Lost in Translation:

Communication Pitfalls and Solutions from The Big Dig

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PMI NH Chapter
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Boston's Big Dig: Ceiling Tile Collapse – July 10, 2006:
26 tons of concrete fell. A woman died. What failed – and why?

Big Dig Tunnel Construction	The Event	Lessons for PMs	Hidden Assumptions
• Labor-intensive, expensive • Disruptive to Boston communities • Government-funded project	• Collapse in the I-90 tunnel • Crushed a car • Milena Del Valle killed	• Challenge assumptions • Design with failure in mind • Ensure responsibility is owned • Test under real-world conditions	• Epoxy was strong enough • Design met code, must be safe • Inspection complete • Once installed, should last

Today's Agenda and Learning Objectives:

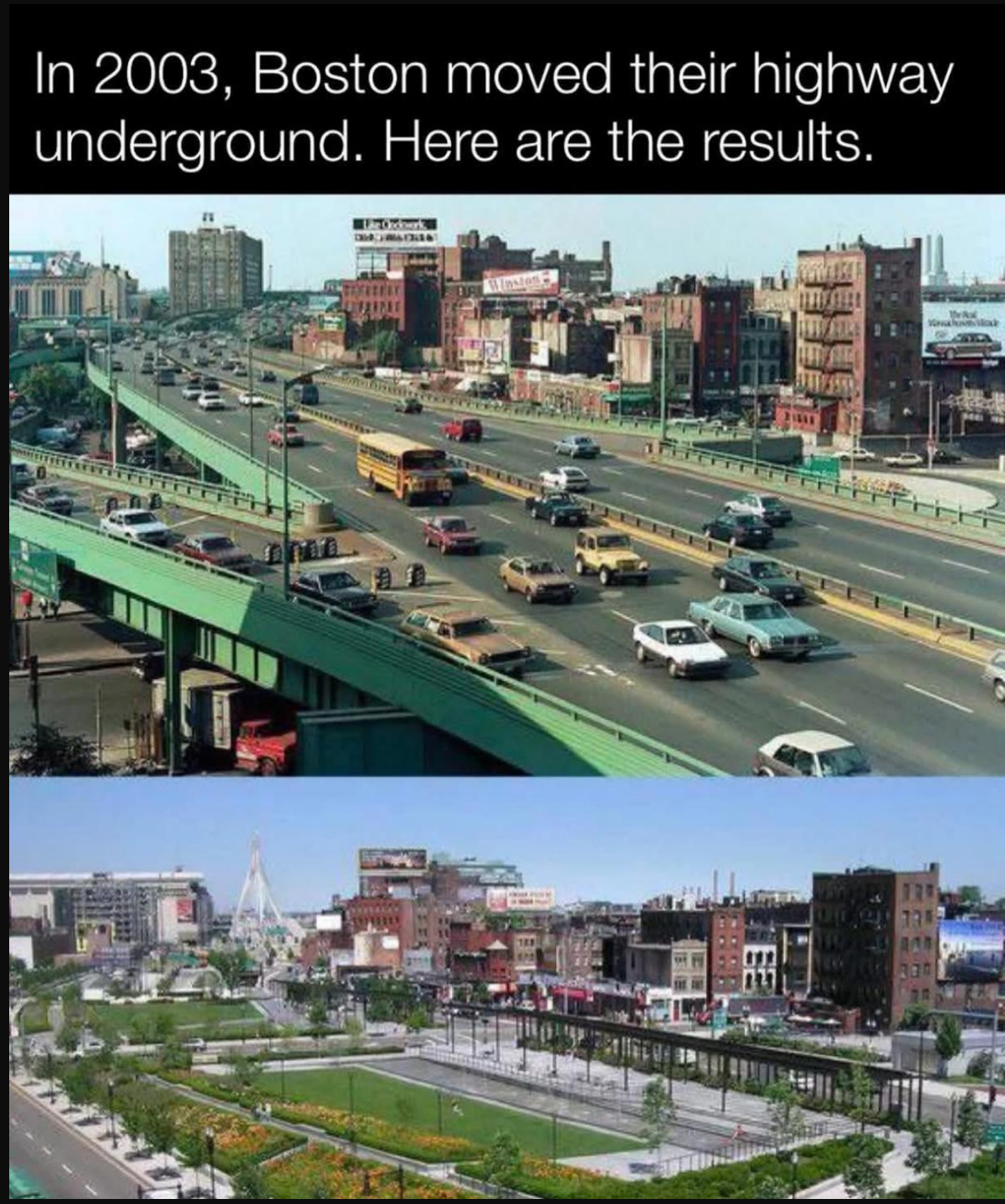
Using the Big Dig as a Case Study of a Mega Project

Align the Vision	Frame the Problem	Map the Path
• Create clarity • Set measurable goals	• Solve the right problem • Align with strategy	• Turn strategy into plans • Plan structured path

- Poll: Think of a project, which one of these tools is most needed at this point in your project?

