Research Implementation: Why is it so difficult to achieve?

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Overview

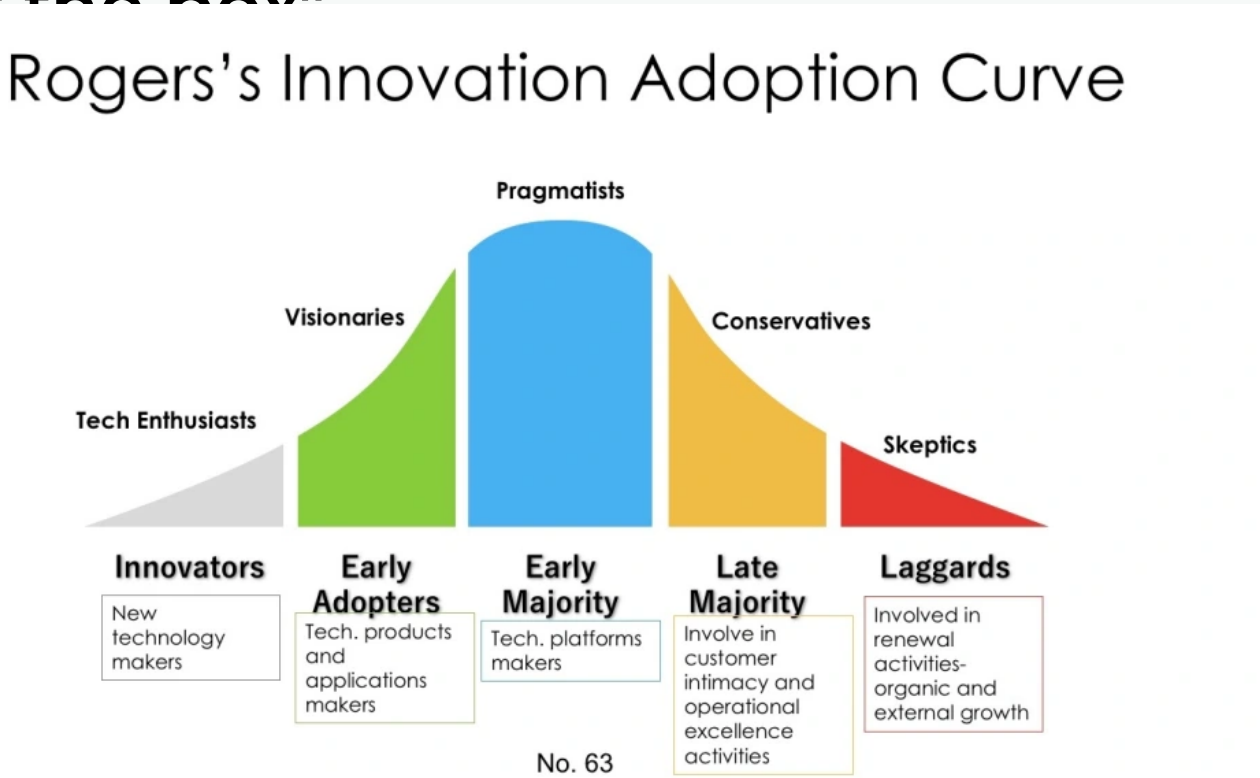
- Implementation
- Innovation
- Why do DOTs lag?
- Barriers
- Potential solutions
- What emerging areas exist?
- Closing comments

Implementation

- “the act of implementing, or putting into effect”
- Implement-”to put into effect according to or by means of definite plan or procedure”
- Innovation – “the act of innovating, introduction of new things or methods”
- For simplicity, we will call it “doing something NEW or DIFFERENT”

Innovation

- Process of introducing something new and successfully bringing it from conception to widespread use
- Not just "thinking outside of the box"
- Everett Rogers
  - Diffusion of Innovation
  - 1962 – First edition
- Innovations for DOT's
  - New to them



Innovation – Key Aspects

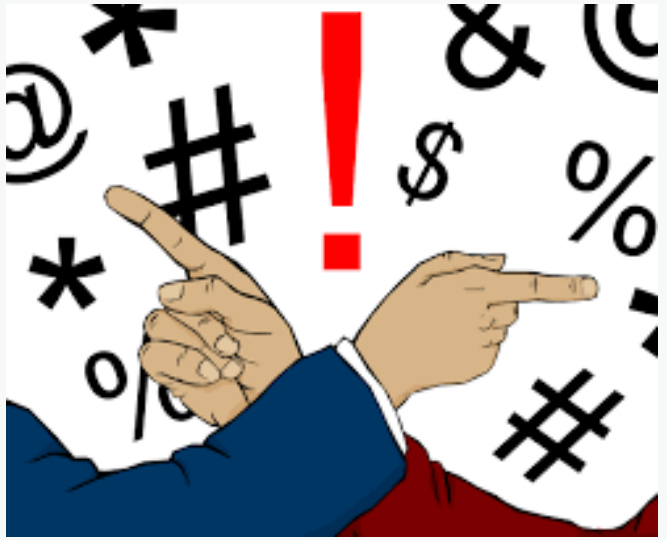
- Process
  - i.e. a journey
- Pairs a problem with a solution
  - Measurable impact
- Values creation
  - Usually results in new features, increased efficiency or reduced costs
- Goes beyond technology

Innovation – How does it work?

