Keeping the Technological Edge:
Leveraging Outside Innovation to Sustain DoD's Technological Advantage

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The CSIS Study on Leveraging Outside Innovation to Sustain DoD's Technological Advantage

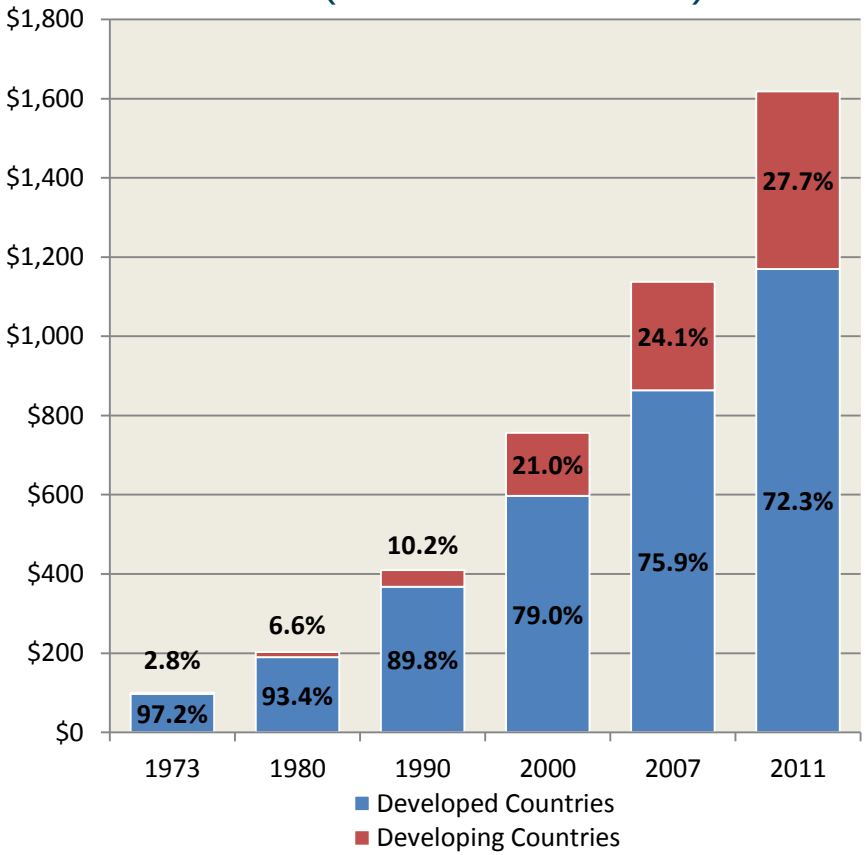
- Performed under contract from the DoD Information Analysis Centers
- 18 month effort involving direct research and over 100 interviews with stakeholders and experts both inside and outside of government.
- Initiated in response to recognition of the changing global innovation environment and DoD's participation in that ecosystem.