What is Boston's Big Dig?

- Most complex and controversial infrastructure project in US history
- Central Artery/Tunnel project – replaced elevated highway with tunnels/bridges
- Executed from 1991 to 2006
  - 15 years long, $14.8B cost
- Elements you may recognize include:
  - Zakim bridge
  - Rose Kennedy Greenway
  - Ted Williams Tunnel



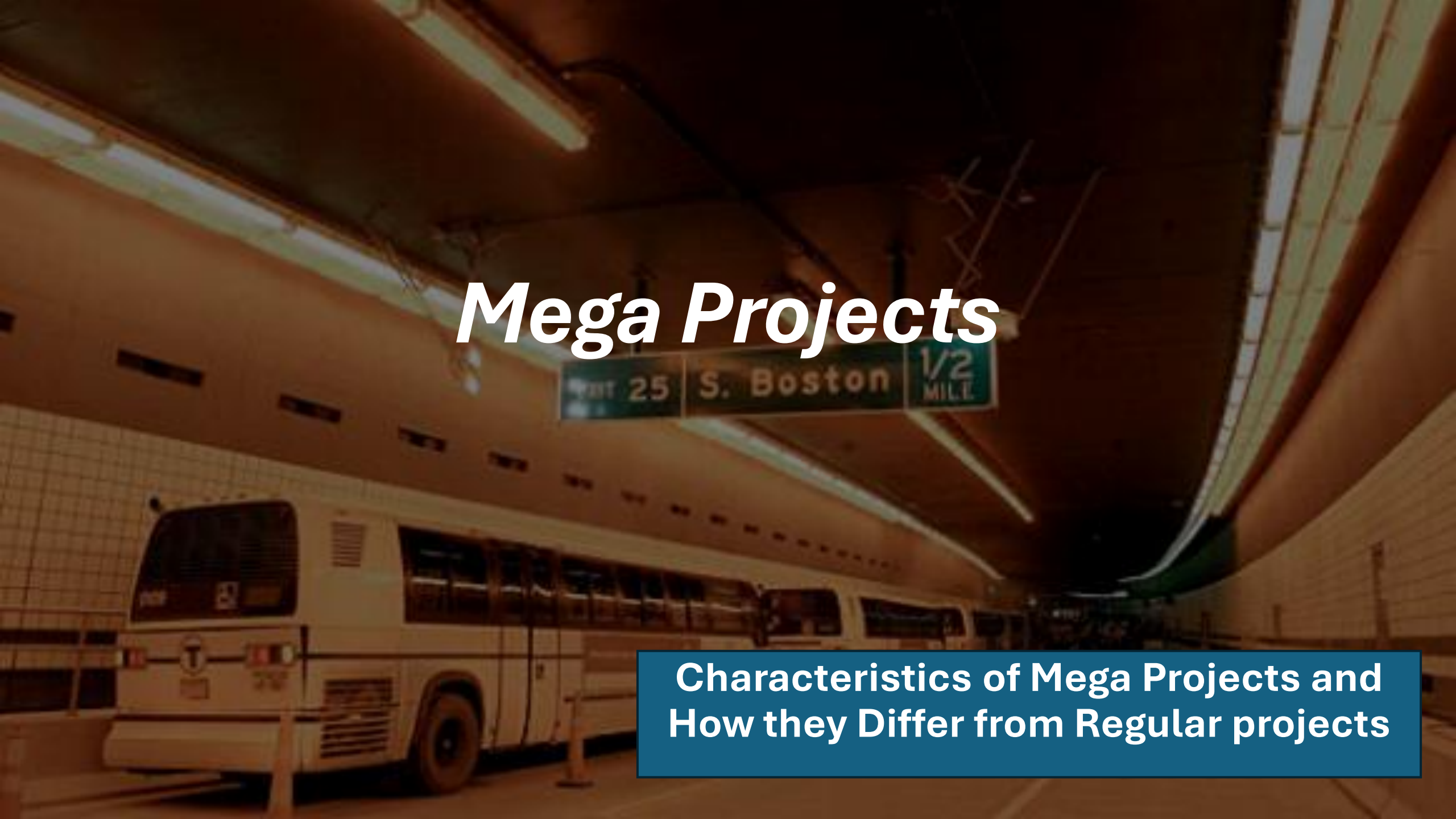
Impact on Boston

Pros:

- Urban transformation
- Improved accessibility
- Symbol of engineering

Cons:

- Public perception: project mismanaged
  - 7 years late and $12B over budget
- Bechtel/Parsons Brinckerhoff sued for mishandling project - $458M settlement
  - Leaking tunnels
  - Schedule delays due to tunnel building mishaps
  - Woman died due to ceiling tile collapse

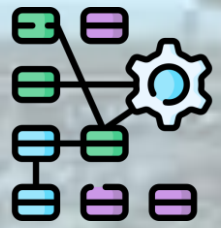


Mega Projects

Characteristics of Mega Projects and How they Differ from Regular projects

Mega Projects typically meet one or more of the following characteristics:

Project **cost** > $1 B



Highest levels of **complexity** for team

Have long schedules that result in more **team turnover** than typical

Requires huge physical and financial **resources** or stretches them to the limit

Built in areas with **hostile** climates and inadequate infrastructure

Include large number of **stakeholders** each with distinct expectations

Losing Value Through Cost Overruns and Delays

Example of Mega Project	Average Cost Overrun (% of Budget)	Average Schedule Overrun (# years)
Olympic Games	150% - 160%	N/A
Berlin Airport Expansion	200%	+9 years
Panama Canal	60%	+1 year
UK High Speed 2	100%	+ 8 years
Boston's Big Dig	*640%*	*+ 7 years*

Mega Projects often achieve completion – but do they achieve performance?

- The gap between design completion and operational value remains one of the most underestimated sources of value erosion

Case Study: Boston's Big Dig

How did Project Failures Contribute to Delays?

Align the Vision	*Frame the Problem*	*Map the Path*
• Poor stakeholder communication • Downplayed problems • No clear measurement of progress • Skipped steps	• Difficulty resolving technical issues • No techniques to innovate solutions	• Overly optimistic schedules • Insufficient oversight • No consolidated roadmap or plans

Align the Vision

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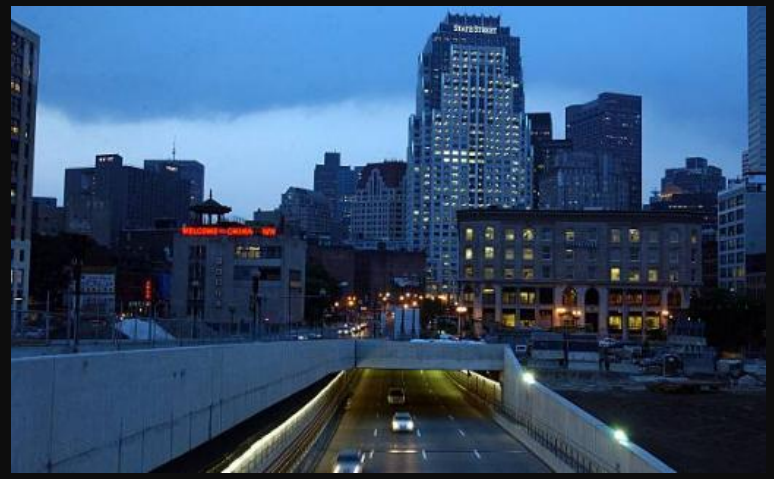
How to implement effective OKRs and what specific metrics are valuable to track?

Building OKRs – Example of Big Dig Strategy

Big Dig Overall Strategy:

- Deliver infrastructure components safely, on time, and on budget
- Build public trust through transparency and accountability
- Ensure engineering quality meet long-term performance standards
- Encourage adaptive learning to ensure real-time adjustments to roadmap



OKRs – Why Important?

