

Strategic Foresight, Deep Uncertainty, and Leadership: A Workshop Report

Darryl Farber^{*}, Mathew Burrows^{**}, and
Martin T. Pietrucha^{*}

Presentation to the Society for Decision Making
Under Deep Uncertainty Annual Meeting
November 15, 2018

^{*}Penn State University, ^{**}Atlantic Council

D + T + A -> I

Diversity + Trust + Analysis -> Intelligence

STRATEGIC FORESIGHT, DEEP UNCERTAINTY, AND LEADERSHIP

[HOME](#) [RECEPTION](#) [SCHEDULE](#) [SPEAKERS](#) [REGISTRATION](#) [SPONSORS](#) [LOCATIONS](#) [CONTACT](#)



**“[A] new type of thinking is essential if [humans are]
to survive and move to a higher level.”**

A. Einstein (1946)

Chatham House Rule

“When a meeting, or part thereof, is held under the **Chatham House Rule**, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed.”

Topics

- Organization — Operations and logistics
- Intellectual architecture — Ideas and methods
- Lessons learned and reflections on future programs

Purpose of Workshop

What, why, how, who, where, when

Educational exercise for graduate students and professionals interested in strategic foresight and analysis for sociotechnical and engineering systems.

The objectives are:

- To understand how changes in technologies and in sociotechnical systems impact society over the long term, and
- To understand how to shape a system's evolution.

Understand the evolving human technology systems frontier

- Bring together academics, analysts, and executives
- Immerse the students in a policy making environment with thinkers and practitioners of a global stature
- Engage with our trans-Atlantic colleagues
- Bring together scientific and technological expertise with policy expertise

Overarching themes and questions

- Strategic foresight and analysis is not about prediction. It is about understanding the different factors — social, political, economic, techno-scientific — that generate the future and learning how one may shape a desirable future.
- Technical innovation is one source of deep uncertainty. A new technology can impact society in ways that were not intended.
- How do experts develop their knowledge about sociotechnical systems?

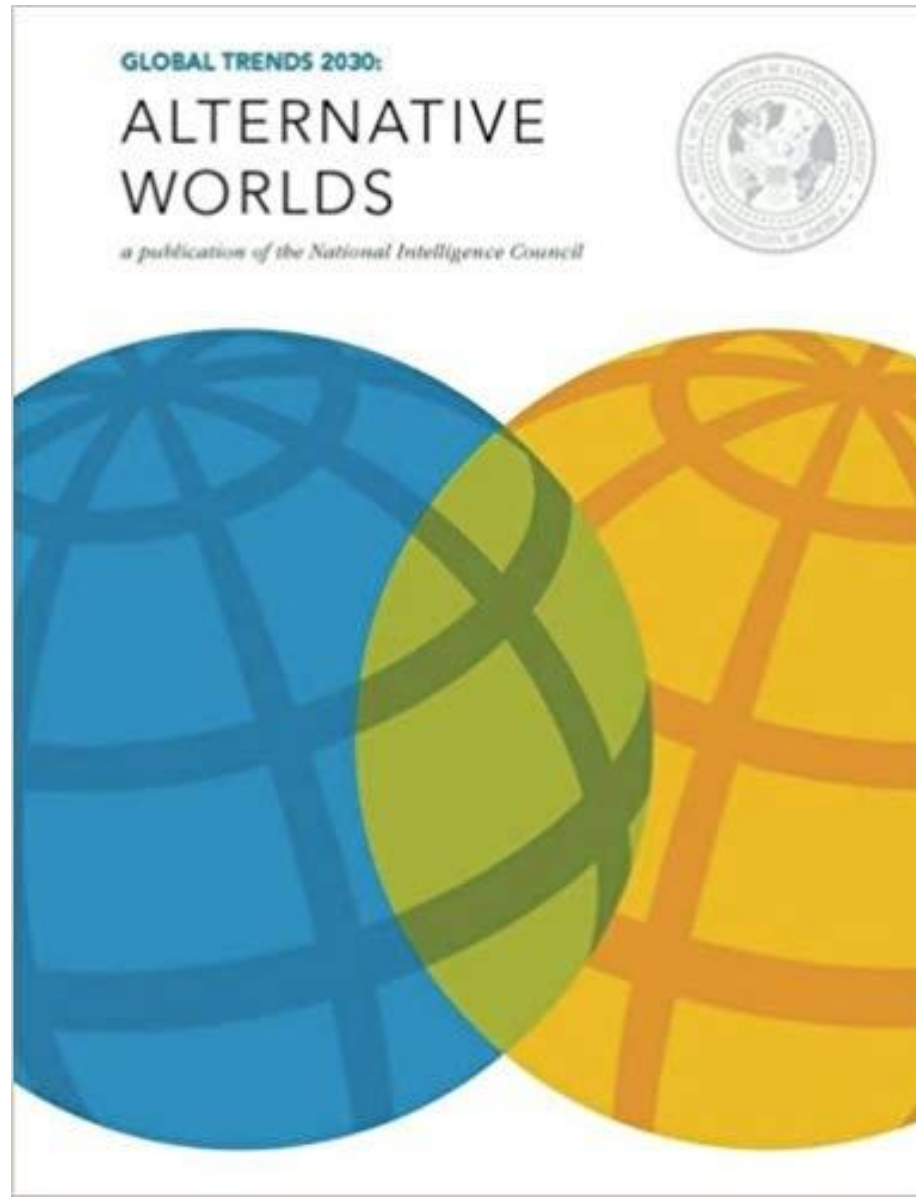
- What are the strategies of foresight a leader could use and what strategies do they use?
- How do leaders think and reason about the future, think through different courses of action, and develop their judgment regarding a set of circumstances?
- What is the role of models and tools in developing professional expertise and judgement?
- What is the role of experience?