Defining Innovation in the Context of the CSIS Study

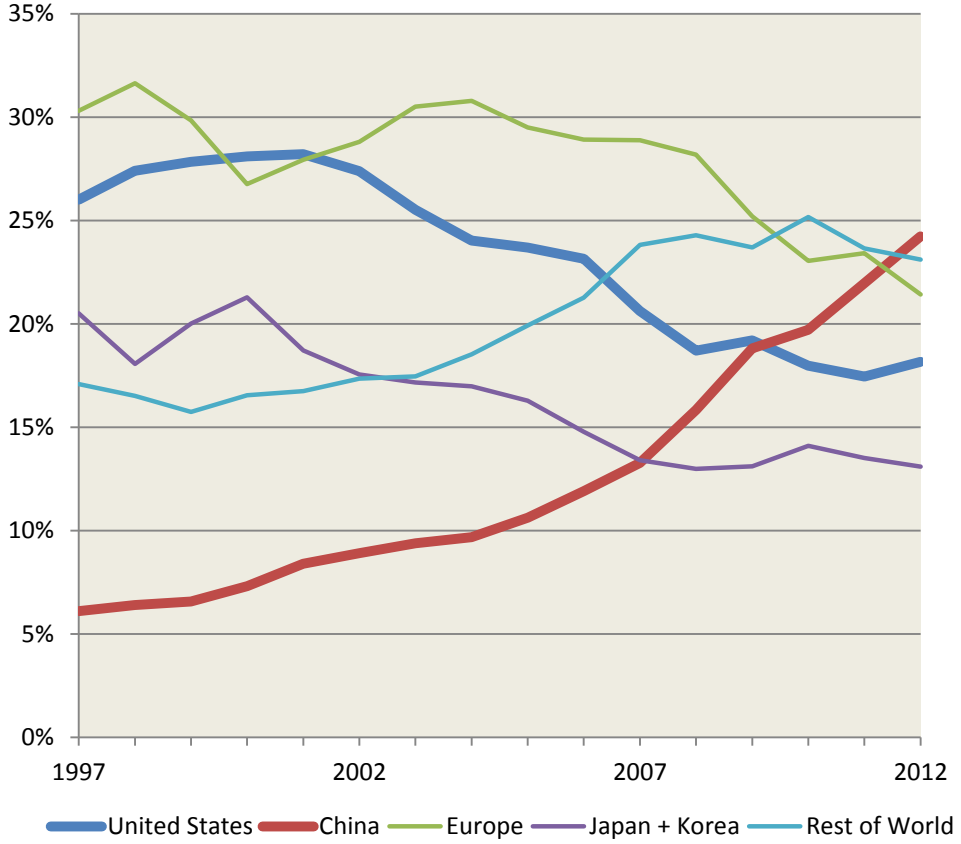
- In the context of this study, innovation is focused on technological development that, when coupled with the processes, CONOPS, and implementation necessary in DoD, provides improved and/or cheaper capability for the U.S. military.
- The study explicitly focused on leveraging outside innovation.
