



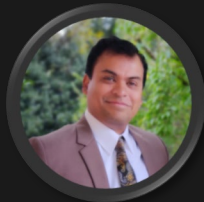
# Unlocking Value from Deployed ERP Systems

## *Generative AI for Systems Engineering (AI4SE)*

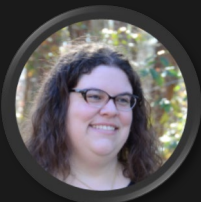
Systems Engineering Research Center

AI4SE & SE4AI Workshop

George Mason University – Arlington Campus



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17 SEP 2024





# Research Team

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## **Jennifer J. McCollum, Product Manager – Special Projects, HQ-AMC**

*A certified PMP with over 22 years of government experience, Ms. McCollum excels in leading complex technology projects and cross-functional teams within the Army. Specializing in data analytics, software management, and emerging technologies like Generative AI, she has a proven track record of driving strategic initiatives that enhance organizational capabilities and ensure regulatory compliance.*

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## **Vikram A. Vazirani, Enterprise Architect, Army SSC**

*Mr. Vazirani is an accomplished IT professional with over 18 years of experience in leading technical teams and overseeing large-scale projects. As the Enterprise Architect and Team Lead for the U.S. Army's largest ERP, Vikram and his team excel in directing multi-million dollar initiatives and driving technological advancements, including a major cloud migration and the transition to Agile methodologies. With a strong educational background, including a master's in Systems Engineering and an MBA, he effectively integrates complex IT solutions to meet organizational goals and ensure mission success.*

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## **Chamroeun (Cham) Chhun, Enterprise Architect, Army SSC**

*As an Enterprise Architect at the Software Engineering Center (SEC) within the Army Shared Services Center, Cham provides software engineering support for ERP systems, with a specific focus on ServiceNow and AI initiatives, and serves as the AI representative for the ASSC.*

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# Implementing AI has Challenges





# Agenda

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- Introduction: Brief overview of the U.S. Army Logistics Modernization Program (LMP)
- Unlocking Value: Imagining the future of LMP with GenAI
- Use Cases and Examples: Detailed exploration of specific GenAI applications within defense ERP systems
- Deployment Strategies: Overview of deployment approaches (Taker, Shaper, Maker)
- Challenges and Opportunities: Key risks and potential for growth in GenAI implementation
- Feedback and Q&A



# U.S. Army Logistics Modernization Program (LMP)



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## • What is LMP?

- **Purpose:** Builds, sustains, and generates warfighting capabilities
- **Global Reach:** Utilizes one of the largest, fully-integrated supply chain and MRO (Maintenance, Repair, and Overhaul) solutions worldwide
- **ERP Solution:** SAP-based, COTS (Commercial Off-The-Shelf) system managing materiel orders and deliveries to Soldiers
- **Financial Backbone:** Serves as the General Ledger for the Army Working Capital Fund (AWCF)

## • Fast Facts

- **Operational Since 2003:** Processes over 9 million transactions daily
- **Financial Scale:** Manages ~\$19 billion in Army Working Capital Fund (AWCF)
- **User Base:** Supports ~23,000 users across 50+ Army and DoD locations
- **Integration:** Connects with 36 partner systems and 255 interfaces
- **Performance:** 98% of transactions completed in under 2 seconds; 99.9% system availability
- **Management:** Overseen by PEO EIS; currently in Capability Support on AWS GovCloud (IL4)

**THE POWER OF LMP**

**If a Soldier shoots it, drives it, flies it, wears it, communicates with it, or eats it – AMC provides it...and LMP is behind it.**

Since its inception, the LMP has managed the purchase of \$340 billion in parts and equipment...

...to maintain and fix tanks, helicopters, and more to support Army Readiness and Soldiers in the field.

**PER MONTH:**

- The LMP completes 90,000 maintenance actions valued at \$192 million
- The LMP manages an average of \$175 billion worth of inventory

## LMP MISSION

- **Deliver Army Readiness** by equipping Soldiers as the Army's National-level logistics and financial management system of record
- **Maintain an adaptive and agile Army force** through continuous process, capability, and technical improvements

**There Is No Army Without Readiness.  
There Is No Readiness Without LMP.**



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# Unlocking Value from LMP – the Vision