Cross Fertilization Between
Engineering Systems and
Strategic Foresight
for
Holistic, Long-term Policy Analysis

3-Day Workshop

Evening Panel Discussion and Reception

A Strategic Analysis

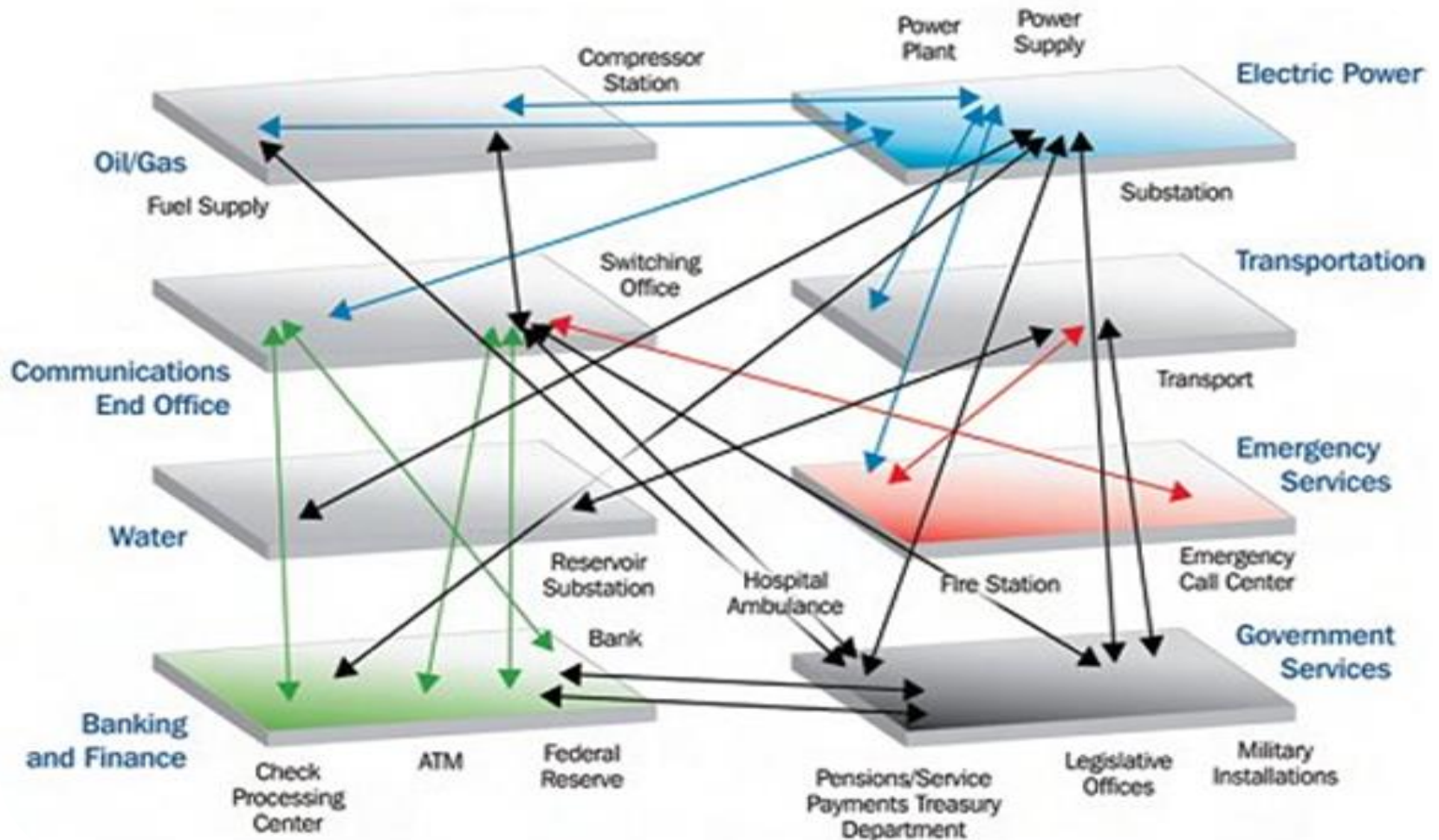


Strategic foresight and analysis is a way to reduce uncertainty

“The goal is to identify the most important streams of developments, how they interact, where they seem to be headed, what drives the process, and what signs might indicate a change of trajectory.”

