Published by :
https://www.ijert.org/
An International Peer-Reviewed Journal

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14, Issue 12, UCBO - 2026

Operational and Supply Chain Improvements During the New Product Development Phase: An On-the-Job Training Study at an Automotive Component Manufacturer

Ishan Zore
Student, MBA- Operations and Supply Chain Management,
School of Business,
Indira University,
Pune, India 41103

Dr. Nagesh Tarte
Asssistant Professor & Guide, School of Business,
Indira University,
Pune, India-411033

Dr. Hetal Bhinde
Associate Dean Ph.D. Programs, School of Business,
Indira University,
Pune, India-411033
hetalb19@gmail.com
ORCID: https://orcid.org/0000-0002-6435-5113

Abstract **- Because all deficiencies in change control, part readiness, welding capability, or documentation can be a source of delay in automotive component production and appear later on as rework or warranty expenses, New Product Development (NPD) is one of the most resource-consuming processes. This study records an 8-week On-the-Job Training (OJT) that was implemented in the Operations and NPD function of a Tier-1 supplier, Belrise Industries Ltd., Chakan, which specializes in the production of fabricated and welded sheet-metal components and assemblies. The study looks through direct participation in the activities, shop floor observation, discussions with engineers and supervisors, and a daily training log, at 10 activities that lie between design release and mass production readiness: Engineering Change Notice (ECN) study, supplier coordination, part readiness verification, robot installation support, cycle time study, welding break analysis, missing weld improvement, positional shift analysis, cross car beam inspection and gauging, and sample dispatch with Production Part Approval Process (PPAP) documentation.**

Results reveal that all ten activities had cross-functional communication as a common success factor. Risks of out dated revisions reaching the shop floor were minimised by controlled ECNs with defined cut-in points and cross functional sign-off and part readiness checks were most effective when carried out a few days before a trial. It was suggested that the interruptions in the welding process were small in themselves but they were numerous, and therefore their impact on output was greater than the sum of the individual interruptions. Welds were often missed at hard-to-reach locations, thus suggesting a fixture or accessibility cause with root cause analysis (RCA) to prevent recurrence, whereas rework was far superior to preventing the occurrence. The quality of a PPAP submission was as good as the discipline applied along the way in the NPD cycle.

Several cost-effective suggestions from the trainee's perspective to enhance NPD readiness are recommended:

- **Shared Supplier Issue Tracker: Instead of relying on Notes, have an Issues Tracker that is updated on a regular basis with any open issues from suppliers that may be missed between Notes.**
- **Early Fixture Review Trigger: If a defect (e.g. missing weld) appears at the same location more than once, make a preemptive fixture & process design review.**
- **Cross-Training within the Installation Plan: Do not have to delay the installation of new automated work-cells because the operators become skilled.**
- **Lightweight Digital Data Capture: Capture cycle time and positional measurement data digitally, which helps to reduce manual compilation efforts and speed up the rate of trend detection.**

By focusing on these coordination points using straightforward tracking and review processes, these simple methodologies ensure the detection of issues at an earlier stage and a smoother transition to mass production without significant investments..

Keywords— New Product Development (NPD), APQP, PPAP, Engineering Change Notice (ECN), Cycle Time Analysis, Welding Quality, Automotive Component Manufacturing.

I. INTRODUCTION

In the automotive component manufacturing industry, one of the most expensive and crucial processes is New Product Development (NPD). The product component or sub-assembly goes through design validation, process validation, quality assurance and production readiness confirmation before it can be approved for mass production. An uncontrolled engineering change, an unqualified component, a lack of capability in the

(This work is licensed under a Creative Commons Attribution 4.0 International License.)

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14, Issue 12, UCBO - 2026

welding process or an incomplete Production Part Approval Process (PPAP) submission at this stage can lead to delays in the launch, warranty problems or high rework costs at full-scale production. In the past decade, the expectations of OEMs in India have increased and now, a component supplier is expected to prove not just their conformance with the design, but also prove their process conformance, traceability and readiness with documented evidence.