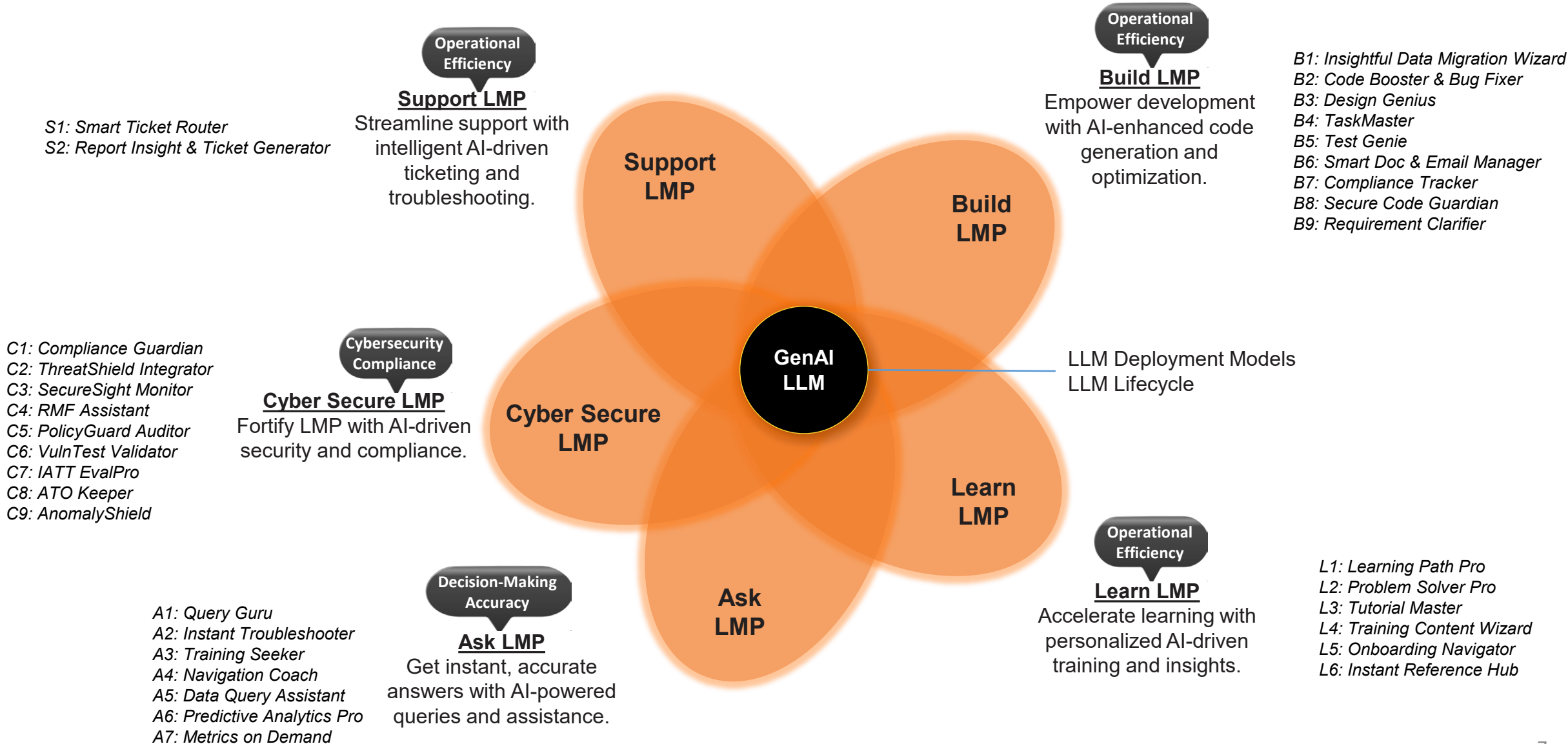


- ERPs are incredibly complex
  - There is a significant learning curve to obtaining access, navigating and understanding data
- GenAI's Opportunity:
  - Offers unparalleled support to stakeholders—developers, requirement managers, logisticians, and warfighters
  - Enhances efficiency and reliability in an increasingly fast-paced and resource-constrained environment
- Imagine:
  - Support: Instant interaction with a support chatbot to unlock accounts, eliminating wait times for ticket resolution
  - Cyber Secure: Automatically scan and identify RMF artifacts that don't comply with organizational policies
  - Build: Automatically populate Change Requirement Documents and User Stories with relevant regulations, laws, and policies
  - Ask: Warfighters can instantly identify the POC for backordered sales orders
  - Learn: Curated, LMP-specific training provided to users for executing specific functionalities



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# GenAI LLM Integration: LMP Use Cases



