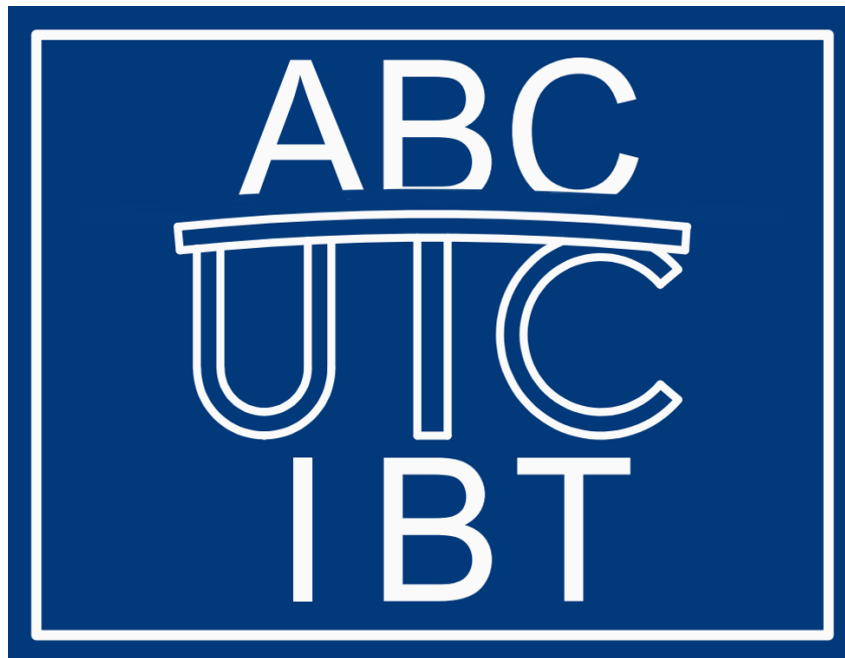# THE NEXT GENERATION OF TRANSPORTATION ASSET MANAGEMENT

Quarterly Progress Report
For the period ending April, 2024

Submitted by:
Principal Investigator – Dr. Atorod Azizinamini
Co-Principal Investigator – Dr. Ankitha Arvan

Affiliation: Department of Civil and Environmental Engineering
Florida International University
10555 W Flagler St, Miami, FL 33174

Submitted to:
IBT/ABC-UTC
Florida International University
Miami, FL

1. Background and Introduction

Transportation asset management (TAM) is a strategic approach to optimizing the performance, safety, and cost-effectiveness of transportation networks. This proposal seeks to conduct a current review of transportation asset management programs (TAMP) (at the national, state, and various international programs) to reveal high-level trends, identify gaps, and ultimately provide a comprehensive framework for United States Department of Transportations (US DOT) to incorporate into their unique TAMPs to address needs related to next generation asset management programs.

Many U.S. state departments of transportation have developed comprehensive plans aligned with FHWA guidelines, utilizing data-driven analysis to guide maintenance and investment decisions. These plans focus on pavement and bridge assets as priority areas, and some include other focus areas such as geotechnical or hydraulic assets. Emerging trends point to the integration of new technologies like AI and sensors to enable predictive maintenance and a shift from reactive to proactive asset management.

While some states have robust programs in place, gaps remain in fully implementing risk-based, lifecycle-driven asset management across networks. Internationally, asset management strategies focused on disaster risk reduction reflect a similar evolution toward more proactive, technology-enabled techniques.

There is a lack of consistent standards across jurisdictions, limited data sharing, and integration across assets. Developing a new framework could accelerate the adoption of next generation transportation asset management by facilitating a common vision, highlighting best practices, providing implementation resources, and promoting greater collaboration across transportation agencies.

2. Problem Statement

Many State DOTs need improved approaches for ensuring that their assets continue to provide the functions for which they were designed, as well as for managing their asset inventory and making optimal decisions, with the limited resources available. The objective of the proposed idea is to develop user friendly, economical, and comprehensive tools that states could incorporate into their unique TAMPs.

3. Objectives and Research Approach

The main objectives of the project include:

Objective 1: Accumulation of extensive information on the existing approaches (successes, challenges and shortcomings) for individual national, state and international TAMPs, through literature reviews, expert interviews, surveys and workshops, and

Objective 2: Development of a system architecture that states could incorporate into their individual TAMPs.

