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ITS AMERICA

A Guide to Practical Next Steps for AI Implementation

Contents

1 Foreword

Delivering safer, more efficient transportation hinges on our ability to embrace and responsibly deploy transformative technologies like artificial intelligence (AI). AI is poised to become a critical enabler of many shared goals within the transportation sector, such as safety, efficiency, economic competitiveness, and mobility. Recognizing this, the Intelligent Transportation Society of America (ITS America) is proud to present this guide, developed in partnership with Cambridge Consultants and informed by the work of our AI and Digital Transformation Working Group. This group, composed of public and private sector experts from technology, engineering, planning, infrastructure owners and operators, policymakers, and academia, collaborated to address the challenges and opportunities of deploying artificial intelligence in transportation. Its work focuses on improving safety, enhancing infrastructure performance and expanding transportation options.

This guide draws on rich insights from discussions, interviews, and collaborations with industry leaders, State Departments of Transportation (DOTs), and local agencies already implementing AI in transportation. It is designed to help transportation leaders align AI initiatives with their goals and transform visionary ideas into measurable outcomes.

Key objectives of this guide include:

- Offering practical steps for operational leaders to deploy AI safely, transparently, and effectively.
- Empowering decision makers to match the right AI solutions to their unique needs.
- Providing actionable tools to turn aspirations into impactful results.

The guide builds upon ITS America's Artificial Intelligence Policy Principles [1] and AI Decoded [2], which have been developed to guide the regulation, development, and deployment of AI technologies in transportation and to demystify AI and showcase its transformative potential in modern transportation. ITS America's AI Principles emphasize trust, human-centricity, and outcome-driven AI use, ensuring that AI applications in transportation:

- Operate safely, transparently, and effectively.
- Deliver net benefits to individuals and communities.
- Build trust to foster broader adoption across the nation.

With this guide, transportation agencies can confidently harness AI to unlock its potential in building safer, smarter, and more connected systems for all users. By embracing these tools and practices, we can reshape transportation to better serve people and communities, driving meaningful and lasting change.

2 Executive Summary

This section provides a foundational overview of the guide, outlining its purpose while introducing key themes and approaches. The guide is designed to equip transportation organizations with clear, actionable steps for successfully implementing AI. By addressing the interplay of processes, people, technology, and data, it emphasizes how different organizational functions must work in unison to develop and execute a cohesive AI strategy.

The core sections of the guide are:

- Executive Function: The role of leadership in fostering innovation and aligning AI strategies with organizational objectives.
- Operational Function: The essential foundations of AI, including data management, processes, technology, and workforce development.
- Delivery Function: Bridging the gap between strategy and execution through proof-of-concepts, pilot programs, and scalable solutions.
- Ten-Point Action Plan: A clear roadmap to prioritize and implement AI initiatives effectively.

Each section provides:

- Key overviews of critical roles in AI deployment.
- In-depth exploration of core focus areas.
- Practical recommendations for different AI maturity stages.
- Real-world case studies demonstrating best practices.

Designed to inspire and inform, this guide emphasizes how transportation systems profoundly impact daily life and why integrating transformative technologies such as AI requires strategic alignment and public trust, with adherence to ethical, cybersecurity, privacy, and regulatory standards. Successful AI implementation depends on delivering solutions that are safer, more efficient, and more resilient.

At its heart, the guide takes a humancentric approach, embracing three essential questions to frame AI adoption:

What? The Essential Building Blocks of AI Implementation.

Who? The key Organizational Functions Critical to Success.

How? A Maturity Model to Integrate These Elements Effectively.

The guide invites transportation professionals to explore actionable tools, real-world examples, and practical insights to turn AI aspirations into impactful outcomes. Detailed sections provide a deeper dive into these strategies.

What? The Essential Building Blocks of AI Implementation

Successful AI implementation in transportation organizations relies on several critical building blocks. They are essential for creating a robust and scalable AI pipeline that can support current and future needs. As shown in our illustration, the building blocks are Leadership, Processes, Data, Technology, People, and Effective Delivery.

These building blocks are not standalone components; they are deeply interconnected. For example:

- High-quality Data feeds into Processes, ensuring accurate governance and model reliability.
- A skilled People function supports the Technology building block by driving innovation and execution.

In addition, some elements depend on external factors like system interoperability standards, digital infrastructure, connectivity, and evolving regulations. Achieving these requires collaboration with stakeholders, including industry partners, academia, and other transportation organizations. (See ITS America-CC Digital Infrastructure Strategy Report for further details.)

Transportation organizations must adopt a holistic approach, integrating these building blocks to create a unified, scalable AI pipeline. This will ensure readiness for both current AI demands and future innovations, enabling organizations to enhance safety, efficiency, economic competitiveness, and mobility in the transportation sector.

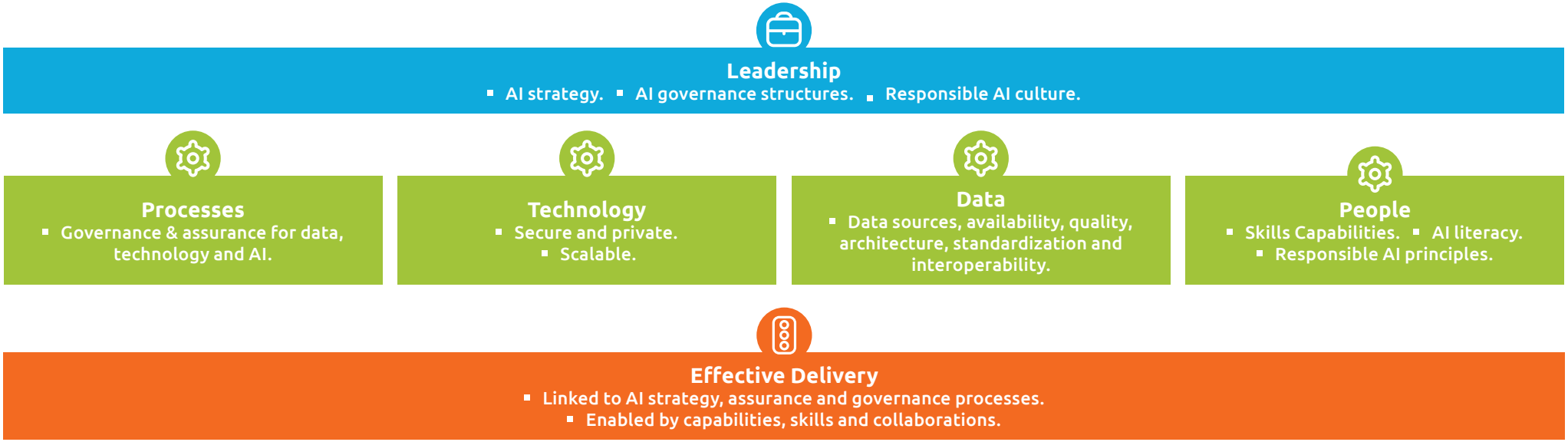

Figure 1: Building blocks for a successful AI implementation.

Who? The Key Organizational Functions

Transportation organizations must ensure three key functions – Executive, Operational, and Delivery – work seamlessly if they are to implement AI successfully. These groups collectively drive the strategic vision, foundational processes and on-the-ground execution required for AI deployment. Central to this collaboration is an AI Governance Group, which ensures coordination, oversight, and alignment across all functions.

