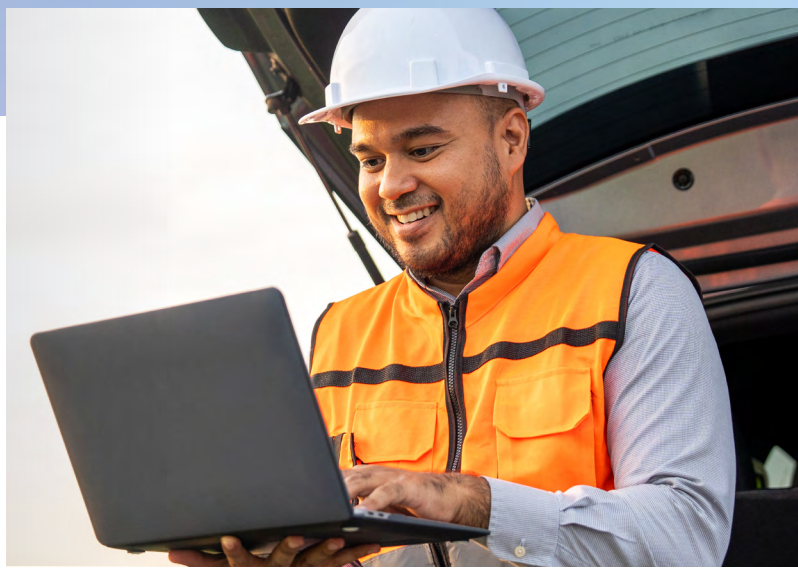
How MassDOT's HEKA assistant reduced engineer search time by 78% and sparked an AI Center of Excellence



Every day, the Highway Division at the Massachusetts Department of Transportation (MassDOT) makes decisions affecting billions of dollars in infrastructure and public safety. Until recently, finding a single technical specification could take 30 minutes—time diverted from actual engineering work.

Recognizing the urgency of this challenge, Deputy Chief Information Officer (CIO) Anu Goutham took a bold approach: not just to fix search capabilities, but to transform how the entire agency approaches artificial intelligence (AI). Through the Commonwealth's Innovate MA program, MassDOT partnered with Amazon Web Services (AWS) and collaborated with Northeastern University Burnes Center for Social Change's AI for Impact Program to develop the first proof of concept for the Highway Engineering Knowledge Assistant (HEKA), an AI-powered assistant. The internal MassDOT AI Engineering team then scaled the solution into a production-ready platform.

This case study explores how MassDOT achieved a 78% reduction in search time with HEKA and created a blueprint for responsible government AI adoption now being modeled nationwide.

Navigating complex documentation challenges in highway engineering

MassDOT serves Massachusetts through its Highway, Registry of Motor Vehicles, Rail and Transit, and Aeronautics divisions. The Highway Division is responsible for maintaining and improving the state's transportation infrastructure. The engineers within the Highway Division work across multiple internal divisions, handling everything from strategic project improvements to tactical field work such as crash analysis, environmental assessments, bridge inspections, and construction oversight.

Given the technical complexity and safety requirements of this work, engineers need immediate access to precise specifications and authoritative guidance. But the documentation challenge proved overwhelming. Engineers navigated fragmented systems containing decades of standard specifications for highways and bridges, with each year's documents totaling over 1,000 pages. Design specifications, standard operating procedures, and policies were distributed across different platforms, making it time-consuming to find reliable answers.

"MassDOT oversees billions of dollars in highways and road projects every year," said Goutham. "Every project depends on strict specifications and requirements for safety, compliance, and timely delivery. Our engineers often spend hours searching for the certifications and requirements they need. When information is hard to find, projects can slow down, costs can rise, and safety can be at risk."

The inefficiency had real consequences. "A lot of their jobs demand being in the field versus sitting on a computer and looking through documentation," explained Goutham. Yet engineers found themselves doing exactly that, diverted from the strategic planning and on-site presence that highway engineering requires.

