

Modernizing a High-Reliability Technical Company: Managing Knowledge Risk and AI Integration in a Regulated Environment

Problem Addressed, Aims, and Research Questions:

Many technical service firms operating in regulated industries rely heavily on the experience and judgement of senior employees. In high reliability environments such as aerospace, and nuclear testing, much of the most critical knowledge is not fully documented but held in the expertise of long-tenured technicians. As this workforce ages, firms face growing risk related to knowledge loss, workflow inconsistency, and succession gaps.

Currently, firms are under pressure to modernize operations through digital tools and AI-enabled systems to improve efficiency, traceability, and competitiveness. However, modernization in regulated industries is complex. Changes must not compromise compliance standards, safety protocols, or quality control.

This study examines how a U.S. based non-destructive testing company, undergoes modernization manages three simultaneous challenges: **1)** Reducing institutional knowledge risk, **2)** Implementing AI-needed workflow systems, **3)** Restructuring workforce roles and compensation.

Research Questions:

1)How can tacit technical knowledge be captured and systematized without disrupting quality standards? **2)** What role can AI-enabled documentation and workflow tools play in regulated environments? **3)** How does role clarification and compensation restructuring affect resistance to modernization? **4)** How can firms balance innovation with regulatory compliance?

Justification: Why and To Who Is This Research Important?

This research is important for executives, scholars/practitioners, and leaders working in regulated industries such as aerospace, defense, healthcare and energy.

Most research on digital transformation focuses on fast moving technology companies. Far less attention is given to small to mid-size technical service companies operating under strict regulatory oversight.

These organizations cannot adopt change quickly or informally. Their transformation must be deliberate, documented, and defensible.

This study provides practical insight into how modernization can occur in environments where error tolerate are low and compliance requirements are high.

This is particularly relevant to: leaders managing aging technical workforces, firms implementing AI in compliance-heavy settings, DBA and Executive PHD communities focused on applied impact

Theoretical Basis for the Work: This study is informed by four primary perspectives:

1)Dynamic capabilities – How organizations adapt and build new capabilities over time. **2)** Knowledge based – How expertise functions as a strategic asset, **3)** Social technical – How technology and human systems must evolve together, **4)** Organizational fit – How structural and cultural alignment influence change adoption

These perspectives help explain why modernization is not just technical implementation, but also structural and cultural alignment.

Research Design: This research uses an embedded – scholar/ practitioner case study approach.

Context: A mid-sized U.S. based nondestructive testing company serving aerospace and the nuclear sectors.

Modernization Initiatives: AI-enabled documentation workflows, process digitization, technician role tiering and restructuring, compensation model redesign, workflow standardization and traceability improvements.

Data sources: Workforce demographic analysis, internal process documentation, operational performance metrics, leadership planning materials, observational field notes.

This study follows the early stages of transformation and documents how modernization decisions are implemented in practice.

Data Samples and Preliminary Observations: A significant concentration of specialized expertise among technicians aged 55+. Inconsistent documentation of tacit processes prior to modernization, early improvements in workflow clarity following structured digital documentation, reduced ambiguity in technician progression after role tiering and compensation alignment. Qualitative performance tracking is ongoing, but early signs suggest improved operational consistency and reduced knowledge dependency risk.

Practical Relevance: Roadmap for leaders seeking to modernize operations without compromising compliance or culture. Implications extend to: industrial workforce succession planning, AI implementation in high-reliability environments, structural redesign in technical service companies, and managing change in low-error-tolerance industries.

By documenting how modernization unfolds within a compliance driven company, this research contributes to engaged management scholarship and aligns with the EMS 2026 theme of translating ideas into lasting organization impact