Long-Term Bridge Performance

LTBP Road Map

Roadmap: First Five Years

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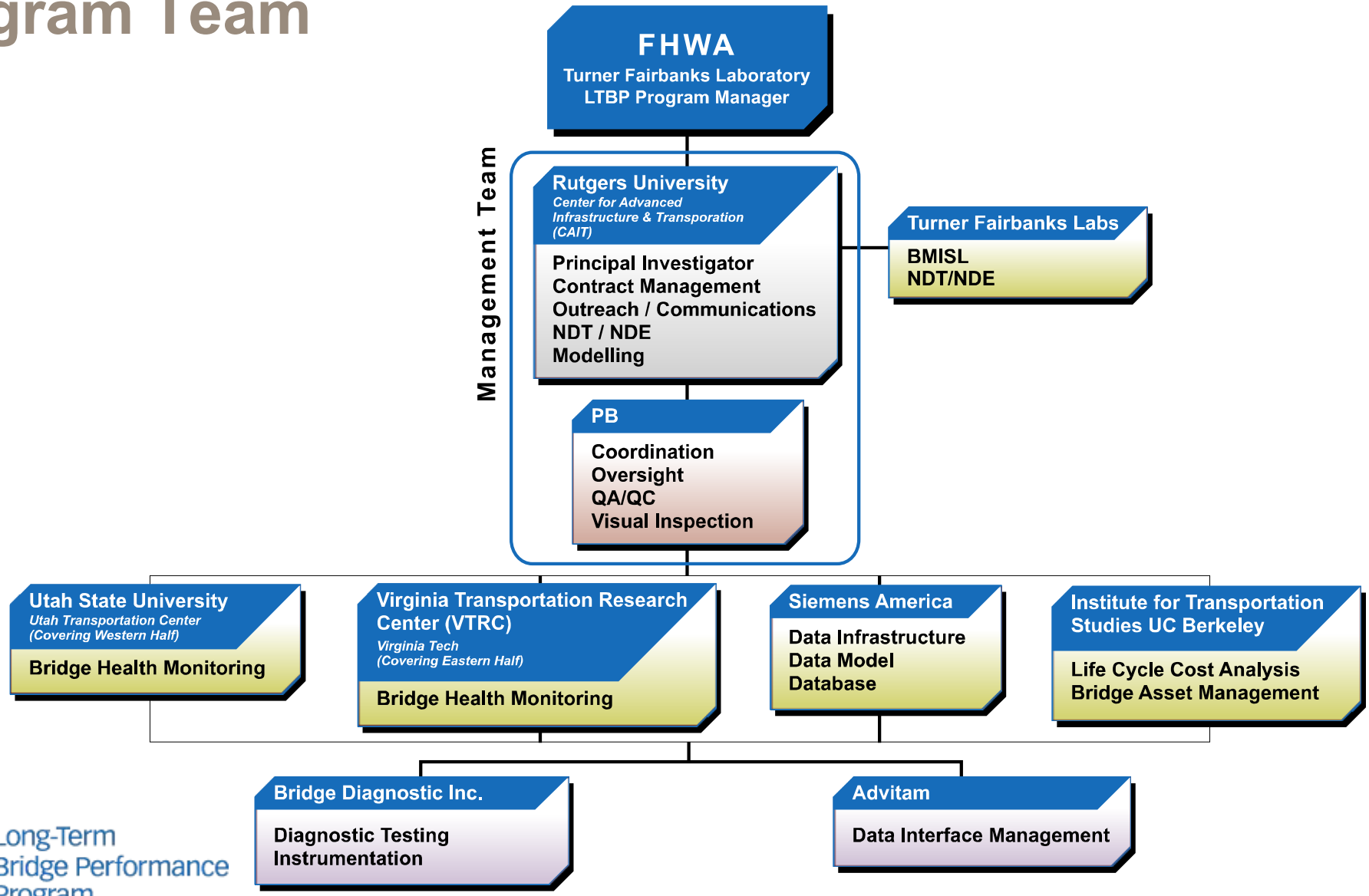
Long-Term Bridge Performance Program

Program Outcome

- **Improved Knowledge of Bridge Performance**
  - *Structural*
    - Better Understanding of Bridge Deterioration
    - Improved Predictive Models
    - Next Generation Design Methods
  - *Operational*
    - Improved Bridge Preservation Practices
    - Improved Life Cycle Cost Models
    - Next Generation BMS