Often NPD is talked about as a design and engineering activity, but a significant percentage of the work required to get to mass production is operational. Operations and supply chain activities procure parts from suppliers when needed, confirm the quality of parts made by the tools and fixtures, train operators, install and commission equipment, including robots and welding cells, and document the process and build the process documentation trail that can be trusted by a customer. Belrise Industries Ltd. is an Tier-1 supplier of sheet metal fabricated and welded assemblies, precision-machined components and allied sub-systems to passenger-car and commercial vehicle original-equipment manufacturers. OEM plants are also located in the Chakan-Talegaon auto belt, where its Chakan facility is located near Pune, close to Tier-1 and Tier-2 suppliers.

This study seeks to explore this issue based upon a practice based investigation through an eight week On-the-Job Training (OJT) programme in the Operations and NPD function of Chakan plant. The trainee participated in and was supported by 10 activities, some of which were related to ECN studies and some to sample dispatch. The study approaches NPD from operations and supply chain perspective, examining how the coordination between engineering, quality, production and suppliers affects the smoothness or problems in a launch. The paper explores the literature, outlines the aims and technique, discusses each activity and the trends within them, and summarizes the results, recommendations and limitations.

II. LITERATURE REVIEW AND THEORETICAL BACKGROUND

A. *Literature Review*

Carrying the idea of a stage-gate system into the automotive arena, Cooper (1990) has identified a series of stages in a new product project where a decision gate is located. The Automotive Industry Action Group (AIAG, 2008a) organises product launch under Advanced Product Quality Planning (APQP) into five phases: planning and definition, product design and development, process design and development, product and process validation, and feedback, assessment and corrective action. The Part Submission Warrant (PSW) is the final part of a supplier's documentation set which shows that the supplier's process can consistently deliver conforming parts at the required rate according to PPAP (AIAG, 2006). Assisting tools in this regard are Process Failure Mode and Effects Analysis (AIAG, 2008b) and Measurement Systems Analysis (AIAG, 2010) which verifies that gauge readings are reliable as well. These methods run within the quality management system established by the IATF 16949 standard (IATF, 2016).

Process efficiency is provided by lean literature. Ohno (1988) and Womack and Jones (2003) focus production improvement on cycle time, takt time and elimination of waste, while Ohno popularized asking why five times about a problem's cause, the 5-Why method. The cause and effect diagram is a technique of root cause analysis, which was developed by Ishikawa (1985). The difference between common cause and special cause variation behind positional and dimensional monitoring is explained by Montgomery (2009) and how cost of poor quality increases as defect is detected later is discussed in Juran and Godfrey (1999). The book Groover (2015) is devoted to robotic automation and integration into production systems. Typically, these sources will work with each framework individually. This paper provides a practice-based description of how they work together, coordinated by an Operations and NPD function, in a working Tier-1 plant.

B. *Theoretical Background*

The study has been based on the structured approach method of APQP and PPAP. The automotive typical NPD cycle consists of Design Freeze and Drawing Release, Tooling and Fixture Design, Trial and/or Prototype Builds, Process Capability Studies, Dimensional and Functional Validation, Production Part Approval and Ramp-Up. Coordinate supplier coordination, verify part/process readiness, and build evidence trails for customer approval at nearly every step in OPS. The internship activities such as part readiness verification, cycle time study, welding and positional analysis map onto the process design and validation activities of APQP.

There are two key control mechanisms. A formal document used to document, review, approve and communicate a design change to all affected functions is called an Engineering Change Notice (ECN), that includes a cut-in point of when/where/from what serial number/date/lot the change applies. PPAP then gathers design records, process flow diagrams, control plans, dimensional results, material and performance results and sample parts into a package for customer sign-off. Both mechanisms provide documentation that serves as the common memory of a cross-functional process: No one person is present throughout all the steps in such a process, so they rely on the output of another function by trusting the documentation.