  - This study is generally not focused on major weapons systems as candidates for sourcing from non-traditional firms at the system level, although components of said systems would be good candidates for insertion of new technology.

Innovation Globalization

Total Global Expenditure on R&D, 1973-2011 (in current $ billions)



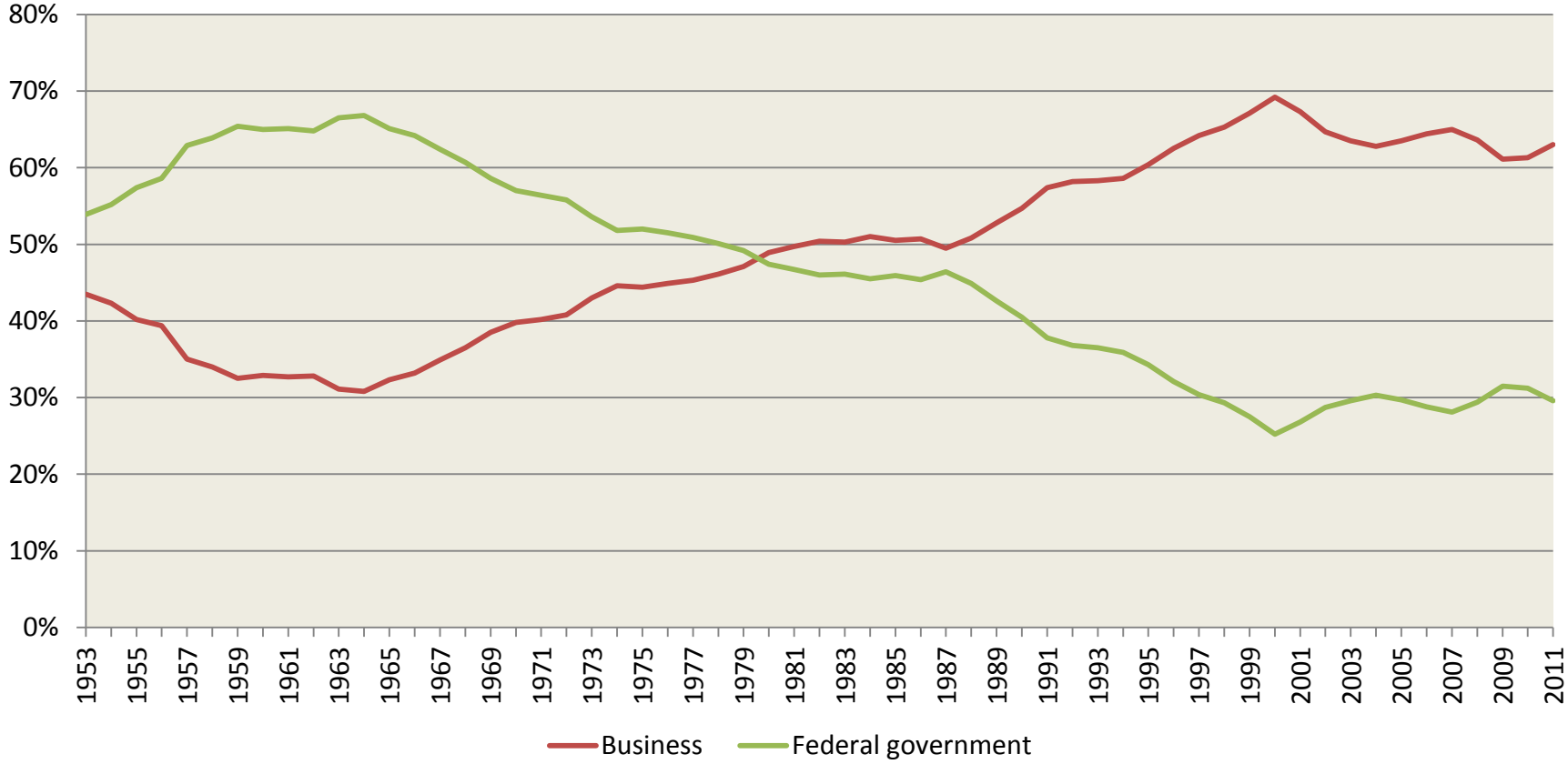
Share of global manufacturing (value added), 1997-2012



