
Title:**Root Cause Analysis for Equipment Failure: A Design Thinking Approach**

Problem Statement:

Inconsistent diagnostics and lack of systematic failure analysis contribute to frequent equipment breakdowns in industrial environments. These failures disrupt workflow, elevate costs, and compromise safety standards. Existing methods are reactive and inefficient, leading to repeated failures and missed opportunities for continuous improvement.

Target Audience:

- Maintenance Engineers
 - Reliability Engineers
 - Safety & Compliance Officers
 - Production Supervisors
 - Mechanical Design Teams
 - Process Improvement Analysts
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Objective:

To design and implement a human-centered, data-informed, and scalable approach to root cause analysis that reduces recurrence of failures, boosts reliability, and aligns cross-functional teams around preventive strategies.

Design Thinking Approach:

Design Thinking introduces a problem-solving framework focused on user context, co-creation, and iterative development—ensuring the RCA solution is actionable, adaptable, and rooted in real-world scenarios.

Empathize:

Explore user environments, workflows, and frustrations

Updated User Insights:

- “We don’t have time for lengthy diagnostics during peak hours.”
 - “Everyone’s using different methods to track failures.”
 - “Lessons learned aren't getting transferred between shifts.”
 - “It's hard to explain the issue to people not directly involved.”
 - “We lack a structured tool for preventive thinking.”
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Define:

Frame a problem that reflects user realities and expectations

Updated Problem Statement:

Teams require a consistent, guided process for root cause analysis that bridges communication gaps, utilizes available data, and empowers staff at all levels to contribute to sustainable solutions.

Revised Key Features:

- Streamlined and modular RCA interface
 - Guided workflows with built-in tooltips and examples
 - Integration with SCADA systems and alert logs
 - Cross-functional discussion boards
 - Role-based access to RCA records and revisions
 - Trend visualization and heat maps for recurring faults
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Ideate:

Generate solution concepts from a cross-disciplinary perspective

New Ideas from Ideation:

- Mobile-compatible RCA assistant with voice-note input
- Augmented reality overlays for fault-point identification
- Self-learning module that improves recommendations over time
- Instant RCA summary generator for shift handovers
- Timeline-based failure journey visualizer
- Library of pre-analyzed RCA cases as reference

Prototype:**Develop and refine a working model of the solution****Components of Updated Prototype:**

- Interactive RCA timeline builder
- Decision-tree based fault diagnosis assistant
- Auto-categorization of failure types (mechanical, electrical, human error)
- Real-time collaborative annotations with expert tagging
- Maintenance impact simulator (cost, time, safety risk)
- Quick-action generation (preventive maintenance task suggestions)

Test:**Evaluate functionality, usefulness, and real-world impact****Updated Testing Objectives:**

- Validate speed and accuracy of the RCA workflow in live environments
 - Confirm compatibility with field devices and user platforms
 - Monitor reduction in repeat issues over a defined period
 - Measure usability across technical and non-technical roles
 - Gather feedback on reporting clarity and team engagement
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