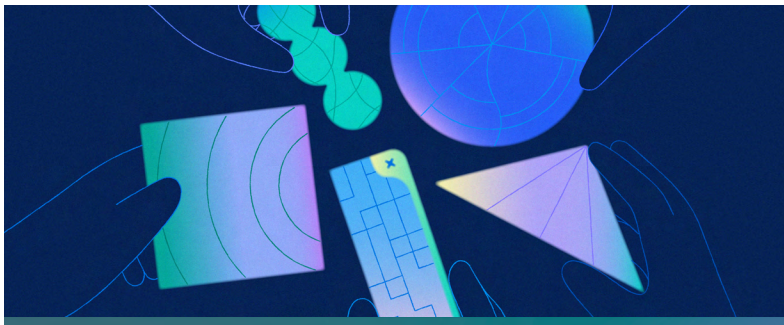
Key Challenge

Highway engineers spent valuable time searching through thousands of pages of scattered technical documentation, taking time away from critical fieldwork and safety inspections.

Building and implementing HEKA through strategic partnerships

Goutham recognized that solving the documentation challenge required more than better search tools. It demanded a fundamental shift in how engineers access and interact with information. She saw an opportunity to apply emerging generative AI technology to create a knowledge assistant that could understand complex technical questions, provide precise, cited answers from official MassDOT documentation, and simultaneously establish responsible AI practices agencywide.

MassDOT launched its AI journey through the Commonwealth's Innovate MA program in January 2024, partnering with AWS and collaborating with the Burnes Center for Social Change to develop the first proof of concept for HEKA. As part of this collaboration, the agency and students from the Burnes Center worked with AWS's Product Acceleration team through Working Backwards sessions and build-and-demo weeks with ongoing architect support, understanding that university-built proofs of concept would require additional work to meet government security and accessibility standards.



"AWS has been amazing. They've provided thought leadership, targeted architecture support, and were present when we needed them. It's always comforting to have a trusted industry partner when working with new technologies."

–Anu Goutham, Deputy Chief Information Officer, MassDOT

"HEKA is a powerful reminder of what becomes possible when public institutions, technologists, and universities learn together," said David Fields, professor of practice at Northeastern University's Graduate School of Education and senior fellow with the Burnes Center for Social Change. "Our students helped MassDOT show that generative AI, when paired with strong governance, transparency, and a clear public purpose, can radically improve how frontline engineers access the knowledge they need to keep residents safe."

Architecting HEKA for scalability and security

MassDOT developed HEKA as a chat interface that uses Retrieval Augmented Generation (RAG) to provide engineers with direct responses drawn exclusively from MassDOT-approved documentation.

The front end runs as a React application delivered through Amazon CloudFront.

The backend handles query orchestration through Amazon Bedrock and AWS Lambda, scaling automatically with demand.

SharePoint connectors feed documents into Amazon Kendra, while the system can also crawl approved websites from Amazon Simple Storage Service (Amazon S3).

Authentication relies on existing role-based access control with single sign-on, restricting access to authorized users. The modular architecture built on Amazon Bedrock and Amazon Kendra creates a scalable foundation for rapid adaptation across other business divisions.

"MassDOT has since built on that foundation to create one of the most forward-thinking departments in the country. It's a model for how the government can adopt new technologies responsibly, build capacity from within, and deliver measurable value for the communities it serves."

– David Fields,
Professor of Practice Northeastern University
Graduate School of Education

Achieving substantial time savings and productivity gains

During testing phases, MassDOT's team compared response times between manual searches and HEKA. The results showed search time improved by 78%, dropping from 30 minutes to 5 minutes.

"With the introduction of HEKA, engineers can now get critical information in minutes," said Goutham. "The system is tuned to MassDOT-approved documentation, so every response is grounded in official standards and policies. Each response also cites its source, giving engineers the ability to validate and cross-check the information."