Defining the Organizational Functions

1. **The Executive Function** encompasses leadership roles such as Executive Director, Director of Transportation Planning, Chief Technical Officer, Chief Data Officer, Chief AI Officer, and others. These leaders require a solid understanding of AI's implications, impacts, risks, and opportunities to align initiatives with strategic goals and foster trust in the organization's direction. By engaging with the Operational and Delivery functions, as well as external stakeholders, academia, industry, and end users, executives ensure informed decision making that integrates multiple perspectives. This collaboration lays the foundation for achieving strategic alignment and public trust (see Section 3).
2. **The Operational Function** includes teams managing District Operations, Program Development, Program/Project Delivery, Safety Operations, IT/OT infrastructure, Environmental Affairs, Human Resources, Research and Development, Legal and Regulatory, and Procurement. These teams serve as the critical thread connecting the Executive Function's strategic vision with the Delivery Function's execution. Operational teams focus on building the right processes, tools, and capabilities to translate strategic goals into actionable workflows, forming the operational backbone of AI adoption. Their work ensures the organization is equipped – from a toolbox perspective to a workforce perspective – to scale AI implementations responsibly (see Section 4).
3. **The Delivery Function** is responsible for implementation, with teams in Project Delivery, Research and Innovation, Technology Implementation, Procurement, and Public Affairs. These teams focus on delivering targeted proofs-of-concept, pilot projects, and scaled deployments that align with the organization's AI strategy. Their work embeds governance, assurance, and accountability into implementation efforts, supported by data, technical, and people capabilities. This ensures every project adheres to the organization's values and operational goals while enabling successful scaling of AI initiatives (see Section 5).

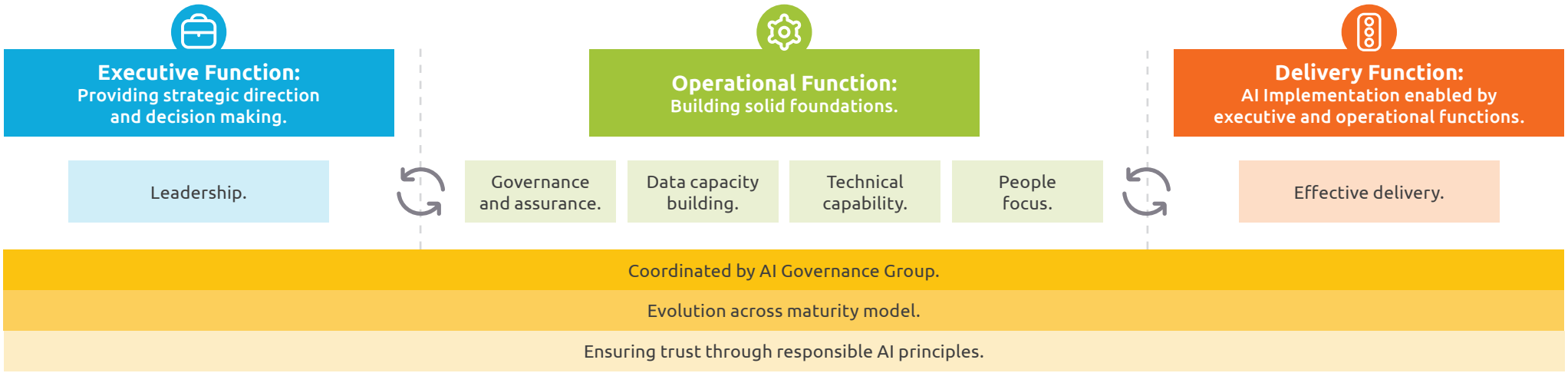

Figure 2: Organizational Functions responsibilities.

The Role of the AI Governance Group

This is the backbone of AI implementation, connecting the Executive, Operational, and Delivery functions to ensure alignment, transparency, and collaboration. The group drives communication, resolves challenges, and upholds ethical standards, embedding principles of responsible AI – safety, transparency, and accountability – into every stage of development.

The AI Governance Group's primary responsibility is to deliver best practices and critical insights to the right teams at the right time, enabling each function to execute its role effectively. (See the illustration below for examples of best practices documentation)

To succeed, the AI Governance Group must be more than an informal initiative. It requires dedicated time, resources, and focus – it should not consist of adding tasks to existing workloads. This investment ensures cohesive coordination, ethical oversight, and strategic progress, building trust both within the organization and with external stakeholders.

A strong, well-resourced group is essential to driving AI initiatives that are impactful, responsible, and aligned with the organization's immediate goals and future aspirations.

To understand how your function can play a pivotal role in this process, explore the tailored insights and actionable recommendations provided in the sections following this Executive Summary. By clearly defining these functions and their collaboration, **this insight empowers transportation organizations to implement AI systems that are not only robust and strategically aligned but also inspire public trust and deliver transformative impact.**

Figure 3: Best practices to follow across functions coordinated by the Governance Group.

How? The Maturity Model for AI Implementation

Achieving AI maturity requires focused effort, resources, and collaboration across all organizational functions. To guide this journey, we have developed a tailored maturity model for transportation agencies, drawing on lessons from established frameworks [3] and real-world insights from our working group and other stakeholders to address sector-specific challenges and opportunities.

Our tailored maturity model offers a clear, incremental roadmap for transportation agencies, outlining key actions and milestones across five levels of maturity – from Level 1 (Aspirational) to Level 5 (Optimized). It helps organizations assess their current state and identify practical steps to drive meaningful change and transformation.

Each level represents a critical step in building AI capabilities:

- Level 1 (Aspirational): Understand AI potential within transportation, organizational needs to implement (both internal to the organization today and new external needs), and gap analysis of technology/data, along with the capabilities and skills.
- Level 2 (Planning): Establish AI strategy and devise an AI strategic plan, create a responsible AI culture program, set up governance and assurance processes, plan capacity building and workforce development, and develop proofs of concept.
- Level 3 (Building Foundations): Enhance data and technological infrastructure, processes, policies, and skills. Create partnerships and engage with users and community to implement pilots.
- Level 4 (Deployment): Establish necessary digital infrastructure and scale-up data and technical capabilities for AI, maintaining robust skills and collaborative partnerships to enable deployments. Review and improve internal processes.
- Level 5 (Optimization): Incorporate continuous improvements on AI strategic plan as new AI developments come into place. Review processes and capabilities and prepare for new implementation needs. Refine and optimize AI systems for sustained impact.

Please see the key actions required across these five stages in Figure 4 (overleaf).

This maturity model offers a practical framework for transportation agencies to assess their readiness, identify gaps, and plan their AI transformation journey. By aligning specific actions with each stage and organizational function, it provides a clear roadmap for progress while embedding the principles of responsible AI.

Detailed actions for each stage of the maturity model, tailored to the responsibilities of the Executive, Operational, and Delivery functions, are outlined in Sections 3, 4, and 5.

