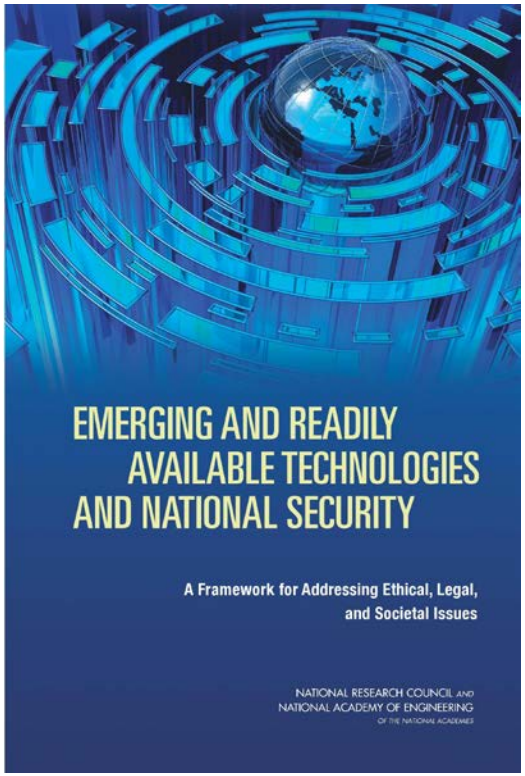

Emerging and Readily Available Technologies and National Security:
A Framework for Addressing Ethical, Legal, and Societal Issues

Herb Lin
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Synopsis

- Emerging and readily available military technologies pose ELSI challenges that are different from those that arise in a civilian context. (Also, study of ELSI in civilian sector much more advanced.)

- To address ELSI issues, conduct best systematic effort to anticipate ELSI issues up front (recognizing inevitable incompleteness)

- Plan to reassess as the work progresses, adapt/modify if necessary.

- Adopt lightweight processes for agencies and researchers who are interested in addressing ELSI.

Key Findings Relevant to Commission's Work

- The ELSI concerns that may be associated with a given technology development are ***very hard to anticipate accurately at the start of that development.***

- ***Sustainable policy***—policy whose goals and conduct can be supported over the long run—regarding science and technology ***requires decision makers*** to attend to the ELSI aspects of the S&T involved.

- ***Public reaction*** to a given science or technology effort or application ***is sometimes an important influence*** on the degree of support it receives.

- Any ***approach*** to promote consideration of ethical, legal, and societal issues in R&D will ***have to address how such plans are implemented at both the program and the project levels.***

Recommendations

- Senior leadership must explicitly and openly make ELSI a priority
- Deploy five key processes
  a. **Initial screening**
  b. **Reviewing proposals**
  c. **Monitoring projects for emergence of issues: provide necessary mid-course corrections**
  d. **Engaging with various segments of the public as needed**
  e. **Periodically reviewing ELSI-related processes**
- Educate and sensitize program managers
- Build external ELSI expertise
- Provide assistance to researchers

NOTE – Approaches to addressing ELSI concerns can be both systematic **and** pose minimal additional burdens on agencies and on researchers

Addressing ELSI issues

- Addressing ELSI issues has two important components
  - Identification of important ELSI issues and competing perspectives.
  - Weighing competing perspectives and determining a course of action.

This effort focuses only on how to identify important ELSI issues and competing perspectives.

Weighing perspectives is essentially a political task, and was beyond scope.

Technologies of Concern

- Emerging and readily available technologies (aka "democratized" technologies)
  - Emerging
    - new and unfamiliar
    - rapid rate of change/progress
  - Readily available = low barriers to entry, hence "democratized" access

- Important to consider these technologies because:
  - Highly uncertain evolutionary pathways due to broad access.
  - Many current technology governance regimes based on state control, but ERA technologies readily available to non-state entities.

