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Systematic Approach for Product Quality Escape Elimination and Defect Reduction

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Vision

The product manufacturing effectiveness, (elimination of product quality escapes and reduction in defects), is key in providing our customers with quality, cost effective and timely deliveries, necessary to meet and exceed our customer schedule and cost constraints and ultimately our war fighter

Current State

Raytheon Missile Systems developed and deployed a custom application, many years ago that enabled a successful execution of a Failure Reporting, Analysis and Corrective Action. The initial design of this FRACA system was for support of development programs

The current initiative in progress is focused on evolving the architecture, process and tool which will drive our culture towards a integrated enterprise FRACA system spanning the full product lifecycle and inclusive of all internal and external support elements

Our objective is to deploy a process and supporting technology to evaluate, resolve and predict product quality issues early in the product life cycle

Definitions

- FRACA(S) - Failure Reduction Analysis and Corrective Action (System)
 - A Process and Method to practice Root Cause and Corrective Action, (RCCA) on items (products) which exhibit Quality Issues (QI) discovered during any stage of the product (item) life cycle.
 - For this discussion we will use a subset of the product life cycle:
 - Typical Product Life Cycle spans from the Architecture thru Deployed Product Sustainment (Depot)

Lessons Learned: Cart before the Horse

- The RMS FRACAS tool was initially designed, to guide development engineering through the FRACA process
- Enhancements to the tool design matured towards the enablement of RMS integrated RCCA process
- Resource limitations created a streamline of standard development processes
 - Resulted in the deployment of a enhanced FRACAS tool not being recognized for its utility and capabilities outside the engineering development world

Key stakeholders were not involved in tool and process changes

What Changed! A Key Stakeholder

- Raytheon formed a FRACAS oversight team to understand and deploy a common FRACA process
- Quality and Mission Assurance, initiated a culture change with a intense focus on elimination of product quality escapes and minimize product quality defects.
 - Resources have been allocated to develop and deploy an integrated FRACA system
- The key organizations such as Manufacturing, Supply Chain and Information Technology are joining Q&MA ,Engineering and Reliability as participating stakeholders
- A rapid development team was formed to develop the architecture and requirements for the integrated FRACA tool of the future , enabling the processes developed by the steering committee