1973-2007 data from Elisa Around and Martin Bell, *Trends in the Global Distribution of R&D since the 1970s: Data, their Interpretation and Limitations*, STEPS Working Paper 39, Brighton, UK: STEPS Centre, 2010, p. 29. 2014 data aggregated to match STEPS data, from National Science Foundation. "International comparisons of gross domestic expenditures on R&D and R&D share of gross domestic product, by region/country/economy: 2011 or most recent year," Science and Engineering Indicators 2014, National Science Foundation, 2014.

Innovation Privatization

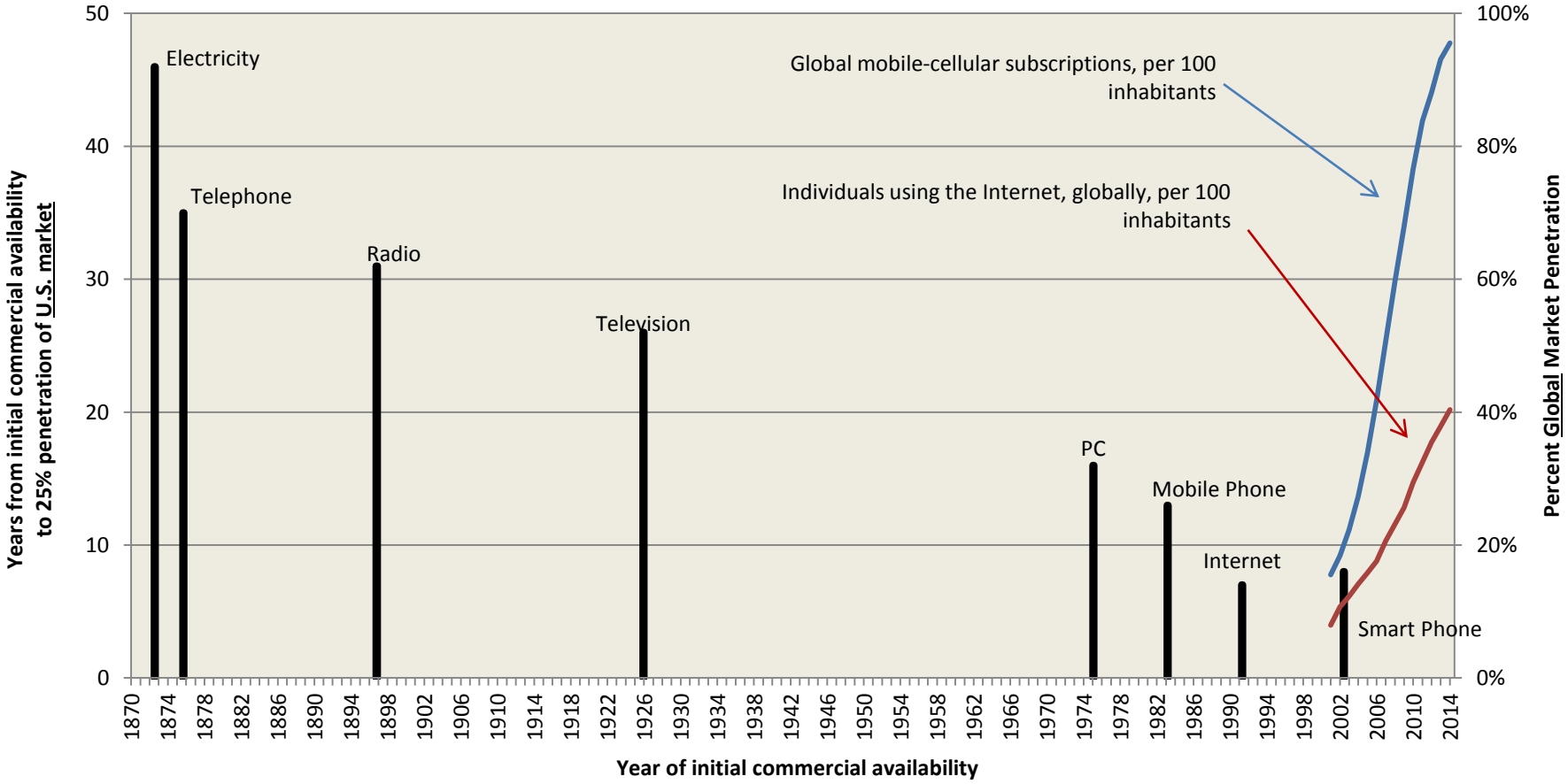
Source of Funds for R&D in the United States, Percent Share of Public and Private Sector, 1953-2011



Source: National Science Foundation, *Science and Engineering Indicators 2014*, National Center for Science and Engineering Statistics, National Patterns of R&D Resources (annual series). See appendix table 4-6.