Long-Term Bridge Performance Program

Program Team



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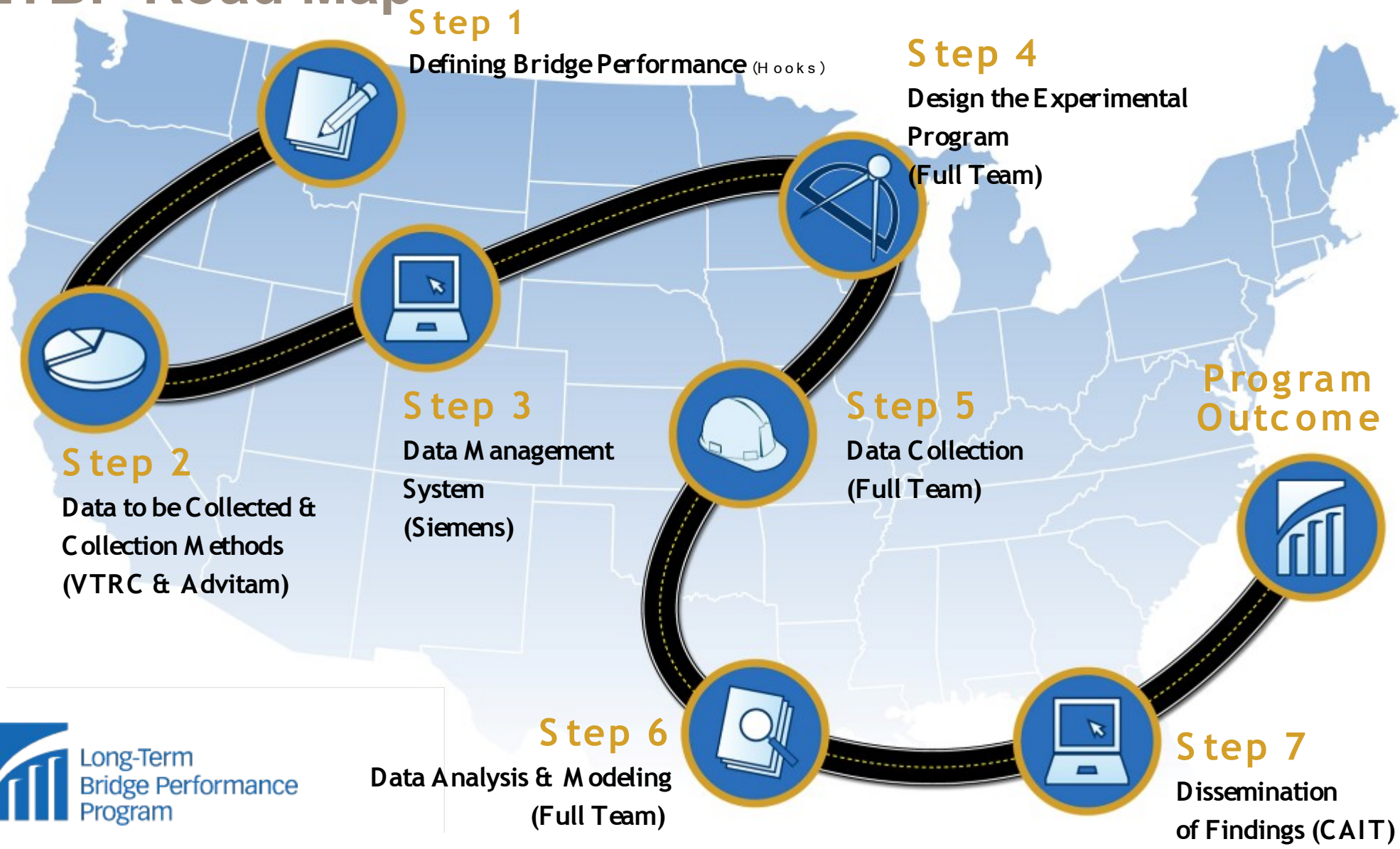
LTBP Road Map



Step 1
Defining Bridge Performance (Hooks)

Step 2
Data to be Collected & Collection Methods (VTRC & Advitam)

Step 3
Data Management System (Siemens)

Step 4
Design the Experimental Program (Full Team)

Step 5
Data Collection (Full Team)

Step 6
Data Analysis & Modeling (Full Team)

Step 7
Dissemination of Findings (CAIT)

Program Outcome

Long-Term Bridge Performance Program

Step 1 – Defining Bridge Performance

Current Status:

