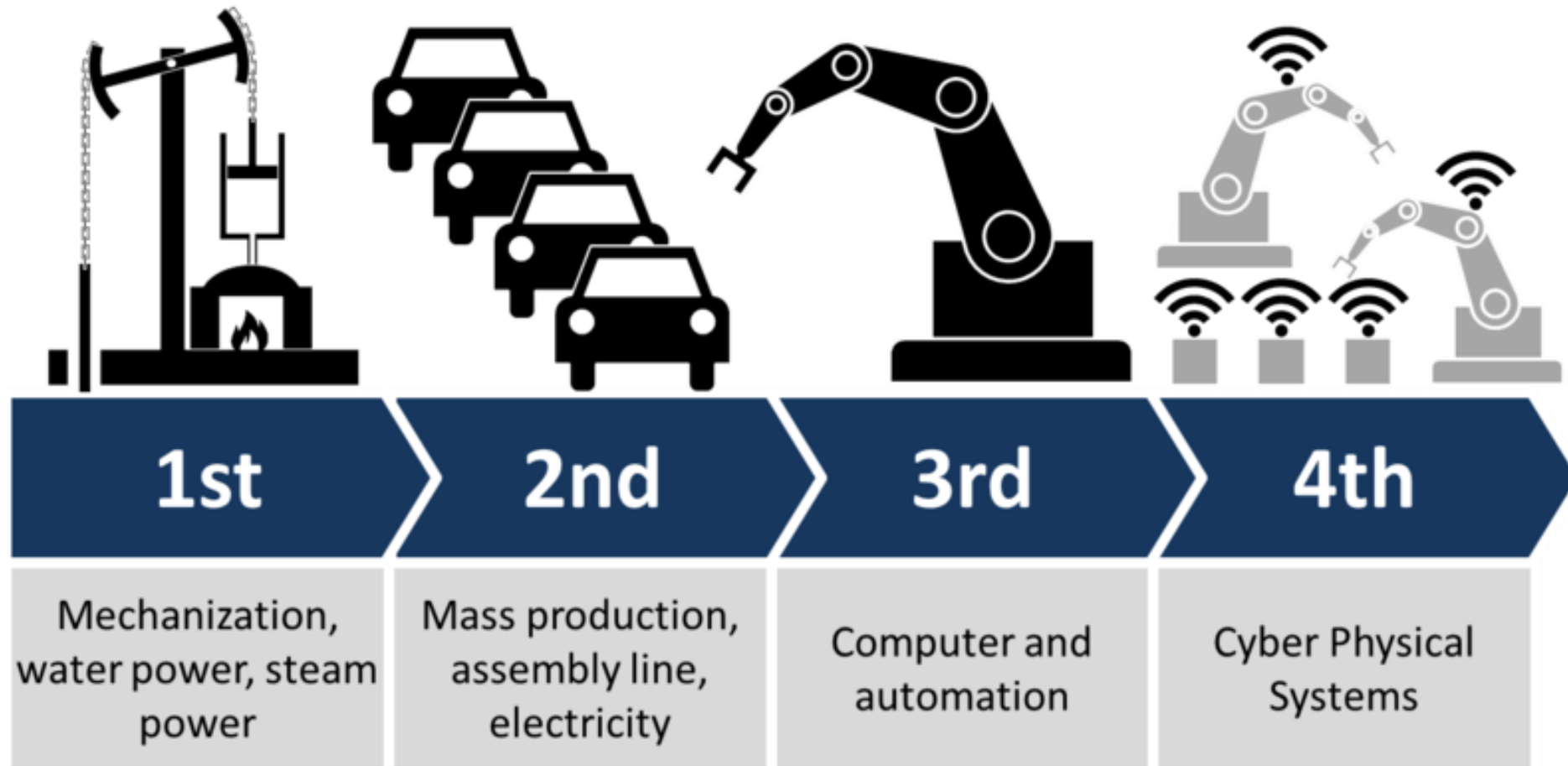


# THE FUTURE IS ENGINEERING

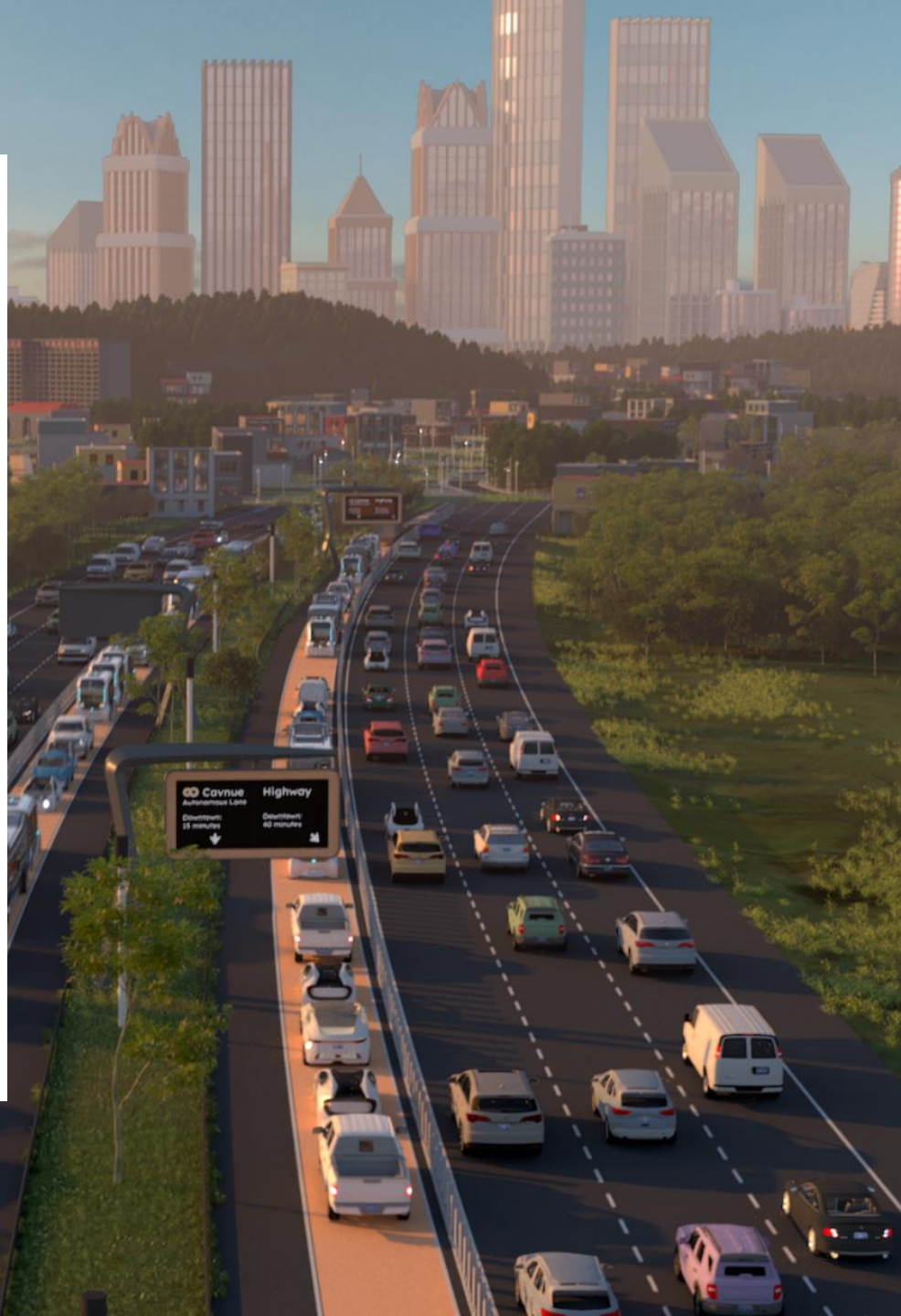


**ENGINEERING  
CHANGE LAB USA**

# CHALLENGE OF THE 4TH INDUSTRIAL REVOLUTION













# ENVIRONMENTAL IMPERATIVES

**Climate Change**



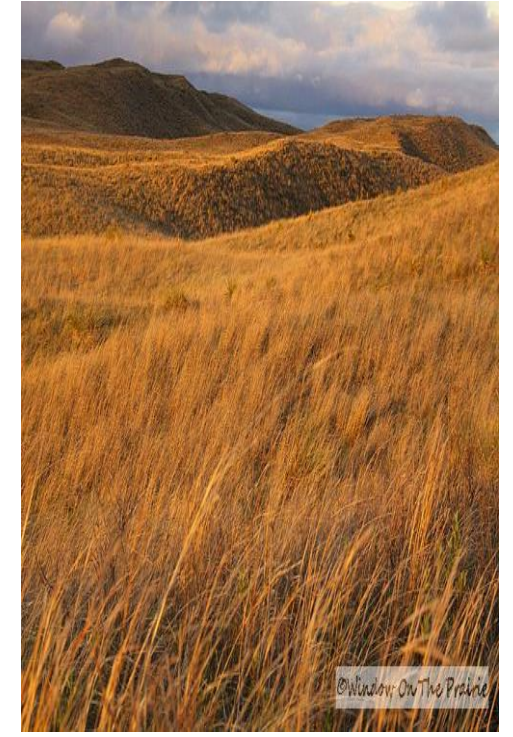
**Population Growth  
& Urbanization**



**Waste**



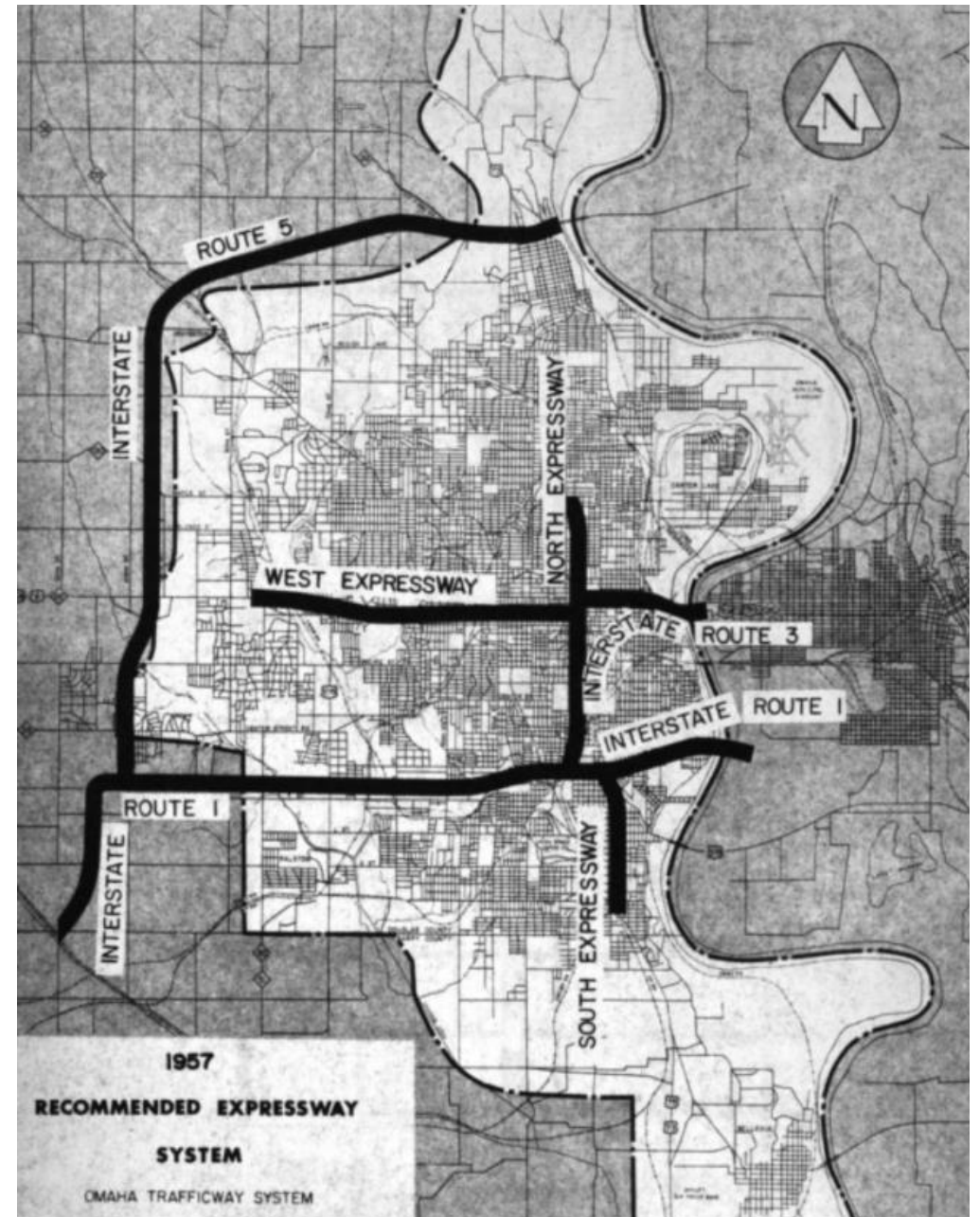
**Natural World**





# SOCIETAL IMPERATIVES

- Infrastructure Funding & Policy
- Zoning & Development Regulations
- Equitable Access to Business & Housing Loans
- Equitable Access to Clean Water
- Equitable Access to Open Space
- Siting of Industrial Facilities



# CURRENT STATE OF ENGINEERING

What are the stories you would tell about the current state of engineering?

What is most hopeful?

What is most troubling?



# Hopeful Perspectives from ECL-USA Summits



Groundswell of interest in positively impacting the future.



Promise of technological advances.



Increasing interest in sustainable design.





# Concerning Perspectives from ECL-USA Summits

Lack of diversity in  
engineering

Commoditization

Threats to  
Licensure

Fragmentation

Trend Toward  
Short-Term,  
Project-Focused  
Thinking

Loss of  
Recognition as  
Leaders in Public  
Policy

Ability to Attract  
Best and Brightest

Potential  
Unintended,  
Harmful Impacts  
from Technologies

Ties Between  
Engineering &  
Social Justice





# ELEVATE

Our Professional Value

Perceptions of  
Geoprofessionals

Lack of Public  
Understanding of  
Our Work and Our  
Value.

Lack of Client  
Understanding of  
Our Work and Our  
Value.

Viewed as Overly  
Conservative.

Underpaid (By  
Clients).

Risk Averse.

Fear of Innovation.





**ELEVATE**  
Our Professional Value

## Key Elements of Mission/Value Statement

- Commitment to lifelong learning.
- Act as trusted advisors – not report writers.
- Visible leaders in our communities.
- Focus on stewardship of the earth and its resources.
- Communicate issues using plain speak.

# IMPERATIVE FOR THE ENGINEERING COMMUNITY

The engineering community can serve as **entrepreneurs, stewards of technology, stewards of the natural environment, and leaders** as an uncertain future unfolds.





# ECL – USA MISSION

The Engineering Change Lab - USA is a **catalyst for change within the engineering community**, helping it reach its highest potential on behalf of society.