OKRs: Outcomes not activities, clarity of purpose, transparency, alignment

Key results: Motivation and engagement, agility and adaptability

OKRs - Template

Objective	Key Result	Key Result
Goal 1: *What do we want to achieve?*	**Goal 1 - Key result 1**: *Tracks progress toward objective*	**Goal 1 – Key result 2**: *Specific, measurable, and out-come focused*
Goal 2: *Ambitious, timebound, motivational*	**Goal 2 – Key result 1**: *Not task-based*	**Goal 2 – Key result 2**: *Should have a clear target*
Goal 3: *1-3 objectives per quarter*	**Goal 3 – Key result 1**: *Could be number, percentage, date*	**Goal 3 – Key result 3**: *2-5 measurable outcomes*

OKRs – Big Dig Ceiling Tiles

Objective	Key Result	Key Result
Obj 1: Ensure long-term structural safety of overhead ceiling panels in the I-90 connector tunnel.	**Obj 1 - Key result 1**: Complete load-bearing testing for all ceiling anchors by 3/2004	**Obj 1 – Key result 2**: Implement ceiling inspection and maintenance plan with 100% coverage before tunnel opening
Obj 2: Achieve flawless & verifiable installation of ceiling tiles support systems to ensure public safety and compliance.	**Obj 2 – Key result 1**: Conduct 3rd-party inspections on 100% of ceiling panel installations by 3/2004	**Obj 2 – Key result 2**: Resolve discrepancies within 10 business days, docs submitted to office

Frame the Problem to Map the Path

Elaborate on Problem Framing process and give example of how it can resolve a specific problem

Problem Framing – Why Important?

- Brainstorm to assess key business/technical issues
- Create environment to foster creativity and innovation
- Develop positive attitudes about what can be done
- Partner with key business/technical experts
- Collect actions – put into plan

Template

PROBLEM FRAMING CANVAS: Defining the Right Problem

Look Inward

What is the problem?
Describe it

List some symptoms

Why haven't we solved it?
- ☐ It's new
- ☐ It's hard
- ☐ It's low priority
- ☐ Lack of resources
- ☐ Lack of authority
- ☐ A (situational) inequity
- ☐ Other: _____

Explain more…

How are we part of the problem?

What assumptions and biases surround this problem? *Individual, system, explicit, implicit…*

Which of these might be redesigned, reframed, or removed?

Who experiences the problem?

When and where do they experience it?

What consequences do they experience?

How do lived experiences of the problem vary?

Look Outward

Who else has it?
Colleagues, competitors, other domains, etc.

*How do they **deal** with it?*

Who does not have it?
Colleagues, competitors, other domains, etc.

Why not?
- ☐ Avoided
- ☐ Mitigated
- ☐ Solved
- ☐ Transferred
- ☐ Other: _____

Who has been left out so far? *Let's broaden our perspective…*

Who benefits when…

…this problem exists?

…this problem does not exist?

Reframe

Stated another way, the problem is: _____.

Make it actionable: How might we _____ as we aim to _____?
(action that addresses the stakeholder/user problem) *(objective / desired condition to be achieved)*

PROBLEM FRAMING CANVAS: Defining the Right Problem – BIG DIG

Look Inward

What is the problem?

- *Ceiling tiles are not adequately affixed to the ceiling, need to be replaced.*
- *Upon inspection, epoxy dried up and cracked over time*

List some symptoms

- *One ceiling tile fell off and killed someone*

What else are we missing?

- **What options do we have? Can we use lighter ceiling tiles? How to make fixes and keep tunnels open? How to communicate with the public? How can we be sure fixes are adequate? Are there updates in engineering standards we need to follow? What should the frequency be of post-construction inspections? How well are responsibilities aligned with MassDOT, Bechtel contractors? What deadlines are we under?**

What assumptions and biases surround this problem?

- *If it passes inspection, it must be safe?*
- *The epoxy bolts will hold indefinitely*
- *Delays are more dangerous than design risks*

Look Outward

Who else has it?
Colleagues, competitors, other domains, etc.

- ***Related infrastruc-ture projects***

Why haven't we solved it?

- ☐ It's new
- ☐ It's hard
- ✓ **Inadequate testing**
- ✓ **Schedule pressures**
- ✓ **Delay avoidance**

Who benefits when…

…this problem does not exist?

- ***Safety, public approval, construction quality, budget/schedule alignment***

Reframe

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Roadmaps: Map the Path

Summarize how these elements should be added to the plan of execution

Road Maps – Why Important?

- Provide strategic direction, planning and decision-making
- Improved stakeholder communication & confidence
- Drive cross-functional alignment
- Prioritize execution while providing flexibility to adapt

Template: How to Build Roadmaps?