- **Conducted Focus Groups with CA, FL, VA, NY, NJ, MN, IA, UT, and TX; interviews planned with MT, OR, AL, IL, OH, NE**
- **Consultation with Expert Working Group**
- **Drafted primer on bridge performance**
- **Identified 20 issues affecting bridge performance to be studied under LTBP**

Define Bridge Performance that is acceptable to FHWA and address broad categories of structural condition, response to loads and impact on traffic service and safety

Long-Term Bridge Performance Program

Step 1 – Defining Bridge Performance

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- **Conducted Focus Groups with CA, FL, VA, NY, NJ, MN, IA, UT, and TX; interviews planned with MT, OR, AL, IL, OH, NE**
- **Consultation with Expert Working Group**
- **Drafted primer on bridge performance**
- **Identified 20 issues affecting bridge performance to be studied under LTBP**

Establish what aspects are critical to FHWA, SHAs. Select those that can be addressed within LTBP resources and recommend for first 5 years of study

Long-Term Bridge Performance Program

Step 1 – Defining Bridge Performance

Current Status:

- **Conducted Focus Groups with CA, FL, VA, NY, NJ, MN, IA, UT, and TX; interviews planned with MT, OR, AL, IL, OH, NE**
- **Consultation with Expert Working Group**
- **Drafted primer on bridge performance**
- **Identified 20 issues affecting bridge performance to be studied under LTBP**

Identify and classify the factors that impact the aspects of performance determined above

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Step 2 – Data to be Collected

Identify all of the relevant parameters for which high quality data should be documented and/or measured to assist with evaluating performance - Las Vegas Document as start

Current Status:

- **Conducted literature review of the 20 performance issue topics**
- **Identified salient research questions yet to be answered under each topic**
- **Defined the data required to address these questions and fill the knowledge gaps**

Long-Term Bridge Performance Program

Step 2 – Data to be Collected

Determine and evaluate the usefulness of relevant bridge and transportation data that is currently being collected

Current Status:

- **Conducted literature review of the 20 performance issue topics**
- **Identified salient research questions yet to be answered under each topic**
- **Defined the data required to address these questions and fill the knowledge gaps**

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Step 2 – Data to be Collected

Determine the items of relevant bridge and transportation data that are not currently being collected but are critically needed

Current Status:

- **Conducted literature review of the 20 performance issue topics**
- **Identified salient research questions yet to be answered under each topic**
- **Defined the data required to address these questions and fill the knowledge gaps**

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Step 2 – Data to be Collected

Investigate the feasibility and cost of obtaining and managing high quality, quantitative data on the items identified above

Current Status:

- **Conducted literature review of the 20 performance issue topics**
- **Identified salient research questions yet to be answered under each topic**
- **Defined the data required to address these questions and fill the knowledge gaps**

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Step 2 – Data to be Collected

Recommend what relevant bridge data should be collected

Current Status:

- **Conducted literature review of the 20 performance issue topics**
- **Identified salient research questions yet to be answered under each topic**
- **Defined the data required to address these questions and fill the knowledge gaps**

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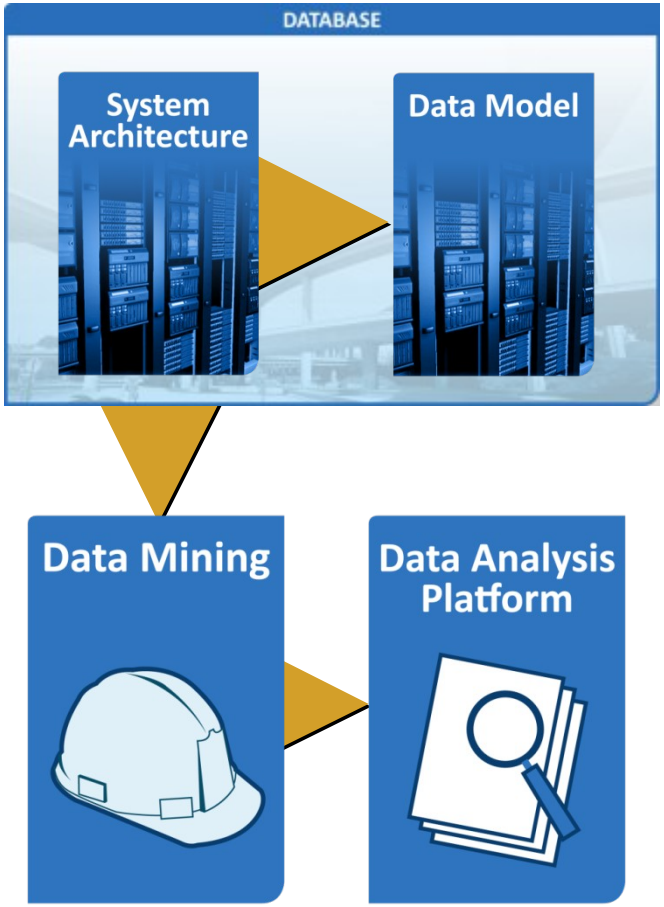
Step 3 – Data Management System