Note: This approach is scalable to any Business System






# Mapping GenAI Capabilities to LMP Use Cases: Current and Future Potential



Use Case	Current GenAI Capabilities											Future GenAI Capabilities												
	1. Text Generation	2. RAG	3. Image Generation	4. Speech Synthesis	5. Translation	6. Summarization	7. Code Generation	8. Music Composition	9. Style Transfer	10. Data Augmentation	11. Personalized Content Creation	12. Story Generation	13. Image Enhancement	14. Interactive Simulations	15. Autonomous Content Moderation	16. Advanced Personal Assistants	17. Complex Video Generation	18. Real-Time Language Interpretation	19. Lifelike Digital Avatars	20. Emotion and Sentiment Analysis	21. Scientific Discovery	22. Holistic System Design	23. Adaptive Learning Systems	
<b>Support LMP: Streamline support with intelligent AI-driven ticketing and troubleshooting.</b>																								
S1: Smart Ticket Router	E	E																						X
S2: Report Insight & Ticket Generator	E	E			E																			
<b>Build LMP: Empower development with AI-enhanced code generation and optimization.</b>																								
B1: Insightful Data Migration Wizard	E	E			E																			
B2: Code Booster & Bug Fixer						E																		
B3: Design Genius																			X	X				
B4: TaskMaster	S																							
B5: Test Genie	S	S			S																			
B6: Smart Doc & Email Manager	E	E			E																			
B7: Compliance Tracker	S	S			S																			
B8: Secure Code Guardian	S	S				S																		
B9: Requirement Clarifier	S	S			S																			
<b>Learn LMP: Accelerate learning with personalized AI-driven training and insights.</b>																								
L1: Learning Path Pro	S			S	S				S	S														X
L2: Problem Solver Pro	S	S			S																			
L3: Tutorial Master	S	S			S																			
L4: Training Content Wizard	S		S		S	S			S	S														X
L5: Onboarding Navigator	S				S	S			S	S														X
L6: Instant Reference Hub	S																							
<b>Ask LMP: Get instant, accurate answers with AI-powered queries and assistance.</b>																								
A1: Query Guru	S	S																						X
A2: Instant Troubleshooter	S																							X
A3: Training Seeker	S				S																			
A4: Navigation Coach	S																							
A5: Data Query Assistant	S	S			S																			
A6: Predictive Analytics Pro	S	S																						
A7: Metrics on Demand	S	S																						
<b>Cyber Secure LMP: Fortify LMP with AI-driven security and compliance.</b>																								
C1: Compliance Guardian	S	S			S																			
C2: ThreatShield Integrator	S	S																						
C3: SecureSight Monitor	S	S																						X
C4: RMF Assistant	S	S			S																			X
C5: PolicyGuard Auditor	S	S			S																			
C6: VulnTest Validator	S	S			S																			
C7: IATT EvalPro	S	S			S																			
C8: ATO Keeper	S	S			S																			
C9: AnomalyShield	S																							

As enterprise products mature, embedded GenAI capabilities will likely expand, addressing more use cases and enhancing functionality.

**E** Embedded/Vertical GenAI capabilities within appropriate product  

**S** Standalone/Horizontal GenAI capabilities 

**X** Future Use case





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# Methodology: Gartner AI Prism Evaluating Use Cases Based on Business Value and Feasibility



- Gartner AI Prism: Industry-standard benchmarking and assessment tool
- Purpose: Evaluates and improves IT performance by comparing operations against industry best practices and peers
- Benefits:
  - Provides actionable recommendations to optimize IT efficiency
  - Helps reduce costs and align IT with business objectives
- Evaluation Process: Rates each use case on **benefit** and **feasibility scales**

## BENEFIT SCALE

(1 = Bad, 5 = Good)

## BENEFIT DIMENSIONS

Efficiency

Improvement

Quality Enhancement

Innovation Enablement

Personalization and Customization

Auditability Advantage

Customer Experience Enhancement

Decision Support

Risk Reduction

Scalability

Workforce Satisfaction and Engagement

## FEASIBILITY SCALE

(1 = Good, 5 = Bad)

