ITC INFOTECH

Business-friendly Solutions

QUALITY PROCESS IMPLEMENTATION IN PRODUCT LIFECYCLE MANAGEMENT SYSTEM

Executive Summary

Product Lifecycle Management (PLM) implementation traditionally concentrates on upstream processes which are design-centric like CAD Data Management, Part &BOM (Bill of Material) Management and Change management. Emphasis is largely on the design team. There are considerable benefits on productivity, time-to-market and collaboration achieved through process standardization and data management capabilities of a PLM system. Only in recent times has the quality aspect of product development been included in a PLM implementation.PLM need to become enterprise centric and not just department specific. The true values of system engineering or a closed loop process will be realized through these initiatives.

In the last few years product complexity has increased, and so has OEM (Original Equipment Manufacturers) and supplier collaborations. A key differentiator for an organization is its robust processes and quality systems. Reports suggest that the cost of building in quality is estimated at 5% of sales, while the cost of non-conformance is 20%. There is significant improvement in this space as more than 80% quality issues are repeat issues. The root cause for such quality related issues is the disconnect between product design and quality processes. Some of the key pain areas of a manufacturing organization are:

- Disconnect between planning and product development, resulting in delays and miscommunication
- Project status dashboards are incomplete and not the latest
- Monitoring and tracking are manual exercises
- Documentation and traceability of data are difficult.
- Process non adherence, resulting in poor quality of product.
- Audit and compliance are manual

This paper documents the best practices for managing quality using a Product Lifecycle Management (PLM) system. Two main processes Quality Audit and APQP process will be looked at.

Who Should Read this White Paper?

The target audience for this paper is anyone with an interest in improving quality processes and systems within an OEM / supplier organization. If you are planning for a PLM implementation or want to achieve more value from your PLM system, thenyou will be able to get insightful information from this paper. More specifically: Product Managers, Quality Managers.

Introduction

The word “Quality” is always present in the vision statement of an organization, be it an OEM or a supplier. This is one aspect which is universally accepted as a key differentiator and a must ingredient towards customer delight. Quality as a department has always been present in organizations to ensure processes adherence and check material / parts standards. In the last few years, market trend is changing and products are becoming more complex, development teams are dispersed and there is a larger supply chain network. Downstream processes are enabled through ERP systems and upstream processes are strengthened using PLM. Between these two, quality systems have remained in a standalone application, and at many times are file based. The need is to have an enterprise system which can make data available to a person on click of a button. The need to integrate quality processes within PLM is as important as all aspects of quality interaction with design and manufacturing. Implementing quality solutions in PLM will ensure an integrated process, complete traceability of information between a requirement, design, manufacturing and testing.

As shown below Quality is second most important item on suppliers focus area.

Toyota’s global vision says:

“Thro ugh our commitment to quality, constant innovation and respect for the planet, we aim to exceed expectations and be rewarded with a smile.”