Current Status:

- **Prototype database system established to house/link to:**
  - ***NBI data***
  - ***Pontis data***
  - ***Inspection reports, maintenance records, photos, etc. as available***
  - ***Weather, traffic and seismic data***
  - ***'Legacy' or historic/external data collected by different states***
  - ***Geographic/GIS data***
- **Developed BridgePortal prototype, providing users web-based navigation and querying of the database system, and as well as graphical representation of data**
- **Ability to integrate with other asset management systems, i.e., pavement and safety**
- **Developing plans to roll-out system to bridge community**



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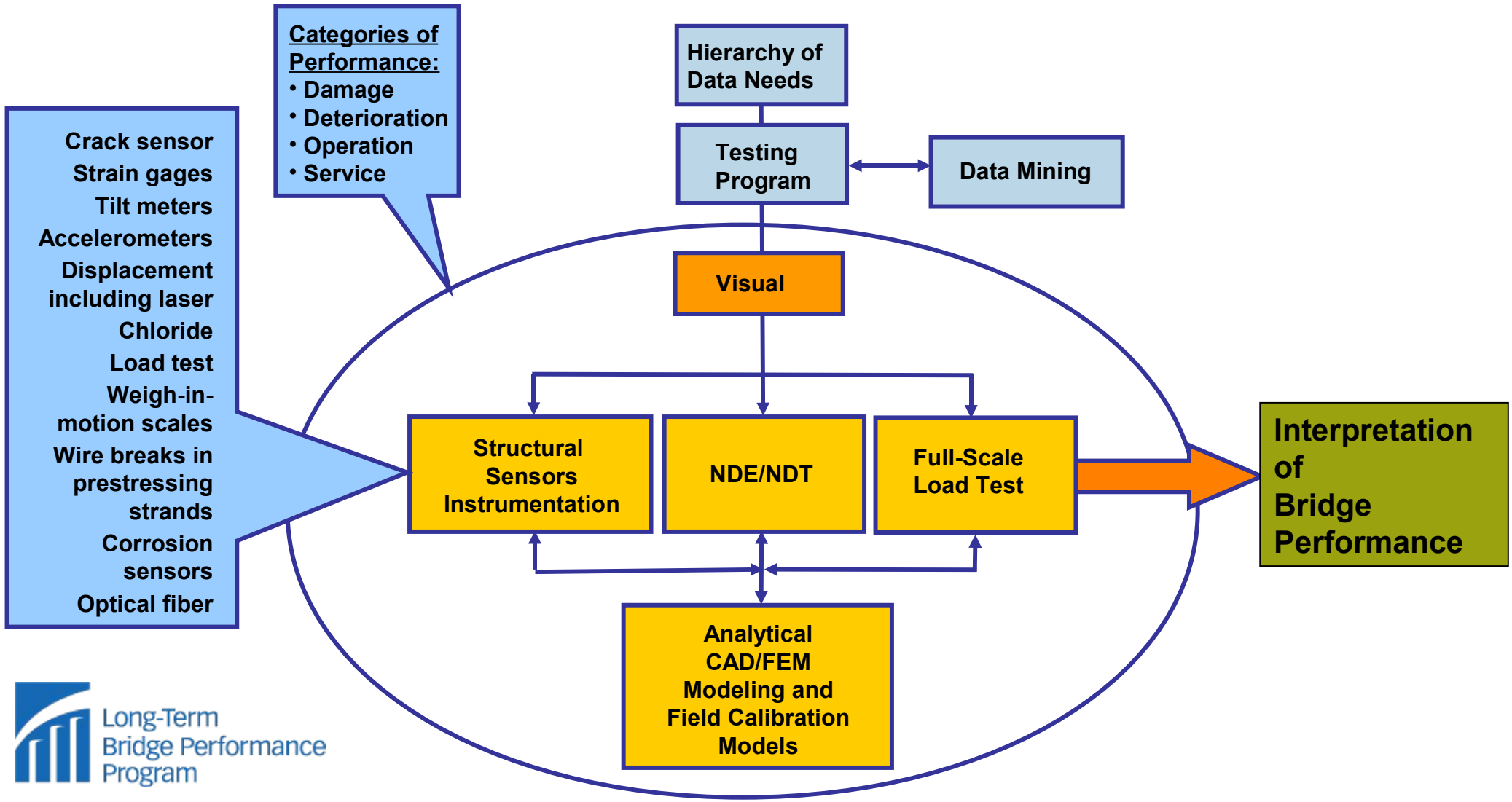
Concept: Integrating High-Quality Quantitative Data