The four lenses are used to measure process efficiency and quality. Cycle time is the time needed to perform one cycle in an operation and Takt time is the pace needed to satisfy a customer's demand. Weld quality is assessed by size of nugget, strength, no spatter/burn through, no lack of weld and interruption logs/root cause techniques trace defects to fixture, parameters, electrodes/technique. Positional shift is any variation from the designed position of a feature and can be either a random (common-cause) or systematic (special-cause). Finally, the cost of fixing an error increases rapidly with each step it makes in its life, known as the “rule of ten”, which is the common theme in all of these activities – early detection.

III. MATERIALS AND METHODS

A. *Research Objectives*

This study examines operational activities during NPD at Belrise Industries Ltd. to achieve seven objectives:

(1) To understand the NPD process followed from design release through to production readiness.

(2) To study operational activities during NPD, including engineering change management, supplier coordination and part readiness verification.

(3) To analyse process improvement initiatives, particularly around welding quality and dimensional control.

(4) To understand the production readiness requirements of tooling, process capability and documentation that precede mass production.

(This work is licensed under a Creative Commons Attribution 4.0 International License.)

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14, Issue 12, UCBO - 2026

(5) To identify operational challenges during NPD and note potential improvement opportunities.

(6) To gain first-hand exposure to manufacturing operations, automation deployment and quality systems.

(7) To consolidate these observations into a structured account of practice that can serve as an academic reference.

B. Research Design and Data Collection

The study is descriptive and observational in nature designed as single site case study at the Chakan facility for an eight week OJT. It is not a hypothesis-testing or statistically inferential design; it is a narrative of real-time, operational experience. Primary data was obtained from direct involvement in ECN review, part readiness, robot time, robot gauging, on the floor observation of robot installation, welding operation, and sample dispatch, informal briefing and discussion with the training guide, the engineers and the supervisors from Operations, Manufacturing Engineering, Quality, and Production, as well as photos taken with permission. The secondary material was general references on APQP, PPAP and automotive quality management which were utilized only to explain, but not to describe specific procedures of companies. Observations were made daily in a training diary and summarized according to the type of activity. The numbers given, e.g. cycle times and numbers of defect/s were recorded then and are reported in a generalised manner here as examples.

C. Analytical Framework

Each activity was analysed under a common structure: The analysis of each activity followed a common structure; background, process followed, tools/documents referred, observations, challenges that were faced, and key learning. Those patterns that emerged during all activities were then summarised in a table of interfaces and risks and a SWOT like analysis of the NPD process was prepared as seen from the trainee's point of view. The layout documentation support was done as the support activity for Manufacturing Engineering and covered in the discussion of readiness. The scope does not include proprietary information, financial, costing, strategic, which was not made available, as well as steady-state mass-production indicators over extended period of time.

IV. DATA ANALYSIS AND DISCUSSION

A. Organisation of the NPD Function and Activity Sequence

The organisation of the NPD function and activity sequence is analysed. The function and activity sequence of the NPD is analysed for organisation.The clearest impression gained was that the NPD is basically cross functional in nature. No department, Design, Manufacturing Engineering, Quality or Production, is capable of moving a component from design release to production. The Operations and NPD function is there to help coordinate this flow, keeping track of what has been done, what is not and what functions should be pulled in to close an open issue. The overall flow that was observed was as follows: Released component or ECN reviewed and communicated, cycle time studies to ensure output targets are met, tooling, fixtures and robotic work-cells prepared, suppliers coordinated for external components, trial parts built and inspected, defects investigated and corrected, when the process is stabilized, samples dispatched with PPAP documentation. The trainee was tasked with assisting in tracking and documenting these readiness activities, providing a cross-departmental perspective on these activities rather than from a departmental perspective.