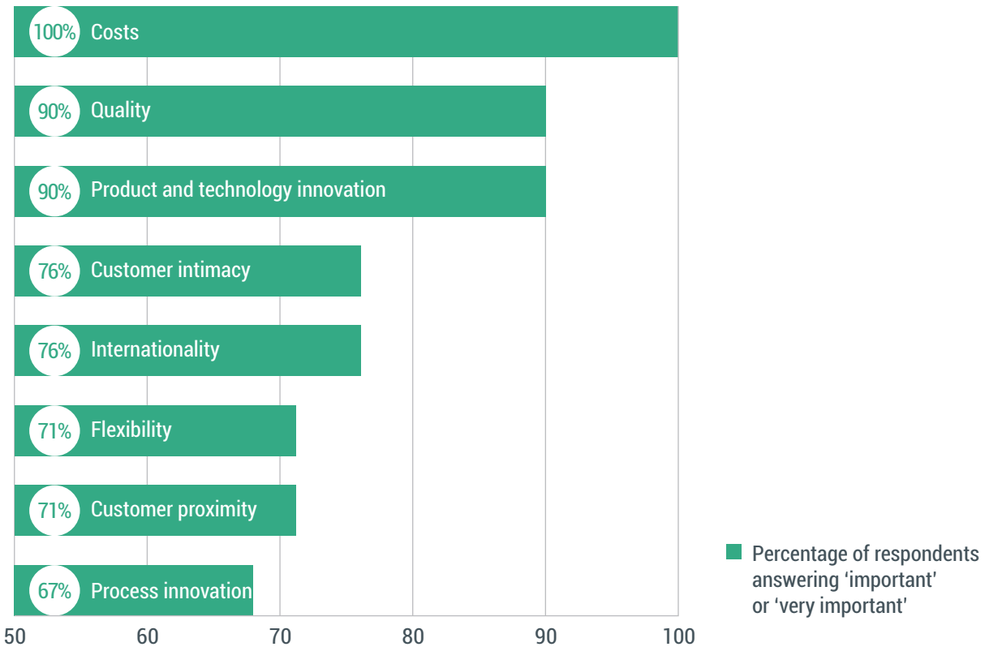

Figure: KPMG’s Supplier Survey 2008

Component Quality Audit Process

Quality auditor is responsible for inspection and quality conformance of all bought out and internal items. They are involved in the processes of component design, APQP, Localization, Capacity Enhancement and Sample request process. Apart from new parts, a component has to be checked and verified whenever there is a change in the way the component is manufactured. It could be a process , tool or material change, in all such cases the component will have to be verified through the audit process.

The vendor development team creates the quality audit check sheet on receipt of the material from supplier in the PLM system.The subsequent process is enabled using lifecycle and workflow features of the PLM system.He also receives the various supporting documents. Some important information captured are:

- Part Number
- Supplier Name
- Inspection category
- Reason of Submission: Identifies whether it is new design or a change etc.

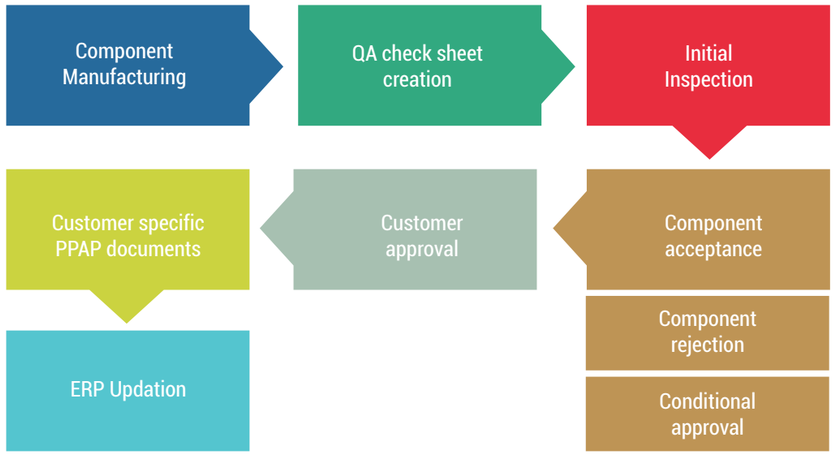

Figure: Component Audit Process

During check sheet submission, VDP will check the availability of relevant supplier's documents like: Dimensional report, Material test report, Process quality plan, Spec meeting copy, Process flow chart, FMEA.

During review of the check sheet quality, the engineer will review all the relevant documents of the suppliers. He will send back the sheet to VDP engineer if there is missing / incorrect information.

Initial Inspection / Testing will be performed by the quality engineer first and then the quality lead. They can do the following activities:

- Request information from the design engineer
- The following decisions can be taken:
  - Component Accepted
  - Conditional Approval
  - Rejected

Comments and decisions of related concern departments need to be recorded in so that the reports can be create with appropriate fields.

Advanced Product Quality Planning (APQP)

Advanced Product Quality Planning is a structured method of defining and establishing the steps necessary to assure that a product satisfies the customer. The goal of Product Quality Planning is to facilitate communication with everyone involved to assure that all required steps are completed on time.

The APQP process chart shown below displays various phases in product development. In order to ensure success of organizations, it is required that a proper organization structure is deployed, ownership for various phases is defined, all functions including vendors and suppliers interact with each other efficiently and activities through all phases are integrated.

