

# Lean Applications in the Department of Defense

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# Introduction

- DoD traditionally viewed as bureaucratic and slow-moving
- Study investigates lean/six-sigma implementation within DoD
- Scientometric review of 465 documents (1992-2025)
- Case study examination of notable works from the dataset and out of dataset example

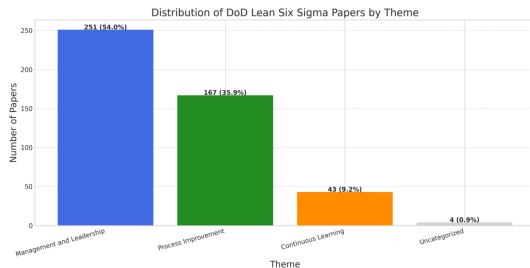
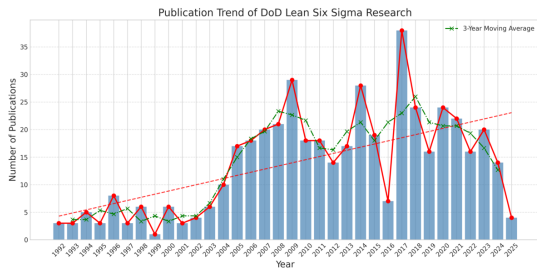
## Literature Search

- In ProQuest create a search as:  
AB("Department of Defense" OR "DoD" OR "DOD" OR "U.S. Army"  
OR  
"Department of the Army" OR "U.S. Navy" OR "Department of the  
Navy" OR  
"U.S. Air Force" OR "Department of the Air Force" OR "U.S. Ma-  
rine Corps" OR  
"U.S. Space Force" OR "National Security Agency" OR "NSA" OR  
"Defense Intelligence Agency" OR "DIA" OR "National  
Geospatial-Intelligence  
Agency" OR "NGA" OR "National Reconnaissance Office" OR  
"NRO")  
AND FT("six sigma" OR "6σ" OR "lean six sigma" OR  
"continuous process improvement" OR "LSS") AND LA(EN)
- 465 documents after cleaning are exported to a spreadsheet.

## Scientometric Analysis

- 2 step Python program to analyze publication trends and then classify themes
  1. Analyze abstracts and publication data for trends then use Latent Dirichlet Analysis on abstract to extract themes
  2. When themes extracted create a list of lean keywords related to that theme (Ex. Process Improvement: process, improvement, quality...), and classify abstracts similarity to theme
- Publication trends: Increase from 1992-2017, decline after 2017
- Document types: Primarily Theses and Trade journals
- Three themes identified: Management (54%), Process Improvement (36%), Continuous Learning (9%)
- From classified papers we now analyze some case studies

# Scientometric Analysis - Graphs



## Management and Leadership - Overview

- Toyota's Horensou vs. DoD's command-and-control
- Case studies show adaptation to DoD structures based on lean principles
- Case studies selected demonstrate lean for management of people and suppliers.

## Management Case - Leadership Development [1]

- Study through interviews with senior leadership in Dept. of Army, Washington D.C. to reduce variability in leadership success for high turnover positions
- Five key themes identified for successful transitions:
  - Knowledge of organization during change
  - Effective communication skills
  - Flexible and adaptive leadership
  - Having performance measures
  - Formal and informal leader development
- Lean connection: *genchi genbutsu* (go and see) and *hourensou* communication
- Shows lean leadership applicable even in hierarchical military structures

## Management Case - Project Engineer Stress [2]

- Study of work-related stressors and turnover among 69 DoD project engineers
- Through root cause analysis the author statistically correlated variables to turnover intention
- Key stress factors identified:
  - Excessive workloads
  - Tight deadlines
  - Technical complexity
  - Interpersonal conflict
  - Insufficient resources
- Lean connection: Addresses *muri* (overburden) as key waste
- Demonstrates need for *heijunka* (leveled workflow) in project management



## Management Case - Contract Environment [3]

- Analysis of Army supplier contract management process
- Structured approach using:
  - Performance Work Statements (PWS)
  - Contract Officer's Representatives (COR)
  - Regular performance reviews (PMRs and CMRs)
- Standardized documents and regular reviews create feedback loops for continuous improvement
- Balance between strict enforcement and contractor relationship
- Lean connection: Reflects Toyota's *keiretsu* philosophy of building long-term supplier partnerships

## Process Improvement - Overview

- Process improvement fundamental to lean organizations
- Based on culture of *kaisen* (continuous improvement)
- Focus on identifying and removing non-value adding steps (waste)
- Case studies demonstrate different approaches to process improvement in DoD

