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BUILD AMERICA CENTER

INNOVATIVE FINANCING AND DELIVERY OF TRANSPORTATION INFRASTRUCTURE

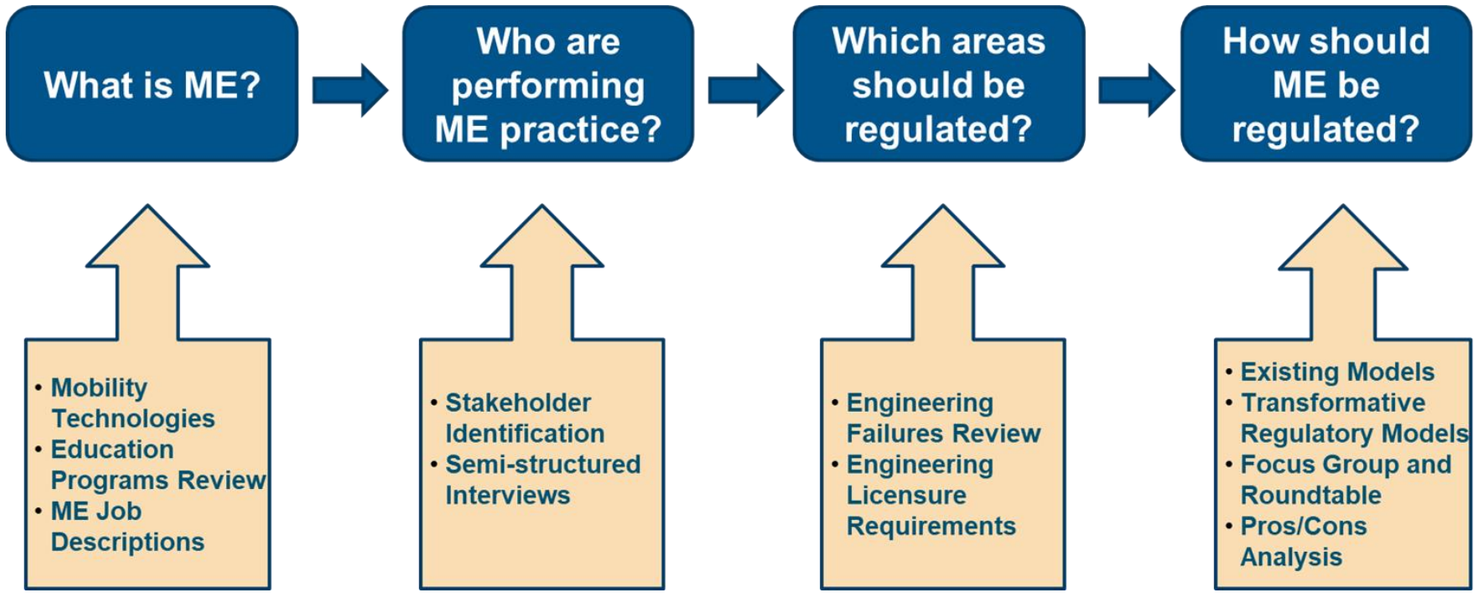
ECL-USA Study on Mobility Engineering Regulatory Framework

Qingbin (QC) Cui and Man Liang

February 13, 2024

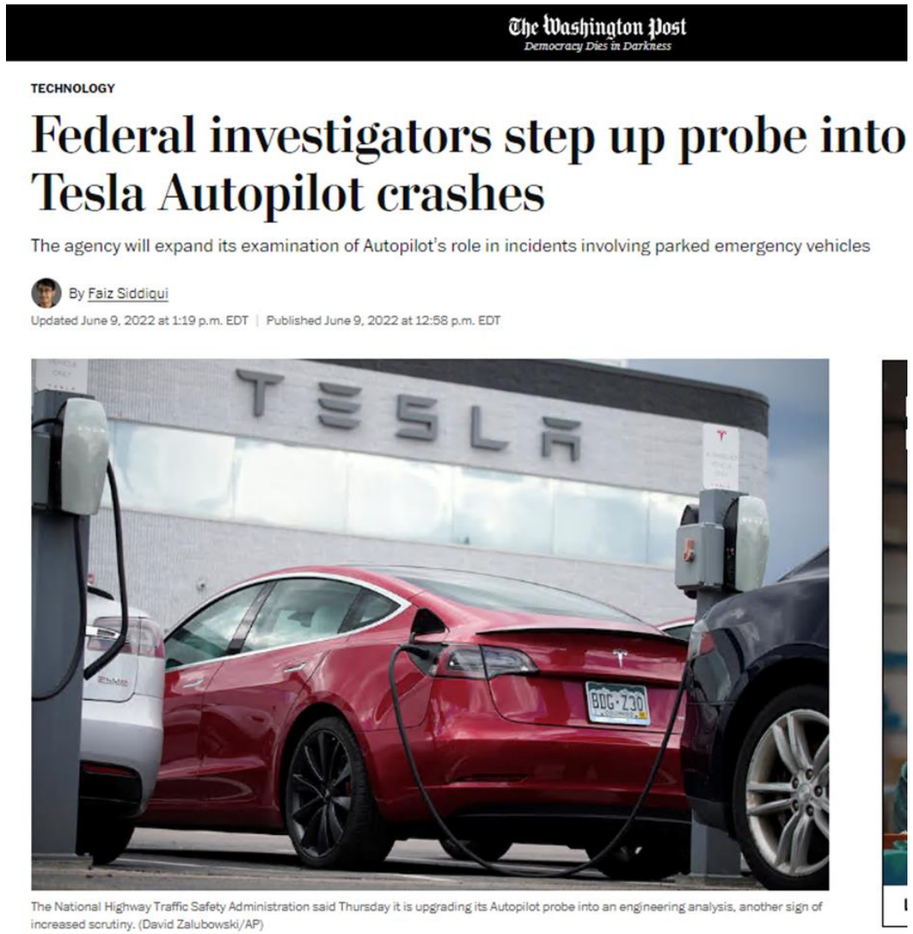
Agenda

- Understanding Mobility Engineering
- State Regulations
- Regulatory Model Development
- Evaluation and Assessment
- Discussions



Why Regulating Mobility Engineering Practice

- Market-Driven
  - Trend in education programs
  - Trend in job market
- Regulatory Gap for ME Professionals
  - No clear career pathway
- Regulatory Gap for Safety Technology
  - ADS implementation
  - Testing procedure
  - Data documentation & AI model
- Regulatory Gap for Ethical Practice
  - No guidance for ethical practice



The Washington Post
Democracy Dies in Darkness

TECHNOLOGY

Federal investigators step up probe into Tesla Autopilot crashes

The agency will expand its examination of Autopilot's role in incidents involving parked emergency vehicles