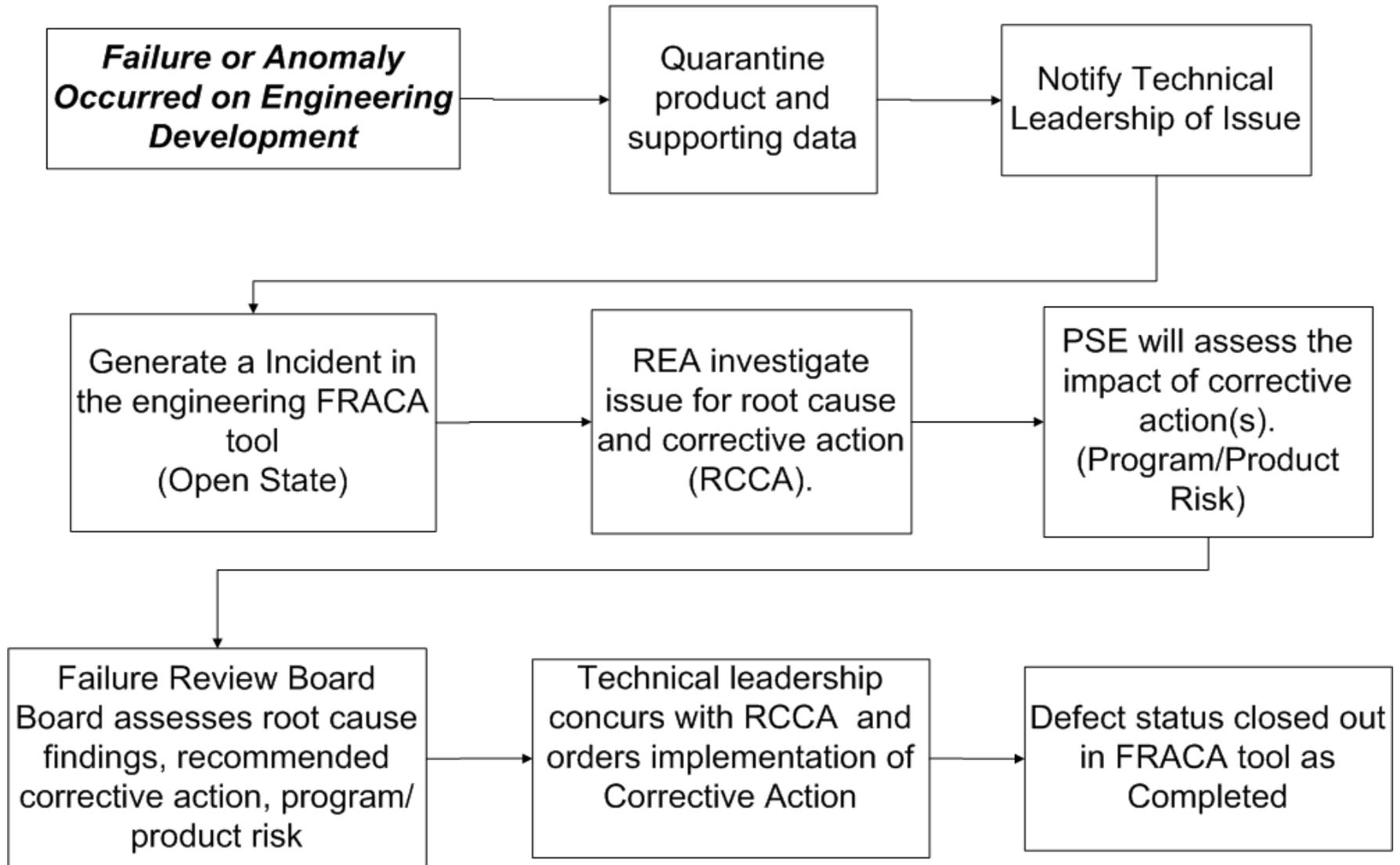
Our Roadmap to a Integrated FRACAS: Current : A Systems Approach

- Enhancements to the current tool, focused on product enabling RCCA by the quality engineering for reducing product quality defect and escapes
 - Pilot successfully complete and the process is currently deployed across RMS.
 - At the end of the pilot (3 months), collected data indicated that significant reduction in quality defects occurred on some of the product lines
- Additional changes to both the FRACA tool and processes (with stakeholder involvement), to integrate manufacturing
- Integration of supply chain and supplier quality product information including, first article testing, lot acceptance, source inspection and supplier internal defects on supplied products prior to product sell-off
- Process and tool updates included information from post delivery product quality issues (Operational deployment and sustainment)

FRACA in Engineering Development

- Since the late 1980's, Engineering development efforts at RMS have fully engaged in RCCA process know as FRACA
 - As the fidelity of the process has matured, so has the tool
- The engineering process summary flow, detailed in the following graphic, illustrates the engineering rigor used to document, isolate and resolve product issues which occurring during lifecycle product stage of engineering development.