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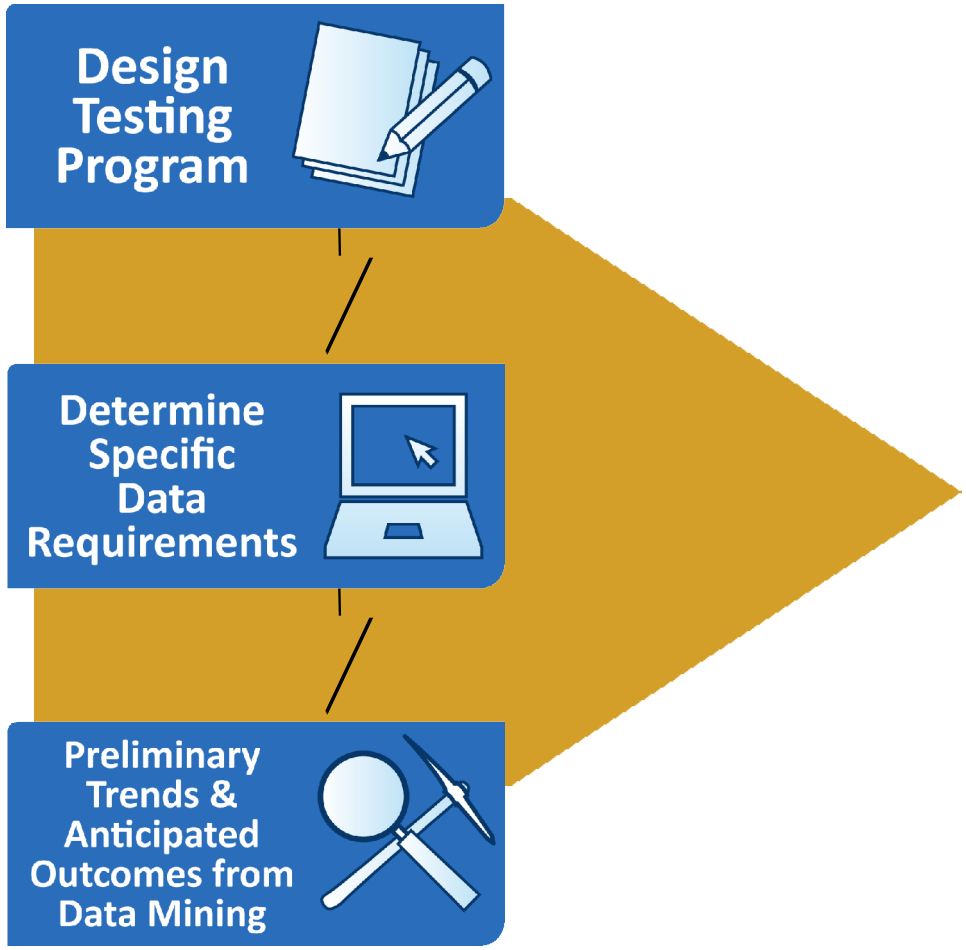
Step 4 – Design the Experimental Program