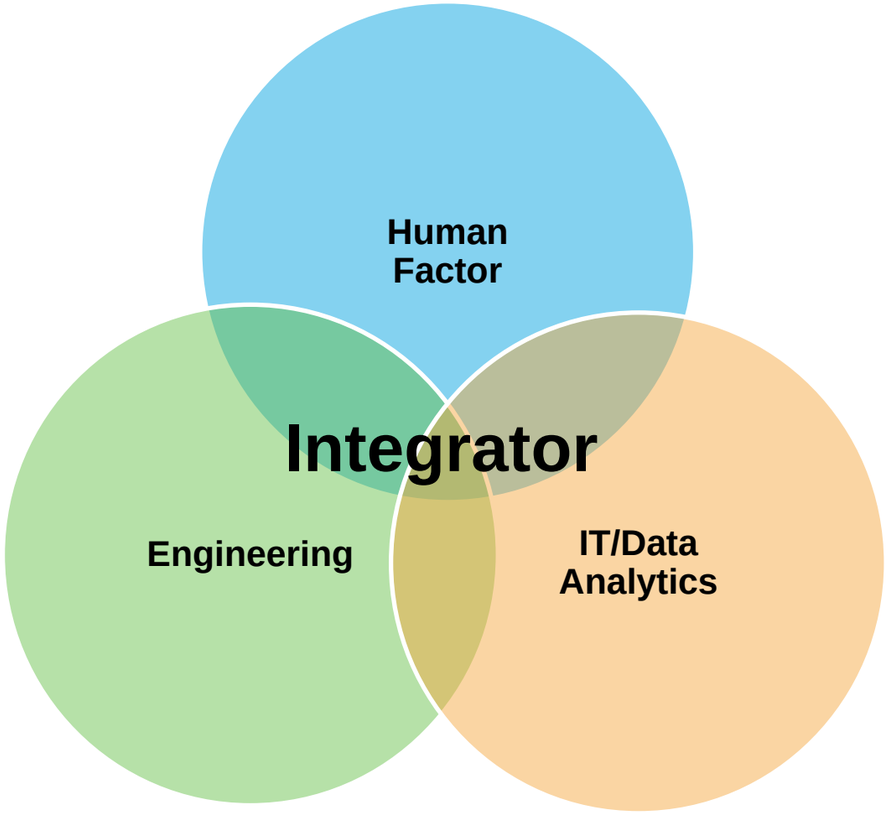
By Faiz Siddiqui

Updated June 9, 2022 at 1:19 p.m. EDT | Published June 9, 2022 at 12:58 p.m. EDT

The National Highway Traffic Safety Administration said Thursday it is upgrading its Autopilot probe into an engineering analysis, another sign of increased scrutiny. (David Zalubowski/AP)

Understanding of Mobility Engineering

- Education Programs
  - A growing education and research program
  - Multi-disciplinary curriculum covering civil, mechanical, automobile, computer, system, electrical, energy, safety, etc.
  - Offered for graduate degree and professional certificate
- Knowledge Requirements from Job Market
  - Vehicle-centric engineering
  - Infrastructure-centric engineering
  - IT and data analytics
- Autonomous Driving Safety Systems
  - Multidisciplinary feature and regulatory need
- Engineering Failures
  - Challenges of system capabilities, Data issues,
  - Needs for ethical consideration and public policies



Knowledge Base

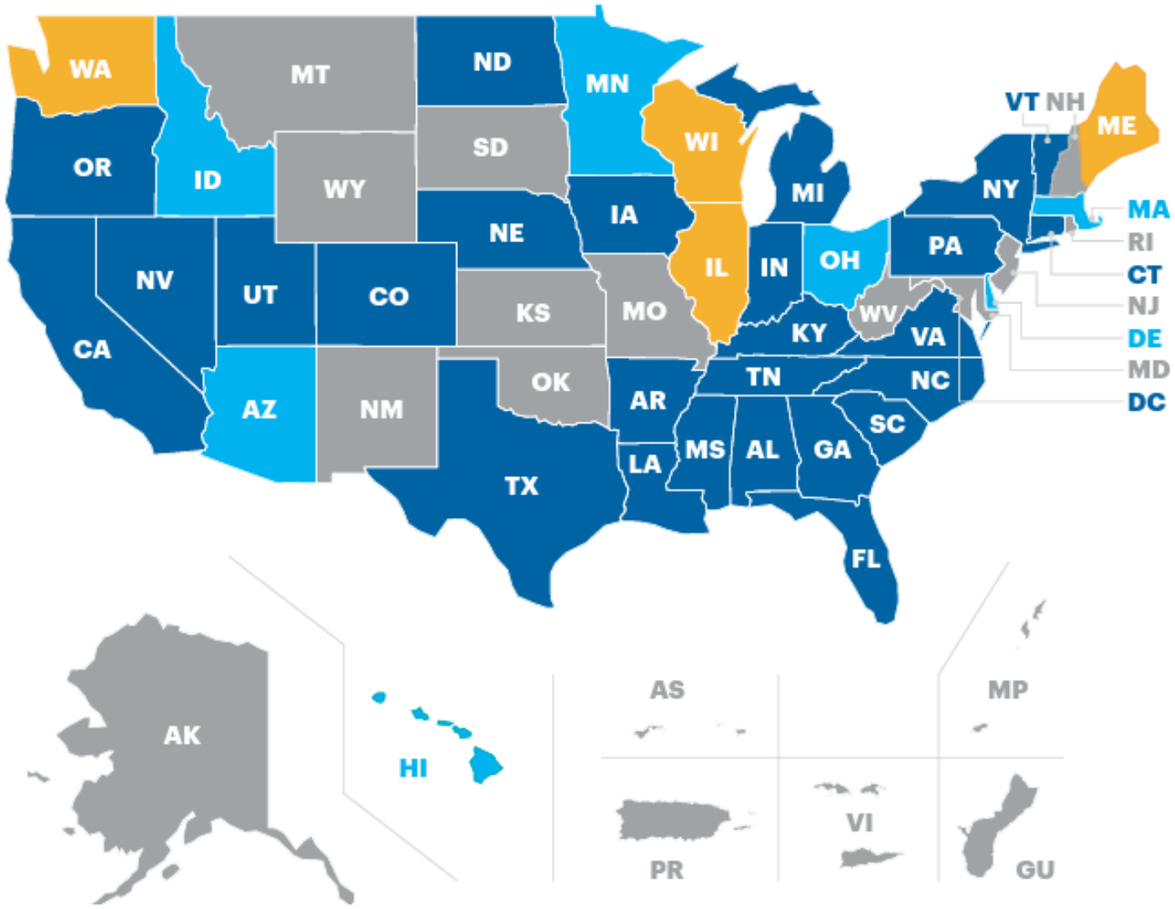
Mobility Engineering: Critical Issues

- Individual vs Organization (team)
- License vs Certificate
- Exam vs Peer Review
- Process based vs Performance based
- Local vs National
- Product vs organization
- Ethical, transparency, users,
- Governance Structure
- Liability and Authority