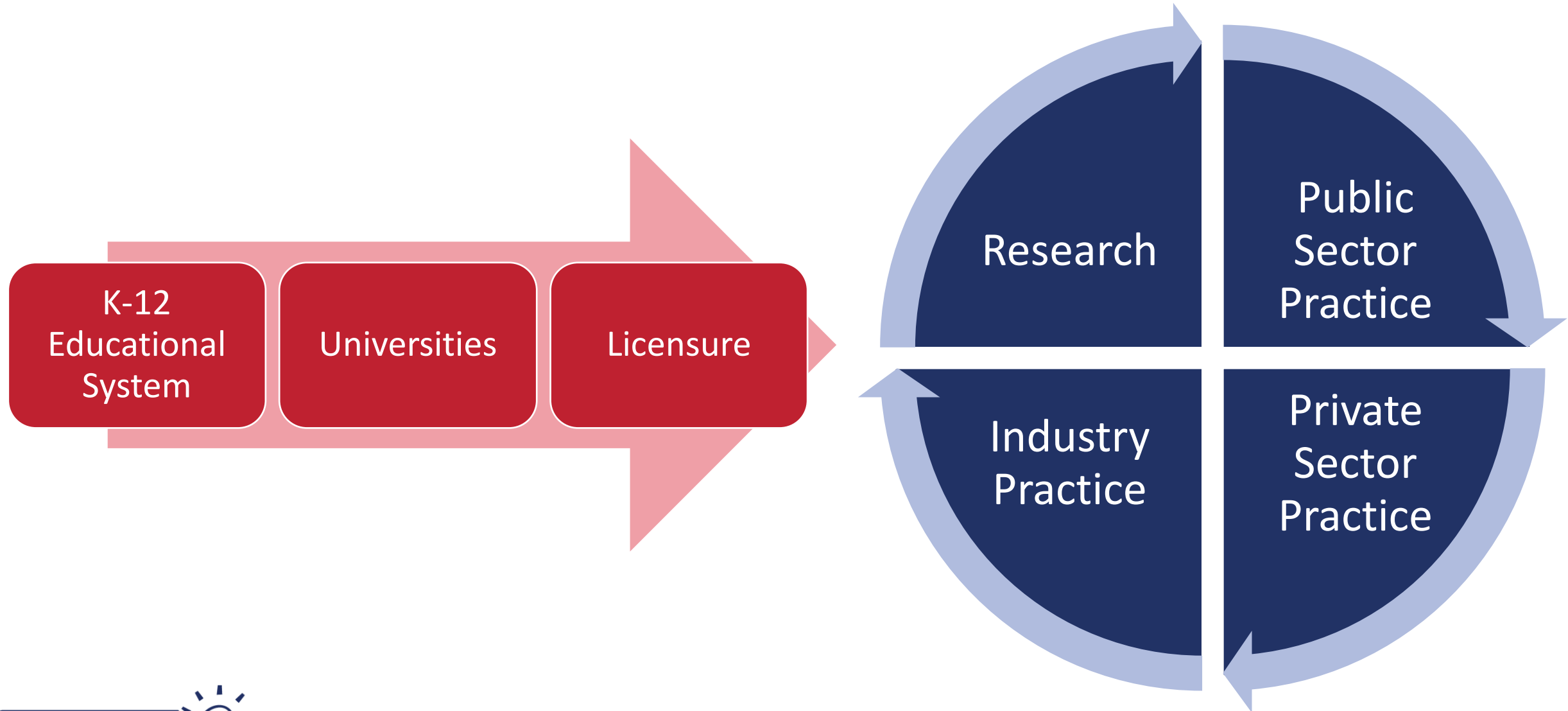
# ECL-USA FOUNDERS / STEERING COMMITTEE

- Stacy Bartoletti, P.E., Degenkolb
- Kyle Davy, Kyle V. Davy Consulting
- Lauren Evans, P.E., Pinyon Environmental
- Edwin Friedrichs, P.E., Walter P. Moore
- Dan Linzell, P.E., University of Nebraska College of Engineering
- Mike McMeekin, P.E., Lamp Ryneearson (EXECUTIVE DIRECTOR)
- Nancy Pridal, P.E., Lamp Ryneearson
- Clint Robinson, P.E., Black & Veatch
- Amy Squitieri, Mead & Hunt
- Elizabeth Stolfus, P.E., Stolfus & Associates
- Bill Stout, P.E., Gannett Fleming





# WHOLE SYSTEM APPROACH



# ECL-USA STRATEGIC LEARNING

EDUCATION

**Public Perception of Engineers**

**Technological Forces Impacting Engineering**

**Engineering Ethics in a World of Rapid Technological Change**

Justice, Equity

**Diversity & Inclusivity**

**New Models for Licensure**

**Entrepreneurship**

ENVIRONMENTALLY RESPONSIBLE ENGINEERING

**Climate Change**

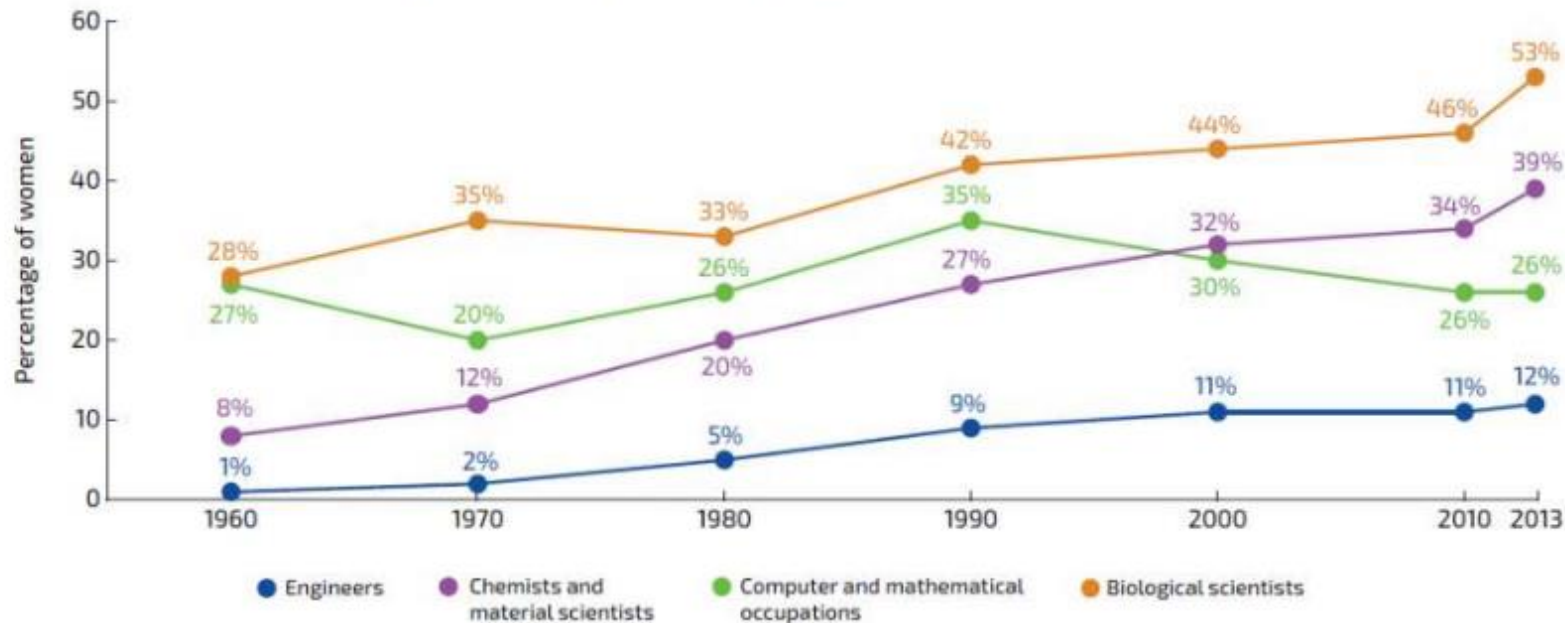
**Public Policy**

Workforce of the Future



# LACK OF DIVERSITY IN ENGINEERING

FIGURE 1. WOMEN IN SELECTED STEM OCCUPATIONS, 1960–2013



Source: AAUW, 2015, Solving the Equation

In the engineering workforce:

- › The percentage of women is stalled out at about 12%, the lowest of the STEM fields.
- › The percentage of under-represented minorities is about 15%.



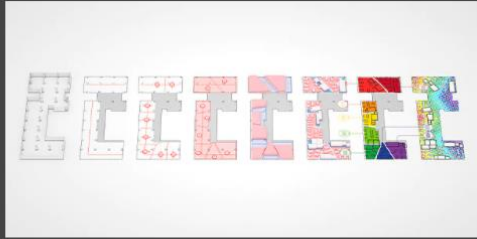


# TEN LEVERAGE POINTS FOR CHANGE

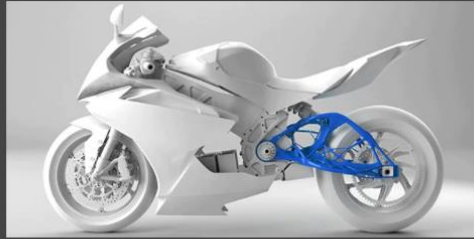
- Overcoming biases.
  - Change the perception of engineering.
  - Formal leadership development programs.
  - Publicize success stories and role models.
  - Support basic needs of URM students.
- Prioritize mentoring at all levels.
  - Create inclusive/equitable workplaces.
  - Fix the “broken rung” on the ladder to leadership.
  - Increase candidate pools.
  - Change recruiting and evaluation practices to eliminate biases.