Path to AI Maturity in Transportation

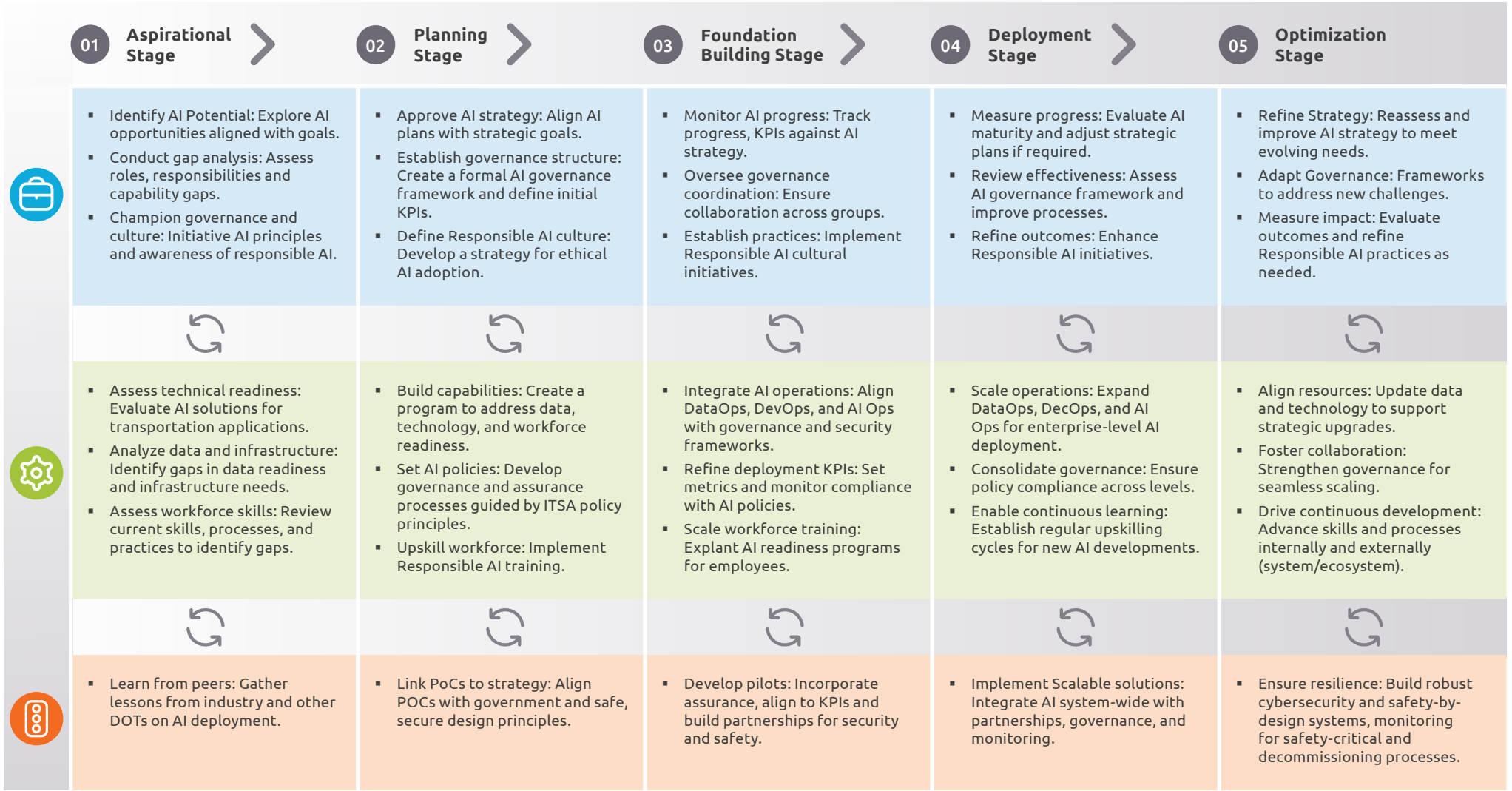

Figure 4: Path to maturity in Transportation organizations.

3 The Path Forward: Ten-Point Action Plan for AI Success

Implementing these priorities is no small task – they require time, effort, and resources across different organizations. Success hinges on leveraging existing roles and expertise while building new skills, processes, and capabilities. Some organizations or even departments within an organization, may be further along than others but aligning funding and resources to the right priorities will be critical.

Beyond identifying these priorities, the actionable steps in the following sections will help make each one a reality and build the capabilities needed for lasting AI success.

Here are the 10 priorities:

These priorities provide a practical roadmap for organizations at any stage of AI adoption, from early exploration to scaling existing capabilities. Success relies on leveraging expertise, addressing skill gaps, and aligning efforts with transportation goals. Here, we break down the Ten Point Action Plan, highlighting their strategic value, with practical steps for implementation.

1. Establish AI Leadership and Strategy

Leadership sets the tone for AI success. A clear AI strategy aligned with transportation goals provides the roadmap for achieving outcomes such as operational efficiency. Executives must define this vision early and secure buy-in across functions to ensure alignment. This involves setting measurable objectives, allocating resources strategically and building trust within the organization.

Key actions:

- Define an AI strategy aligned with organizational goals and broader transportation priorities.
- Engage operational and delivery functions early to foster collaboration and secure trust.
- Establish leadership accountability through roles like Chief AI Officer or AI Governance Lead.

2. Foster a Responsible AI Culture

A strong organizational culture is critical for implementing AI ethically and effectively. Transportation organizations tend to prioritize safety and efficiency, these values must be extended to AI initiatives. Leaders must embed Responsible AI principles – such as transparency – into daily operations and decision making to build trust and accountability.

Key actions:

- Integrate Responsible AI principles into organizational values and operational practices.
- Promote workforce engagement and education to create a shared understanding of AI's ethical dimensions.
- Establish KPIs to measure outcomes, ensuring AI initiatives align with Responsible AI principles and deliver transparent results.

3. Understand AI Technological Capabilities

Understanding where AI can add value is essential for making informed decisions about investments and applications. Transportation organizations should assess the opportunities and risks of AI technologies across various use cases, such as traffic management, predictive maintenance, and service delivery.

Key actions:

- Conduct evaluations of current and emerging AI technologies to identify high-impact opportunities, assess risks and plan mitigations, ensuring alignment with organizational goals. Establishing frameworks to monitor development in AI tech capabilities relevant to transportation and to the organization.
- Hire AI experts to provide holistic insights beyond vendor-specific solutions, enabling DOTs to fully understand the opportunities, risks, and ecosystem-wide impact of AI applications.
- Develop robust business cases for AI applications, outlining costs, benefits, risks, and implementation pathways to support strategic decision making and prioritize investments.

4. Build the Right Capabilities for AI

AI success relies on strong data and technical infrastructure, underpinned by robust cybersecurity measures. Transportation organizations must ensure their systems are flexible, scalable, secure and aligned with broader digital infrastructure transformation efforts. These capabilities should not be developed in isolation but integrated into a wider strategy that prioritizes safety. Identifying gaps in the current data and technical stack and addressing them is critical for enabling the seamless integration of AI into transportation systems.

Key actions:

- Conduct capability assessments to identify gaps in data, technical infrastructure, and cybersecurity protocols, ensuring alignment with transportation strategic goals.
- Invest in scalable, cybersecure infrastructure designed to support AI applications while mitigating risks and ensuring safe operations.
- Align AI capabilities looking into the future with broader digital infrastructure transformation, creating integrated systems that are adaptable to future technological advancements.

5. Strengthen Governance and Risk Management

AI introduces unique risks, such as bias, safety concerns, and regulatory challenges, requiring governance structures to adapt. Transportation organizations must integrate AI-specific governance into existing frameworks, including IT, data, and regulatory governance, while ensuring accountability and fostering innovation. This approach enables organizations to mitigate risks effectively and address the nuances of AI technologies, maintaining public trust and compliance.

Key actions:

- Establish AI governance processes that align with IT, data, and regulatory governance frameworks to ensure consistency and adaptability.
- Define roles and responsibilities for AI oversight across all functions, ensuring accountability for AI-specific risks and outcomes.
- Regularly assess and update governance frameworks to address emerging risks, ensuring continuous innovation and compliance.

6. Monitor AI Strategy Plan with Clear Metrics

Metrics and KPIs are critical for tracking progress and ensuring accountability. Organizations must establish indicators that measure not only technical success, but also organizational readiness, workplace adoption, and user satisfaction.

Key actions:

- Define KPIs that track progress on AI adoption, organizational readiness, and outcomes.
- Use feedback loops from proof of concepts (PoCs) and pilots to refine strategies and improve implementations.
- Ensure metrics are outcome-driven and align with organizational goals, Responsible AI principles, and the expectations of governance boards, and community members.

7. Empower People with Humancentric AI

AI success depends on empowering both the workforce and end-users. Employees need the skills to design, deploy, and oversee AI tools, while end-users must trust in AI's reliability and usability. A humancentric approach ensures technology works for people – not the other way around.