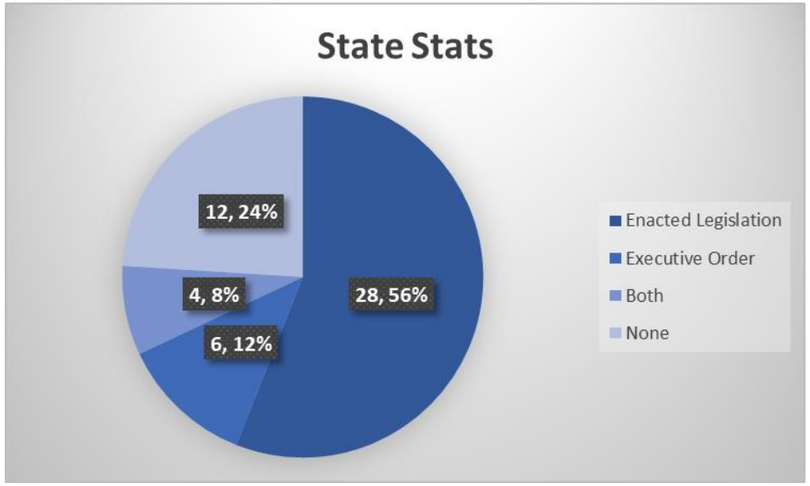
Mobility Engineering Features

- Fast Evolving and Innovation
- Uneven Tech Advancement
- Multi-disciplinary
- Wide Industry Sectors
- Public-Private Partnership
- Human-Tech Interaction

State CAV Legislations

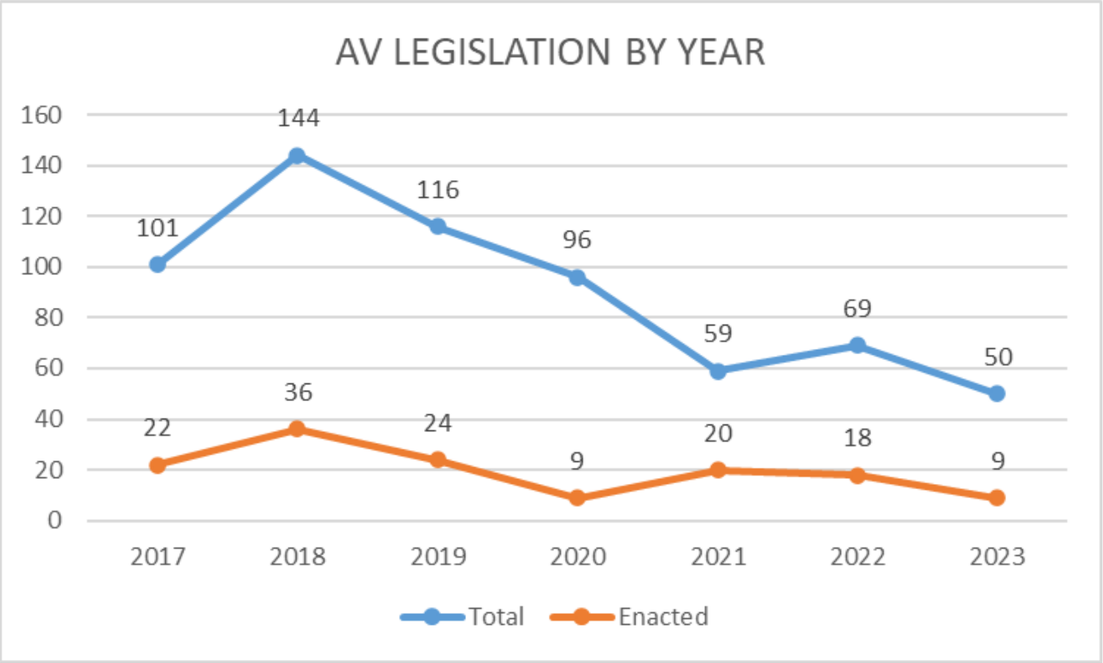


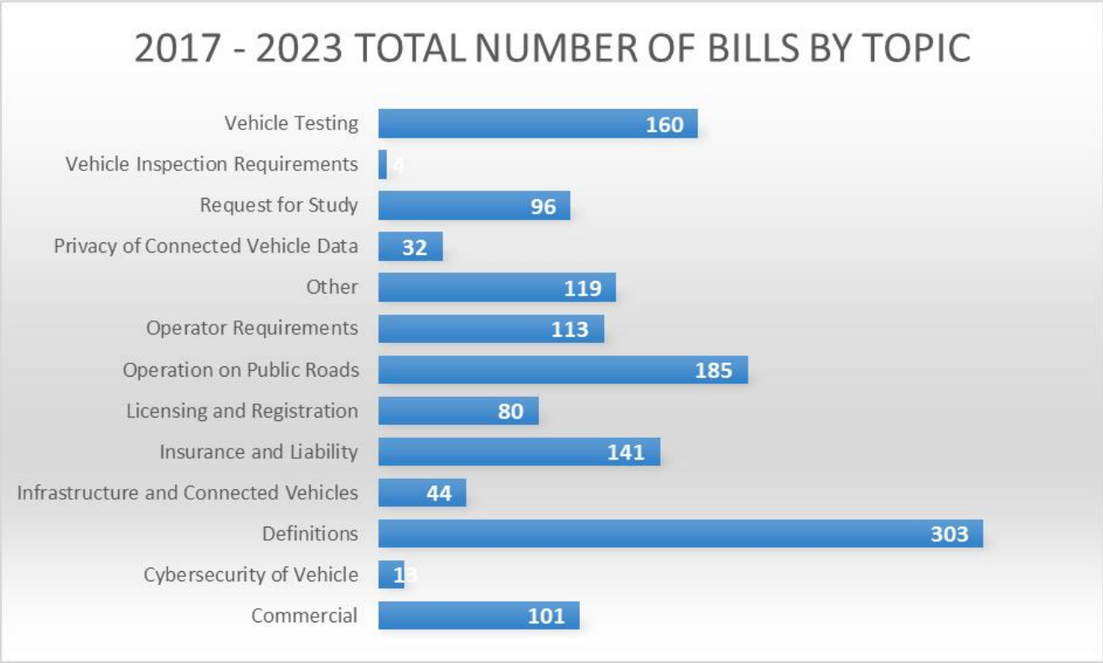
- Enacted legislation
- Executive order
- Both
- None



Data Source: NCSL

State CAV Legislations





- Topics are concentrated around definition, operation, and testing.