# TECHNOLOGY & THE FUTURE OF ENGINEERING



Explore a wider range of design options



Make impossible designs possible  
Generative design lets you create optimized



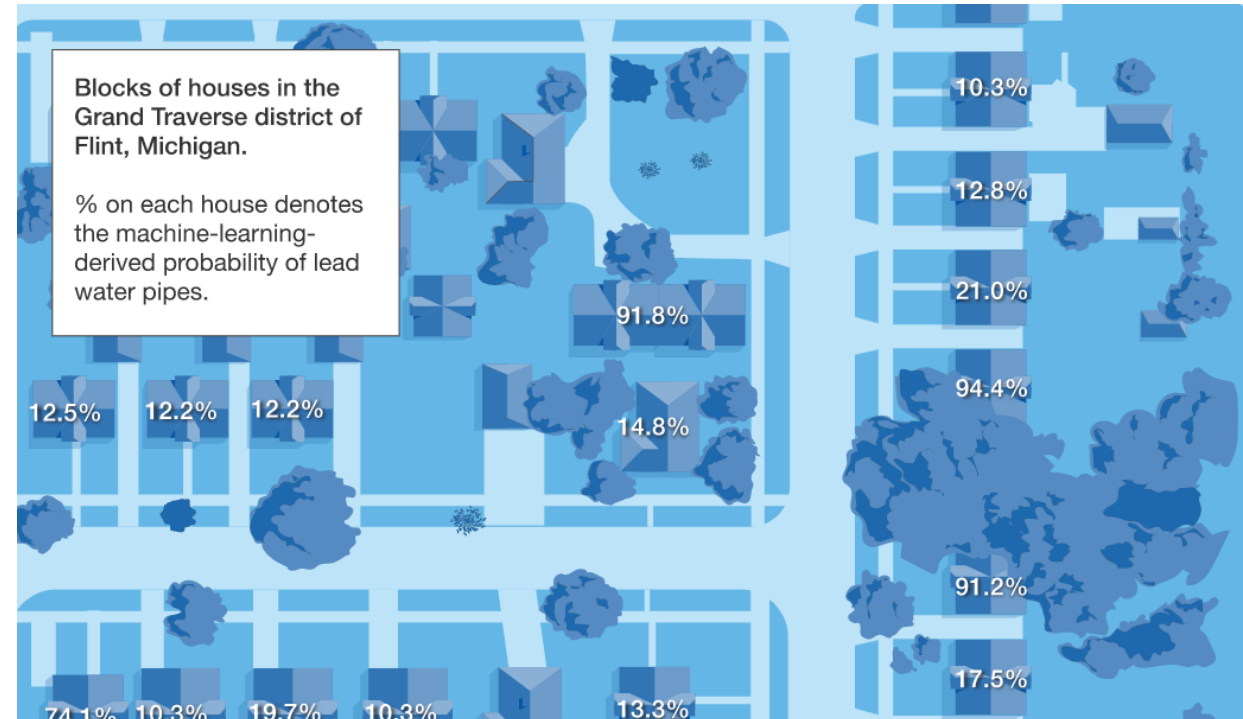
Optimize for materials and manufacturing methods