Organizations must ensure employees gain the right level of AI literacy to understand and oversee its applications and limitations. Subject matter experts (SMEs) are critical for providing expertise and professional oversight, ensuring effective use of AI systems.

Key actions:

- Design AI systems with transparency and user accessibility in mind.
- Provide AI literacy training for employees at all levels – tailored to their roles – to enable confident use and oversight of AI technologies.
- Utilize SMEs to ensure professional oversight and Responsible AI implementation.

8. Deploy AI with Intent

AI deployments should be intentional and aligned with strategic goals. Organizations must design PoCs, pilots, and full-scale implementations with clear objectives, supported by robust processes and technical capabilities. Collaborations and partnerships are key. This means ensuring interoperability of data, technical systems, and processes around assurance for cybersecurity, performance, and safety.

Key actions:

- Align deployments with organizational goals and transportation priorities.
- Coordination and interoperability of different approaches on governance and assurance of all partners and stakeholders in deployment.
- Establish processes to monitor AI solutions during POCs and pilots to improve for scaling up securely and safely.
- Incorporate humancentric principles, such as transparency and explainability, into deployment plans.

9. Collaborate for Innovation

Collaboration accelerates innovation by bringing together different expertise and perspectives. Transportation organizations should actively engage with academia, industry, and research institutions to share knowledge and drive progress.

Key actions:

- Partner with academia, research institutions and programs like the University Transportation Centers (UTC) Program, the U.S. DOT Volpe Center, HASS-COE, and Advanced Research Projects Agency-Infrastructure (ARPA-I) to leverage shared expertise.
- Participate in industry initiatives, working groups, and research collaborations to exchange insights and best practices.
- Develop cross-sector partnerships to tackle complex transportation challenges and drive scalable innovation across supplier ecosystem.

10. Ensure Transparency and Trust

Building trust is fundamental to AI adoption, particularly in transportation where public and community confidence is critical. Agencies must ensure transparency, foster communication and design systems that prioritize explainability.

Key actions:

- Create a communication strategy to regularly engage the public and stakeholders, explaining AI goals, benefits and limitations.
- Build AI systems with user-friendly interfaces that allow stakeholders and end-users to understand outputs. Incorporate tools for visualizing and explaining AI decisions clearly.
- Actively gather input from communities throughout development and deployment stages. Address concerns promptly and demonstrate how feedback informs improvements in AI systems.

4 The Executive Function

Leadership is the cornerstone of successful AI adoption in transportation organizations. Establishing a clear AI strategic direction, aligned with your organizations strategic plan is essential to ensuring AI initiatives deliver meaningful and responsible impact. Without a shared vision, teams cannot work together effectively to achieve common goals.

Leaders must prioritize AI projects that address critical transportation challenges and deliver tangible benefits, rather than deploying technology for its own sake. Irresponsible deployment risks wasting resources and eroding public trust. Leadership carries the responsibility of ensuring AI is used safely, ethically, and strategically to tackle the sector's most pressing issues.

Given the priorities, challenges, and budgets across transportation organizations, leaders must carefully allocate resources to AI initiatives that align with their unique contexts. As a transformative yet nascent technology, AI requires thoughtful evaluation of its strategic value and its potential impact on communities, businesses, and the environment.

The Executive Function must develop sufficient AI literacy to embed AI into transportation roadmaps effectively. This includes understanding how AI can contribute to key goals, such as:

- Accelerating safety and efficiency initiatives.
- Driving operational efficiency through innovative problem-solving.

Leaders must also address key complexities in AI adoption:

- **Maturity:** Many AI solutions are in pilot stages with unclear scaling paths. Leaders must assess feasibility, readiness, and strategic alignment to focus resources effectively.
- **Uncertainty:** AI poses risks in performance, safety, ethics, and compliance. Robust governance and responsible processes are essential to mitigate these challenges.
- **Transparency:** Explainable and ethical AI builds trust and secures buy-in from the workforce. Transparent decision making at every level fosters confidence and stakeholder alignment.
- **Skills and Capabilities:** Determine the readiness of the workforce, what additional skills are required for introducing AI.

This foundational knowledge and focus enables leaders to guide the organization through the Aspirational and Building Foundations stages, with a focus on three key areas:

- **Define Strategic Direction:** Assess AI's potential to achieve transportation priorities and develop a comprehensive AI Strategic Direction and Plan. This serves as a roadmap for aligning AI efforts with organizational goals and informs all other functions on priorities, actions, and integration.
- **Champion a Responsible AI Culture:** Promote a culture that prioritizes safety, security, and transparency, ensuring these principles extend across the entire AI system, including partner ecosystems. Engaging the workforce and earning trust in strategic decisions are crucial for the success of any transformational initiative.
- **Establish AI Governance:** Appoint an AI Governance Lead (e.g., Chief AI Officer) and establish an AI Governance Group with representatives from key functions. Using a RACI framework – defining roles as Responsible, Accountable, Consulted, and Informed – ensures clarity in coordination and accountability. This group will drive compliance, oversight, and organizational maturity, with regular assessments to inform strategic decisions and align efforts with an organization's transportation priorities.

Key actions for the Executive Function, outlined in the AI maturity model, empower leaders to build strong foundations, drive strategy, and foster responsible governance to unlock AI's transformative potential.

Executive Function Key Actions

01 Aspirational Stage	02 Planning Stage	03 Foundation Building Stage	04 Deployment Stage	05 Optimization Stage
▪ Identify the potential use and benefits of AI to achieve transportation strategic goals by: ▪ Considering relevant Responsible AI guiding principles for AI implementation in transportation. ▪ Understanding the readiness of current and forthcoming AI solutions within transportation. ▪ Exploring the suitability and potential positive and negative impacts of AI to achieve different transportation goals. ▪ Performing Organizational assessment and gap analysis, of capabilities and workforce skills to undertake AI projects.	▪ Establish and approve the AI strategic plan, targeting each of the transportation strategic goals. ▪ Define a culture change programme for Responsible AI within the organization. ▪ Appointment of Chief AI Officer (CAIO), and set up of AI Governance Group. ▪ Set up coordination channels with Data Governance, IT governance, Regulations and Cybersecurity Governance. ▪ Assess business cases and approval for PoCs link to strategic plan with associated KPIs and success criteria.	▪ Monitor the progress against AI strategic plan and strategic goals. ▪ Empower teams to execute Responsible AI culture programmes. ▪ Monitor and review the functioning of the Governance structure and AI governance and improve if necessary. ▪ Set up external strategic partnerships for pilot implementations. ▪ Assess business cases and approval for Pilots linked to strategic goals and KPIs. Approve PoCs as appropriate.	▪ Measure progress against strategic plan and review as appropriate. ▪ Monitor Responsible AI culture programmes and incorporate enhancements as needed. ▪ Track KPIs on processes, governance and skills on achieving organizational maturity. ▪ Consolidate external strategic partnerships and collaborations for scaling up. ▪ Approve business cases and resources for scale up implementations, based on concrete contributions to achieving transportation strategic goals.	▪ Introduce continuous improvement cycles on strategic plan, as AI technology and capability needs evolve. ▪ Monitor continuous improvements to Responsible AI culture programmes. ▪ Optimize processes for business cases approval for scale up applications. ▪ Re-assess priorities, new needs for technology, new skills needed for new developments on AI that could be useful for achieving strategic goals. ▪ Continue building strategic engagements with other transportation organizations.

Figure 5: Executive Function key actions across the maturity model.