Data source: NCSL

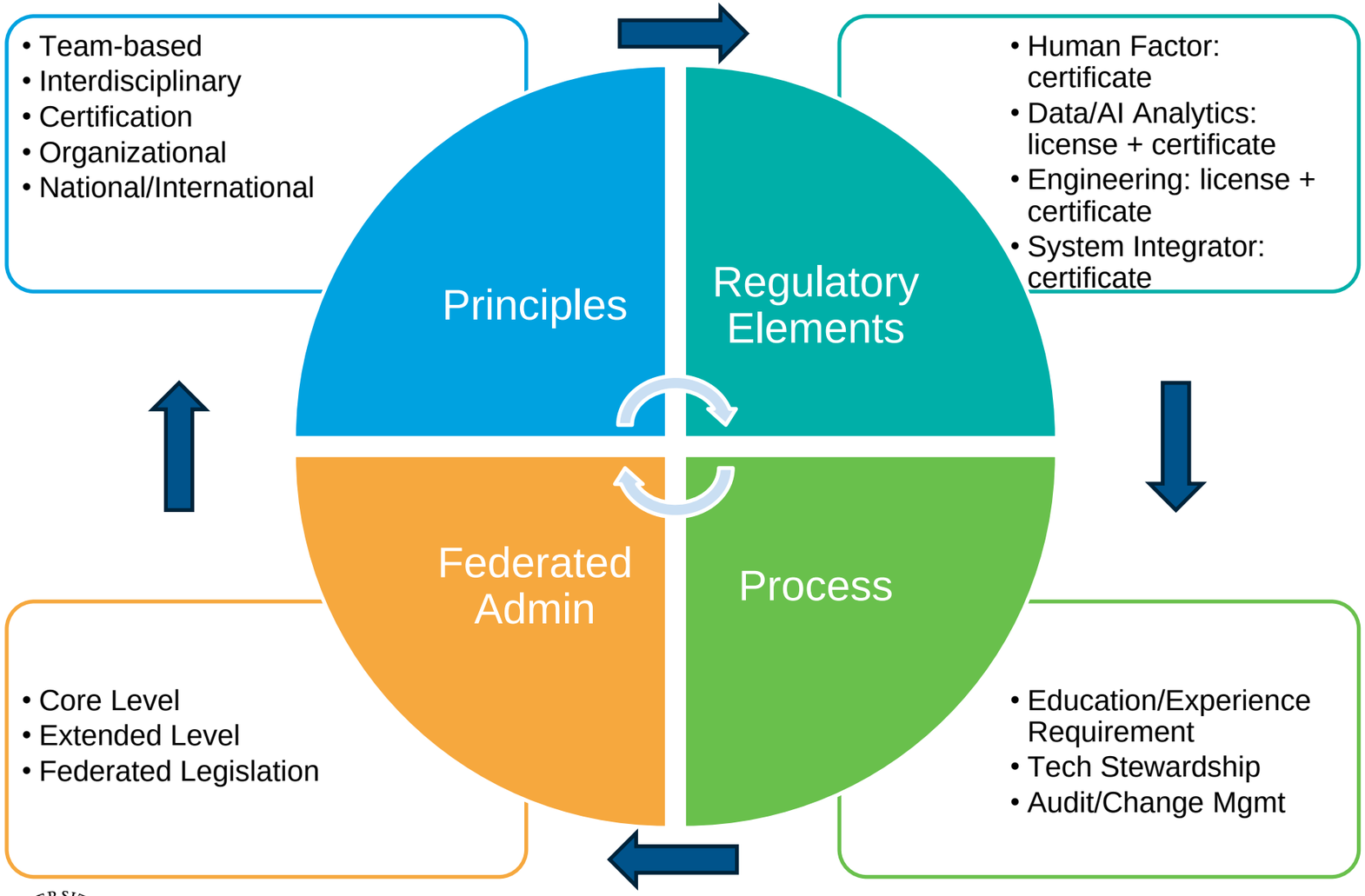
Focus Group and Roundtable Discussions

- Prototype Development
  - Setting the Stage
  - Future vision
  - Benefits
  - Key elements
  - Means and procedures
  - Admin
- Prototype Evaluation

Mentimeter Workshop

https://www.menti.com/alx1nvy6jevr
access code: 4541 2376

Overview of Prototype



Pro's

- Broad Applicability
- Multi-disciplinary Scope
- Public Protection and Increased Safety
- Compatibility with Existing Systems
- Broad Benefits
- Attractive Value Proposition
- Complementary to NCEES
- Adaptive and Agile

Con's

- Lack of System Integrator Certification
- Bureaucracy and Funding
- Inequality of Certificates
- Data and Intellectual Property Sharing

Unknowns

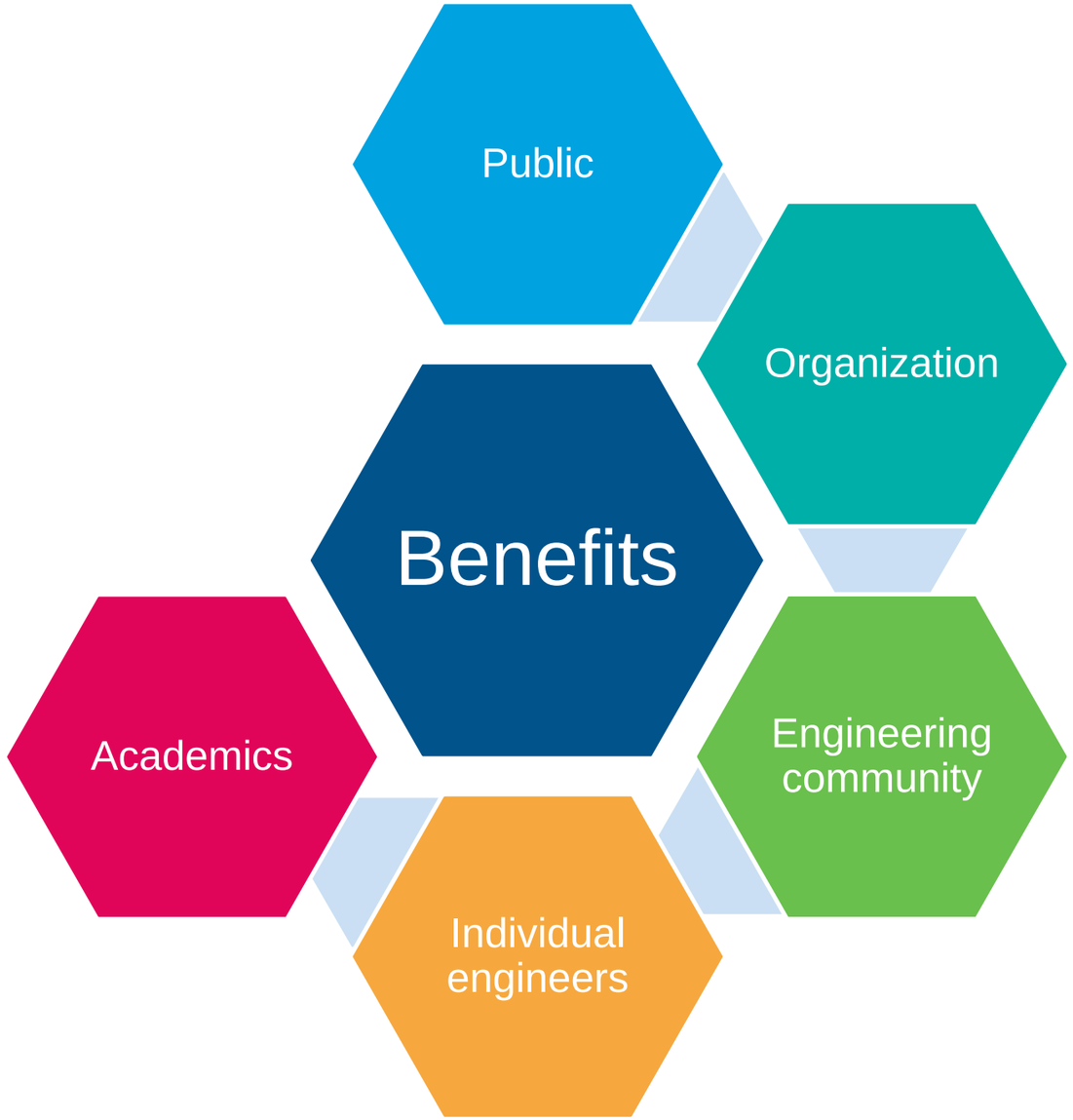
- Enforcement
- Voluntary or Required
- Mechanism for Implementation
- Transition from Licensure to Public Protection