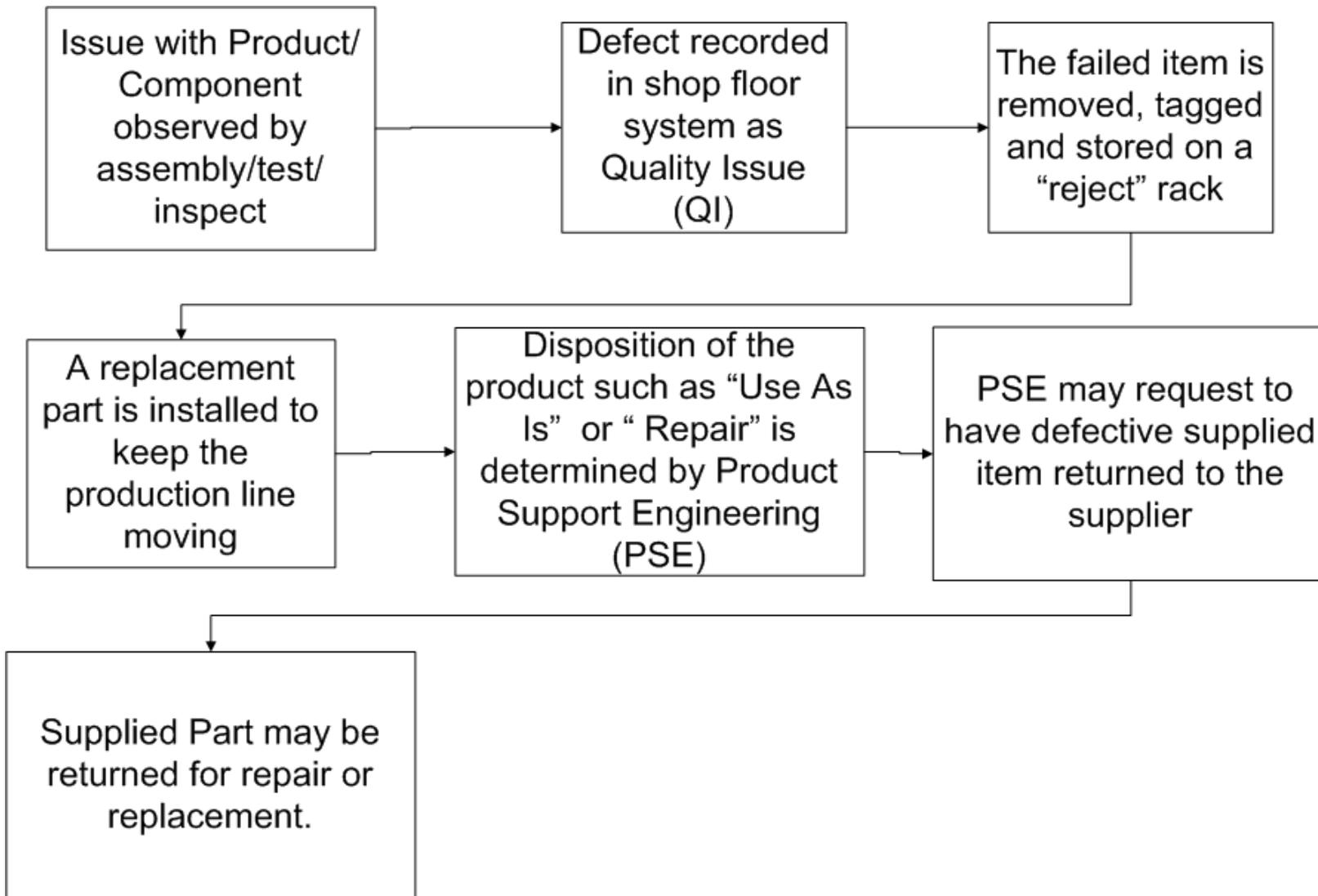
Engineer FRACAS Process



FRACA in Manufacturing

- In the manufacturing environment, and in order to satisfy customer schedule demands, the majority of product defects, unless they are resulting in line stoppages, critical safety issues or deemed as systemic, are not investigated
- Many defects are resolved by the “R &R”, process, Remove and Replace
 - The defected items are often bagged, tagged and stored for disposition, in order to keep the production line moving
- Detailed investigations of supplied product defects are occur based on individual program resources
 - The exception of product performance, safety or line stoppage issues