Generative Design

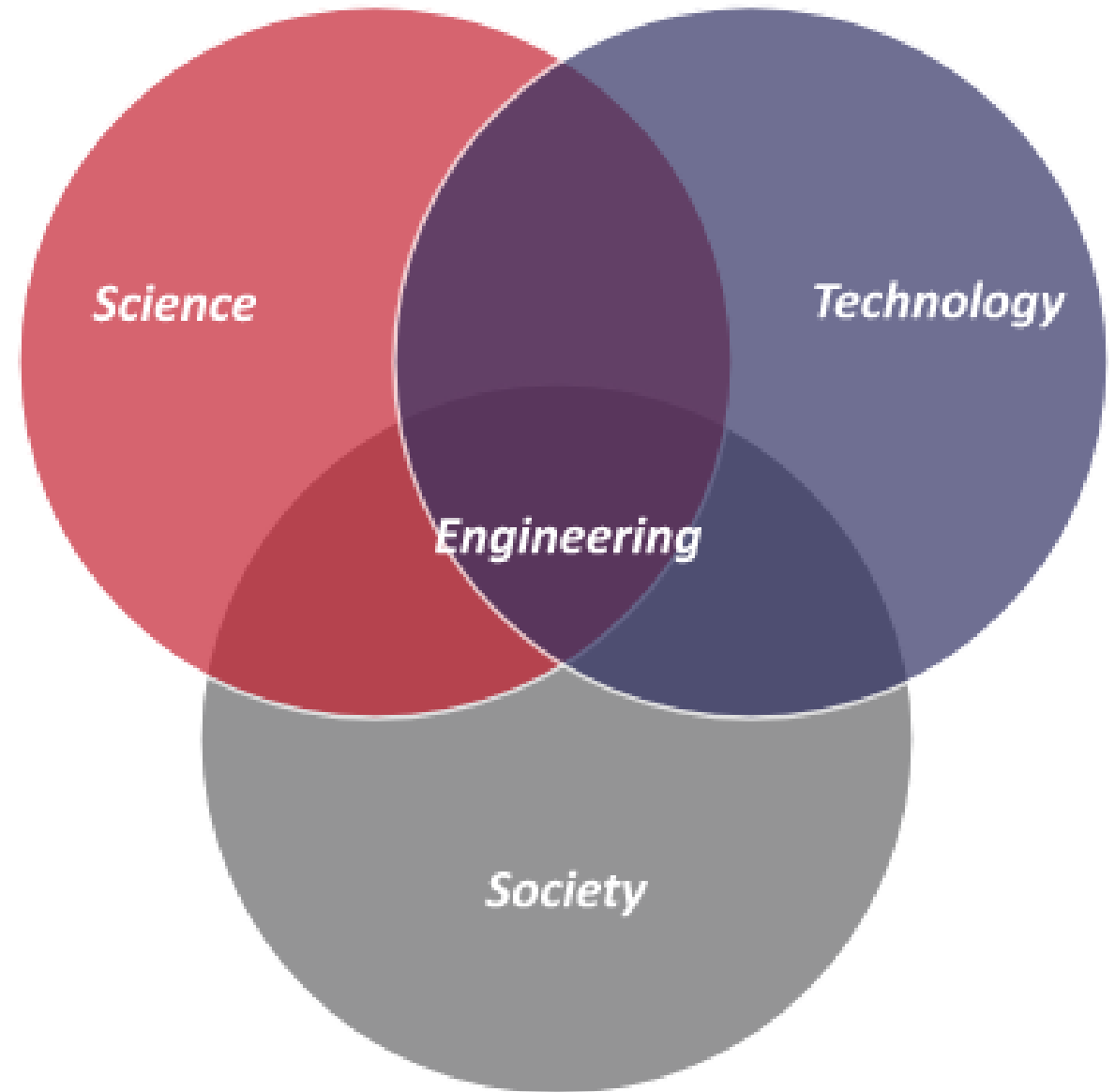
Artificial Intelligence



3D Design, Visualization & Construction



# TECHNOLOGY & THE FUTURE OF ENGINEERING





# TECHNOLOGY & THE FUTURE OF ENGINEERING

## VALUE CREATION MATRIX

<b>Emergent Technologies</b> ----- <b>New Ways of Working</b>	<b>Tactical Differentiator</b>  <b>Mod Risk</b> <b>Low/Mod Rewards</b>	<b>Value Creator Leading In Blue Oceans</b>  <b>High Risk</b> <b>Potentially High Rewards</b>
<b>Current Technologies</b> ----- <b>Current Ways of Working</b>	<b>Combatant in Red Oceans</b>  <b>Low Short Term Risk (High Long Term Risk)</b> <b>Low Rewards</b>	<b>Role Player / Bit Player Working for Technology Leaders</b>  <b>Mod Risk</b> <b>Low/Mod Rewards</b>
	<b>20<sup>th</sup> Century Social/Environmental Challenges</b>	<b>21<sup>st</sup> Century Social/Environmental Challenges</b>