Using APQP will bring in standardization in the day-to-day activity of OEM and supplier collaboration. This will ensure:

- Reduction in complexity of Product Quality Planning
- Easy means to communicate Product Quality Planning requirements
- Identifies changes and risks early in the lifecycle, thereby reducing late design and process changes

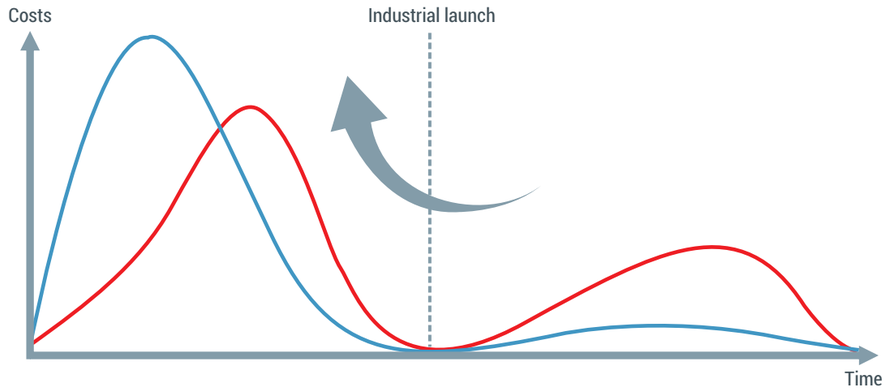

Figure: Cost Movement

APQP process follows the Deming Cycle of Plan-Do-Check-Act (PDCA) Cycle, which advocates the idea of continuous improvement.APQP is the essential discipline that offers both, the customer and the supplier a systematic approach to quality planning, to defect prevention, and to continual improvement.

There are three basic characteristics that are essential and must be adhered to for APQP to work. They are:

- Activities must be measured based on who, what, where, and when
- Activities must be tracked based on shared information (how and why), as well as work schedules and objectives
- Activities must be focused on the goal of quality-cost-delivery, using information and consensus to improve quality

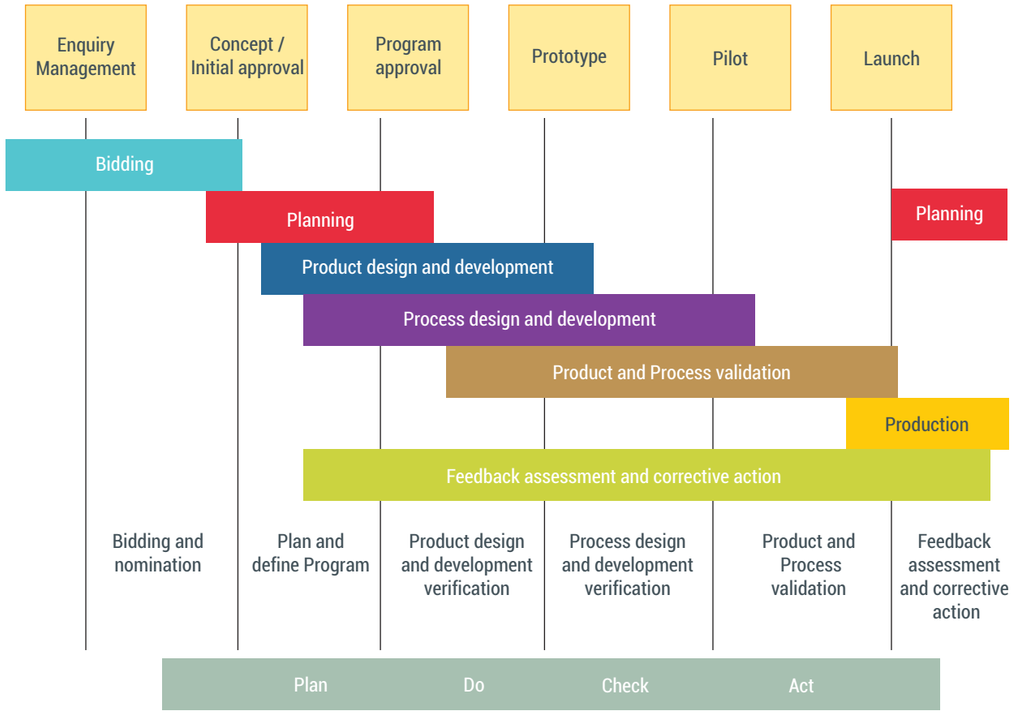

Figure: APQP Process Reference: AIAG Manual

There are five phases to an APQP process:

- Planning and Definingthe Program
- Product Design and Development
- Process Design and Development
- Product and Process Validation
- Feedback and Corrective Action.