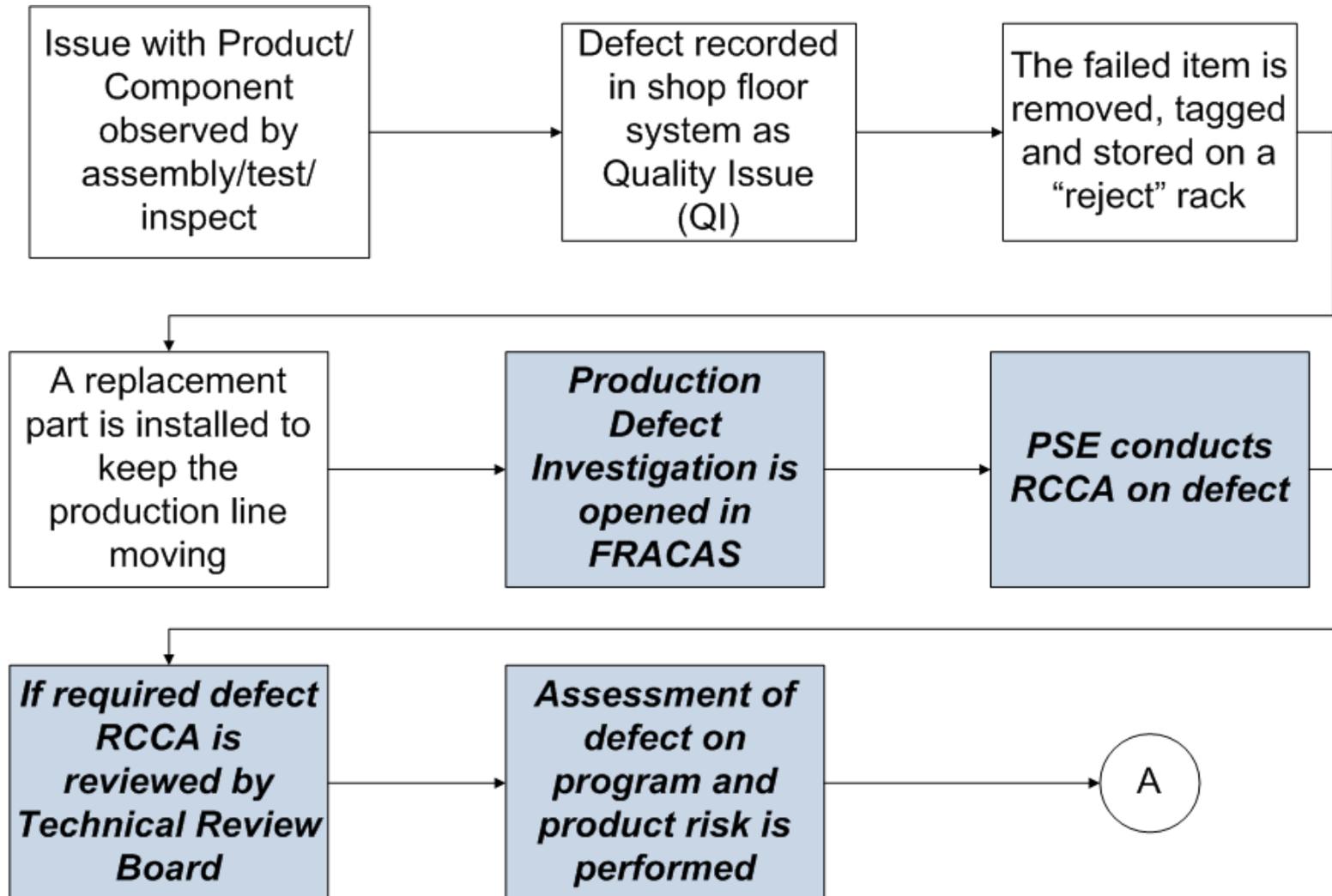
Manufacturing FRACA Process



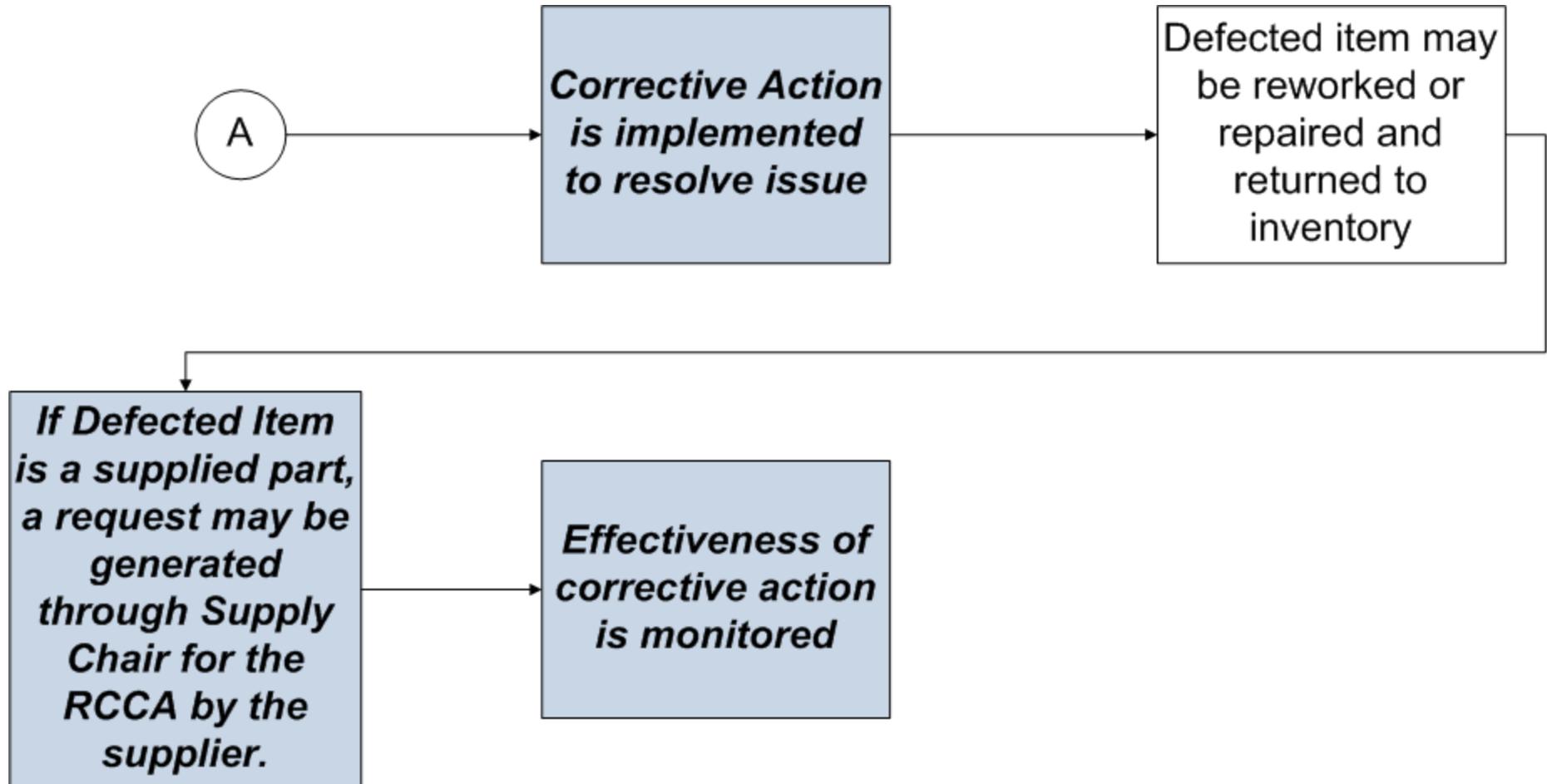
Enhanced FRACA in Manufacturing

- Infusion of the engineering FRACA tool, with manufacturing quality support requirements has optimized the tool to include a emerging product quality manufacturing FRACA level of engagement.
- One critical component is the ability to directly access, via the tool, the shop floor data containing manufacturing defects observed during the production process
- Under the pilot program quality engineering, supported by reliability and manufacturing, initiate FRACA of recorded product defects