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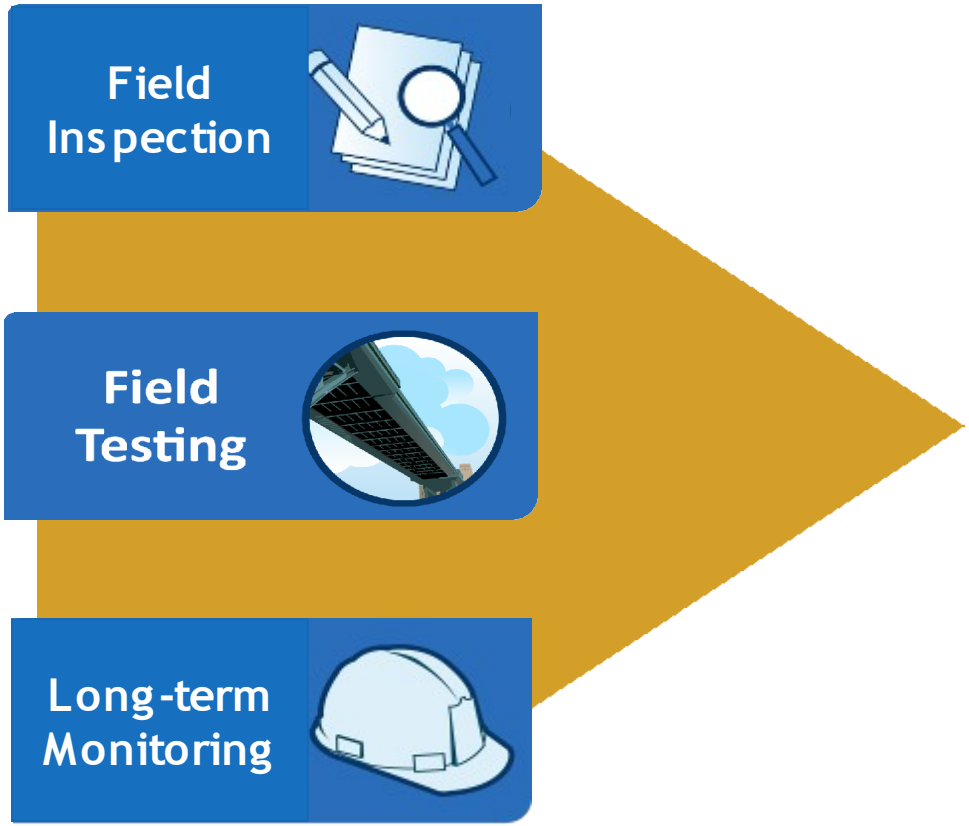
Current Status:

- **Compiled data collection matrix, matching the data needs with applicable data collection methods, collection frequencies, cost considerations, priority rankings, etc.**
- **Drafted NDE/NDT protocols**
- **Drafting visual inspection protocols**
  - ***Utilizing segmental approach***
  - ***Quantitative measures***
- **Selected pilot bridges in VA & UT**
- **Drafted instrumentation plans for VA & UT pilot bridges**
- **Conducted feasibility study and conceptual design of an Accelerated Infrastructure Testing Facility**

Step 5 – Data Collection - Pilot



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Current Status:

Initiating Pilot Phase

- Evaluate and refine protocols for:
  - Visual Inspection / Documentation
  - NDE (GPR, Impact Echo, Ultrasonics)
  - Electrochemical Testing
  - Physical Sampling and Testing
  - Structural Load and Dynamic Testing
  - Structural Modeling
- Install Long-Term Instrumentation to monitor:
  - Loading (Superstructure Stress/Strain/ Tilt)
  - Environment (Wind, Precipitation, Temp)
  - Traffic (Vehicle Type/ Frequency/WIM)

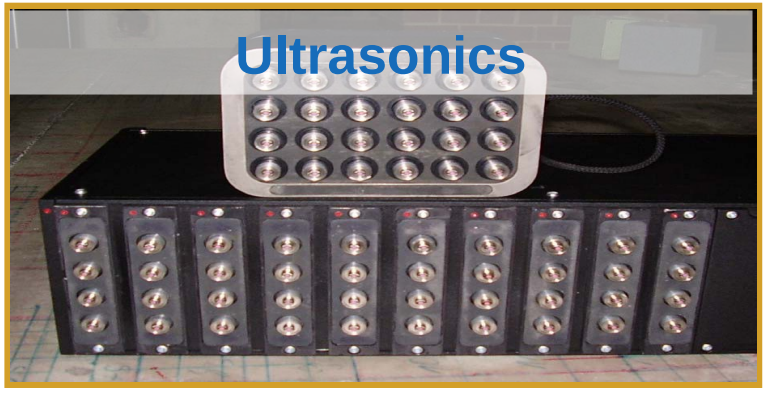
NDE Techniques

GPR

GPR

Seismic / Ultrasonic

Ultrasonics



Ultrasonic / Impact Echo

Resistivity

Half-Cell

Long-Term Bridge Performance Program

LTBP Pilot Program – Virginia Pilot Bridge

Constructed in **1979**
2-Span continuous built-up **steel** girder

- CIP **concrete** deck
- **16,500** AADT
- **6%** truck traffic
- NBI Deck condition rating = **6**

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LTBP Pilot Program – Utah Pilot Bridge

