CUSTOMER CASE STUDY

Adaptive FMEA: Scaling Risk Analysis with Multi-Agent AI

Transforming risk analysis from static databases to real-time predictive intelligence

Solution: BKOAI Simulation-Aware FMEA System **Industry:** Industrial Operations

Use Case Focus: Predictive Risk Analysis

GOALS

- Transition from static, manual risk analysis to dynamic, data-driven reliability.
- Accelerate decision-making through parallelized failure mode investigations.

CHALLENGES

- Traditional FMEA relies on static knowledge bases and delayed manual updates.
- Siloed data prevents integration of simulations, maintenance logs, and live sensors.

SOLUTIONS

- Deployed an Orchestrator Agent to run parallel multi-agent data inquiries.
- Integrated Graph, Document, Log, and Predictive Agents for comprehensive analysis.
- Utilized a Synthesizer Agent to unify knowledge and deliver actionable predictions.

RESULTS

- Enabled dynamic adaptation by continuously learning from live simulations.
- Reduced analysis timelines significantly through simultaneous agent operations.
- Shifted reliability workflows from reactive reporting to proactive risk prevention.

EXECUTIVE SUMMARY

BKOAI has developed an innovative simulation-aware Failure Mode and Effects Analysis (FMEA) system that leverages Deep Search Agents and the Agent-as-a-Service (AaaS) framework. By replacing static, manual, and sequential risk reviews with a parallel, multi-agent architecture, this solution seamlessly integrates real-time simulations, historical maintenance logs, and live sensor data. This transforms traditional, reactive FMEA processes into highly dynamic, predictive reliability workflows. The system empowers industrial operators to proactively identify, analyze, and mitigate complex equipment risks before failures occur.

The FMEA Bottleneck

Traditional Failure Mode and Effects Analysis (FMEA) remains a bottleneck for modern industrial operations. Reliability teams struggle with static knowledge bases that require slow, manual updates, leading to outdated risk assessments. Furthermore, investigations typically follow rigid, sequential pathways that delay critical decision-making. Important diagnostic resources—including real-time simulation results, historic maintenance logs, and live sensor streams—remain isolated in separate software silos. This lack of integration forces operators into a reactive posture, where they analyze failures only after costly downtime events have occurred.

Multi-Agent Parallel Architecture

To overcome these challenges, BKOAI introduced a simulation-aware FMEA system powered by a multi-agent architecture. At its core, an Orchestrator Agent decomposes complex analytical queries into parallel sub-tasks. Dedicated specialized agents then execute these tasks simultaneously. The Graph Agent retrieves established failure causes from the FMEA database, while the Document Agent extracts context from manuals using semantic search. Simultaneously, the Log Agent inspects maintenance histories for recurring patterns, and the Predictive Agent applies machine learning to live sensor data.

Unified Insights and Proactive Reliability

The architecture culminates with the Synthesizer Agent, which aggregates findings from all specialized agents into a unified, coherent risk report. This synthesis successfully bridges the gap between structured historical knowledge, real-world operational logs, and live predictive analytics. By executing these complex processes in parallel, the system slashes evaluation times and delivers highly accurate risk assessments. Industrial operators can seamlessly transition from historical reporting to dynamic, proactive risk mitigation. This transition ensures optimal asset uptime, reduced maintenance costs, and enhanced operational safety across the enterprise.

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