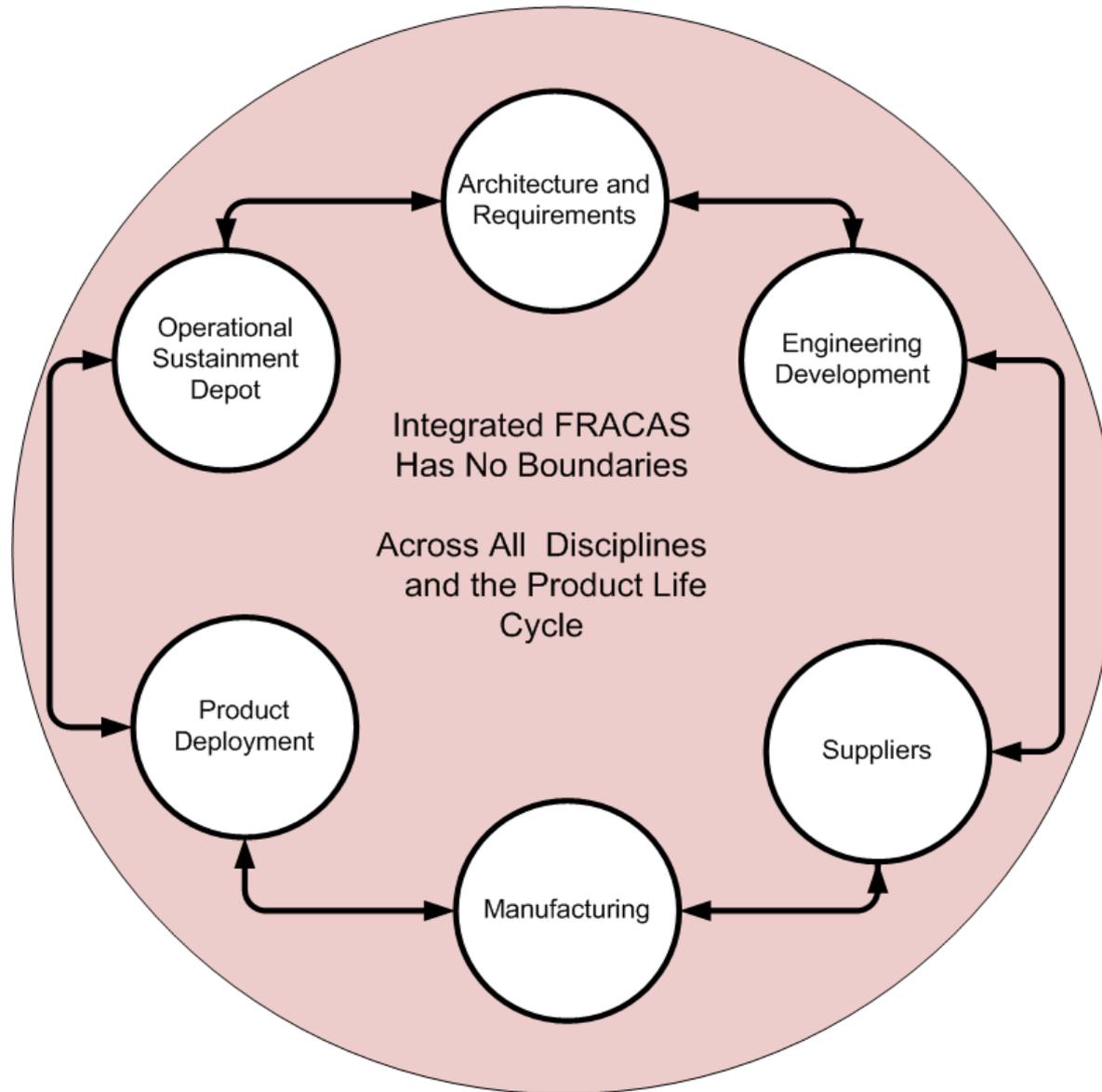
Manufacturing FRACA with Enhancements (Pilot)



Manufacturing FRACA with Enhancements (Pilot)



Integrated FRACAS: The Future



Summary

- Product quality defects and escapes cause schedule delays, product cost increases.
 - The cost of “quality issues” is real, and has a direct effect on producer and consumer risks and costs
- Leadership is fully engaged on the FRACA requirements and execution process
- Efforts at RMS are underway towards a integrated FRACA system with direct ties into Manufacturing, Supply Chain, Engineering and our Customers, enabling a uniform process
- Currently a team is working to develop the architecture and requirements for a RMS enterprise FRACA system
- End state of collecting and analyzing data to not only react early in the manufacturing process but, to predict product quality issues, through out the product lifecycle.
 - The path forward is focused to insure our customers receive our products and services, On Time, On Budget, with minimal risk