## FEASIBILITY DIMENSIONS

AI Data Readiness

Interconnectedness

Dependencies

Uncertainty

Novelty

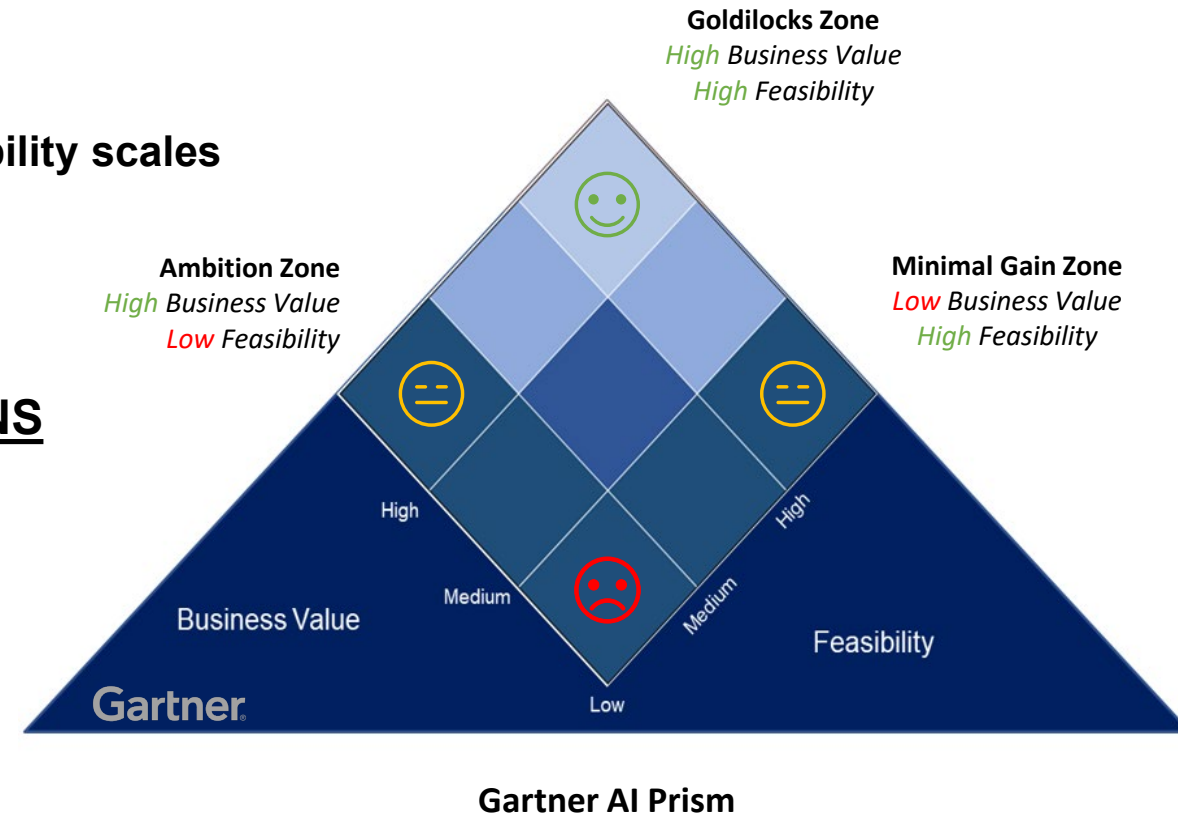
Technical Requirements

Regulatory Requirements

Stakeholder Involvement

Change Mgt

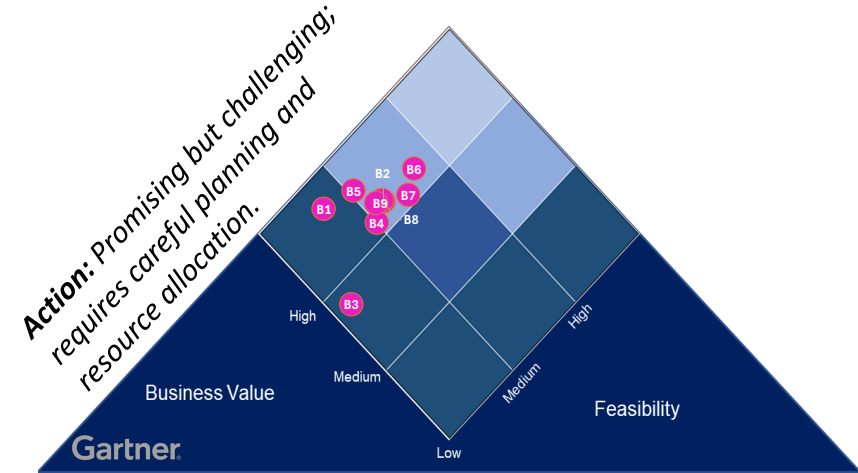
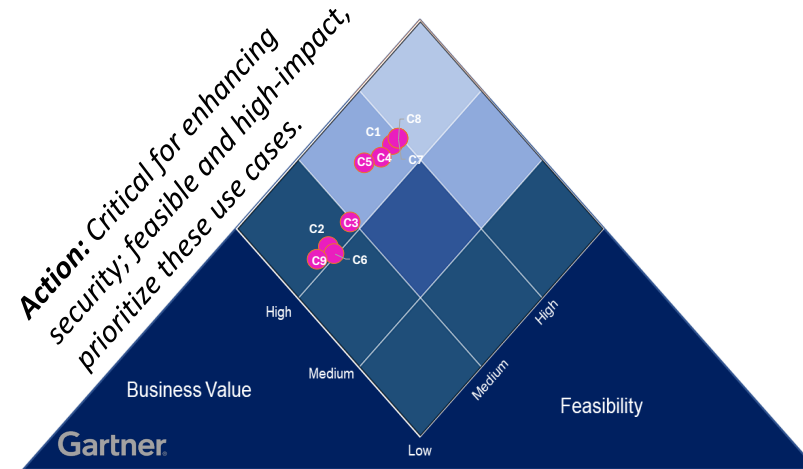
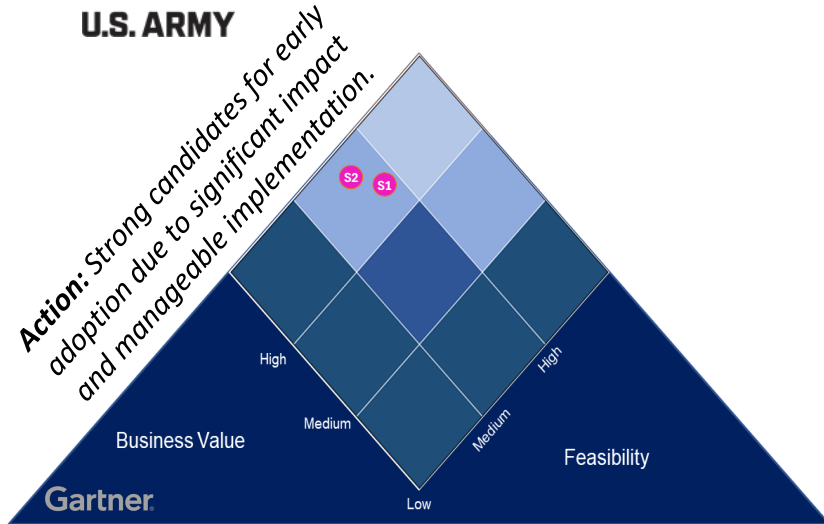
Risk Exposure