Constructed in **1976**
Single span AASHTO beams with **integral abutment**

- CIP concrete deck with asphalt overlay and membrane
- **22,250** AADT
- **29%** truck traffic
- NBI Deck condition rating = **7**

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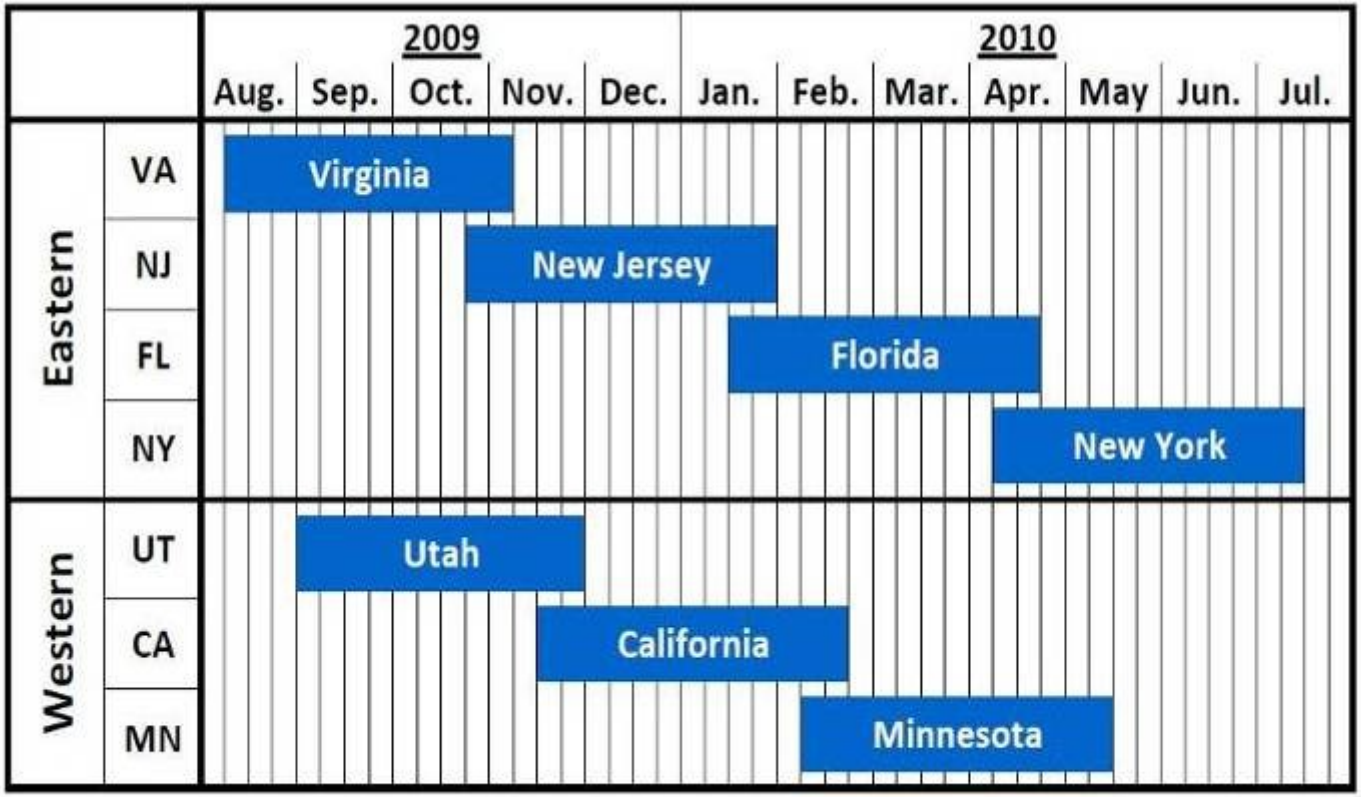
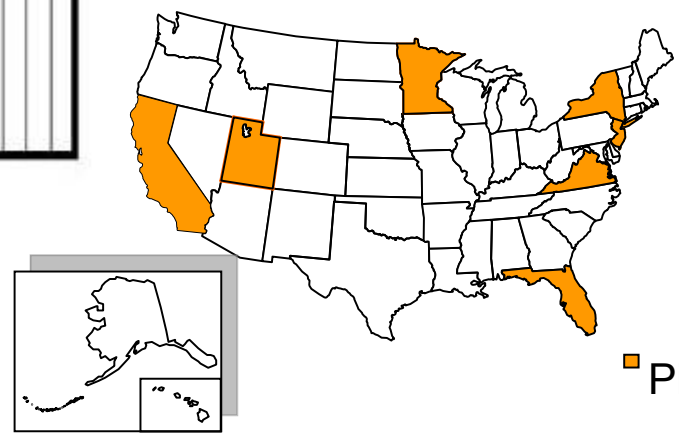
Step 5 – Pilot Phase Schedule