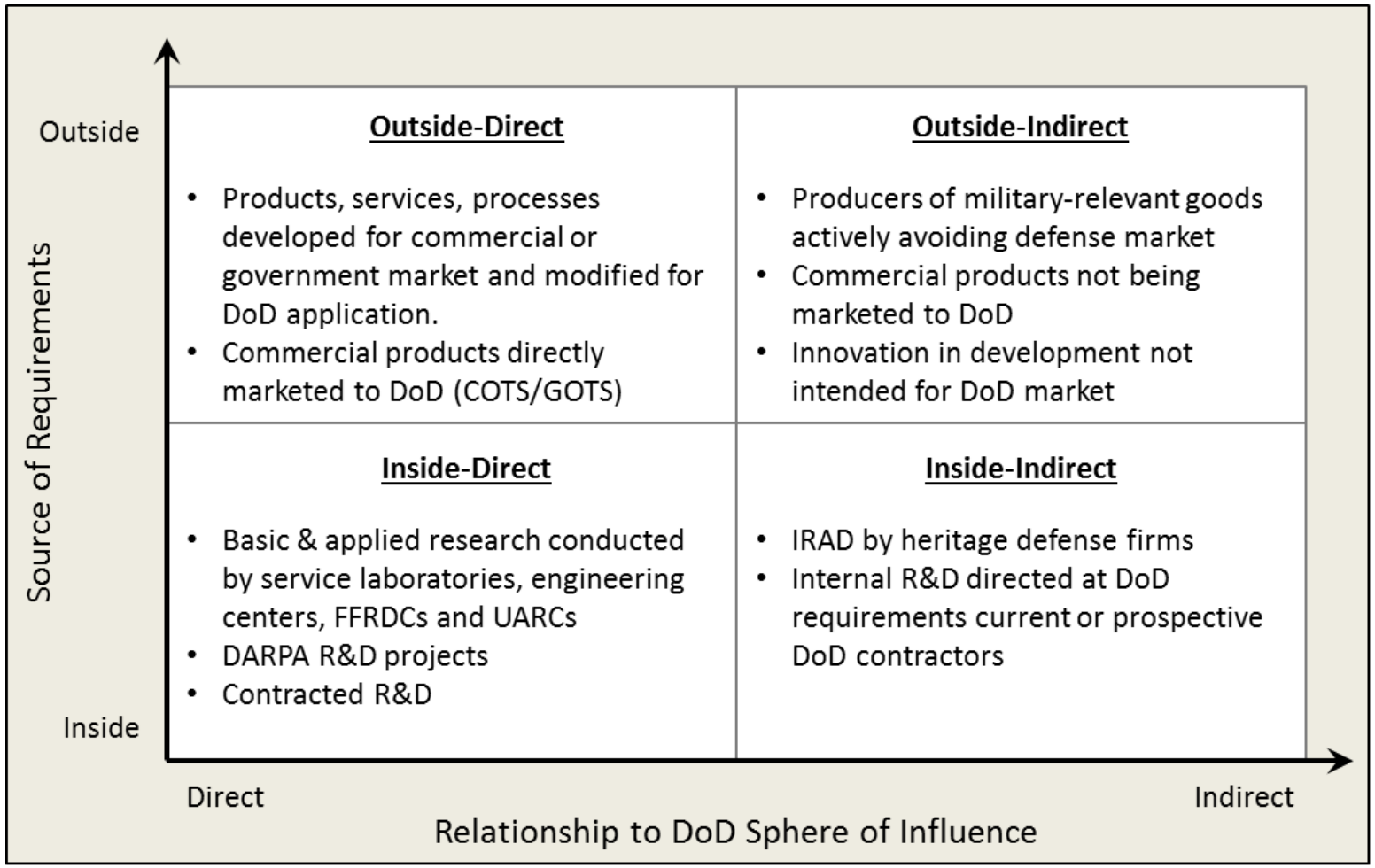
Innovation Acceleration and Commercialization