Today, 500 engineers within the Highway Division are enrolled in HEKA, with approximately 100 daily active users. Engineers use the tool to develop presentations, cross-check project design documents, and quickly verify standard operating procedures. The browser-based, mobile-friendly interface provides a familiar user experience similar to consumer AI tools, while maintaining the security and accuracy requirements of government work. The organized, cited responses have significantly reduced frustration with SharePoint searches, giving mid-level and senior-level engineers more time to focus on field inspections and project oversight.

"We've also discovered that HEKA is rapidly onboarding new engineers, particularly entry-level ones," explained Goutham. "This frees up mid-level to senior-level engineers for strategic work. Their time is limited, so this really helps."

RESULTS

78%
reduction in search time

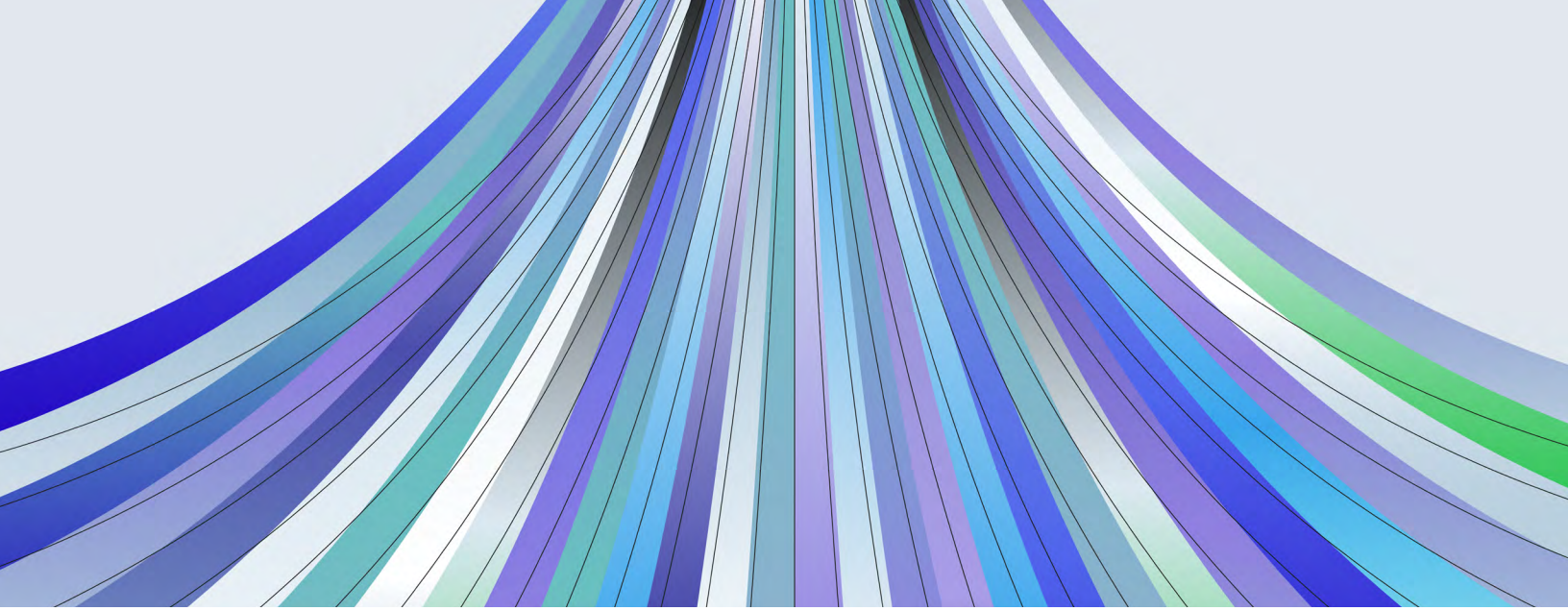
500
engineers enrolled

100+
daily active users

TIMELINE: PROOF OF CONCEPT TO PRODUCTION

2024

- **JAN** — *Started AI journey through the Innovate MA program*
- **APR** — *Kicked off requirements sessions*
- **JUN-JUL** — *Initial proof of concept ready*
- **OCT** — *Production deployment began*
- **NOV** — *Pilot went live*