- Got to take risks!
  - But have to be willing to accept failures
- Collaboration
- Goal setting
- Culture of innovation

Why do DOTs Lag?

- Takes years to implement
- Culture
- Laws
- Policies
- Politics
- Industry pushback



Barriers to Implementation and Innovation

- Implementation or innovation traditionally not seen as a priority
  - Conservative culture
  - “not my job”
  - “not my neck on the line”
  - “you’re not the boss of me”
  - ‘30 year’ mantra
  - Specifications
  - Cost(s)
  - Siloed

DOTs "Changing" Culture

- STIC and EDC
- FHWA and AASHTO pushing implementation and innovation within DOTs
- $$$ is provided as an incentive to coax DOTs to consider an innovation
- Have a Departmental champion

LTRC

DOTs “Changing” Culture

- NCHRP 20-68
  - US Domestic Scan Program 23-04
  - Developing and Maintaining a Culture of Innovation within DOTs
  - https://www.nationalacademies.org/osdocs/SCAN23-04.pdf
- Highlights DOTs successful in Innovation
  - Texas
  - Indiana
  - Notes that innovation culture starts at the “Top”

Moving Forward – Solutions?

- Educate students
- DOT turnover
  - Large leaps in adopting innovations
- Incentivize
  - $ to employees to “save” money
- <u>Difficult to do properly</u>

Moving Forward – Solutions?

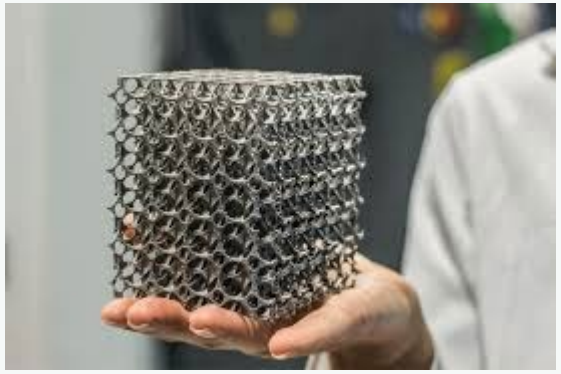
- Continuing education
- Better specifications
  - Generic to allow for competition
- Remove “silos”
  - Force work and collaboration across different aspects of the DOT agency

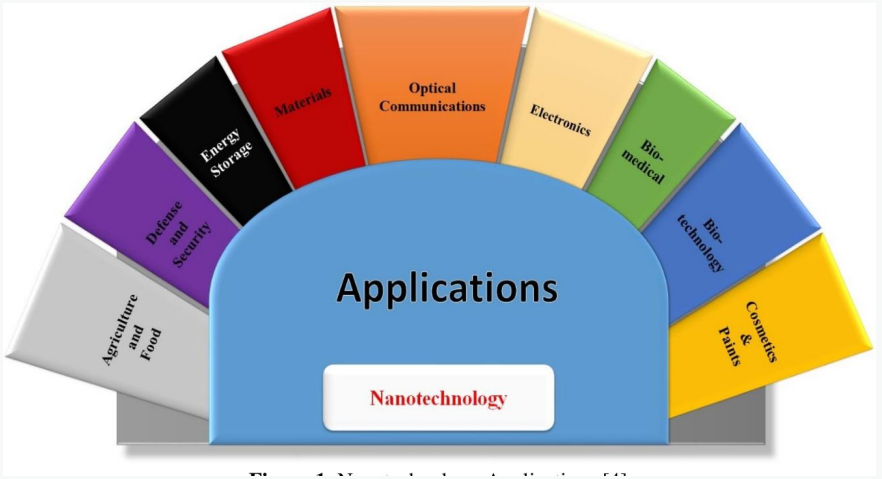
Future Research Direction

- Artificial intelligence
  - Functional
    - Reactive, limited memory, theory of mind and “Skynet”
  - Purpose
    - Generative, predictive, assistive, conversational
  - Capability
    - Weak (narrow), Strong (general – theoretical), Superintelligent (theoretical)
  - Technology
    - Machine learning, deep learning (ANN), natural language processing, robotics, expert systems (decision making)

Future Research Direction

- 3D Printing
  - Plastics
  - Metal
  - Concrete
- Nanotechnology
  - Materials
  - Molecular modifications
- Smart roads / systems





Closing Comments

- Research implementation
  - Time, effort, patience, willingness to change, champion

Closing Comments

- Innovation
  - Culture development takes time, effort, patience, willingness to change

Questions