4. Description of Research Project Tasks

The following is a description of tasks carried out to date.

Task 1 – Literature review

A mix of desk research, surveys, interviews, peer workshops, and solution assessments will provide comprehensive insights into global best practices that can inform the new transportation asset management framework. This task will include:

1. Desktop study of existing transportation asset management plans and frameworks. Thoroughly review state DOT and international plans to analyze current practices, strategies, and gaps.

2. Survey state DOTs on their asset management programs. Gather details on current status, maturity level, technologies used, challenges/gaps, and future plans. Compare across states.

3. Review academic literature on latest asset management research and innovations. Look for cutting edge methods and technologies piloted in studies.

4. Interview asset managers at leading state DOTs. Get insights on lessons learned, keys to success, pitfalls to avoid, and advice to peers.

5. Host workshops with transportation officials to discuss real-world issues and priorities to facilitate peer knowledge sharing and networking. (Further detailed in Task 3)

6. Examine case studies of optimization projects that improved asset performance or ROI. Identify replicable strategies.

7. Benchmark asset management programs internationally. Compare US and global approaches to glean best practices.

8. Assess technological solutions and tools for modernizing asset management (including incorporation of smart sensors, AI and autonomous vehicles and other new-age technologies). Determine which are most impactful to TAMPs, and other new technologies that soon will be ready for widespread adoption and need to fit into TAMPs.

Deliverable: Report on Findings Interim Report (The interim report will include complied information from the desktop study, surveys, interviews; The final report will include the findings from in person DOT workshops and international visits following Tasks 3 and 4).

Progress: This task has been completed 100%

Task 2 – Formation of ad-hoc committee

1. Develop anticipated needs from the ad-hoc committee (i.e Monthly web-call, report review, etc.)

2. Request formal commitment of existing proposed committee members identified in Section 2.2.1, as well as any other requested member of the committee

Deliverable: Kick off meeting by March 31, 2024 to introduce committee members and share detailed work plan.

The following is the list of individuals who already confirmed to serve for the committee (Note: other individuals may be asked to join to address individual technical or other needs of the program):

Name	Title	Organization
Laura Wagner-Bartz	Asset Management Section Manager, Digital Transformation Solutions	HNTB Corporation
Rabindra Koirala	State Bridge Maintenance Engineer	GDOT
Russell T Howells	Project Manager - Structures	KCI Technologies Inc.
Joe Krajewski	Senior Technical Advisor - Structures	HNTB Corporation
Doug Cantrell	Staff Engineer – Structures Management Unit	North Carolina Department of Transportation
Louis Ruzzi	Structural Engineer	WSP USA
Negar Naeimi	Transportation Engineer (Civil)	Bridge Design Branch 19
Matthew Mortensen	Bridge Inspection Engineer	DelDOT Bridge Section

Progress: This task has been completed 100%

Task 3 – US workshops
Below are some suggestions for conducting a successful best practices workshop with a state DOT and their stakeholders. The goal is to foster an open, productive dialogue where all stakeholders feel heard and can contribute to improving the asset management program.

1. Preparation:

    a. Work closely with DOT to identify key stakeholders (engineers, contractors, IT staff, planning department, maintenance crews, etc.) to invite so that the workshop views the elements of TAMPs from planning, through design, preservation and repair of all types of infrastructure assets.
    b. Send clear objectives, agenda, and any prep materials in advance.
    c. Set ground rules up front to encourage openness - no judgement, stay collaborative, focus on improvement.

2. Format:

    a. Have experienced facilitators guide each group to keep them on track.
    b. Start with presentations from DOT on current program and practices. Allow time for Q&A.
    c. Break into small groups with cross-functional participants to tackle specific topics or case studies.
    d. Reconvene to share group findings and have open discussion on challenges and potential solutions.
    e. Capture all feedback, recommendations, action items.
    f. Leave time for networking and informal discussion.

3. Follow-up (this step serves to make the workshop a good ROI for key stakeholders to take the time to participate in the workshop for immediate internal collaboration and follow-up measures with the broader participants of the national and international workshops:

a. Establish working groups to continue momentum on key initiatives identified.
b. Express appreciation to DOT leadership and all participants and keep the individuals up to date on the progress of the Idea program by sharing key milestones, report findings, and eventually revisit each DOT to present the new architecture. Allow the participants to provide feedback to the new framework before finalizing next steps in the process.