“Seeks to identify the factors that will shape the future so that policy makers can devise strategies and formulate policies to maintain positive trajectories and shift negative ones in a more positive direction.”

Interdependent Critical Infrastructure



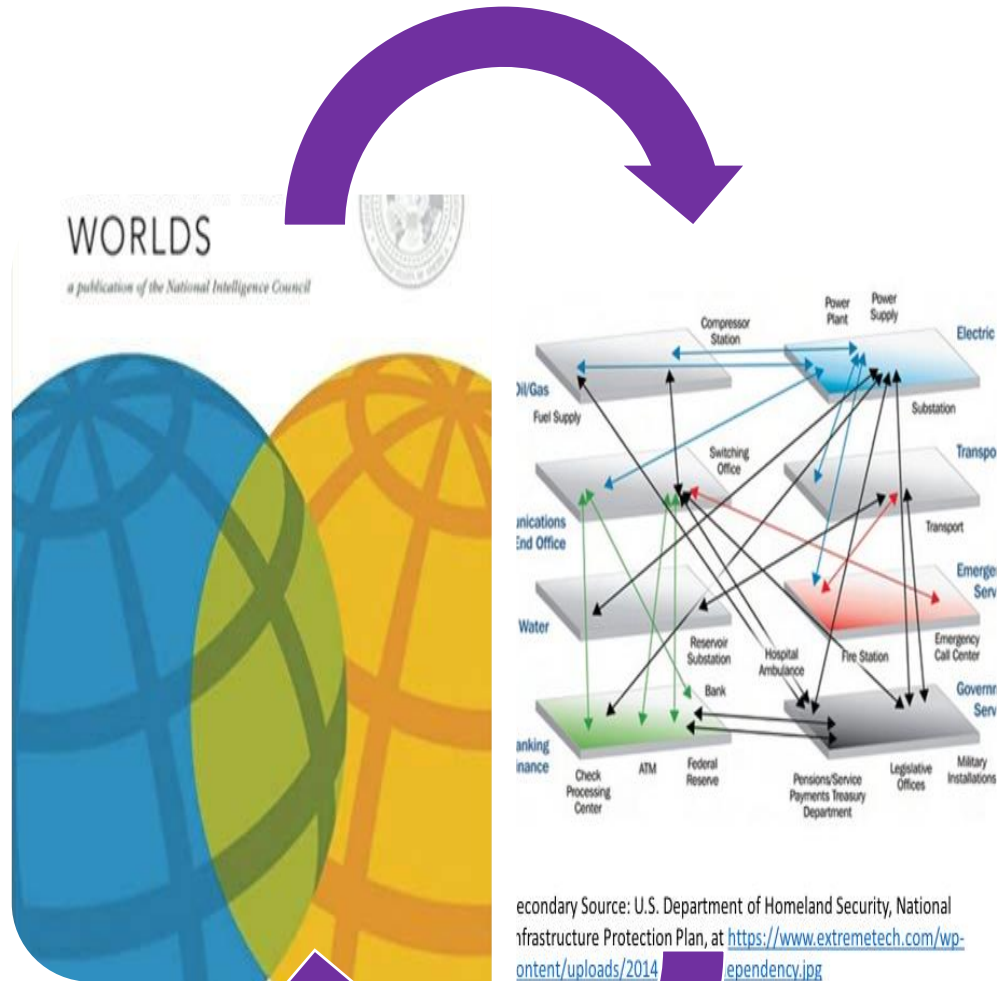
Secondary Source: U.S. Department of Homeland Security, National Infrastructure Protection Plan, at <https://www.extremetech.com/wp-content/uploads/2014/07/interdependency.jpg>