# PE

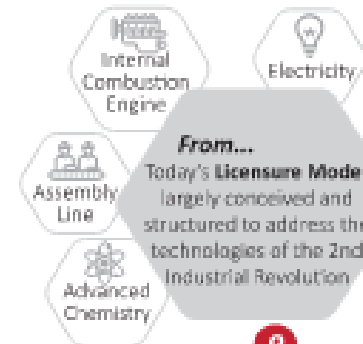
THE MAGAZINE FOR  
PROFESSIONAL ENGINEERS

## DOES LICENSING NEED A SHAKE-UP?

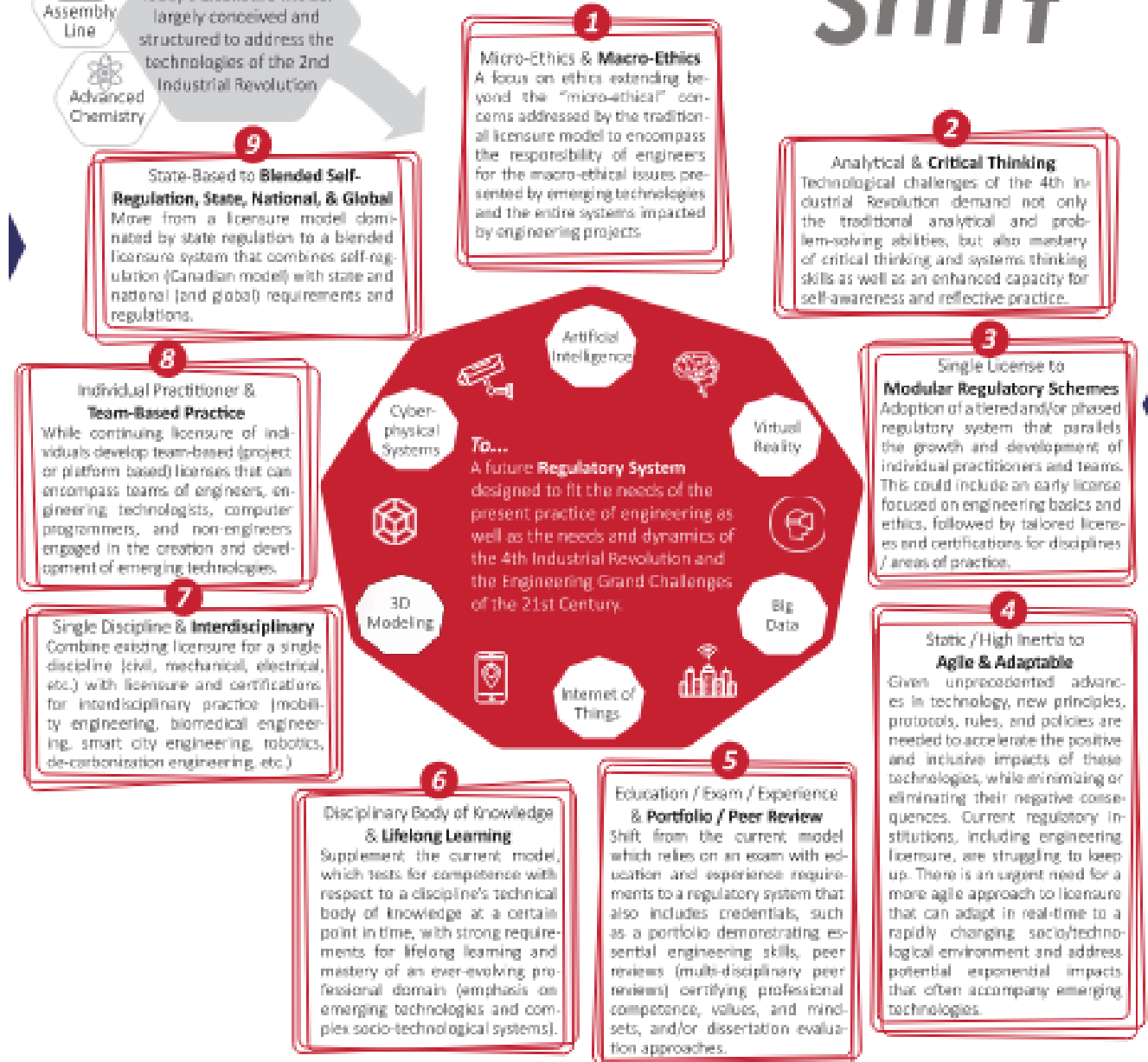
*Emerging technologies are transforming society. Is the PE licensing system ready?*

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102368399  
MICHAEL MCMEERIN, P.E.  
14710 W DODGE RD STE 100  
OMAHA, NE 68154-2027

PUBLISHED BY NSPE SPRING 2021



# Mapping a *Transformational Shift*





# Summit 11 – The Imperative of Climate Change and the Future of Engineering – Engineering Community Success Factors

- Coalescence around common climate vision.
- Nationally known climate scorecard.
- Trusted, “Fauci-like” spokespersons.
- Transformation of engineering education.