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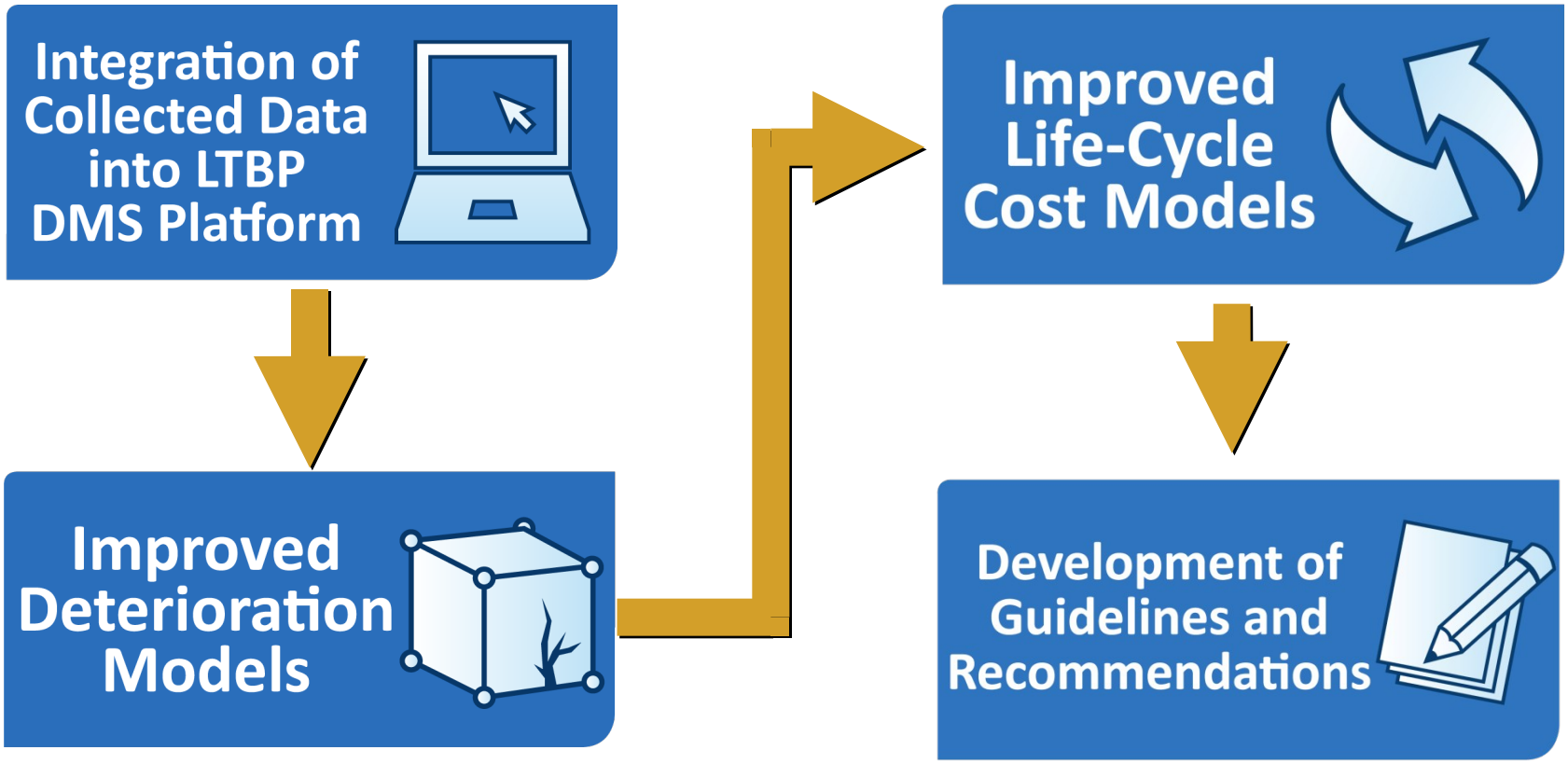
Step 6 – Data Analysis & Modeling



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Step 7 – Dissemination of Findings

Outreach to all Bridge Stakeholders

Education

New FHWA Resources

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