Example:

The Texas Department of Transportation (TxDOT) has developed an AI Strategic Plan to enhance the safety, efficiency, and reliability of its transportation systems. Spanning 2025 to 2027, this plan exemplifies the role of the Executive Function in setting a clear AI strategy. It provides guidance on defining AI, assessing AI readiness, AI adoption and recommending foundational capabilities. Additionally, it outlines a roadmap for implementation and identifies key business use cases. By establishing a unified direction for all stakeholders, TxDOT's plan serves as a central reference point to guide its AI initiatives.

5 The Operation Function

The Critical Role of the Operational Function bridges the strategic direction set by the Executive Function with the execution by Delivery teams. It transforms **'what' needs to be done** into **'how' it gets done** by establishing processes and building capabilities that enable innovation while ensuring safety, security, trustworthiness, and compliance. It plays a critical role in maintaining the integrity of AI deployments, protecting privacy and fostering responsible use.

To achieve this, the Operational Function is accountable for:

- Establishing governance and assurance processes based on best practices [4] to ensure cybersecure and safe AI.
- Developing data and technical capabilities aligned with the AI strategy and maturity assessments.
- Building workforce skills and addressing gaps through upskilling, hiring, or outsourcing.

The following sections provide actionable guidance for each area, beginning with AI Governance Processes.

5.1 Setting up AI Governance Processes

AI Governance processes in transportation organizations should align with guiding principles, best practices and relevant regulations. As part of the organization's broader governance framework, AI governance must integrate with existing systems such as IT (e.g., cybersecurity), data, regulatory, and general governance structure. Setting up a tailored AI governance structure is essential to address the unique risks and responsibilities introduced by the technology, recognizing that no one-size-fits-all solution exists due to varying organizational needs and risk preferences.

AI Governance ensures traceability, transparency, and accountability across the AI lifecycle – from design and development to procurement, deployment, and monitoring. It must adapt to organizational contexts while ensuring alignment with existing governance frameworks.

Areas of focus for Governance should be:

1. Define Roles and Accountability: Assign clear responsibilities across the organization, coordinated with the AI Governance Group, to ensure accountability and alignment.
2. Integrate Guiding Principles: Embed AI policies, regulations, and transportation-specific guidelines into governance processes, ensuring alignment with Data, IT, and Regulatory Governance Groups.
3. Establish KPIs for Progress and Outcomes: Set measurable outcome-based KPIs to track organizational capabilities, skills building, adoption of responsible AI culture, and the benefits of PoCs, pilots, and deployments.
4. Enable Traceability and Documentation: Implement mechanisms to document activities, track AI risks, and ensure AI assurance.
5. Create a Use Case and Risk Repository: Develop a centralized system to manage and monitor AI risks while maintaining records of implemented solutions.
6. The illustration shows the key actions required to evolve AI governance at each stage of maturity.

Operational Function Governance Processes

01 Aspirational Stage	02 Planning Stage	03 Foundation Building Stage	04 Deployment Stage	05 Optimization Stage
▪ Support the Executive to appoint key leadership roles, and to set up AI Governance Group. ▪ Support the Executive with RACI assessments within the Operational Function to determine members of the AI Governance Group. ▪ Perform a maturity assessment of the organization's capabilities and processes and identify gaps to inform the Executive. ▪ Familiarize with best practices and examples for AI Governance in transportation from other organizations.	▪ Define AI responsibilities and roles for governance processes, establish new roles or new teams if necessary. ▪ Develop AI policies at organizational level guided by ITSA AI policy guiding principles. ▪ Define Key AI governance processes for AI developments and for AI procurement, following best practices from OMB. ▪ Assign governance responsibilities within the Operational and Delivery functions for deployment of PoCs.	▪ Embed AI governance processes within all teams with involvement in AI projects. ▪ Establish processes and KPIs to monitor and measure policy compliance. ▪ Create external collaborations through the AI Governance group to the advance knowledge exchange on AI governance and policy of AI for transportation. ▪ Work closely teams for pilot design, development and deployment and coordination of AI governance with pilot stakeholders.	▪ Consolidate AI governance processes and monitor functioning at all levels of the organization. ▪ Establish revision and monitoring of processes with feedback loops and put improvements in place. ▪ Refine KPIs to measure the benefits and value of different pilots and solutions. ▪ Adapt AI Governance processes to scale up implementations which might include coordination of governance with a variety of stakeholders, users, industry, academia and third-party technology.	▪ Establish continuous improvement processes for AI Governance within the organization. ▪ Update of KPIs that evolve with new technological developments. ▪ Update policy with new best practices, regulations and standards that might affect transportation organizations and their AI governance needs. ▪ Continuous engagement and collaboration on governance processes of scaled up implementations.

Figure 6: Operational Function key actions on governance across the maturity model.

Case study

The FHWA in Pennsylvania has a governance process that lends itself well to AI. The State Transportation Innovation Council (STIC) Management Team is able to quickly evaluate innovations to determine whether they are appropriate to be implemented in Pennsylvania. If the innovation is appropriate, it is assigned to a Technical Advisory Group (TAG) to guide it through the Innovation Development Process. Innovation Owners lead development teams and help produce the Innovation Development Summary and Deployment Plan forms while presenting updates on progress at STIC meetings. This integration of state transportation personnel and innovation stakeholders ensures embedded governance at every step of the process.

5.2 Setting up AI Assurance Processes

As per the NIST AI Risk Management Framework, AI assurance processes should provide the necessary evidence on the safety, security, performance, protection of privacy, regulatory compliance, accountability, transparency, and explainability to determine the trustworthiness of the AI solution. AI assurance processes (together with AI governance) are designed to reduce risks, increase user understanding, and build trust.

The importance of AI Assurance in transportation is highlighted in the recent HAAS COE whitepaper, An Overview of AI Assurance for Transportation. Furthermore, in its evaluation and recommendation of AI assurance guidelines, the whitepaper highlights four major pillars on which to focus assurance processes: Basic Lifecycle Considerations, Design Time Assurance, Operation Time Assurance and Contingency Management. It specified that the AI assurance framework should be flexible and open to interoperability in other Federal or state AI assurance programs.

Another very valuable resource is the MITRE report on AI Assurance, a repeatable process for assuring AI-enabled systems (2024). The report recommends that AI assurance approaches should be expanded with sector-specific resources to achieve domain-specific outcomes.

Taking all this into account, the following should be kept in mind for the purposes of AI Assurance:

1. To understand the purpose of the AI solution within a transportation environment, the context of the application, and the complexity of interactions with other systems, data, and people is important to determine assurance needs.
2. To consider best practices, as detailed earlier, to map, measure, and mitigate risks.
3. To develop knowledge, methods, and tools to create cybersecure AI systems by design.
4. To consider interoperability of assurance processes. Transportation projects are normally cooperative in nature, so there is a need to standardize the assurance processes for different contexts and ecosystems. (Different third parties, partners, and contractors might have different ways of addressing assurance.)
5. To consider governance and assurance after deployment, due to the potential high impact of AI in safety and security.

In the context of transportation, the concept of AI assurance should be considered from a humancentric perspective, due to the variety of actors and users that come into the equation. It is also vital to articulate and communicate this assurance to transportation users of the technology or to those impacted by it to ensure trust at the outset as well as over long usage periods.

Key actions for assurance processes at different stages of the maturity model are detailed in Figure 7 (overleaf).