TABLE I.
ACTIVITIES OBSERVED, OWNING FUNCTIONS AND PURPOSE

Activity	Primary Owning Function	Purpose
ECN Study	Design / Engineering	Understand how design changes are approved, documented and communicated
Supplier Meeting Participation	Supply Chain / Operations	Understand coordination with external suppliers during NPD
Part Readiness Verification	Operations / Quality	Confirm component availability and validation before trials
Robot Installation Support	Manufacturing Engineering / Production	Observe automation deployment to improve productivity
Cycle Time Study	Manufacturing Engineering	Measure and analyse operation timing against target
Welding Break Analysis	Production / Manufacturing Engineering	Study interruptions and their effect on production
Missing Weld Improvement	Quality / Production	Identify weld defects and study corrective action
Positional Shift Analysis	Quality	Study dimensional variation in manufacturing operations
Inspection and Gauging	Quality	Verify dimensions and quality requirements
Sample Dispatch and PPAP	Quality / Operations	Understand customer approval and documentation requirements

Table I shows the top ten activities of a launch, and the function which owns each one. As can be seen in the ownership column, 9 of the 10 activities are spread over more than one function – and the other function is also involved – and the 10th activity, cycle time study, lets other functions make decisions.

B. Engineering Change Control and Supplier Coordination

The trainee was given an introduction to the ECN format, and followed the stages of approval from Design and Engineering to Manufacturing Engineering to Quality to implementation, as well as how the change was communicated to Production and Supply Chain, and how part configurations were compared before and after the change was made. Table II lists the fields that an ECN collects. One design change was noticed to affect tooling, fixtures, inspection gauges and supplier specifications, all of which had to be changed simultaneously. Cross-functional sign-off made the process controlled, not ad hoc, and the cut-in point was a critical factor as it ensured that old and new revisions didn't get muddled on the shop floor or in inventory. The biggest challenge for the newbies was the drawing conventions and terms in the revision-history section.

TABLE II.
LLUSTRATIVE FIELDS CAPTURED IN AN ENGINEERING CHANGE NOTICE

Field	Purpose
Part Number and Revision	Uniquely identifies the affected component and its version
Reason for Change	Explains the driver: customer request, design fix, cost or feasibility, quality
Affected Functions	Lists departments (Design, Manufacturing Engineering, Quality, Supply Chain) that must act
Cut-in Point	Specifies the serial number, date or lot from which the change applies
Approval Signatures	Cross-functional sign-off before implementation on the shop floor

(This work is licensed under a Creative Commons Attribution 4.0 International License.)

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14, Issue 12, UCBO - 2026

In supplier meetings the trainee attended in a listening and note-taking capacity. Component readiness against project time lines, specification limits, inspection and sample submission, delayed and non-conforming components, delivery dates and quantities, and communicating to suppliers to ensure they are on schedule were discussed. The findings were clear: coordination is as much about the discipline of the communicating process (clear, timely and documented follow-up) as it is about the technical content. Unclosed issues that reoccurred near the trial date were more expensive to solve and suppliers had to have a sufficient lead time for an engineering change. The open-issues tracker was reviewed prior to every meeting, helping the trainee pick up on abbreviations, part numbers and previous conversations.

C. *Part Readiness Verification and Automation Deployment*

All components should be verified for availability, identified and validated prior to a production trial. The trainee checked part number, revision level, quantity against the trial requirement, checked batch and lot markings against accompanying documentation, checked if inspection or test certificates were available and identified any deficiencies to the Operations team and NPD team. However, the sub-assemblies are created in a definite sequence, so if one assembly is not delivered or mis-identified, the whole trial can be delayed. If there was a problem later on, traceability markings would be what enabled the batch to be traced to its production and inspection records, and verification was most effective when it was completed a few days before the trial date. Initially, it was challenging to read lot codes and the quality group was needed to direct them.

A robotic work-cell was being installed in the internship as an effort to improve productivity. The trainee watched the robot and its control cabinet being received, unpacked and positioned, the area was barricaded, early discussions were held on the motion path and how it would integrate with the surrounding manual and semi-automated processes, and the anticipated benefits versus the manual process were considered. The installation process was found to be a multi-stage process where physical installation is not necessarily the last and safety integration, programming, and validation are the next steps. Safety fencing and interlocks were regarded as a requisite and built before the equipment was installed. On repetitive work, automation was implemented to enhance the consistency and to alleviate the fatigue of the operator; in addition, automation was also used to increase the throughput. This activity was an observational activity due to time constraints, particularly in relation to programming and motion path teaching.