Scaling from HEKA to an AI Center of Excellence

"An important responsibility that we have at MassDOT is to establish safe and responsible AI practices and usage," explained Goutham. To achieve this vision, she built a comprehensive AI practice known as the AI Center of Excellence. The Center grew from two team members to eight in just months, establishing governance frameworks, testing standards, and ethical guidelines.

MassDOT implemented a multi-pronged approach to build organizational capacity, including upskilling internal staff through AWS Cloud Practitioner certifications, adopting Agile methodologies, developing internship-to-hire pipelines, and creating AI literacy programs for business users. The agency also developed AI readiness assessments covering seven dimensions to help business units understand their AI maturity and receive targeted support.

Building on HEKA's success, MassDOT deployed several additional AI applications. The Registry of Motor Vehicles (RMV) virtual assistant launched on Mass.gov in April 2025, helping residents with license renewals, vehicle registration, and Real ID requirements. The team also developed a mentor-mentee matching system for the agency's 300-participant mentorship program, a vehicle invoicing system, and assistants to support operational deadlines for business partners. Additionally, they created a request for information (RFI) summarizer. The RFI summarizer was developed as a proof of concept through a partnership with University of Massachusetts Amherst co-ops.

"We continue rolling out AI-powered applications through our partnerships," said Goutham. "Our internal AI engineering team is much stronger than they were six months ago."

Becoming a model for other state agencies

HEKA's success earned recognition at the highest level of state government. The solution was showcased to Massachusetts Governor Maura Healey, and Goutham and the team behind this innovation received an award for their efforts. Now, Goutham fields calls from state DOTs nationwide asking how MassDOT accomplished its AI transformation. Through communities of practice, she shares governance frameworks and best practices to help other agencies implement similar solutions and avoid common pitfalls.

GOUTHAM'S ADVICE FOCUSES ON FOUR ESSENTIAL AREAS:

1	*Industry partnerships*	Collaborate with organizations like AWS for thought leadership and higher education institutions to build proofs of concept quickly. "Partnerships with universities like Northeastern, UMass Amherst, and others in the future let us experiment safely and move fast," said Goutham.
2	*Change management*	Invest heavily in user adoption strategies and organizational change processes, not just technology.
3	*Formalize AI teams early*	Establish dedicated AI teams and governance structures before scaling applications.
4	*Strong governance*	Build frameworks with guardrails that make AI manageable and help business partners feel comfortable with the technology.

"Rolling out a tool is one thing, but investing in change management and user adoption is huge. You need to have a strategy around change management."

–Anu Goutham, Deputy Chief Information Officer, MassDOT

Transforming government service through thoughtful AI implementation

What started as a solution to help highway engineers find technical specifications faster became a blueprint for responsible AI adoption in state government. Engineers who once spent 30 minutes searching through scattered documents now get precise, cited answers in minutes, allowing them to focus on work that directly serves Massachusetts residents. From that initial success, MassDOT established an AI Center of Excellence, deployed applications across multiple divisions, and built governance frameworks now guiding state agencies nationwide.

Looking ahead, MassDOT continues expanding knowledge assistants across additional divisions and developing new AI applications through a structured intake process. The agency is also modernizing legacy documentation through a comprehensive content management initiative to ensure accessibility standards across all materials that support AI systems.

For other state agencies considering AI adoption, MassDOT's journey offers a clear roadmap: start with a concrete problem, build governance alongside technology, invest in partnerships and change management, and create frameworks that scale responsibly. The result is more than efficient operations—it's better service to the millions of residents who depend on safe, reliable infrastructure and responsive government services.

Contact us

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