought the change they are co-ordination, motivation and control and efficiency and learning.

After analysing the related papers it is understood that, the quality improvements discussed neither process nor product nor system nor behaviour. Transformation is not just improving any of the aspect which is stated above. This case study has uniqueness of clustering all process, system and more specific towards behaviour which marked as important for transformation.

2. Problem Description

Why Quality transformation is required:

Due to continuous escalation from leading commercial vehicle Original Equipment Manufacturer, the organization has urgency to raise the company standard to automotive quality standards. This transformational change journey started at April 2018. Step back and reflections has been done along with management team to take the organization to next level. The following are the current gap which is addressed during brain storming with management.

Independent and empowered quality organization formulated to encounter the issues which affecting the current performance. Veto right, approval, bringing pot risk to table, true customer focus, mindset and behavior of process owners, healthy friction and collaboration between quality function and out of quality function, frontloading of projects, risk mitigation during developments, proactive approach rather than reactive it needs more than just structural change to lift quality performance in all functions.

The industry bench mark for commercial vehicle are “zero customer complaint in ‘zero km”, claims per million is less than 30, Production Part Approval Process (PPAP) right first time on time greater than 95%, and internal audit non conformance on time closure rate is greater than 90%. Considering this metrics customer started escalating about the performance of the company. Hence it is recommended to go for complete transformation to improve the current scenario. As shown in Table 1, the data were collected to measure the current level of the organization.

| Table 1: Leading key performance indicator of the organization |
|---------------------------------------------------------------|
| Key performance indicator | April 2018 – March 2019 |
| Number of customer complaint | 800 |
| Launch CPM [Claims per million] | 200 |
| PPAP right first time on time | 70% |
| Internal audit non conformance on time closure rate | 30% |

2.1 Customer claim handling process

Figure 1 explains the current process for customer claim handling. Gap in receiving the claim information on time and appropriate. Once the information is received there is no distribution channel to create the complaint awareness from top management to operator level. Initial investigation requires manual follow up with respective production team. No trigger or status about the report to customer. Once the initial response is done, the team has to work to analyze the complaint for permanent solution. In the existing process no defined timeline for each reporting like containment and final report.
This leads to delay in response and action implementation. Due to delayed implementation complaints are continue to receive before cut off failures. Each stage of activities being done manually. This also pulled the satisfaction level of customer down.

2.2 New product quality

The role of new product quality in project management is to check the sample before it is submitting to customer. The mindset of project management is that quality is seen as blocking point into decisions. Project quality is not involved in important decision like finalizing the customer requirements, new supplier selection and so on. The project management is not having the structured approach of cross functional mapping for involving quality team. Less involvement of quality team in project management leads the organization to receive more escalations while submitting the new products.

2.3 Audit Management

Audit are performed only because “Must Do” to satisfy customer. Importance and opportunity of internal audits is not understood by the organization which affects the image of the organization during external audit and customer audits. Also this audit score is nowadays a part of customer score card and the organization is in the tremendous pressure to establish the internal audit process in a right context. The challenges are struggles with too many open or delayed post audit activities. Some gaps are being closed without deep root cause analysis which results in recurring issues. This is not complaint with industry standards that may cause negative customer feedback. Figure 2 gives the information of on time audit non conformance closure rate from 2018 quarter 1 (Jan to Mar 2018) to quarter 1 of 2019 (Jan to Mar 2019).
Current problems are differentiated in three aspects like behavior, process and system with respect to quality transformation. The identified gaps will be addressed in new methods which will be outlined in detail below. The use of technology for handling customer complaints especially to receive notification from customer on time. Change the behavior of people using veto right concept and survey method to improve on time audit gap closure rate.

3. Methodology
To improve the quality performance in view of customers the organizations have done product related initiatives. By instituting additional inspection which caused extra investment to management. However the performance in front of customer is not improved. Every month the organization tend to receive different sort of issues which is clearly indicating that, systemic gaps in the process and behavioural aspect of the people in core supply chain. Hence it is suggested to use new approach to bring the cultural transformation instead of only adding inspection controls and product related poka yokes to eliminate human error

3.1 Transformation in customer claims handling
Customer claims handling process completely reworked and new methods are amended, the current challenges are ineffective management of claims which leads customer dissatisfaction. The flow of handling process from start to end updated with clear responsibilities which are introduction of RPA [Robotic Process Automation]. RPA is the technology that allows anyone today to configure computer software or a “ROBOT” to emulate and integrate the actions of a human interacting within digital systems to execute a business process. RPA robots utilize the user interface to capture data and manipulate applications like humans do. They interpret, trigger responses and communicate with other systems in order to perform on vast variety repetitive task only substantially better. RPA software robots never sleeps. Makes zero mistakes and costs a lot than an employee with perfection.