Operational Function Assurance Processes

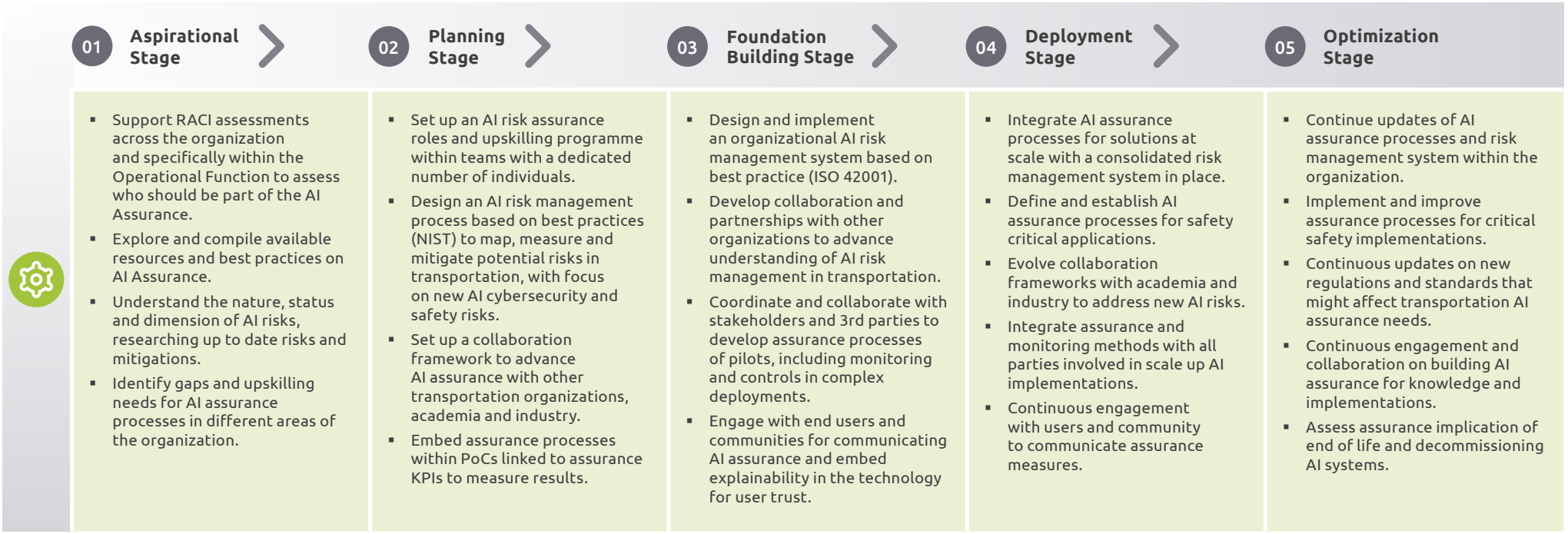

Figure 7: Operational Function key actions on assurance across the maturity model.

Case studies

HAAS-COE has been established to serve as a central place within the USDOT for expertise in automation and human factors, computer sciences, machine learning, sensors and other technologies involving automated systems. The HASS COE will conduct research on areas including systems safety, technical standards and emerging topics assessment. It will facilitate and accelerate collaborative multi-modal and international research, innovation and safe technology deployment.

The FAA is a prime example for safety assurance. It recognizes that due to the nature of AI technology and contexts and applications, the types of evidence necessary to assure safety are not predetermined. In its Roadmap for AI Assurance, 2023 the FAA demonstrates that an incremental approach to assurance processes, learning and building assurance experience on lower criticality functions can build experience with systems and advances in assurance for higher criticality of applications. This can help with developing consensus, before moving towards higher-criticality functions.

5.3 Building Data and Technical Capabilities

The operational level is also responsible for technical and workforce capability building. Key areas of focus are:

1. Data

- There is a need to consider data sources from the outset and to ensure that the required data do not end up in different systems and formats with different access agreements from different suppliers. There must be consideration of data quality and data availability, including data standardization needs, interoperability challenges, and custom agreements with suppliers.
- 'Ground truth' data availability is also important for AI development – this serves as a 'gold standard' that AI models learn from and use to evaluate performance within the appropriate context.

2. AI Model Lifecycle

- Understanding the range of AI models and suitability for right applications.
- Embedding humancentric AI design, development, testing, and validation techniques before deployments.
- Aim for cybersecure and safe models-by-design by embedding assurance and governance from the start.
- Assess suitability of AI models to scale up (PoCs and pilots might unearth higher costs and environmental impact of certain models above others, therefore choosing the more suitable options).
- Consideration of retraining models with new data to prevent performance degradation, as well as monitoring model outcomes to detect any biases or inaccuracies that might develop.

3. Technology Stack

- Designing cybersecure and safe architectures that consider data capture, data processing, data storage and data monitoring, as well as AI model system integration and systems interactions.
- Create infrastructure and frameworks that can support expansion with DataOps, DevOps, and AIOps integration, whether through cloud services, distributed computing, or modular architecture.
- Anticipate systems' interoperability needs and organizational partnerships for solution development.
- Consider the need to build in trust to platforms, for example, add technology such as blockchain enables trust across all the stakeholders.
- Consideration of options such as edge compute, shifting to smaller custom models, and running on CPU rather than GPU.

Key actions and considerations at different stages are detailed below. As before, these are not exhaustive and need to be considered in light of each transportation organization's unique situation and needs.

Operational Data And Tech Capabilities

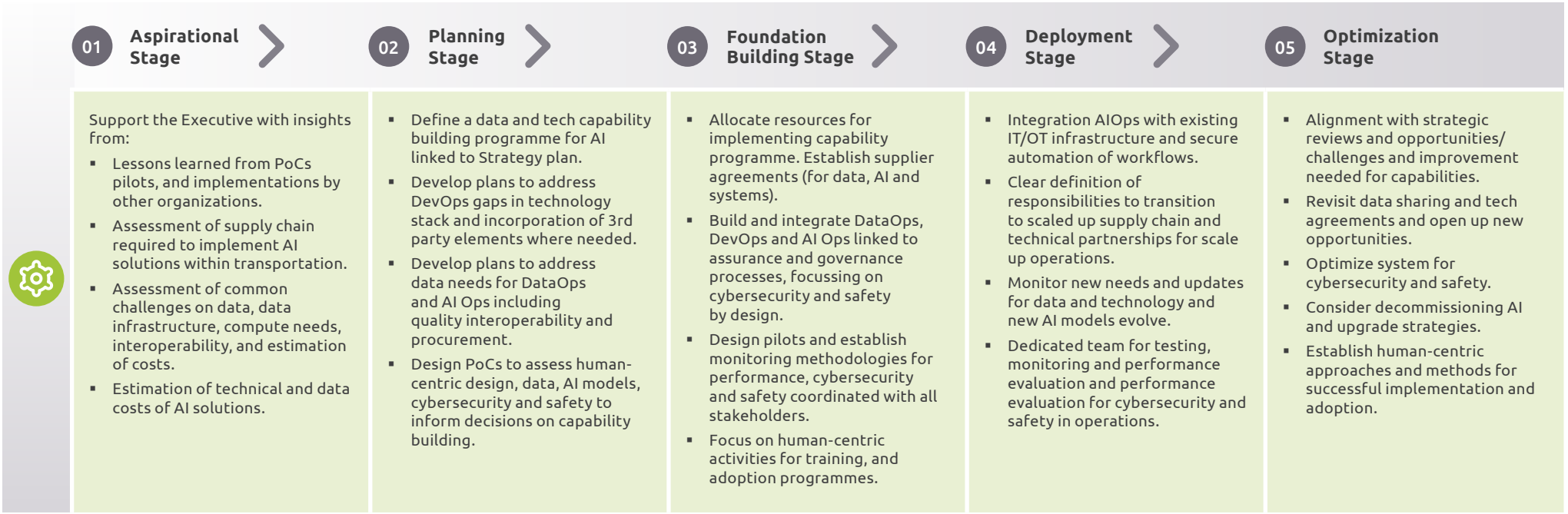

Figure 8: Operational Function key actions on Data and Tech capabilities across the maturity model.