Component 1

Component 2

1. Current work outcomes

3. Continued work

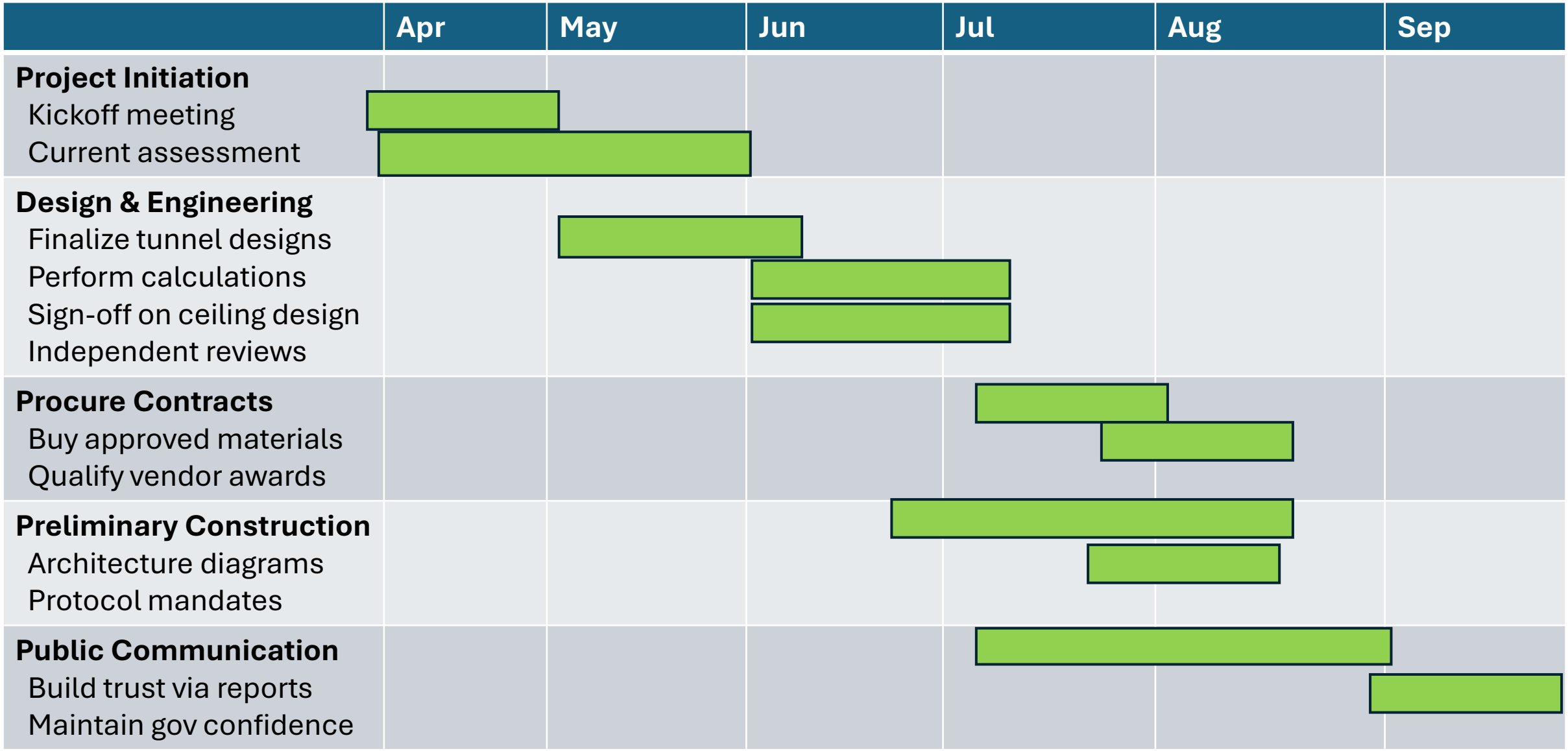
4. Visionary outcomes for future years

2. Related activities on which the work is dependent

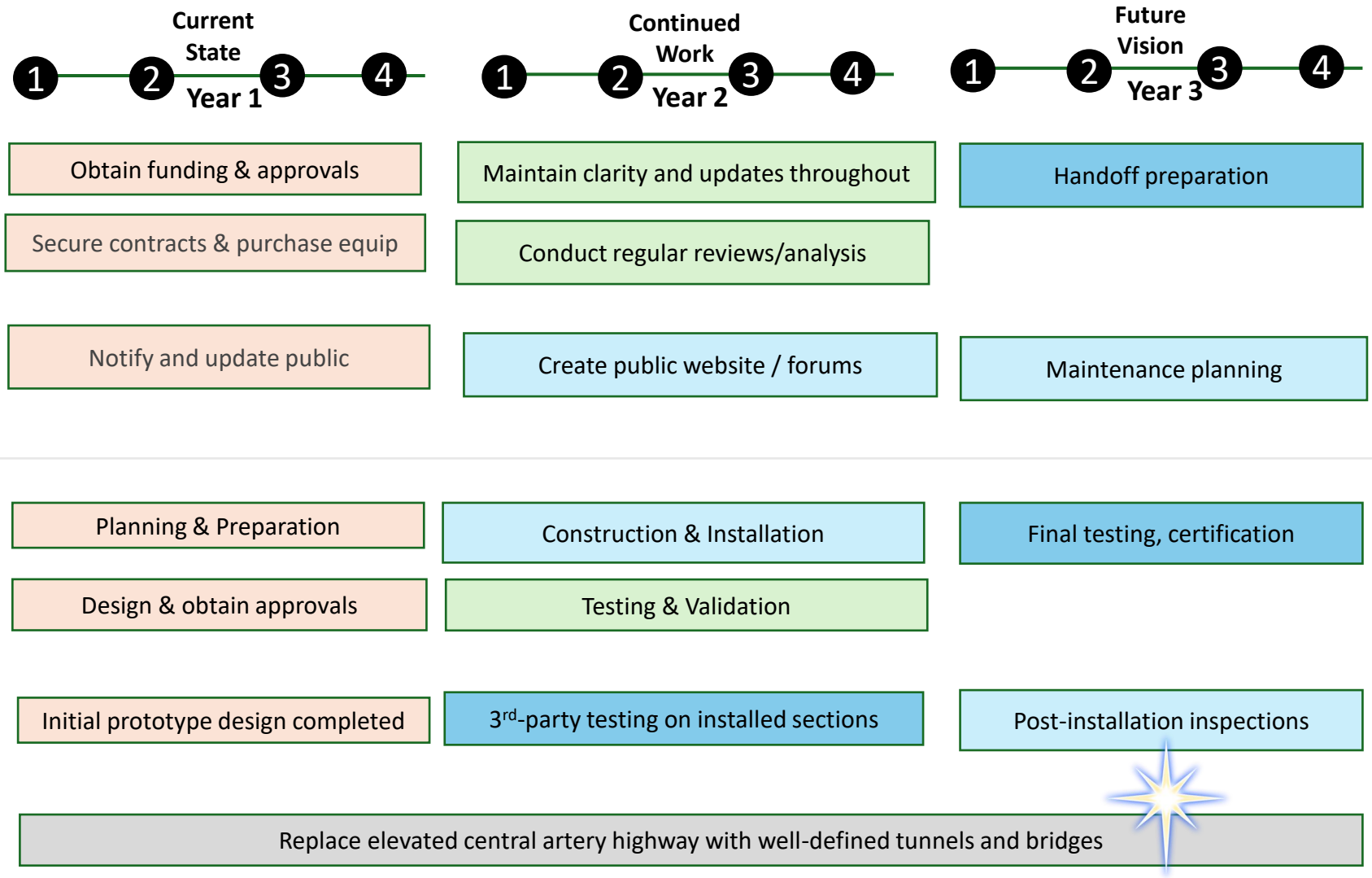
5. Alignment to corporate and local priorities

Key
Current funded
Related work
Continued
Future New
Corp Op Plan Align

Big Dig: Current Schedule



Big Dig Roadmap



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Key Takeaways

- Start with high-level strategy
- Build for clarity, alignment, structured path
  - OKRs: Objectives & key results = measure progress
  - Problem framing: Identifies key issues for which to plan
  - Road maps: Plan of execution

Align the vision, Frame the problem, Map the path

Thank You

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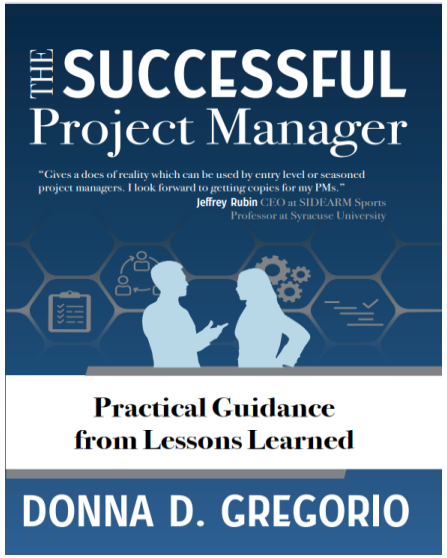

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Photos source: 827 Boston Big Dig Stock Photos, High-Res Pictures, and Images - Getty Images

Exercises - Slides

OKRs – Exercise – Use template to fill out for your project

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Exercise Time Template

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