Figure 2. On time non conformance closure rate before implementation
Figure 3 explains the use of RPA for customer claim handling process, become agile and brought lot of transparency between customer and supplier. The RPA will read the claim information automatically from customer portal the moment customer updated the data in respect of vendor code then the ROBOT picks information and will update them in a Integrated Supply Chain Quality portal (ISCQ) which is exclusive for the organization. ISCQ will send the communication to respective stakeholders and wait for immediate response if the immediate response will not be updated in the ISCQ the RPA will send the escalation to management also it will send warning notification. Incase of repeat claims similarly it will work for each steps of problem solving which is described in Figure 3 and also this will not be limited to sending the feedback to customer. It also go back to the product directory and search the similar product and process and give the trigger to process owner for horizontal deployment. If the same failure mode was not captured in PFMEA [Process Failure Mode Effect Analysis] it will also send the trigger to process design engineer to update the same. The help of RPA, response time to customer drastically improved and number of claims reduced by effective horizontal deployment also updation of failure mode in PFMEA act as a proactive tool for quality to eliminate defect outflow with appropriate controls.

3.2 Transformation in project management

The project management function faced lot of issues while submitting new products to customer especially PPAP RFToT (Right First Time on Time) and sample submission, this leads to loss of business, so management decided to have robust new development process to eliminate the discussed issues. PCA concept with veto right approach shows in Figure 4 which supports the project
management organization. In existing approach during planning quality interface was missing. Gap in requirement capturing and cascading requirements which leads to launch claims.

To ensures the interface to the customer for quality to drive the right quality mindset in the project teams and constantly radars and manages risk through all project phases. In order to ensure customer requirements are rightly understood and validated in the proposed product and process design and to achieve flawless launch. Redefined project management organization structure mentioned below. Veto right is a concept of empowering quality team by changing the behavior of the individual in an organization. Transformation result cannot be achieved because the behavioral management challenges are frequently underestimated. Especially resistance to accept change results failure in transformation process. Employee needs to recognize and understand their roles in order to satisfy the customer requirements. Earlier quality is ignored now it is empowered that is called veto right given to quality.

**Figure 4**: Project management revamped structure - Quality blue box with PCA concept through Veto right approach

Assure phase explains the synergy with in quality team. Product, supplier and value stream quality is working together to achieve the common goal of the organization. In control phase the role of project quality is to act as a co-pilot of project manager and interact with customer for quality aspects and connecting the quality dots in the projects also tracking of quality deliverables in the project. Gate keeper for quality and has veto right in project reviews, this all brings the filtration of quality issues in early stage and control the defect outflow to customer. In Figure 4, Q interface is quality interface between customer and project quality. Project staff comprises all functions. Eng means engineering, S&P denoted as sourcing and purchasing, M&L states that manufacturing and logistics, Q for quality. ISC stands for integrated supply chain, MKT means marketing, KAT is key account team, F for finance.

### 3.3 Transformation in audit process

Quality transformation will not reach to the next level without mature audit culture. However the organization decided to change the perception of audit. Make employees to understand the purpose and terms of engagement, auditors to understand their roles and mission. The questionnaire has been formulated to conduct a campaign to understand the real voice of auditor and auditee in the organization. The questionnaire contains ten aspects. Table 2 gives an overview of the ten aspects of the questionnaire in a logical order. Seventy five auditors, seven process owners with six hundred and fifty auditees in five manufacturing locations of the organizations were participated in the campaign. It
is measured in a 1 to 5 scale. 1 is poor response, 3 moderate response and 5 is good response. A rating scale provides more than two options, in which the respondent can answer in neutrality over a questions being asked. The criteria of the questionnaire defined based on the issues faced in audit process. The criteria were finalized using brainstorm session of core team members in the quality and key production functions. The overall score is calculated according to the number of responses under each ratings. Responses under rating 5 eliminated due to prioritization. 80% of the rating falls under 1 and 3 scale and 20% for scale.