Evaluation

Benefits

- Embody and define the body of knowledge
- Easy entry process
- Dissolving silos and providing disrupting education solutions
- More opportunities
- Preparing graduates for the 21st-century economy:

- Board-certified mobility engineer
- Professional identity
- Career advancement
- Embracing a larger population of engineers
- Larger certification and license ecosystem



- Enhanced regulatory system
- Safety Assurance
- Trust and Confidence
- General Understanding
- Liability and Risk Management

- Eligibility for contracts
- Reduced liability insurance
- Protection from unethical behaviors
- Increased market value with trusted product
- Competitive commercial attributes
- Assessing competence
- Gate of entry and pricing

- Increase public trust and image
- Speaks to fundamental values
- New opportunities
- Shifting toward the 4th industrial revolution
- Expand practice
- Ability to 'inference' when needed
- A professional identity for unlicensed engineers
- Specialized credentials
- Umbrella title

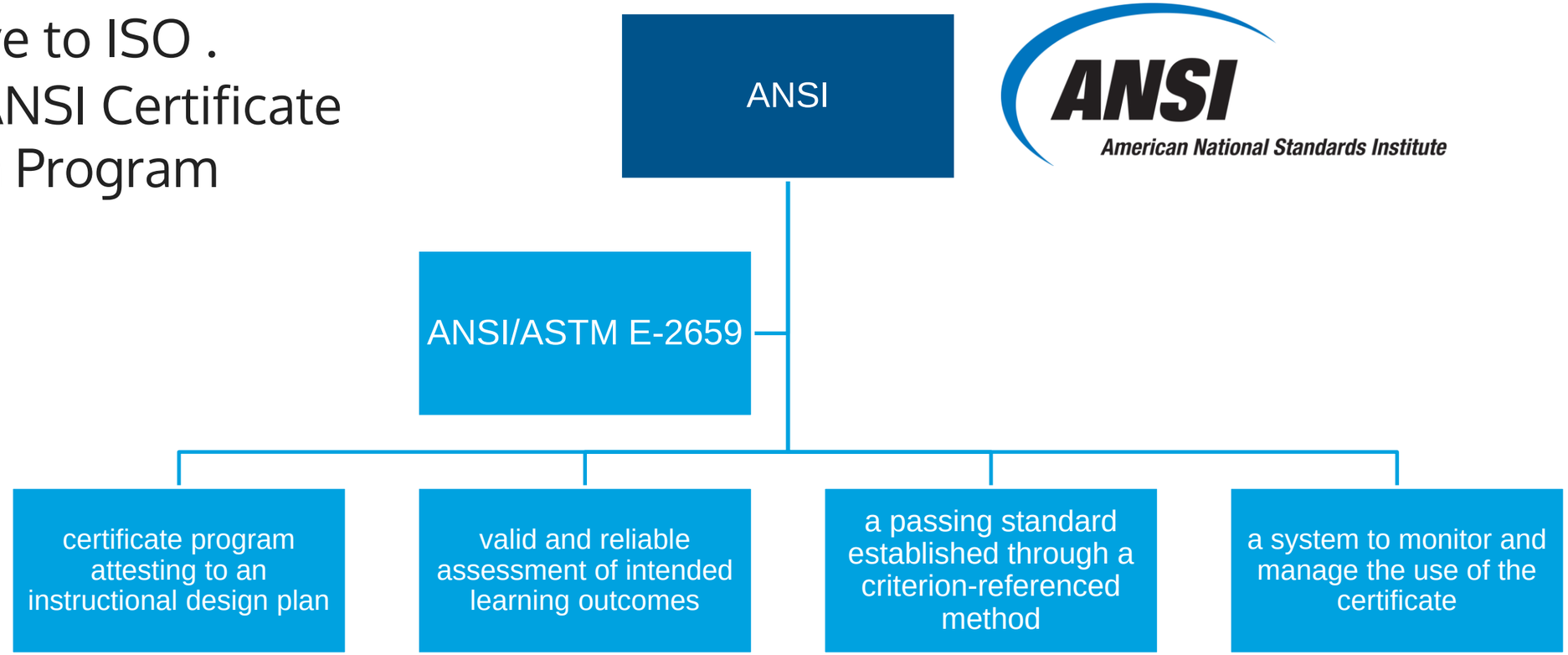
Regulatory Model Options

- **Option 1: ISO/ANSI Collaboration Model**
  - Become an accredited developer
  - develop and submit standard for ANSI review and approval
- **Option 2: Mobility Engineering Institute (/Future Engineering Institute)**
  - Organization, Principles, Regulatory Elements, and Process
- **Option 3: NCEES New PE License**
- **Option 4: NCEES-Based Team Certification**