# Prioritizing GenAI Use Cases

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**SUPPORT LMP**

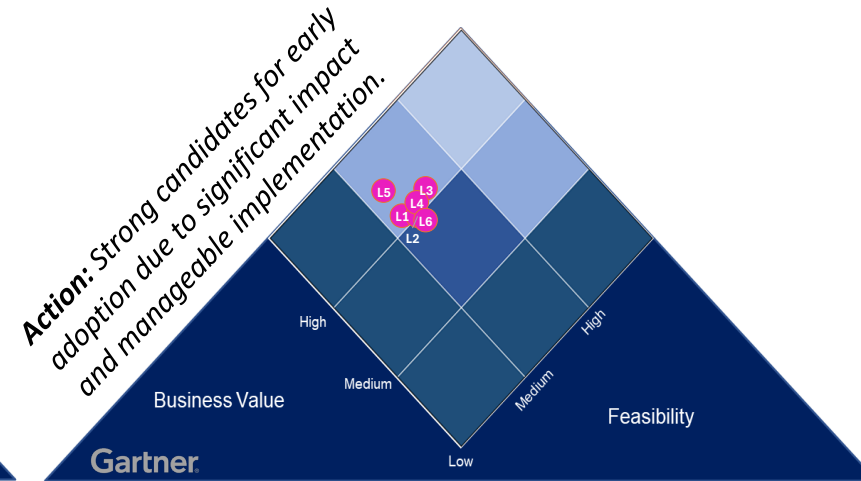
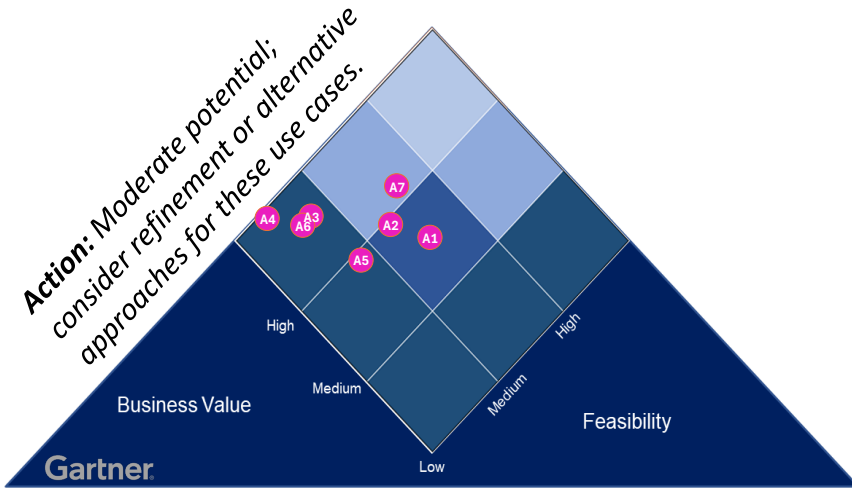
S1 Smart Ticket Router    S2 Report Insight & Ticket Generator

**CYBERSECURE LMP**

C1 Compliance Guardian    C2 ThreatShield Integrator    C3 SecureSight Monitor    C4 RMF Assistant    C5 PolicyGuard Auditor    C6 VulnTest Validator    C7 IAT EvalPro    C8 ATO Keeper    C9 AnomalyShield

**BUILD LMP**

B1 Insightful Data Migration Wizard    B2 Code Booster & Bug Fixer    B3 Design Genius    B4 TaskMaster    B5 Test Genie    B6 Smart Doc & Email Manager    B7 Compliance Tracker    B8 Secure Code Guardian    B9 Requirement Clarifier



**ASK LMP**

A1 Query Guru    A2 Instant Troubleshooter    A3 Training Seeker    A4 Navigation Coach    A5 Data Query Assistant    A6 Predictive Analytics Pro    A7 Metrics on Demand

**LEARN LMP**

L1 Learning Path Pro    L2 Problem Solver Pro    L3 Tutorial Master    L4 Training Content Wizard    L5 Onboarding Navigator    L6 Instant Reference Hub

## Overall Focus:

- Prioritize high-value, feasible cases in Support, Cyber Secure and Learn LMP.
- Strategically plan for more challenging Build and Ask LMP use cases.