- The broader context for technology
  - Globalization (many minds, broad access to materials)
  - High connectivity (rapid diffusion of knowledge)
  - Lack of government monopoly (private sector is driver)

Two domains for consideration

- Foundational (or enabling) technologies
  - support, facilitate, drive, and may be essential to other technologies and many applications areas.
  - Examples:
    - Neuroscience as enabler for robotics and prosthetics.
    - Synthetic biology as enabler for manipulation of genetic function

- Applications areas
  - defined by a common problem that many applications might help to solve; may draw on many different technologies.
  - Example:
    - Prosthetics and human enhancement (replacing or enhancing human functionality, cognitive manipulation)

A two-part process

- Do the best you can to anticipate ELSI issues up front, recognizing inevitable incompleteness of effort.
  - Use many sources for insight
  - Be as systematic as possible using a structuring framework
    - By stakeholder (e.g., research subject, researcher..)
    - By cross-cutting themes (e.g., nature of harm; humanity; technological imperfections)
    - By sources of ELSI insight (e.g., disciplinary and philosophical ethics; precautionary principle and cost/benefit analysis)
  - Engage as many possible stakeholders as possible

- Plan to reassess as the work progresses, adapt/modify if necessary

After the Initial Analysis. . .

- Initial analysis of ELSI issues is inevitably incomplete.
  - Paths of technology evolution are uncertain; technology forecasts often inaccurate
  - New military technologies often used in unanticipated ways
  - Ready availability increases space of possible applications

- Anticipating unanticipated ethical, legal, and societal issues is oxymoronic, but….

- Quick response to unanticipated issues is enhanced by addressing in advance a wide variety of identified issues
  - Provides building blocks upon which responses to unanticipated ESLI issues can be crafted.

  - Obtain a broad range of perspectives and possible stakeholders to get more information, enhance legitimacy

  - Plan to adjust in midcourse.

Some additional considerations

Approaching the problem

- Top-down? Start with philosophical ethics, apply to different technologies.
  - Deontology
  - Consequentialism
  - Virtue theory

  Advantage – systematic coverage, consistent template for analysis
  Disadvantage – artificial consistency not in accord with how people really make ELSI decisions

- Bottom-up? Start with different technologies, consider ELSI issues in specific contexts, abstract from different technologies

  Advantage – allows fine-grain analysis
  Disadvantage – seems ad hoc

- A middle ground – start with different technologies, consider ELSI issues, look to philosophical ethics for insight for additional issues

Challenges

- Complexity of topic – temptations to boil the fractal ocean
- Importance of real scientific experience in grounding analysis and recommendations
- Real-world considerations important in committee deliberations
  - Minimizing bureaucracy and burden on program managers, researchers
  - Desire for intermediate options beyond “stop” or “go.”
- Persuasive vs mandatory approach in recommendations
- Bridging the gap between high-level policy intentions and how it appears “on the ground” to people in the field.
- Importance of willingness to keep asking the questions; better to know some of the questions than all of the answers
- Importance of human judgments in programmatic decisions – more important than any specific oversight mechanism.

For more information…

Herb Lin

Chief Scientist, Computer Science and Telecommunications Board

National Research Council

202-334-3191

hlin@nas.edu

www.cstb.org

BACK UP

Scope

- *The conduct of research*, including selection of research areas, design of particular research investigations (e.g., protocols, experiments), and execution of those investigations.
  - Broader than protection of research subjects alone.

- *Research applications,* relating to intended new capabilities. ELSI concerns include concerns about intended effects or purposes of the application and concerns about side effects.

- *Unanticipated, unforeseen, or inadvertent ELSI consequences* of either research or applications when something goes awry, when research does not proceed as expected, or when unanticipated applications raise additional ELSI concerns.

Many diverse sources of input

- Military and other ethicists
- Futurists
- Disciplinary ethics – biotechnology and engineering
- Legal scholars
- Technologists – information technologists, neuroscience, synthetic biology, roboticists, prosthetics developers
- Science studies scholars
- Program managers from multiple government agencies (NASA, NIH, NSF, DOE, USDA, FDA)
- Risk assessment and communications scientists
- International specialists in science and ethics

Many briefings to committee

- National Security Context
- Prior ELSI work in civilian sector
  - Biomedical/Engineering Ethics
  - Emerging Technologies
  - Mechanisms Used by Government Agencies to Address ELSI
  - Embedding Ethics in Research and Development
- Science and Technology: state of the science, possible applications, ELSI
  - Foundational Science
  - Applications for Specific Problem Domains
  - Nuclear technologies (for comparison)
- Non-U.S. Perspectives on Ethics in Science and Technology
- Risk Assessment and Risk Communications