- Progress in D/I.
- Multi-disciplinary collaboration.
- Public policy acumen.
- Focus on racial and environmental equity as energy system transitions.

# A CLIMATE CHANGE NOBLE PURPOSE STATEMENT FOR ENGINEERING

- Embracing Trusted Leadership role.
- Focus on positive economic impacts.
- Advance shifts in public policy.
- Drive private sector innovation.
- Respect for the natural environment.
- Justice and equity as key elements.
- Designing energy infrastructure.
- Fostering social entrepreneurship.
- TRANSFORMING ENGINEERING PRACTICE.

# CLIMATE CHANGE NOBLE PURPOSE STATEMENT FOR ENGINEERING

The consensus of climate scientists can no longer be denied; climate change is real; the impacts are serious—and they are accelerating. Across all economic sectors, climate change is being accelerated by human-created technologies. In addition, we have seen throughout history that those people with the least resources are the most impacted by major challenges like climate change. Because the Engineering Community *(1)* is central to the creation and use of these technologies, we are uniquely positioned to help lead the way out of this climate crisis. There is an urgent imperative for the engineering community to take informed and intentional actions now to both reduce greenhouse gas emissions and adapt to the impacts of a changing climate. It is our duty and purpose to serve humanity in this way - contributing our skills and knowledge, without reservation, to help society make the best use of Earth's precious resources.



- IMAGINING NEW VALUE PROPOSITIONS & MODELS OF PRACTICE
- ADAPTING TO THE ASPIRATIONS, VALUES AND NEEDS OF NEW GENERATIONS IN THE WORKFORCE



For more information on Engineering Change Lab-USA, contact Executive Director Mike McMeekin at [mike.mcmeekin@lamprynearson.com](mailto:mike.mcmeekin@lamprynearson.com) and visit our website [www.ecl-usa.org](http://www.ecl-usa.org)

# THE ENGINEERING FIRM OF THE FUTURE

Summit 12 Report  
June 16, 2021

# EXTERNAL LANDSCAPE OF THE NEXT DECADE - KEY INSIGHTS FROM GROUP DISCUSSION

- Public sector clients need assistance in thinking more creatively.
- Clients need assistance in recognizing the value of long-term planning and investments in resilience.
- Firms can create value by assisting public sector clients in thinking beyond outdated standards.
- Clients need assistance in responding to stakeholders.
- Embracing diversity will create new opportunities for firms.
- The complexity of today's challenges can only be addressed through new types of collaborations.
- Business models need to move beyond billable hours and incorporate holistic value creation strategies.
- **To contribute at higher levels and to escape commoditization, firms need embrace an entrepreneurial culture.**

# ECL-USA Focus Groups - Objectives

- Develop a picture of over-arching core values and aspirations of engineers and young professionals within engineering firms.
- Examine both personal and organizational values.
- Compare and contrast findings across age cohorts.
- Assess degree of alignment between individual and organizational values and aspirations.

# Focus Groups – Summary of Findings

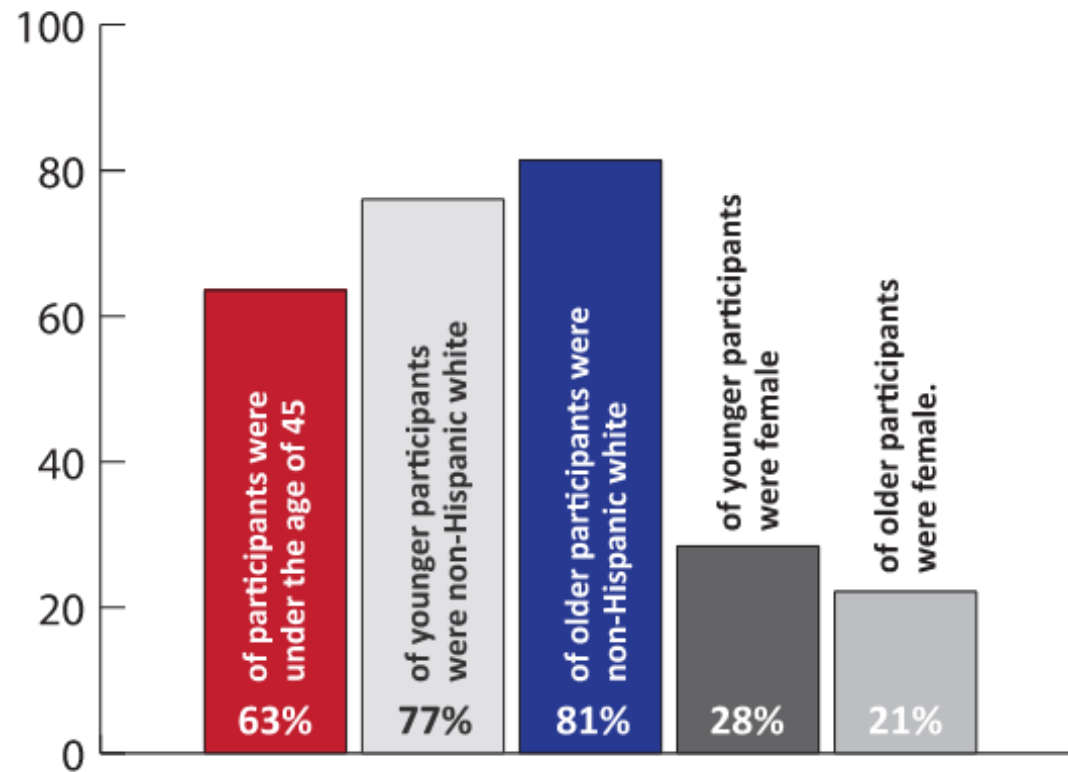
- **Making the World a Better Place** and positively impacting communities is the predominant theme – demonstrating the importance of purpose.
- Personal Values
  - **Integrity / Honesty** as fundamental core values.
  - **Work/Life Balance** significant for older cohorts.
- Organizational Values
  - **Putting People First** given high importance.
- Aspirations & Wishes
  - Improvements in **Diversity / Equity / Inclusivity** as a significant wish for the future.
  - **Innovation** significant for younger cohorts.
  - **Environmental Stewardship** is on the radar.