D. *Process Efficiency: Cycle Time and Welding Break Analysis*

The cycle time study involved determining the cycle time of an operation with the component under development and comparing it to the desired output rate. The trainee used a stopwatch to time a few repetitions, documented load, process and unload elements individually (Table III), compared to takt time and discussed any fixtures or sequencing change needed if the target is exceeded. It was possible to see where time was being lost, the small variations in operator motion were obvious to the extent that they would affect consistency, and several repeats were required as a single repeat was not reliable. The next step in a timing exercise is to compare cycle time with takt time, making it an input to a capacity-planning exercise.

TABLE III.
LLUSTRATIVE STRUCTURE OF A CYCLE TIME STUDY

Element	What Is Measured
Load Time	Time to place the component into the fixture or machine
Process Time	Time for the value-adding operation, such as welding or forming
Unload Time	Time to remove the finished or processed component
Total Cycle Time	Sum of all elements, compared against the target takt time

The welding break analysis examined breaks in a welding job over several work cycles. Interruptions were classified by potential cause with welding operator and supervisor (Table IV), and time lost due to interruptions were estimated, along with discussion with production team regarding mitigation (preventive maintenance scheduling, material staging, etc.). The number of such interruptions was large, but brief, and the cumulative effect of all the interruptions was greater than any single one indicated. It helped to categorise by cause and so identify an intervention – be it maintenance, material planning or training – that would pay off best. Consistent logging enabled patterns to be seen that were not captured by a single shift's observation. The first classification made by the trainee was generally to classify common material changes as breaks, which the shift supervisor corrected.

TABLE IV.
LLUSTRATIVE CATEGORISATION OF WELDING INTERRUPTIONS

Category	Example Cause
Equipment-related	Electrode wear, gun or torch malfunction, power fluctuation
Material-related	Delayed component staging, incorrect material batch
Process / operator-related	Parameter adjustment, minor rework, operator changeover

E. *Quality Validation: Missing Weld, Positional Shift and Inspection*

The missing weld improvement study began with To identify the location of missing welds, the missing weld improvement study started with records of the inspections, which were used to determine where missing welds had been documented, and then a direct examination of affected assemblies to determine if there was a missing weld or a partial weld was formed. Follow up inspection of fixture or parameter corrective action was done during a root cause discussion with quality and production personnel with regard to the fixture clamping, weld-gun access and programmed weld-point sequence. Missed welds were more likely to occur at specific locations that is more difficult to access, indicating a fixture or accessibility problem, rather than random. It was important to have a short feedback loop between quality (which could detect the defect) and production or manufacturing engineering (which could change the process if necessary) so as to avoid recurrence, even basic root cause analysis, much better than reworking defective parts.

The drawing was used to find the nominal position and tolerance of a feature, a sample of the parts was taken on a gauge and the readings were plotted to determine if the variation was random or would indicate fixture wear. Table V shows the illustrative structure. The majority of the parts sampled were within tolerance, however borderline readings indicated that there was little room for the process to run. A directional pattern

(This work is licensed under a Creative Commons Attribution 4.0 International License.)

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14, Issue 12, UCBO - 2026

was a better indicator of a special cause than an isolated out-of-tolerance reading, and there was some variation from one setting to another of the gauge, emphasizing the need for a standard setting procedure. The quality engineer cross-checked the trainee's early readings prior to use.