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# GenAI Deployment Strategies: Options, Pros & Cons, and Adoption Trends



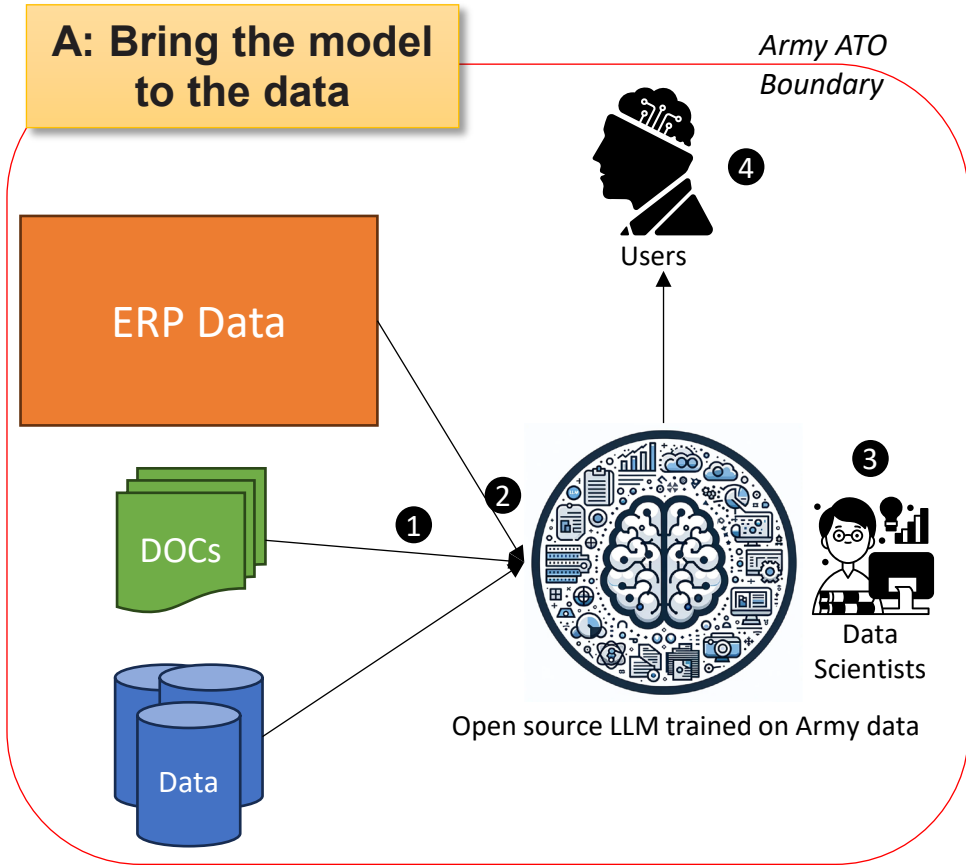
Approach	Description	Options	Pros and Cons	Examples
<b>Taker</b> >95%+ Adopting Today	Use API of Commercial Opensource LLM or Embedded GenAI features OOTB. <i>Use Prompt Engineering to pass domain context.</i>		<b>Pro:</b> Fast startup, quick updates/innovations. <b>Con:</b> Involves transmitting Army data over commercial internet, will be prohibited.	<ul style="list-style-type: none"> <li>• ChatGPT Enterprise</li> <li>• Microsoft Copilot</li> <li>• Google Gemini</li> <li>• ServiceNow Now Assist</li> </ul>
<b>Shaper</b> 3-4% Adopting Today	Fine Tune Pre-trained LLM with additional data. <i>Less need to pass domain context within Prompt.</i>	<b>A: “Bring the model to the data”.</b> The model is hosted on the organization’s infrastructure, either on-premises or in the cloud environment.  <b>B: “Bring data to the model”.</b> Organization can aggregate its data and deploy a copy of the large model on cloud infrastructure.	<b>Pro:</b> LLM and data never leave Army boundary. <b>Con:</b> Limited choice of LLMs, committed once picked.  <b>Pro:</b> Vast options of LLMs and services, able to switch/upgrade LLMs as business evolves. <b>Con:</b> Cybersecurity risk unless FedRAMP’d, vendor lock.	<b>Bring the model to the data</b> <ul style="list-style-type: none"> <li>• Vendor deployment service (Asksage, 3<sup>rd</sup> party)</li> </ul> <b>Bring the data to the model</b> <ul style="list-style-type: none"> <li>• SAP Business AI</li> <li>• Asksage</li> <li>• Scale AI Donavon</li> </ul>
<b>Maker</b> <1% Adopting Today	Create and Train a new model from scratch. <i>Building a foundation model is expensive and complex, requiring huge volumes of data, deep expertise, and massive compute power.</i>		This option involves investing in data scientists and building our own LLM. Not our core competency and likely to be cost prohibitive.	DIY