Case study

Caltrans Traffic Operations Data Standards Implementation Recommendations. The project started in September 2023 to provide guidance for Caltrans within the state to improve data and system interoperability across the transportation system. It focuses on improving standardization of traffic operations data communications across California's transportation infrastructure. The benefits of this study and resulting recommendations and roadmap for data standardization will greatly facilitate the use of different data sources by AI technology in order to provide value and solutions that can accelerate innovation and transportation goals.

5.4 Building up People Skills

A Responsible AI culture refers to the ethical and transparent development, deployment, and use of artificial intelligence. Principles of Responsible AI include privacy, transparency, safety, and accountability. These values need to be embedded within the whole transportation organization and need the buy-in of all workforce members. For that, there needs to be an alignment with the mission and core values of that transportation organization in the first place. Based on ISO/IEC 42001, a Responsible AI culture should take into account the following:

- Transparency in development: This includes transparency of AI models and impact of outputs, and adherence to relevant legislation, including legislation about data privacy.
- Alignment with organizational ethical principles: Ensuring that any data bias, algorithmic bias, and instances of discrimination are detected and corrected before deployment. This should also consider any impact on the environment.
- Humancentric assurance with explainability at the core: This ensures that risks and impacts are understood, a risk management system is in place, accountability is established, and the end-user is at the core of developments. This way, human-AI interactions, user understanding, and appropriate guidelines are put in place as a mitigation to the risks defined.

In addition, to achieve a Responsible AI culture, an organization-wide AI literacy or learning program can ensure the workforce has the capabilities to leverage AI responsibly and effectively in their roles. This should be tied to organizational strategy and linked to organizational goals and challenges.

One-off learning events are unlikely to have the same impact as a structured program with executive sponsorship that is embedded across the organization. While a baseline understanding of AI concepts for transportation applications is important across the organization, AI learning content should be differentiated according to the various roles and levels of seniority.

In designing a structured AI learning program, the key areas of focus should be:

1. Assess anticipated upskilling of workforce that AI solutions within transportation require (i.e., technical, legal, cybersecurity, safety, ethics, and regulatory) and prepare a skills development plan.
2. Define objectives and KPIs for AI in transportation that are linked to organizational goals for achieving organization-wide excellence.
3. Foster a responsible AI culture with focus on transportation applications.
4. Design content focused on building broad capabilities, i.e. the skills, knowledge, behaviors, and tools people need to effectively implement AI, beyond technical knowledge.
5. Differentiate learning by role and seniority. Different groups require unique capabilities in relation to AI or more in-depth knowledge of certain issues. Enhance learning outcomes by designing learning linked to roles and responsibilities.
6. Embed mechanisms for feedback that allow for continuous improvement and iteration of learning programs.

A series of key activities as the organization matures is illustrated below. Once again, this is indicative of key actions that will be dependent on each transportation organization's priorities and plans.

Operational People Capabilities

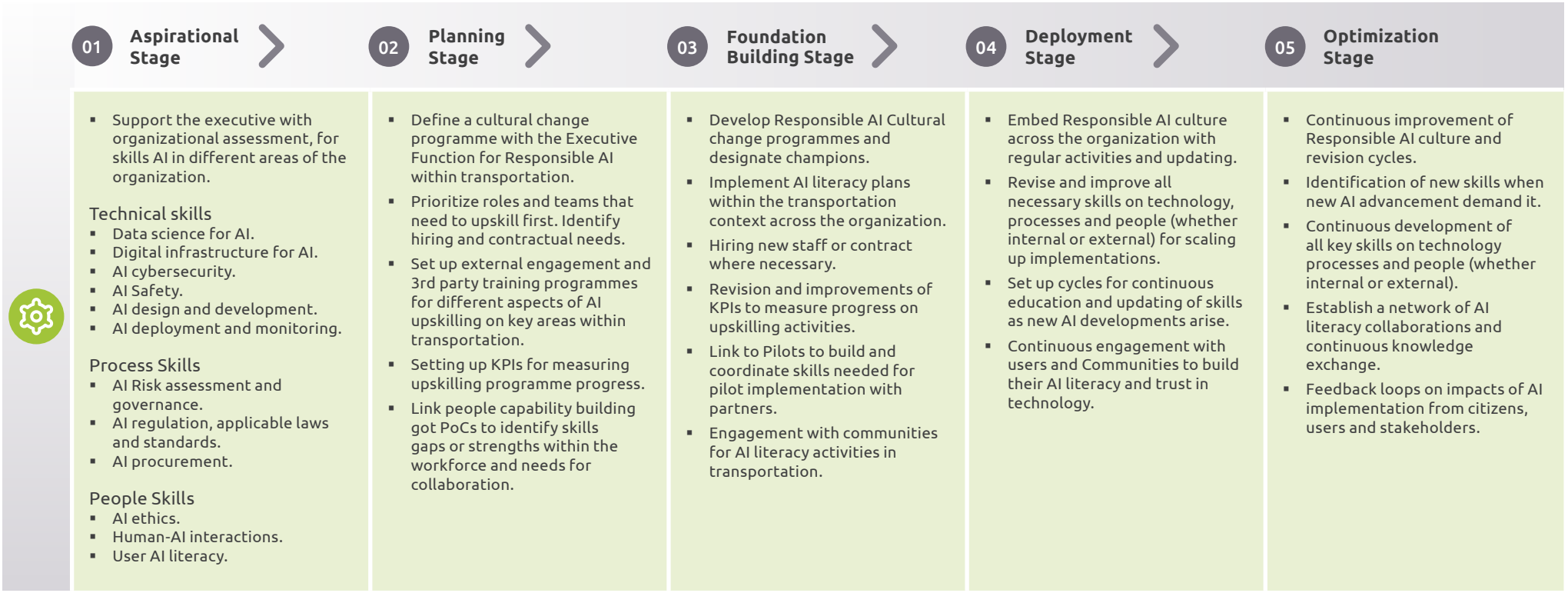

Figure 9: Operational Function key actions on building people skills across the maturity model.

Case studies

The Texas Department of Transportation AI User Group (AI-UG) has an objective to educate Texans about emerging AI technologies, while providing a public forum for public sector stakeholders to engage and drive discussion about next generation AI technologies.

The Washington State Department of Transportation has an Artificial Intelligence Task Force, includes a forum for the discussion of challenges/concerns from the public Stakeholders can use the forum to suggest opportunities for improvement and refine policies related to AI implementation. This task force includes industry representatives, technology experts,. labor organizations and civil liberty groups from across the state.

6 The Delivery Function

The responsibility of the Delivery function is to carry out effective and successful implementation of AI, including PoCs, pilots, and scaled-up solutions. The effective delivery of AI by this function is only possible if it is connected to the strategic direction. It is also vital to have the right capabilities in place, measured by KPIs, with governance and assurance processes embedded to ensure the cybersecurity and safety of the solutions.

PoCs are normally designed to demonstrate a degree of feasibility of the solution for a particular purpose and are developed in a research environment. A pilot encompasses the design and implementation of AI solutions, incorporating lessons learned from pilots, and real environments with a bigger commitment of resources and costs. Finally, to decide on a scaled-up implementation, there needs to be an in-depth strategic business case and cost-benefit analysis. Information gathered after pilot deployments will provide sufficient evidence to assess the impacts on and benefits to transportation goals and build the strategic case for scaling up.

In all these types of implementations, there will be key areas to consider:

Context of Application and Level of Risk

- Determine the context of application and the level of risk of the AI within that context (i.e., safety critical or not safety critical) and decide accordingly what levels of governance and assurance need to be in place.

Solution Level Decisions

- Plan for solutions that are humancentric, cybersecure, safe, and fair by design.
- Prioritize choices for AI design, development, and deployment such as data needs, compute needs, and deployment decisions like edge computing.