TABLE V.
LLUSTRATIVE DATA STRUCTURE FOR POSITIONAL SHIFT ANALYSIS

Sample No.	Measured Position (Illustrative)	Within Tolerance?
1	Nominal ± 0.2 mm	Yes
2	Nominal ± 0.3 mm	Yes
3	Nominal + 0.6 mm	Borderline; flagged for review
4	Nominal ± 0.2 mm	Yes
5	Nominal ± 0.3 mm	Yes

The cross car beam, which forms part of the structure beneath several vehicle sub-systems, was used for inspection and gauging, meaning it is particularly important that it is dimensionally accurate. The trainee watched the typical workflow of visual inspection to dimensional gauging, helped to place the part in the gauge, marked the pass/fail results for each inspection feature and recorded how out-of-tolerance results were followed-up and how the inspection frequency and sample size were determined. A risk-based approach was implemented with more rigorous processing of the critical structural parts than the less critical brackets. A number of features could be checked quickly and consistently using standardised gauging fixtures and a clear record enabled a drifting dimension to be captured before it became a fault. It was initially difficult to find the critical-to-quality features on such a large assembly, and it required the inspection checklist and the quality engineer.

F. Sample Dispatch and PPAP Documentation

The last of the readiness activities was sample dispatch. The trainee watched the samples being selected, identified and prepared, checked at a general level the documentation compiled for a PPAP submission (Table VI), and reported that dispatch was coordinated with the completion of inspection and documentation, ensuring that the samples never went away before the supporting documentation. The PSW serves as a customer's formal acceptance that the process of a supplier is ready for production. Not only was dispatch not considered a routine shipment, but these records and inspection data were treated as a controlled event, and missing information was a direct cause for delays in approval. Conceptually the most challenging activity was understanding PPAP which relies on outputs from almost all previous activities.

TABLE VI.
ROAD CATEGORIES OF DOCUMENTATION IN A PPAP PACKAGE

Category	General Purpose
Design Records and ECNs	Confirms the part is built to the latest approved design
Process Flow and Control Plan	Documents how the part is manufactured and controlled
Dimensional Results	Evidence that sample parts meet drawing tolerances
Material / Performance Results	Evidence that the part meets material and functional requirements
Sample Parts and PSW	Physical evidence and formal submission for customer sign-off

G. Consolidated Interfaces and Risks

Reviewing the 10 activities, almost all required effective and timely cross-functional communication between at least two functions. Communication was clear and early in ECN review, and thus work went well. When information was received late and informally, such as when information was received from suppliers, there was pressure near the trial or dispatch date. Early issue identification, from ECN review to PPAP documentation, provided no means to cause additional delays and hence the summary of interfaces and risks in Table VII indicate where it is most important.

TABLE VII.
EY INTERFACES AND RISKS ACROSS ACTIVITIES

Activity	Key Interface	Risk if Poorly Executed
ECN Study	Design / Engineering and Manufacturing / Quality	Delayed tooling or fixture update if not clearly communicated
Supplier Coordination	Supply Chain and external suppliers	Component shortfall or non-conformance near the trial date
Part Readiness	Operations and Quality	Delayed or aborted trial due to missing or mismatched components
Robot Installation	Manufacturing Engineering and Production	Delayed commissioning if safety and integration are not planned early
Cycle Time Study	Manufacturing Engineering (internal)	Line unable to meet takt time if not found before ramp-up
Welding Break Analysis	Production and Maintenance	Reduced throughput from unaddressed recurring interruptions
Missing Weld Study	Quality and Production / Manufacturing Engineering	Recurring structural defect if root cause is not resolved
Positional Shift	Quality (internal)	Fit issues downstream if drift is not detected early
Inspection and Gauging	Quality (internal)	Out-of-specification parts reaching the customer
Sample Dispatch / PPAP	Quality, Operations and Customer	Delayed approval and mass-production start

H. SWOT Assessment of the NPD Process

Table VIII summarises the trainee's SWOT-style view. It reflects a limited-duration, learning-stage exposure and should be read as an outside observation rather than a formal organisational audit.

TABLE VIII.
WOT ASSESSMENT OF THE NPD PROCESS AS OBSERVED

Dimension	Observations
Strengths	A defined cross-functional ECN process; structured part-readiness and inspection checkpoints before trials and sample dispatch; investment in robotic work-cells; an evidence-based PPAP approach drawing on upstream data.
Weaknesses	Some supplier information reached stakeholders informally rather than through systematic tracking; fixture or process design reviews could be triggered earlier for recurring defects; cross-training on new automated cells took longer than installation itself.
Opportunities	Shared trackers for supplier open issues; wider use of root-cause analysis for recurring quality issues; digitised cycle-time and positional data to speed up trend detection.
Threats	Rising OEM quality and documentation expectations; dependence on external suppliers for certain components; shift of risk from manual variability to equipment uptime and programming reliability as automation grows.