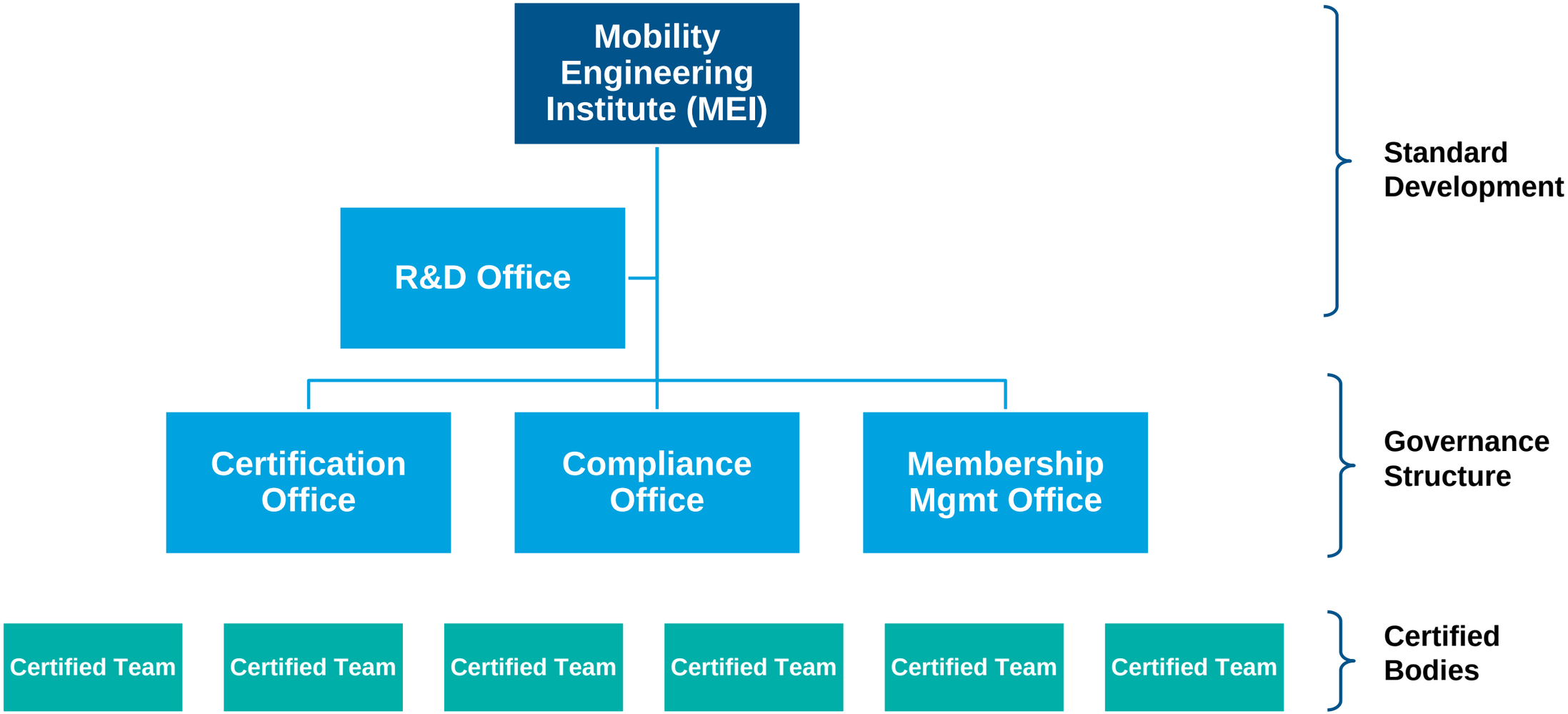
Option 1: ISO/ANSI Collaboration Model

ANSI is the official U.S. representative to ISO .

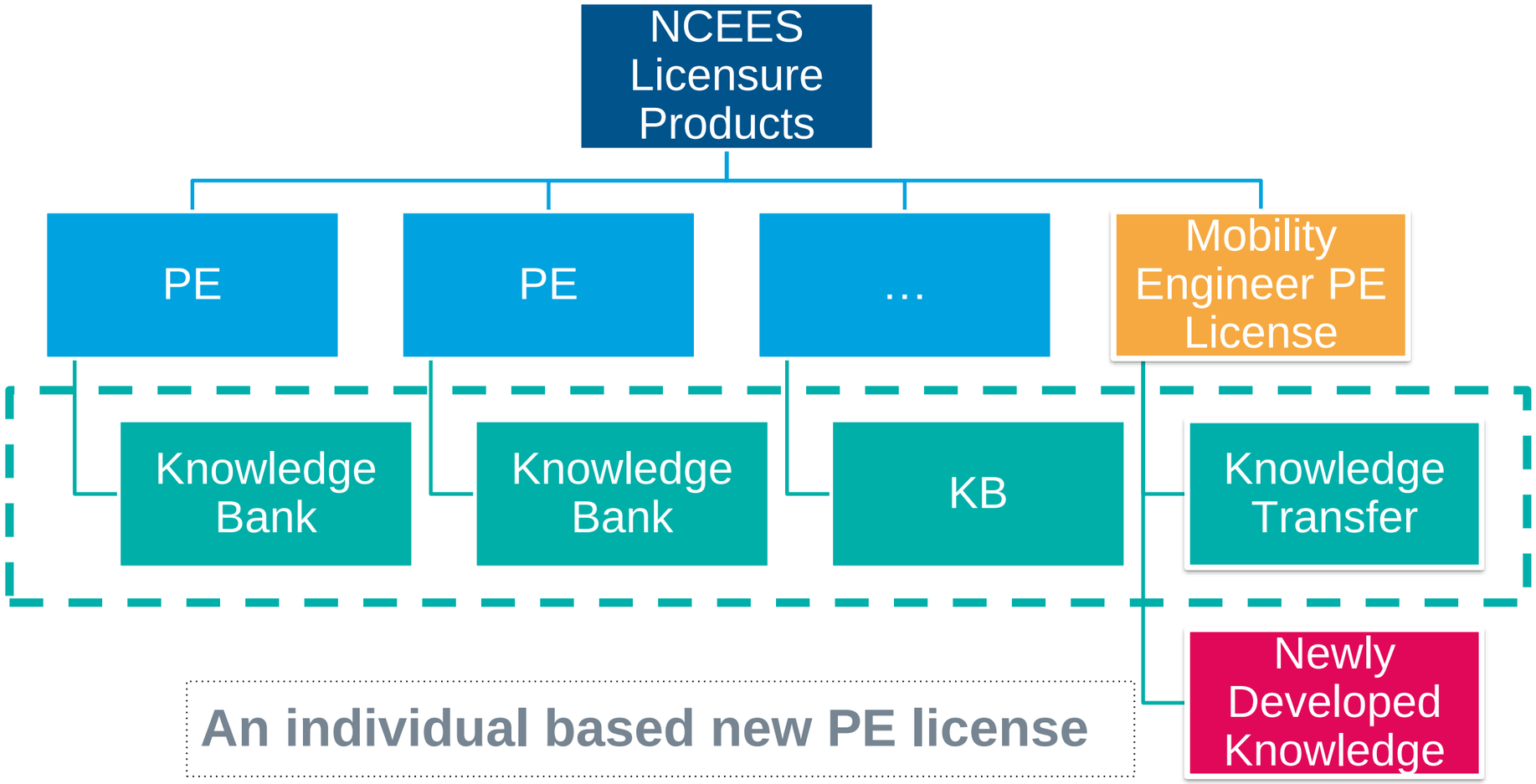
ANSI-CAP™ : ANSI Certificate Accreditation Program