Source: <https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/technologys-generational-moment-with-generative-ai-a-cio-and-cto-guide>

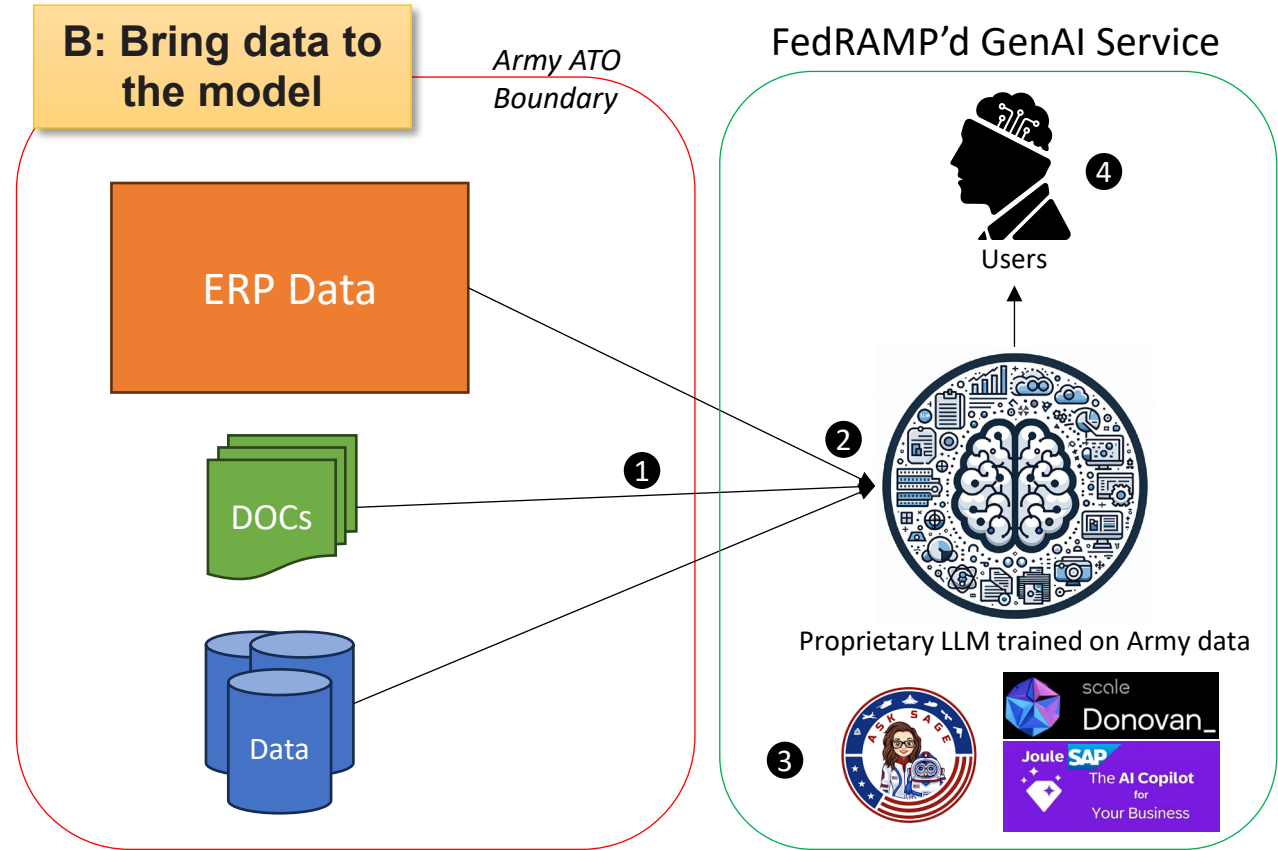


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# Shaper Deployment Strategies: Bringing the Model to the Data vs. Bringing Data to the Model



- 1 Extraction of both structured data (e.g., ERP databases) and unstructured data (e.g., documents, videos, logs).
- 2 Pre-trained large language models (LLMs) undergo domain-specific training to enhance relevance and accuracy.
- 3 Data scientists are responsible for the ongoing maintenance and curation of LLMs.
- 4 Users interact with LLM and consume GenAI artifacts.