The APQP solution consists of three major areas:

- Pre-configured APQP plan, to enable reuse and standardization.
- Integrated processes using PLM system. Ensure Automatic activity management with integration with the deliverable's lifecycle state.
- Compliance, Dashboard Reports

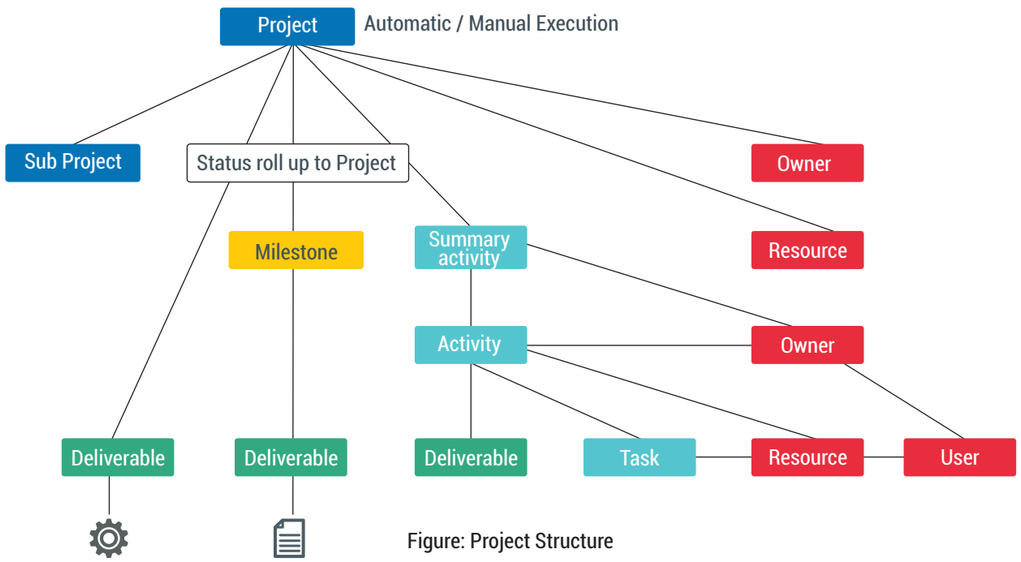

Figure: Project Structure

Advanced Product Quality Planning (APQP)

Reports are a very important aspect of any process. It provides a scorecard for compliance and efficiency. Graphical reports provide a user friendly and an easily readable output of process metrics. These reports are of particular importance to the middle and senior management of an organization. Having such moment-in-time snapshots could also form the basis of a year-over-year comparison capability. In one single view, managers can review the various outputs and take necessary actions.

It is easy to visualize distribution of items/ events along a scale. Helps detect unusual patterns in a sample data. Gives a visual picture of average and range without any further analysis. A brief description of the quality reports are given below:

- **Reason for Submission:** In this report, the user can analyze the various submission reasons for a quality check sheet across different suppliers. Color coding can be used to differentiate each supplier
- **Lifecycle State Report:** It is important for the managers to see how the quality team is performing. By looking at this report, managers can review the various states in which a quality -check sheet is in. It also gives information on how many supplier parts were accepted and how many, rejected
- **Inspection Category Over Time:** Different inspection categories might require different times for completing an audit. The time required for an audit is calculated as the duration from check sheet creation to it getting approved / rejected
- **Project Timelines:** Time line provides an overview of the important phases / activities of the project. It can be configured as per the needs of the project. It shows the percentage completion and status of the activity
- **Project Item Status Report:** This report lists the project items associated with all projects that meet the input criteria. Project items include tasks, milestones, deliverables, activities, summary activities and action items
- **Project Status Report:** This report will list status information for a list of projects
- **Document status report:** Provides the list of all documents present and those which are still pending. This is an important report which will provide the list of all deliverables which are pending. Managers can take action based on this report
- **Task Status Report:** The status of each individual tasks is shown in this report

Summary

Process standardization and adherence are a must for any quality improvement initiative. This value can be fully realized throughout an organization using an integrated and robust software system.A good quality management system with standardization across all departments of design and manufacturing area must. Strong multi-layered audit and verification process linked to a sound supply chain management process will provide valuable benefits to the organization.

Some benefits of a having a quality system implemented in PLM is given below:

- Improved adherence to APQP process leading to enhanced product quality and customer satisfaction
- Integrated project management and PLM system improves collaboration, efficiency and product quality
- Improved decision making abilities. Reduces design cycle time due to availability of precise information
- Reduced the complexity of product realization for the customers and suppliers
- Compliance with different international standards like TS, ISO etc.. are realized with minimum efforts
- Information traceability and transparency between management, planning and execution teams improved
- Enabled easier and faster searches
- Real-time alignment of dashboard and status reportswere generated
- Better control of non –conforming products

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