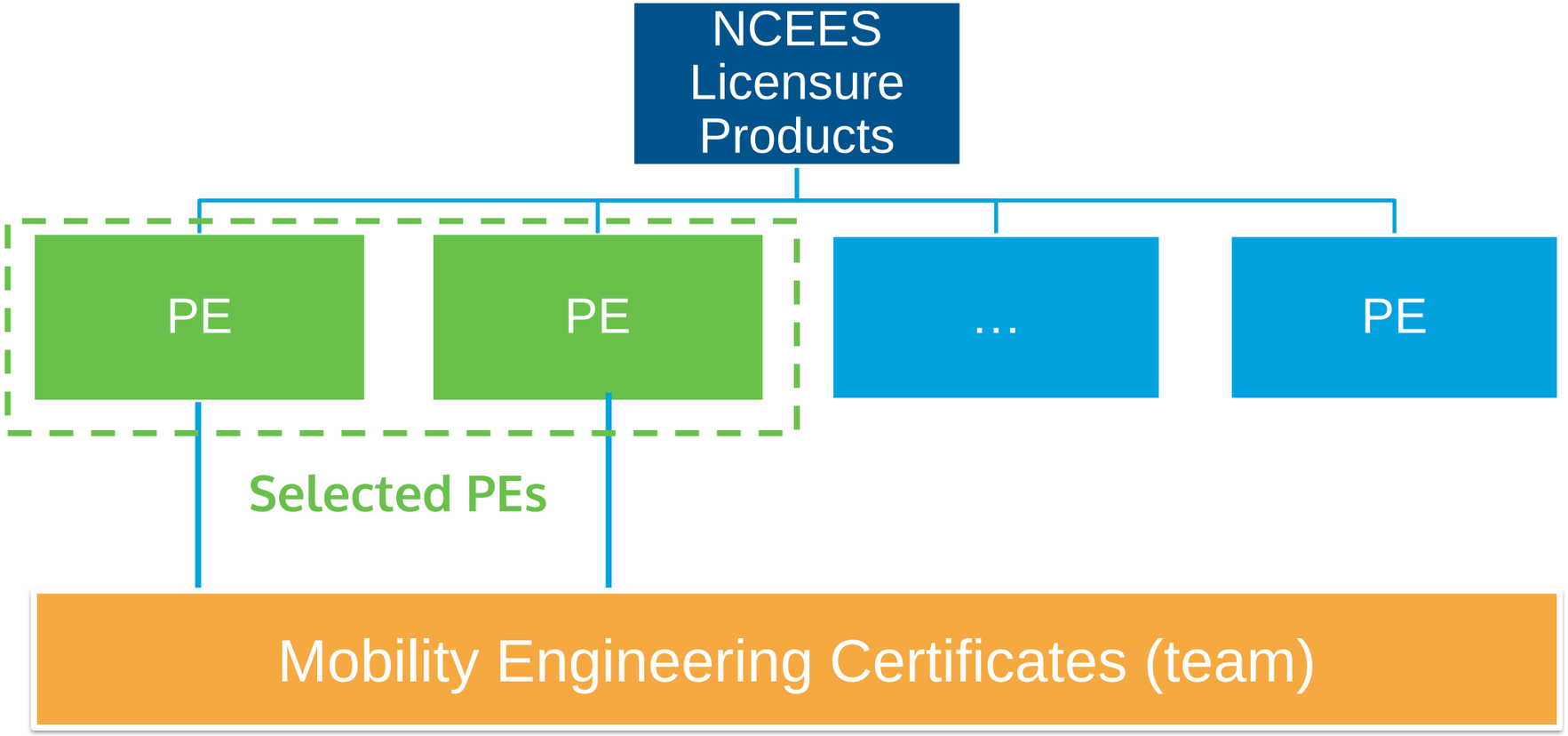
Option 2: MEI/FEI Model



Option 3: NCEES-Based New PE License



Option 4: NCEES-Based Team Certification



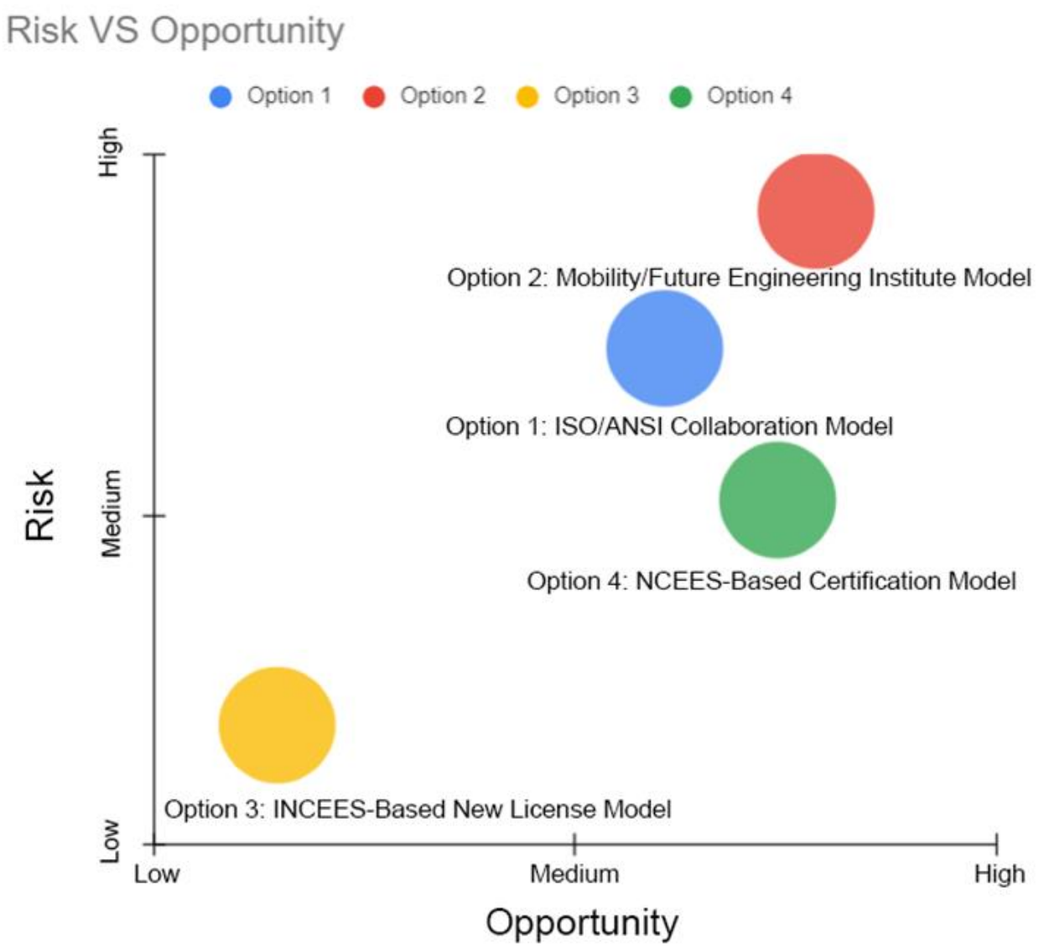
A team-based certification

Evaluation of Regulatory Options

1. Roundtable Discussions
2. Criteria Selection
3. Evaluation and Rating
4. Recommendations

Opportunity	Risk
• Applicability • Compatibility • Agility • Value Proposition • Scalability • Innovation • Partnership	• Endeavor • Bureaucracy • Acceptance • Ambiguity • Effectiveness • Implementation Challenge • Transition

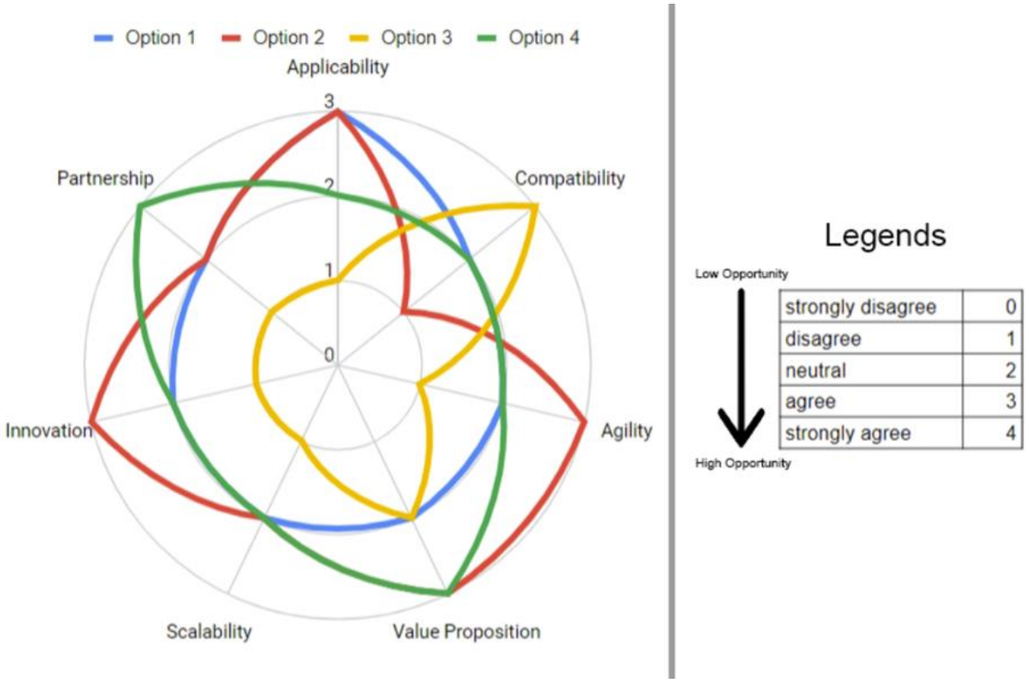
Evaluation Result



Opportunity-Risk Tradeoff

- **Option 2:** Best Opportunity, but High Risk
- **Option 4:** Optimal Opportunity with Medium Risk

Opportunity Analysis



Legends

Low Opportunity

strongly disagree	0
disagree	1
neutral	2
agree	3
strongly agree	4

High Opportunity

Opportunity Criteria	Option 1	Option 2	Option 3	Option 4
Applicability				
Compatibility				
Agility				
Value Proposition				
Scalability				
Innovation				
Partnership				

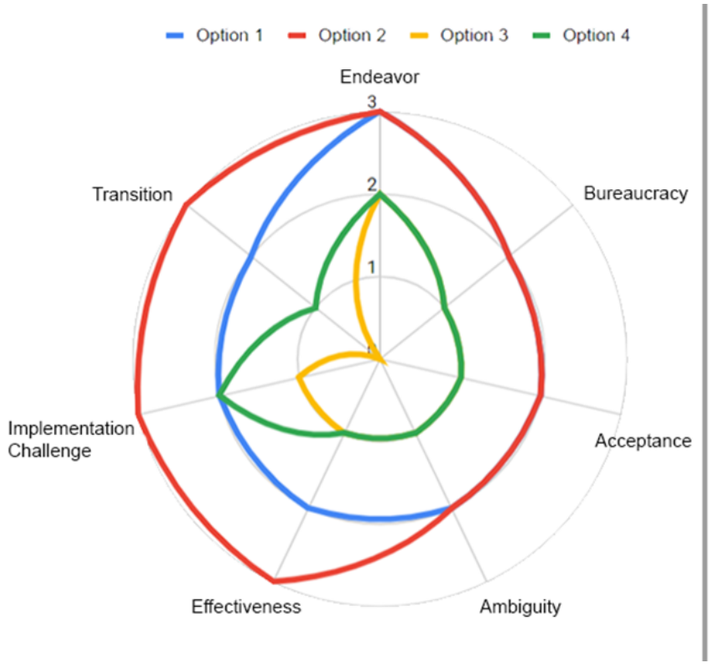
	Rank 1
	Rank 2
	Rank 3
	Rank 4