Engineering Systems

“A class of systems characterized by a high degree of technical complexity, social intricacy, and elaborate processes, aimed at fulfilling important functions in society.”

Source: de Weck, Roos, and Magee. 2011. *Engineering Systems: Meeting Human Needs in a Complex Technological World*. Cambridge, MA: The MIT Press.

An Academic-Think Tank Partnership



Panel discussions with a mix of senior practitioners and academics – to show the relationship of theory with practice — “the notes *and* the tune”

Scenario analysis exercise on energy technologies and flood risk

Atlantic Council and the National Academy of Sciences Building, Great Hall in Washington, DC

May 15-17, 2018

Background and speakers

- Idea for workshop began in March 2017
- Planning May 2017 — May 2018
- All direct financial activities complete September 2018
- Follow-up report and next step planning June 2018 — current



Mat Burrows



Martin Pietrucha



Debra Knopman



Willem Auping



Jan Kwakkel



Rob Lempert



Ellen Laipson



Gen. (ret) C. Robert Kehler



Cmd. Eric Popiel



Gen. (ret) James E. Cartwright



Roberto dos Reis Alvarez



Gina Guillaume-Joseph



Conrad Tucker



John Regas



Dan Cahoy



Bruce Vojak



Malia K. Du Mont



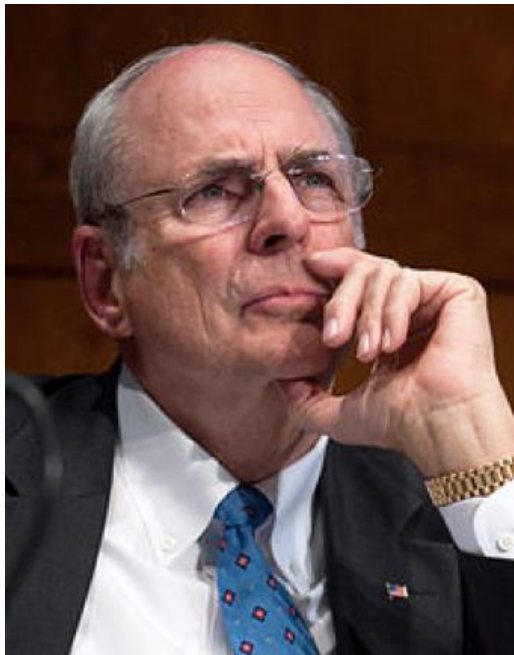
Eric J. Barron



Steve LeVine



Anthony Atchley



Norman Augustine



Darryl Farber²²





HEARKEN TO THE MISERIES THAT BESET MANKIND. THEY WERE WITLESS ERST AND I MADE THEM TO HAVE SENSE AND BE ENDOWED WITH REASON. THOUGH THEY HAD EYES TO SEE THEY SAW IN VAIN. THEY HAD EARS. BUT HEARD NOT. BUT, LIKE TO SHAPES IN DREAMS, THROUGHOUT THEIR LENGTH OF DAYS WITHOUT PURPOSE THEY WROUGHT ALL THINGS IN CONFUSION--THEY HAD NO SIGN EITHER OF WINTER OR OF FLOWERY SPRING OR OF FRIVOL SVMMER, WHEREON THEY COULD DEPEND, BUT IN EVERYTHING THEY WROUGHT WITHOUT IVDGMENT, UNTIL SVCH TIME AS I TAUGHT THEM TO DISCERN THE RISINGS OF THE STARS AND THEIR SETTINGS, AYE, AND NVMERS, TOO, CHIEFEEST OF SCIENCES, I INVENTED FOR THEM, AND THE COMBINING OF LETTERS, CREATIVE MOTHER OF THE MVSES' ARTS, WHEREWITH TO HOLD ALL THINGS IN MEMORY--TWAS I AND NO ONE ELSE THAT CONTRIVED THE MARINERS' FLAXEN-WINGED CAR TO ROAM THE SEA--IF EVER MAN FELL ILL, THERE WAS NO DEFENCE, BUT FOR LACK OF MEDICINE THEY WASTED AWAY, UNTIL I SHOWED THEM HOW TO MIX SCOTHING REMEDIES WHEREWITH THEY NOW WARD OFF ALL THEIR DISORDERS--HEAR THE SVM OF THE WHOLE MATTER--EVERY ART POSSESSED BY MAN COMES FROM PROMETHEVS



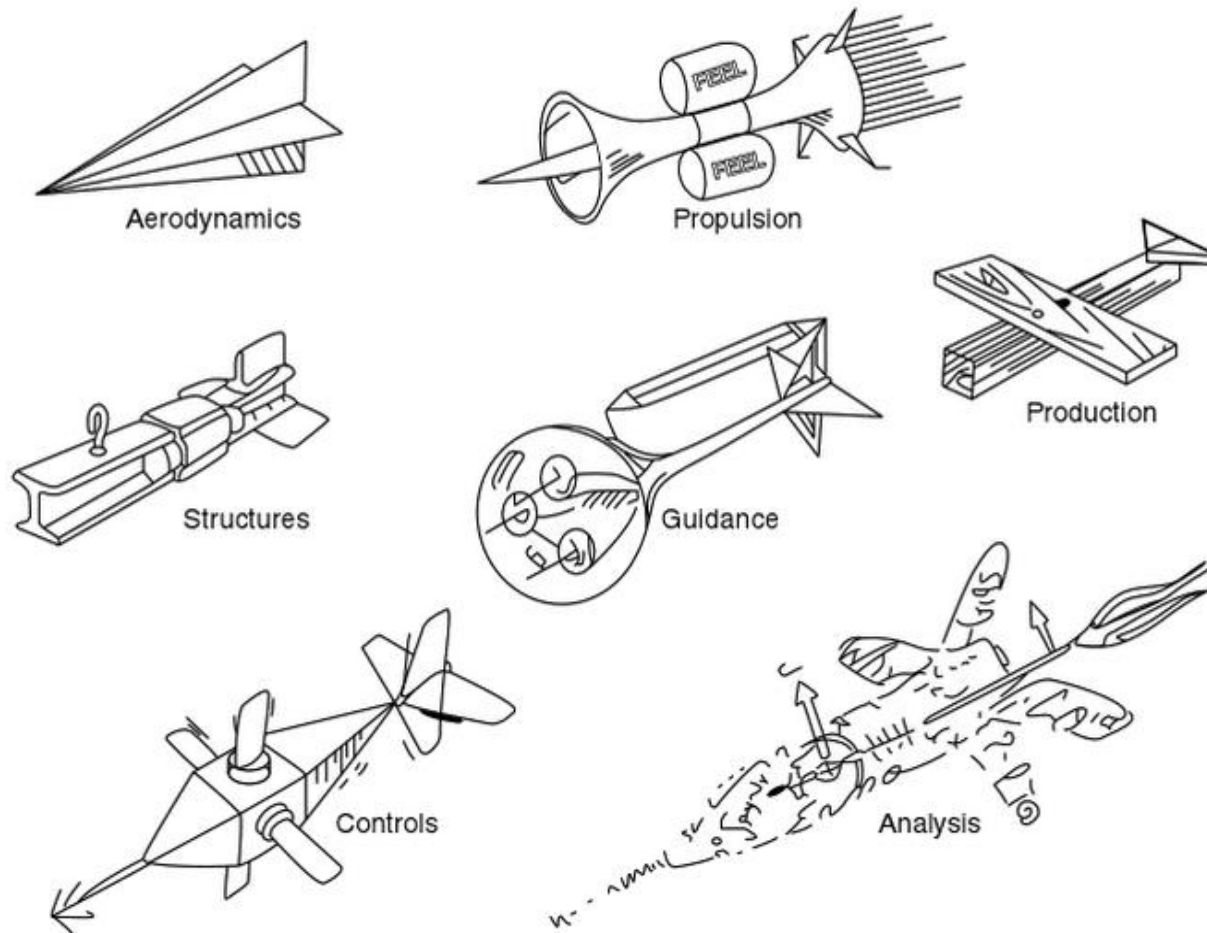
Participants included:

Diversity of Fields

Political science, meteorology, chemistry, materials science, engineering and policy, communications, mathematics, geography, statistics, (data science), computer science, engineering science and mechanics, aerospace engineering, systems engineering

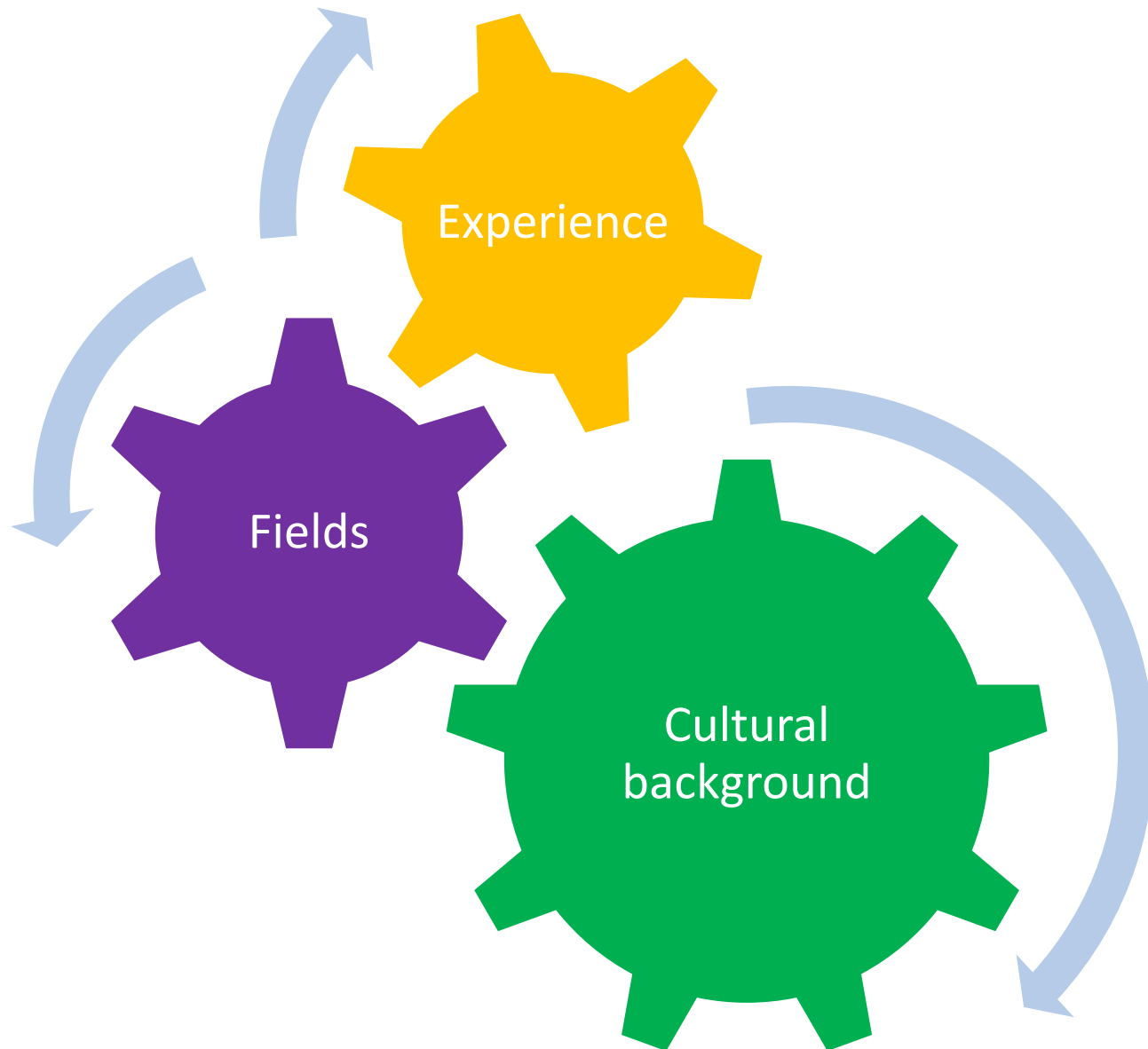
Model makers and model users

Different viewpoints of a system



The ideal missile design from the viewpoint of various specialties, source A. Kossiakoff et al. 2011. *Systems Engineering Principles and Practice*, 2nd ed. p. 31,
26

Diversity of Participants



Day 1 start 11:00 — lunch — afternoon

- Introduction
- Need for strategic foresight and analysis
- Methodological Primer
- **Panel Discussion** at National Academy of Sciences
Building Great Hall

Socio-engineering Systems Innovation: Forces of Disruption and Leadership

Day 2

- **Introduction to Systems and Platforms**

 - Security Challenges and Technology

 - Gigabyte Society and Augmented Reality

- **Critical Infrastructure**

 - Deep Uncertainty in Innovation

 - Breakthrough Serial Innovation

- **Analytic Exercise**

 - A study on flood risk and transportation: A case study with Bangladesh.

 - Cost of transitioning from gas to electric propelled privately owned vehicles.

Day 3 end by 2pm

- **Workshop Exercise Presentation**
- **Future of work and talent development and the evolving educational enterprise**

Modeling approach & take-a-ways

- Policy analysis and search through a solutions space to identify options that are robust across a range of scenarios.
- Need for conversations with stakeholders that requires listening and trust building and starting the modeling process from how the stakeholders perceive their problems.
- Need to elaborate how mental models, which drive decision-making, correspond to the world.

Findings and Observations

Understand that context is essential for effective decisions and leadership.

Context is an interpretative activity and there are multiple contexts — such that an issue is decided upon the relevant context.