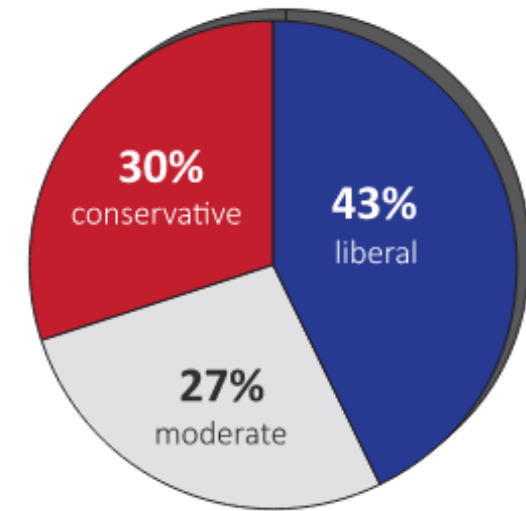
# WILL THE VALUES OF THE FIRMS OF THE FUTURE LINE UP WITH THE ENGINEER OF THE FUTURE?



Darshan Karwat  
Arizona State  
University  
Re-Engineered  
Research Team



Participant Political Views



Younger engineers identify as more politically liberal, and older engineers identify as more conservative.



# KEY INSIGHTS FROM GROUP DISCUSSION

- Firms need to find balance between traditional practice and new demands for attention to environmental protection, social justice and DEI.
- The values of younger generations could create tension with traditional metrics.
- Factors in the current environment for firms limit the ability to adapt to new values and mindsets.
- Conflict could result if client goals clash with new values.
- There is evidence of shifts emerging – stronger voice for young staff and project types.
- To constructively confront conflicts, firms need cultures that support dialogue and reflection.
- Firms will need to invest in development related to entrepreneurship.
- Firms are recognizing the need for policy shifts to support women and maintain diversity.
- Firm leaders will need to adapt their thinking to accommodate emerging values.

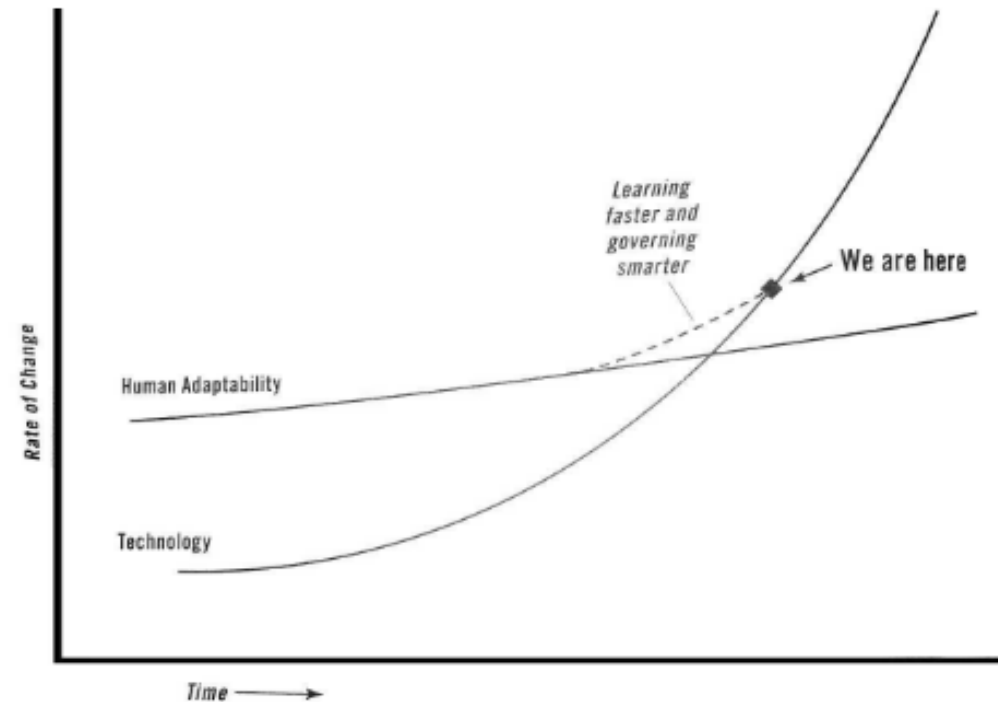
# THE ENGINEERING IDEAS INSTITUTE

ECL-USA Summit 13

- **Engineering in an Age of Acceleration**
- **Engineering and Racial Justice**

## Eric Teller's Adaptability Curve

.....





# WHAT WILL BE THE FUTURE OF ENGINEERING?

A composite image featuring three individuals: a young man in a blue hard hat, a young woman in a yellow hard hat, and an older man with a white beard. They are all looking down at a laptop. The background is a complex, multi-level highway interchange with many cars, overlaid with a grid pattern. The overall color palette is dominated by blues and oranges.

WHAT WILL YOU DO TO PROTECT THE FUTURE OF THE  
ENGINEERING COMMUNITY?





# UPCOMING ECL-USA EVENTS

- Summit 14 – Early 2022
- The Engineering Ideas Institute III – Summer 2022

**Mike McMeekin, P.E., ENV-SP**  
Executive Director ECL-USA

[Mike.McMeekin@lamprynearson.com](mailto:Mike.McMeekin@lamprynearson.com)



**“Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it’s the only thing that ever has.”**

- Margaret Meade