- **Option 2 performs optimal at the criteria of applicability, agility, value proposition, and innovation.**

Why?

- **Focused Target:** Tailored to meet the regulatory needs of mobility engineering professionals.
- **Full Ownership:** Assumes complete control of the process, ensuring agility for future change.

Risk Analysis



Legends

Low Risk

High Risk

strongly disagree	0
disagree	1
neutral	2
agree	3
strongly agree	4

Risk Criteria	Option 1	Option 2	Option 3	Option 4
Endeavor				
Bureaucracy				
Acceptance				
Ambiguity				
Effectiveness				
Implementation Challenge				
Transition				

	Rank 1
	Rank 2
	Rank 3
	Rank 4

- **Option 2 has the highest risks in Endeavor, Transition, Implementation, Acceptance, Effectiveness.**

Why?

- **Stand-alone Institute:** the development process is anticipated to be challenging.
- **Lack of Resource:** would not leverage the well-established resources from ISO, ANSI, or NCEES.

Evaluation Results

- ❑ Need for Mobility Engineering Regulation
- ❑ Challenges and Opportunities of Establishing Mobility Engineering Regulatory Framework
    - ❑ Future Engineering Licensure Models
- ❑ Regulatory Models and Their Opportunities and Risks
- ❑ NCEES-based Team Certification