## Process Improvement - Cost Analysis of Ceremonies [4]

- Study of Army's Change of Command (COC) ceremonies and associated costs
- Found Army lacks proper process to evaluate production loss costs:
  - Company-sized unit: \$17,964 per hour
  - Division-sized unit: \$404,200 per hour
- Research led to development of cost tool to support decision-making
- Lean connection: Identifying hidden costs (muda) in traditional practices

## Process Improvement - Depot Repair Lead Time [5]

- Application of Lean Six Sigma to small government depot repair facility
- Analysis revealed 80% of repair lead time attributed to non-value-added waiting
- Implementation included:
  - Cross-training personnel
  - Process swimlane improvements
  - Standardized documentation
- Results: 84% decrease in lead times (114 days to 18 days)
- Lean connection: DMAIC methodology effectively applied to service operations
- Shows lean principles adaptable to maintenance service contexts

## Process Improvement - DoD Contract Cost Overruns [6]

- Machine learning analysis of 524 DoD contracts to predict cost overruns
- Random forest model achieved 80% accuracy in predictions
- Primary factors contributing to overruns:
  - Inaccurate cost estimation (42% of cases)
  - Inadequate risk assessment (21.8%)
  - Scope modifications (11.8%)
  - Technical issues (6.1%)
- Lean connection: Cost overruns represent financial *muda* (waste)
- Identification of key factors enables targeted *kaizen* initiatives

## Continuous Learning - Overview

- Building culture of continuous learning (*hansai* and *kaisen*) is cornerstone of Toyota Way
- Digital age amplifies learning through data and knowledge management
- Poor information systems create waste if data not accessible at right time by right people
- Case studies show DoD efforts to improve knowledge management and data-driven learning

## Continuous Learning - PTSD Diagnosis Tool [7]

- Development of Classification Automation Tool (CAT) using machine learning for PTSD diagnosis
- Approaches diagnostic errors as form of waste in engineering terms
- Stacked ensemble machine learning achieved statistically significant reduction in misdiagnoses
- Identified ten key predictors connected with PTSD in veterans
- Lean connection: Reduces defects (misdiagnoses) in medical process
- Both false positives and false negatives represent different forms of *muda* (waste)

## Continuous Learning - Army Knowledge Management [8]

- Qualitative case study examining Army's knowledge management implementation
- Used two assessment tools: Knowledge Management Maturity Model (KM3) and Knowledge Management Assessment Tool (KMAT)
- Analysis revealed "people" component ranked lowest - tacit knowledge not properly shared
- Four knowledge transfer barriers identified:
  - Content management issues
  - Personnel turnover impacts
  - Portal use and governance challenges
  - Need for institutional governance

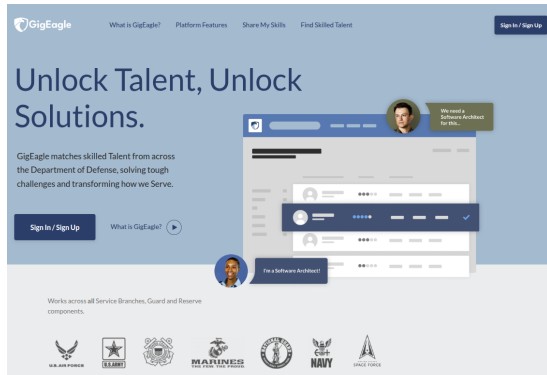


## Continuous Learning - Army Data Fabric [9]

- Implementation of data fabric technology to address data stovepipes and inefficient sharing
- Creates common layer for data discovery, synchronization and security across systems
- Critical challenges identified:
  - Data isolation in warfighting functional systems
  - Compression-induced information loss
  - Unnecessarily restrictive classification
  - AI capabilities unable to access needed data
- Project Rainmaker developed as tactical data fabric solution
- Lean connection: Addresses digital *muda* (waiting waste) with pull-based data system

## Out of Sample Study - Defense Innovation Unit

- Established 2015 as DoD's gateway to tech companies
- Streamlined acquisition: 60-90 days vs. years
- Example: GigEagle
  - Matches DoD with Reserve/Guard personnel for gigs
  - Addresses waste: underutilized talent
  - Lean approach to human capital management



## Conclusion

- Lean/Six Sigma has gained traction in DoD and has been proves to be useful across DoD organization
- Lean implementation achieved through management practices, process improvements, continuous learning through data management
- Publication decline since is interesting 2017 suggests maturation in research, changing terminology, or maybe less adoption

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