(This work is licensed under a Creative Commons Attribution 4.0 International License.)

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14, Issue 12, UCBO - 2026

V. FINDINGS, CONCLUSIONS AND SUGGESTIONS

A. *Findings*

The Belrise Industries Ltd. study of NPD activities led to seven findings. First, the need for departments to communicate with each other is essential and the coordinating role of the Operations and NPD function arises from the fact that no single department is responsible for all the dependencies. Second, engineering changes need to be well managed and have defined cut-in points and cross functional sign-off to prevent the possibility of delay or outdated revisions being used. Third, when carried out with sufficient lead time, readiness activities – including part verification, layout documentation and cycle time studies – increase the likelihood of a successful launch. Fourthly, automation helps in achieving efficiency and consistency under proper safety planning and when integrated with existing processes. Fifth, cycle time studies are a low cost, high value process of identifying a bottleneck and determining if a new process can meet takt time. Finally, risk reduction is greatest when the gauging, positioning analysis and missing-weld investigation is used in conjunction with root-cause analysis rather than as a means of sifting good parts from bad. Seventh, problems that were detected early were addressed with little disruption to the class.Seventh, problems that were detected early were addressed without significant disruption to the class.

Other improvements in operation were noted. Structured ECN management mitigated the possibility of employing an outdated revision. Systematic part checks decreased the number of trials that were delayed or aborted. The robotic work-cell was envisioned to help to increase consistency and output rate of the related welding operation, and to decrease operator exposure to repetitive, physically demanding work. Utilizing the information from positional data, the quality team was able to distinguish normal variation from the emerging special cause. A root cause investigation was conducted to address a recurring problem of missing weld on a specific part. A set of standardised gauges and checklists facilitated more rapid and consistent verification of critical dimensions. The most significant issue that directly affected the ease of customer approval was disciplined PPAP compilation.

B. *Conclusions*

The study finds the success of change management, supplier coordination, part and process preparation verification, targeted automation, and disciplined quality validation and rigorous documentation are the critical factors that decide whether the new product launch goes well or if it becomes an impediment. No single activity can be a successful guarantee; it is the organized and coordinated execution of all of them, coordinated by the Operations and NPD function that makes it possible to have an efficient and reliable transition from development to stable mass production. Personally, the internship deepened the understanding of manufacturing processes, enhanced observational and analytical capabilities by experiencing actual manufacturing challenges, and reinforced the importance of effective cross-functional collaboration.

C. *Suggestions*

These are suggestions for the main stakeholder groups of ideas for learning stages, not prescriptions.

Supply chain and procurement: Create a common, updated and formal supplier open-issues tracker to minimise the chance of missing open-issues between meetings.

Manufacturing engineering and quality: If a defect, like a missing weld, is appearing at the same spot again, conduct a fixture / process design review proactively. If possible, investigate and explore the use of a light digital data capturing device to allow for quicker picking up of trends with cycle time and positioning-measurement data.

Production and training: Incorporate cross training and operator familiarisation with new automated work cells into installation schedule, not on the critical path after the equipment has been commissioned.

Reinforce to the design, engineering and NPD team that verification of the cut-in point and full distribution of an ECN should be done, especially for new engineering and interns, before considering a change as implemented on the shop floor.

Internship coordinators: Guide and give a brief introduction about the shop-floor terminology and format of documentation in the initial few days during internships in the Operations and NPD function to minimize the orientation time.