Governance Assurance Processes

- Embed AI assurance processes within implementations, with mitigations in place linking to KPIs and reporting to the AI Governance Group.
- Involve the community in decision making, providing transparency on governance and assurance of the technology and embedding explainability in AI solutions to build trust.

Data and Technical Capabilities in Place

- Coordinate with the Operational function to build the right technical and data capabilities needed for AI implementations.
- Explore the technical stack necessary and third-party elements, partnerships and outsourcing that need to be in place.
- Considerations for third party elements or skills and procurement need following the Federal Office for Management and Budget (OMB) best practices.

Humancentric Developments and Implementations

- Ensure humancentric AI developments and implementations that have the end-user and the community as a core part of the AI application.
- Address human-AI interactions, with appropriate interfaces and use of the technology, with sufficient transparency and explainability in place to build trust.
- Focus on the upskilling needs for the entire AI lifecycle and education of end-users. Organizations could consider partnerships and contracting with others to achieve this.
- Maintain continuous community engagement and consultations to monitor the impacts on AI implementations in the communities and make sure safety and efficiency are being achieved.

Our maturity model shows the main key actions at different stages of implementation (see Figure 10 overleaf).

Delivery Function

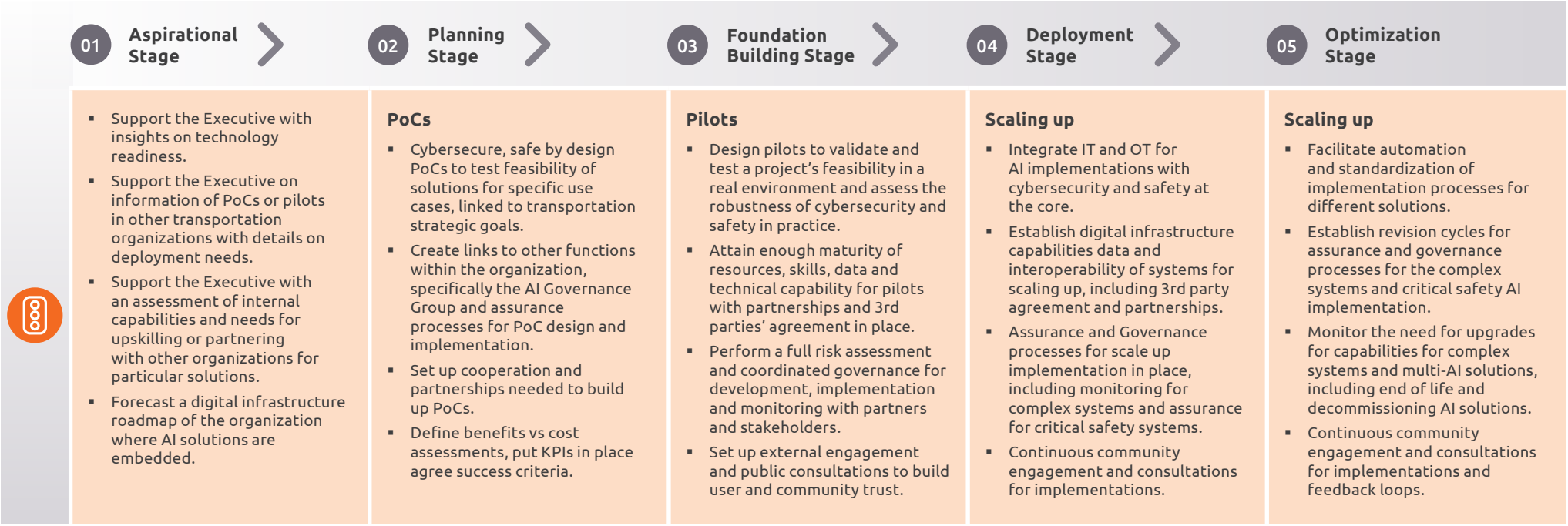

Figure 10: Delivery Function key actions across the maturity model.

Case study

The Delaware Department of Transportation (DelDOT) Final Report on AI, released in April 2024, details how it has been creating an 'AI-enhanced integrated transportation management system (AI-ITMS)'. This system has implemented AI solutions in different contexts to monitor traffic flows, identify anomalies, and evaluate, predict and execute response solutions to traffic congestion problems. DelDOT highlights that its system 'goes beyond' a simple notification system and that it works proactively to enhance mobility by making changes that evolve over time. In assessing its challenges and lessons learned, DelDOT points to institutional challenges as a key area of focus. DelDOT claims that in-house software development is vital to successful systems integration. DelDOT further advocates for a suitable funding and contracting mechanism for the retention of AI and ML development services. The old model of procuring an 'off the shelf' product is increasingly unsuitable for the dynamic requirements of advanced and constantly changing systems.

7 Summary

Implementing AI in transportation is complex and demands a clear vision, aligned resources, and coordinated execution. This is a summary of the Top 10 Action Plan detailed previously.

1. **Establish AI leadership and strategy:** Align AI initiatives with transportation goals through clear strategic direction and strong leadership.
2. **Foster responsible AI culture:** Build organizational accountability, ethics, and skills to ensure AI developments are safe, while protecting consumers' rights.
3. **Understand AI technological capabilities:** Assess benefits, opportunities, and risks that inform business cases and strategic investments.
4. **Build the right capabilities for AI around data, technical, and cybersecurity assets:** Develop robust infrastructure, technical expertise, and cybersecurity measures to ensure safe and scalable AI.
5. **Strengthen governance and risk management:** Implement processes to identify, measure, and mitigate AI adoption risks effectively.
6. **Monitor AI strategy plan with clear metrics:** Use KPIs to refine goals, address dynamic needs, and continuously improve strategies.
7. **Empower people with humancentric AI:** Focus on humancentric design, AI literacy at all levels, and end-user and community engagement.
8. **Deploy AI with intent:** Establish the right humancentric and technological capabilities, processes, and KPIs needed to design and implement PoCs, pilots, and scaled implementations effectively.
9. **Collaborate for innovation:** Partner with academia, industry, and stakeholders to share knowledge and drive meaningful progress.
10. **Ensure transparency and trust:** Foster internal alignment and public confidence by ensuring AI solutions are explainable, transparent, and ethical.

8 Conclusion

Organizational maturity in the Executive, Operational, and Delivery functions of a transportation organization is paramount to responsible safe, and effective AI deployments. This AI Implementation Guide provides transportation practitioners across all facets of an organization with a roadmap on how to think about collaboration, governance, and culture when deploying AI.

To achieve our shared transportation safety and efficiency outcomes with AI, we must continue to foster a culture of safety, trust, transparency, and accountability within organizations at the outset. From there, organizations deploying AI can communicate an even greater sense of trust and usability among end-users and the community who will ultimately benefit from the deployment of these technologies.

As we move toward a transportation system powered by intelligent technologies such as AI, there is an opportunity to realize the benefits across the transportation system and for all stakeholders. Careful consideration before technical implementation enables AI to be adopted and deployed at scale, representing a good investment for all involved.

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3 AI Maturity Framework Enterprise Applications, IBM, 2021, A Data Science Maturity model for Enterprise assessment, Oracle, 2020), some are more organizational-oriented (AI Maturity Model and organizational assessment, MITRE, 2023), and others are more holistic (Ethical AI Maturity model Salesforce (2021), Responsible AI Maturity Model, Microsoft, 2023).

4 *See* ITSA AI policy principles, NIST AI risk management framework, HASS AI Assurance White paper, MITRE AI Assurance A Repeatable Process for Assuring AI-enabled Systems , ISO/IEC 42001 AI risk management system.

5 AI Risk Management Framework | NIST.

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