Years from initial commercial availability to 25% penetration of U.S. market

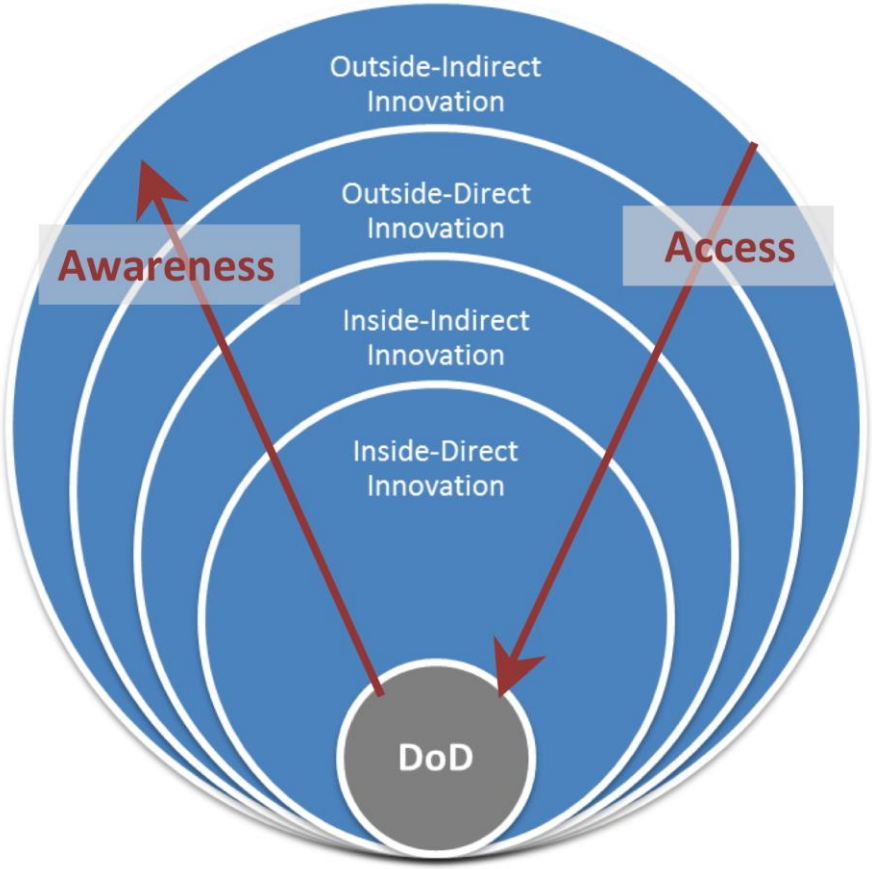


Data for electricity, telephone, radio, television, PC, mobile phone, and internet all come from Raymoned Kurzweil's published dataset at Singularity.com. Smartphone data comes from ASYMCO. Global cellular and internet data comes from the International Telecommunications Union.

Matrix of "Centers" of Innovation



Leveraging Outside Innovation



Leveraging "outside innovation" requires:

1) Awareness – what is it we don't know about
2) Access – how do we get it
   - Addressing acquisition barriers
   - Requirements collaboration
   - Finding funding to support innovation

Findings

- A strong DoD R&D program is essential for funding both military-unique innovation and the basic S&T underpinning U.S. innovation.
- BUT, this investment is insufficient for ensuring future U.S. technological superiority in the face of a changing global innovation environment.
- DoD has numerous initiatives, including Secretary Carter's recent outreach in Silicon Valley, seeking to address this technology challenge
- DoD can better connect the disparate parts of the innovation knowledge base, including the S&T, acquisition, requirements, funding and warfighter communities.
- DoD acquisition can make it hard for DoD entities to consider outside innovation and can discourage commercial firms from DOD business.
- Current processes and funding focus too little on the role of the warfighter in identifying and pulling innovation into defense capabilities.

Awareness Recommendations

- Create and share a better knowledge base of emerging commercial technologies and processes at home and globally. Need to expand and connect the search for specific technology development from outside innovation.
- Use small “demonstration” projects and operational experimentation to identify and incorporate outside innovation.
- Establish initiatives to promote “operational innovation” to warfighters through experimentation, expanding use of field testing for evaluation, and report/disseminate results of exercises and experiments.
- Encourage more warfighter-innovator collaboration.
- Guide development toward potential uses (for example via targeted IR&D investment or technology development). Open dialogue with industry providers on potential/anticipated DoD.

Access Recommendations: Requirements

- Develop and expand forcing functions within the warfighter and acquisition communities that identify capability gaps, match available and emerging technologies and concepts with those gaps, and rapidly pull those technologies and concepts into operational use.
- Create requirements flexibility that allows consideration of potential solutions that don't seem to fit existing programs or requirements.
- Build early and continuous warfighter input into the technology identification and validation process, for example by emphasizing technology insertion in exercises.
- Specify necessary open, modular architectures and identify desired outcomes, but provide flexibility in approaches to meet those outcomes.
- Consider disposability (i.e., planned obsolescence), not updating, as a viable acquisition strategy.

Access Recommendations: Acquisition

- Capture/leverage wartime rapid fielding lessons learned, under which DoD has accepted more risk. Accept commercial/civil solutions for operationally-essential capabilities, where appropriate.
- Adjust acquisition incentives where needed to entice commercial and non-U.S. firms via OTA and other mechanisms
  - Cost accounting standards
  - Export Controls
  - More clarity, and possibly flexibility, in intellectual Property
  - Aggressively tailor Milestone System when appropriate

Access Recommendations: Funding

- Expand mechanisms for warfighters to fund urgent operational capability needs.
- Expand BBP goals/encouragement of prototypes to include prototypes for proof of concept, validating requirements, defining requirements, and as a means to design experiments and tests.
- Source funding for warfighter initiatives. Funding cannot wait for the full PPBE cycle followed by congressional appropriations. DoD need for a pre-arranged set of funds to be available to verify, evaluate, and begin to incorporate outside innovation discoveries

Centers of Defense-Relevant Innovation