Deliverables: Workshop summary or presentation on individual workshop findings - share workshop summary, feedback, and next steps with all participants. Following Tasks 3 and 4, Interim Report from Task 1 will be updated, and a Final Report will be prepared on the current state of TAMP.

Progress: This task is ongoing

Task 4 – International visits
Following the same proposed tasks and deliverables as in Step 3.

Progress: This task is ongoing

Task 5 – Development of new TAMP architecture
Incorporate findings from Steps 1-4 into the new asset management framework and supporting implementation plan. The new structure will address the following components:

1. Awareness: the reports and summaries from the conducted workshops will result in information that is consumable, important and impactful to the transportation asset management community. We will work with other industry groups (TRB, ASCE, DFI, etc.) to further broadcast the results. It is anticipated that the most impactful information from the study will be the shortcomings in current US DOT TAMPs, to have the architecture needed to incorporate innovative technologies, AI, smart sensors etc. into existing framework to make proactive decisions for different transportation assets. The awareness should not be alarming to the industry, and each shortcoming should be addressed in the new proposed framework or as a need for future incorporation.

2. Acceptance and Adaptability: To assist state DOTs with incorporation of the new TAMP framework, videos, guidelines, and support will be provided as needed to facilitate wide industry acceptance and adoption. The framework will be adaptable to and leave room for future technological advancements and we will prioritize a system that works with existing structure as much as possible with the least learning curve to incorporate the findings of this IDEA proposal. Marketing of the program results will be executed through existing high-level relationships including other University Transportation Centers, the ad-hoc committee, industry involvement, tradeshow presentations and professional publications.

The specific deliverables and schedule for this task will be expanded on following Task 4 given that the specific needs and associated tasks and outcomes of the new framework are not yet known.

Progress: This task is ongoing

Task 6 – Develop future needs

Under this 18 month proposal, it is likely that there will be components of the next generation of TAMP that can not be implemented or prioritized in this study. A report on future needs will be generated to address any of these individual future needs of the program, to stay one step ahead of creating an adaptable framework capable of handing future demands. The specific deliverables and schedule for this task will be expanded on following Task 5 since the specific needs of the new framework is not yet known.

Progress: This task is ongoing

Task 7 – Program reporting (ongoing)

A technical progress report will be submitted at the end of each quarter to the members of the ad-hoc committee. The report will cover progress of individual tasks, approval of travel budgets to conduct workshops, review of project accomplishments and any risk mitigation measures that may be needed to stay on time and on budget. As needed, web-calls with the participating members will be hosted.

Progress: This task is ongoing

5. Expected Results and Specific Deliverables

Output: Literature review, expert interviews, surveys, workshops, quarterly and final reports, journal articles, and conference presentations.

Outcome: Development of a new, comprehensive system architecture for the next generation of transportation asset management system.

Impact: Development of brand new, economical, and cost-effective transportation asset management system. The new system is necessary to work with current technological and other advancements in the transportation industry to consider long-term sustainability of infrastructure decision making processes.

6. Schedule

Progress of tasks in this project is shown in the table below.

Item	% Completed
Percentage of Completion of this project to Date	85%

Research Tasks	2024												2025					
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
1. Literature Review	▨	▨	▨	▨														
Interim Report				✗														
2. Formation of Ad-hoc committee	▨	▨	▨															
Kick-off web-conference			✗															
3. US Workshops			▨	▨	▨	▨	▨	▨	▨	▨								
4. International Visits									▨	▨	▨	▨						
TAMP Current Status Final Report													✗					
5. Develop new TAMP architecture										▨	▨	▨	▨	▨	▨	▨		
6. Develop future needs															▨	▨	▨	▨
7. Quarterly Progress Reports			✗			✗			✗			✗		✗				✗

7. References

[1] Sinha, K. C., Labi, S., & Agbelie, B. R. (2017). Transportation infrastructure asset management in the new millennium: continuing issues, and emerging challenges and opportunities. Transportmetrica A: transport science, 13(7), 591-606.

[2] Vandervalk-Ostrander, A., Guerre, J., & Harrison, F. (2003). Review of data integration practices and their applications to transportation asset management (No. FHWA-IF-03-023).

[3] Management/Preservation, Bridges and Structures, FHWA 2022 (https://www.fhwa.dot.gov/bridge/management/).