D. *Implications of the Study*

The results have implications for a number of groups. They demonstrate that readiness is a process of coordination and early detection, not late inspection, for operations and NPD management. They demonstrate to quality and manufacturing engineering staff that conducting root cause analysis and trend review of measurement data will provide greater protection than sorting parts after the fact. For suppliers, they show the value of early communication of engineering changes and of shared tracking of open issues. The study provides a documented case on how the APQP, PPAP, ECN control and lean tools are used together on a shop floor, as a complement to classroom instruction in each of these areas.

E. *Limitations of the Study*

The observations are only for one plant, one function, one period and may not reflect other Belrise Industries plants or other periods. Each activity was limited by the length of the internship, and some activities, specifically PPAP submission and the complete commissioning of the robot, were only partially observed. Actual cycle times and defect rates, and actual supplier names are generalised or illustrative for confidentiality. The trainee also had a steep learning curve for reading drawings, reading of the ECN record, reading of gauge readings, and new terminology used on the shop floor, as well as working in a more observational than hands-on way for the most technical work.

F. *Future Scope of the Study*

This report indicates some topics for future research. A longer quantitative study could be conducted to kick off from ECN to PPAP approval and ramp-up, and measure steady state production parameters that fall outside the scope of this study. Data captured in a digital format of cycle-time and position could help with statistical process control and detection of drift earlier. To test the rule-of-ten logic in this context, the cost of poor quality that could be avoided by implementing early root-cause analysis could be measured. Comparisons between plants or product families might investigate whether the coordination patterns found here are general.

ACKNOWLEDGMENT

I would like to express my sincere and heartfelt thanks to Belrise Industries Ltd., Chakan for allowing me to join them for On-the-Job Training in the Operations and New Product

(This work is licensed under a Creative Commons Attribution 4.0 International License.)

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14, Issue 12, UCBO - 2026

Development function and to my Training Guide and also my Operations and NPD team for their guidance and being patient with me in understanding shop-floor processes. I would also like to express my gratitude to the Quality and Manufacturing Engineering and Production departments for allowing me to stay on during inspection, gauging, installation of the robot and sample dispatch. I am thankful to my faculty guide Dr. Nagesh Tarte, Head of department and faculty coordinators of Indira University for academic guidance and to family and peers for encouragement.

Disclaimer: Quantitative information including exact cycle times, defect rates and supplier names have been generalised or presented for illustrative purposes for the sake of confidentiality. Observations are based only on the limited period of time that the trainee has spent and cannot be seen as an audit of the organisation.

REFERENCES

[1] AIAG. (2006). *Production part approval process (PPAP)* (4th ed.). Automotive Industry Action Group.
[2] AIAG. (2008a). *Advanced product quality planning (APQP) and control plan: Reference manual* (2nd ed.). Automotive Industry Action Group.
[3] AIAG. (2008b). *Potential failure mode and effects analysis (FMEA): Reference manual* (4th ed.). Automotive Industry Action Group.
[4] AIAG. (2010). *Measurement systems analysis (MSA): Reference manual* (4th ed.). Automotive Industry Action Group.
[5] Cooper, R. G. (1990). Stage-gate systems: A new tool for managing new products. *Business Horizons, 33*(3), 44–54.
[6] Groover, M. P. (2015). *Automation, production systems, and computer-integrated manufacturing* (4th ed.). Pearson.
[7] IATF. (2016). *IATF 16949:2016 Quality management system requirements for automotive production and relevant service parts organizations* (1st ed.). International Automotive Task Force.
[8] Ishikawa, K. (1985). *What is total quality control? The Japanese way*. Prentice-Hall.
[9] Juran, J. M., & Godfrey, A. B. (1999). *Juran's quality handbook* (5th ed.). McGraw-Hill.
[10] Montgomery, D. C. (2009). *Introduction to statistical quality control* (6th ed.). John Wiley & Sons.
[11] Ohno, T. (1988). *Toyota production system: Beyond large-scale production.* Productivity Press.
[12] Womack, J. P., & Jones, D. T. (2003). *Lean thinking: Banish waste and create wealth in your corporation* (Rev. ed.). Free Press.

(This work is licensed under a Creative Commons Attribution 4.0 International License.)