Table 2 : Survey questionnaire and result

| Serial Number | Criteria         | Description                                                                 | Rating – 1 | Rating -3 | Rating -5 | Overall score |
|---------------|------------------|-----------------------------------------------------------------------------|------------|-----------|-----------|---------------|
| 1             | General          | Internal, external business environment                                      | No response |           |           |               |
| 2             | Reason           | Real reasons/motives for conducting an audit and closing the gaps timely     | No response |           |           |               |
| 3             | Audit process    | The process of practically executing the audit and the importance of certain issues (time, conviction, involvement of auditor, auditee) | x          |           |           | 30%           |
| 4             | Team aspect      | The extent to which team culture existed                                      | x           |           |           | 20%           |
| 5             | Training         | Scope of the training existing for audit                                     | x           |           |           | 15%           |
| 6             | Resource         | Resource adequacy to complete an audit on time                                | x           |           |           | 15%           |
| 7             | Benefits / effectiveness | The benefits and effectiveness of audits measured in terms of organizations leading key performance indicator | x          |           |           | 7%            |
| 8             | Influences       | External factor which is affecting the audit                                 | x           |           |           | 6%            |
| 9             | Concern          | Major concern for conducting an audit and closing non conformities on time    | x           |           |           | 7%            |
| 10            | Help             | How global organization supports for audit process                           | No response |           |           |               |
According to the survey poor and moderate response are compiled and overall score calculated. The questionnaire returns generated a considerable amount of data which identified the root concerns of the implementation of effective audit process. Based on the overall score forty five actions were identified and implemented. The above questionnaire helped to address the systemic gap in the process.

Figure 5 outlines the breakup of the actions. Thirteen actions were implemented in audit process they are audit planning, execution and monitoring using automation and dedicated person for managing the tool for all five manufacturing locations. Nine actions related to coordination between auditee and auditors. Seven actions for training of entire stake holders. Seven actions related to resource to implement the gaps. Finally nine actions related to benefits, concerns and influences. After the campaign the breakthrough changes are observed in the auditing process.

4. Results and Discussions

By implementing the customer claims handling process using RPA, human interaction is eliminated for documentation which was resulted in quick response to customer. A wide gap in updating the process documents was missing during the manual process which is made robust. Without consolidated view of data, analysis gap was observed which is eliminated. BOT will give the repeat claim notification for better focus to rectify the ineffective corrective action. Use of RPA system people inefficiency identified and resolved. The real benefit of RPA is to update the horizontal deployment data base which is the input for designer while making new developments.

Empowering project quality by changing the project management staffing structure and given all authority to quality to work collaborates with in project team. This early involvement of quality, understanding, implementing customer requirements brings RFToT. Veto right approach resulted in drastic reduction of launch claim. Involvement of project quality from business award to start of production is measured and monitored in a systematic way. During every phase review project quality have Veto right to claim the right for quality. These discipline in the process made all new development launch without flaw.
Table 3: Result after implementation

| Key performance indicator | Before implementation | After implementation | Average/ Month (Second Quarter) |
|---------------------------|-----------------------|----------------------|---------------------------------|
|                           | Average / month       | July 2019           | August 2019                     | September 2019 |         |
| Number of customer claims | 66                    | 5                   | 4                               | 4              | 4       |
| Launch CPM                | 30                    | 0                   | 0                               | 0              | 0       |
| PPAP Right first time on time | 70%                | 95%                 | 100%                            | 100%           | 98%     |
| Internal audit non conformance on time closure rate | 30%          | 85%                 | 91%                            | 100%           | 92%     |

The response to the questionnaire in audit implementation helped the organization to streamline the process. Each section in the questionnaire have found to be important and action initiated to the responses with immediate effect which gives the motivation to those who participating in audit. Employees feel accountable for closing the gaps identified during the audit, auditors feel accountable for audit advocacy and transparency.

In table 3, number of customer complaint average 66 per month after implementation of RPA model this is drastically reduced to single digit. Launch claims per million is zero and PPAP RFTot 98, this is achieved because of addressing issues proactively in phase reviews by empowered quality team. Addressing internal audit non conformance improved to 92% due to right system control which was streamlined through campaign.

5. Conclusion:
Quality transformation is an integral part of business world. Accelerate the rate of quality improvement in core supply chain. It is focusing on excelled quality mindset. Implementation of process, system and behavior model improved the organization leading key performance with respect to quality. Comparing the result obtained in the case study between the traditional practice of quality management and transformation models shows the greater results. It can be concluded that the elimination of human intervention in claims handling process gives better result. Early involvement of project quality in project management brings significant improvement for flawless launch of projects which helped the organization to increase the market out performance and zero recalls. Implementation of audit process has limitations, caused by issues such as understanding of audit requirements and practical aspects of managing the resources and keeping it up to date. It was indicated that the employees found it difficult to quantify the true benefit of the audit result in terms of customer claim reduction and problem prevention. Hence recommendation were made on the opportunities existing to improve the audit process.
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