- 1 Extraction of both structured data (e.g., ERP databases) and unstructured data (e.g., documents, videos, logs).
- 2 Pre-trained large language models (LLMs) undergo domain-specific training to enhance relevance and accuracy.
- 3 Vendors serve as aggregators of large language models (LLMs), offering these as Software-as-a-Service (SaaS) solutions.
- 4 Users interact with LLM and consume GenAI artifacts.



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# LMP GenAI Challenges and Opportunities



## CHALLENGES

- Before You Arrive...
  - Cyber Security (IL4, FedRAMP, NIST, OWASP Top 10)
  - Fiscal and skillset limitations
  - Evolving laws, regulations, and policies
  - ... and more!
- ERP integration
  - Securing defense-specific content
- Ethics and Compliance
- Data Quality and AI Data Readiness
- End User Trust and Adoption
- Sustaining a Path in Rapid Evolution
  - LLM Lock/learning transferability
  - Availability of Training Data
  - Acquisition, Contracts, Consumption models, etc.

## OPPORTUNITIES

- Community Engagement – we're in this together!
  - Project Linchpin
  - Task Force Lima
- Experimentation
  - Leveraging DoD-approved LLMs can demonstrate the art of the possible and garner executive support (CamoGPT, NIPRGPT etc.)
- LMP Stakeholder Engagement – developing a community of users to inform, influence, and support integration of AI



# We Want Your Feedback

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- What challenges do you see that may inhibit AI4SE?
- Additional opportunities?
- What will help move our use cases into the Goldilocks zone?



<https://ahaslides.com/AI4SELMP>

# BACKUP



# Use Case Descriptions

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- **Support LMP:** Streamline support with intelligent AI-driven ticketing and troubleshooting.
  - S1: Smart Ticket Router: AI-Powered Ticket Routing and Automated Responses
  - S2: Report Insight & Ticket Generator: Automated Analysis and Ticket Creation from Technical Reports
- **Build LMP:** Empower development with AI-enhanced code generation and optimization.
  - B1: Insightful Data Migration Wizard: AI-Driven Data Analysis and Reporting Automation
  - B2: Code Booster & Bug Fixer: AI-Assisted Code Generation and Bug Optimization
  - B3: Design Genius: AI-Powered System Design Optimization
  - B4: TaskMaster: AI-Enhanced Project Management and Task Allocation
  - B5: Test Genie: Automated Test Case Generation and Execution
  - B6: Smart Doc & Email Manager: AI-Based Document and Email Management
  - B7: Compliance Tracker: AI-Driven Regulation Identification
  - B8: Secure Code Guardian: Generative AI for Code Security and Threat Detection
  - B9: Requirement Clarifier: AI-Assisted Requirement Clarification and Validation
- **Learn LMP:** Accelerate learning with personalized AI-driven training and insights.
  - L1: Learning Path Pro: Personalized AI-Driven Learning Paths
  - L2: Problem Solver Pro: Advanced AI-Generated Problem-Solving Guides
  - L3: Tutorial Master: Dynamic Requirement-Specific Tutorials
  - L4: Training Content Wizard: AI-Assisted Training Material Creation
  - L5: Onboarding Navigator: Customized Onboarding and Role-Specific Orientation
  - L6: Instant Reference Hub: AI-Powered Reference Material Access





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# Use Case Descriptions (Cont'd)



- **Ask LMP:** Get instant, accurate answers with AI-powered queries and assistance.
  - A1: Query Guru: AI-Driven Complex Query Resolution
  - A2: Instant Troubleshooter: AI-Powered Instant FAQ and Troubleshooting
  - A3: Training Seeker: AI for Finding Training Content Queries
  - A4: Navigation Coach: AI-Guided Basic Navigation and Functionality Queries
  - A5: Data Query Assistant: AI-Powered Analytic Queries
  - A6: Predictive Analytics Pro: AI-Driven Predictive Analytics for Supply Chain Optimization
  - A7: Metrics on Demand: AI-Enabled Real-Time Metrics Generation
- **Cyber Secure LMP:** Fortify LMP with AI-driven security and compliance.
  - C1: Compliance Guardian: AI validates ERP configurations against cybersecurity standards, identifying gaps and recommending fixes.
  - C2: ThreatShield Integrator: AI analyzes threat data to identify and prevent security breaches.
  - C3: SecureSight Monitor: AI monitors ERP systems for anomalies, initiating real-time security actions.
  - C4: RMF Assistant: AI automates RMF process, documentation, and evidence collection.
  - C5: PolicyGuard Auditor: AI evaluates ERP security policies for DoD compliance, identifying and suggesting fixes.
  - C6: VulnTest Validator: AI performs security testing, simulating attacks, and reporting vulnerabilities.
  - C7: IATT EvalPro: AI prepares and evaluates IATT checklists, ensuring security controls are tested.
  - C8: ATO Keeper: AI monitors ERP systems for ATO compliance, automating documentation updates.
  - C9: AnomalyShield: AI detects advanced threats and provides real-time incident responses.