Decision processes also are social interactions so that the negotiation of meaning and trust may depend on the context.

Reflections

The workshop is done in the spirit of enhancing personalized education for learning about complex sociotechnical systems.

If experts disagree how to resolve or make clearer the sources of their disagreement and why, it will affect the believability of their claims about the future.

Models are abstractions of reality that requires the skill of matching models with their use. When are models useful and when do they muddle?

“Don’t fall in love with your model.” S. Golumb.

- Strategic foresight is not about predicting the future, it is about understanding what is possible and why.
- Strategic foresight is about interpretation and meaning – it is about making sense of the world.
- Technological innovation is one factor that generates ambiguity or deep uncertainty.
- Leadership is about making sense and deciding a course of action in a context where many times short-term thinking drives out long-term thinking and planning.

Acknowledgments

- We gratefully acknowledge the Atlantic Council Scowcroft Center for Strategy and Security, the following colleges, institutes, and departments at Penn State University: College of Engineering, Center for Security Research and Education, Smeal College of Business, College of Liberal Arts, Eberly College of Science, College of Earth and Mineral Sciences, Schreyer Honors College, Applied Research Laboratory, Materials Research Institute, Institutes of Energy and the Environment, Institute for CyberScience, Huck Institutes of the Life Sciences, Rock Ethics Institute, School of Engineering Design, Technology, and Professional Programs, Center for Supply Chain Research™, Department of Statistics, Department of Chemistry, Department of Engineering Science and Mechanics, Department of Aerospace Engineering, School of Electrical Engineering and Computer Science.



Source: Albert Herter, National Academy of Sciences Building

What may the 21st century mean?