The “Push” and “Pull” of Innovation

Todd S. Bridges, Ph.D.
Senior Research Scientist (ST), Environmental Science

U.S. Army Corps of Engineers

USACE Innovation Summit
September 17, 2019
Thoughts from Down-Under…
Innovation in Medicine vs. Civil / Environmental Engineering

**Medicine**

1960
- Heart surgery/transplantation
- MRI / CT

1980
- Laser surgery
- Laparoscopic surgery / MIS
- HARRT

2000
- Human Genome Project draft complete
- Biologic treatments
- Artificial pancreas

**Civil / Environmental Engineering**

1960
- ?

1980
- ?

2000
- ?

2020
- ?
What is innovation?

- **Innovation**: The introduction of new advancements into practice.
  - A new concept, business process, engineering model, construction technique, measurement method, etc.
  - Can range from small to large, depending on the impact for practice and the value produced.
    - From incremental to transformative (or “revolutionary”).
The Push-Pull Model of Innovation

- The “process” of innovation includes many elements and factors.
- The Push-Pull Model:
  - Push- R&D/technology-driven innovation (e.g., the laser, the internet).
  - Pull- User/customer-driven innovation (e.g., Woodman’s development of GoPro camera, Lego’s use of customer collaboration).
The Push-Pull Panel

- **Dr. Todd S. Bridges**, Senior Research Scientist (ST), Environmental Science; USACE, Engineer Research and Development Center
- **Dr. Don Leo**, Dean, College of Engineering; University of Georgia
- **Dr. Deborah Edwards**, Global Sediment Technical Lead, ExxonMobil
- **Dr. Michael J. Donahue**, Vice President, Water Resources and Environmental Service; Director, National Coastal and Ecosystem Restoration Practice; AECOM
- **Dr. Edmond J. Russo Jr.**, Deputy District Engineer for Programs and Project Management, USACE Galveston District
- **Dr. Mihan McKenna**, Senior Scientific Technical Manager, USACE Engineer Research and Development Center
- **Dr. Jane Smith**, Senior Research Scientist, Hydrodynamic Phenomenon; USACE, Engineer Research and Development Center
Panel Questions

- What is innovation?
- What are the major obstacles to innovation?
- What are the key factors that facilitate innovation?
- How can we measure innovation?
- How can R&D-push and user-pull be coordinated?
- What are the key challenges and opportunities for USACE?
  - How would you rate USACE’s level of innovation (1-10)?
“The changes in surgical endoscopy leading up to 1988 were, in fact, gradual and evolutionary. For any major change or progress to take place, many factors must fall into place. In the case of laparoscopy, dramatic technical innovations were required. Additionally, there is a season for any change, requiring a favorable and supportive philosophical environment. Authoritative institutions must be convinced of the safety and efficacy of the changes relative to the comfortable status quo. Momentum always favors inertia. Fears must be overcome: fear of making mistakes, fear of failure, fear of established procedures becoming obsolete, and fear of established authorities losing control. Successful change requires timing and a force more powerful than the status quo. The strongest force for sustainable change is a worthy goal.”
The importance of social processes...

- “There is a season for any change…”
  - “Favorable and supportive philosophical environment…”
  - “Authoritative institutions must be convinced…”
  - “Fears must be overcome:”
    - “Fear of making mistakes,
    - “Fear of failure,
    - “Fear of established procedures becoming obsolete,
    - “Fear of established authorities losing control.

- A revolution requires revolutionaries!
  - How are you contributing to innovation?
  - What risks are you willing to take for “the cause”?
  - How are you incentivizing innovation in others?
The importance of “a worthy goal”…

The Physician’s Pledge
AS A MEMBER OF THE MEDICAL PROFESSION:
I SOLEMNLY PLEDGE to dedicate my life to the service of humanity;
THE HEALTH AND WELL-BEING OF MY PATIENT will be my first consideration; ...

ASCE Code of Ethics, Fundamental Cannons
1. Engineers shall hold paramount the safety, health, and welfare of the public and shall strive to comply with the principles of sustainable development\(^3\) in the performance of their professional duties.

\(^3\)In November 1996, the ASCE Board of Direction adopted the following definition of Sustainable Development: “Sustainable Development is the challenge of meeting human needs for natural resources, industrial products, energy, food, transportation, shelter, and effective waste management while conserving and protecting environmental quality and the natural resource base essential for future development.”
We are Part of a Noble Profession…

I SOLEMNLY PLEDGE to dedicate my life to the service of humanity by providing safe water resources, now and in the future, for ALL people AND the ecosystems on which we depend.

Essayons!