

The Case for Industry Leadership in STI Policy Implementation.

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What's this session about?

It's about narrowing the gap between government funding for R&D and society's need for beneficial deliverables:

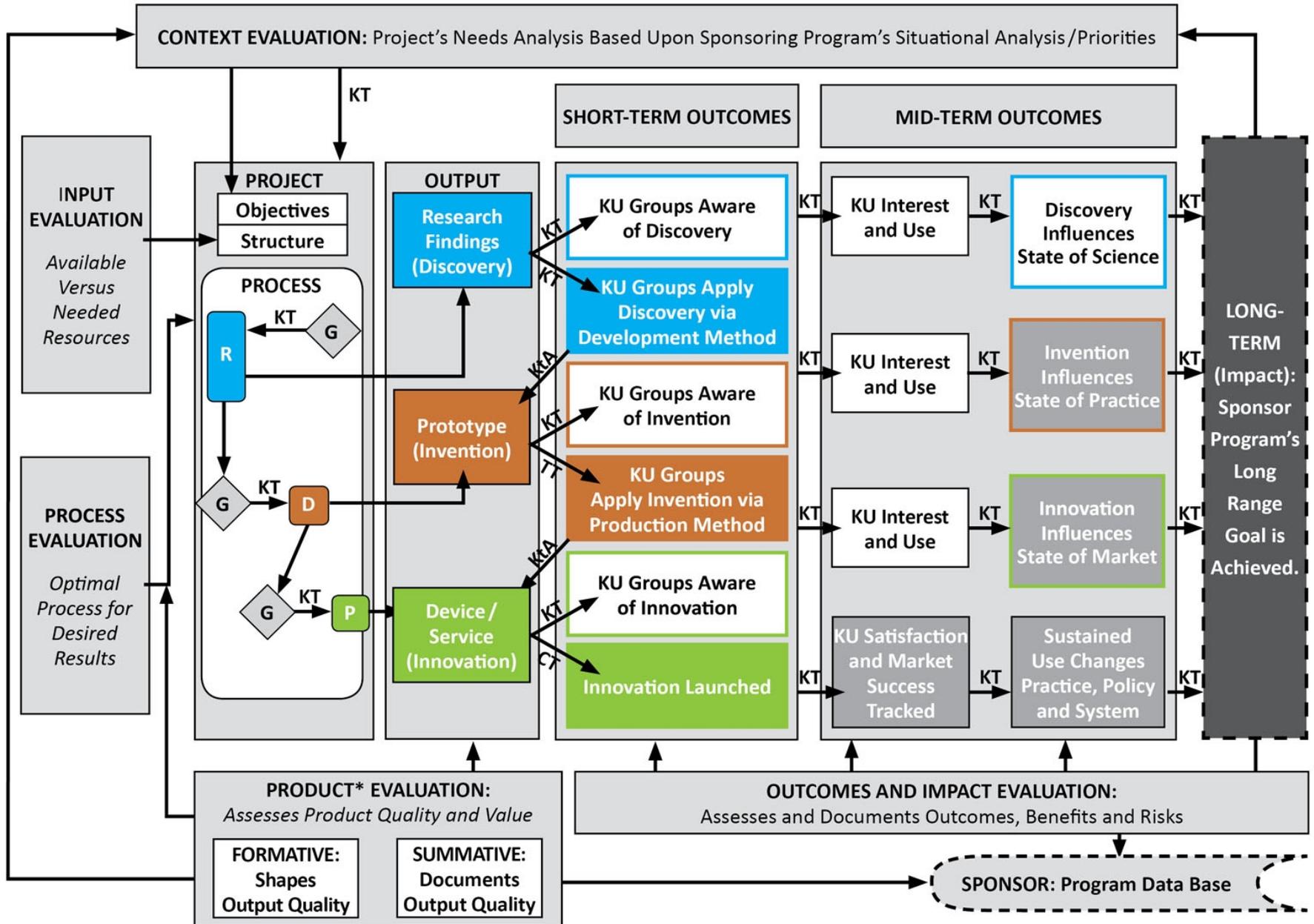
- The free market forces of industry address most societal needs for technological innovation, except those too large, too small, too late or premature . . .
- Government's address some of these “market failures” by investing public funds, but success requires proper alignment between investment, value chain and results.
- STI Policies based on linear model of university-led R&D is generally *ineffective*; requiring sector realignment to deliver intended beneficial socio-economic impacts.

Commercial Innovation Markets

Industry delivers technological innovations to society when they meet standard commercial market requirements (market size; customer affluence; high profit margin; low entry barriers):



Figure 7. Planning and Evaluating Technology-Based R&D: Role of KT from Beginning to End



Conditions of Market Failure

- When standard business conditions are not met -- but need is deemed important to society -- government's supply resources to fill market gaps.
- STI Policies address societal needs for new knowledge under conditions of market failure.
- Problems arise when 'new knowledge' is defined only in the long-term and indefinite context of university-based scholarship and publications.
- New knowledge is not limited to scientific findings.

Government R&D Laboratories

Public tax dollars are allocated to generate new knowledge outputs embodied in 3 different *states*:

- Scientific research → *Conceptual Discovery Output*
(*know what ?*)
 - Engineering Development → *Tangible Invention Output*
(*know how ?*)
 - Industrial Production → *Commercial Innovation Output*
(*know why ?*)
- Each *state* follows its own trajectory, outcome, impact.

CONCEPTUAL DISCOVERY STATE

Labs conduct scientific research (basic, fundamental, curiosity-driven) to expand the base of fundamental knowledge.



TANGIBLE INVENTION STATE

Labs conduct scientific research (applied, oriented)
AND engineering development to transform conceptual discoveries
into operational prototypes – *'proof of concept'*.

Need for breakthrough prototypes



\$\$ to Agency Laboratory/Team



Applied SR & Experimental ED



Proof of Concept Prototypes



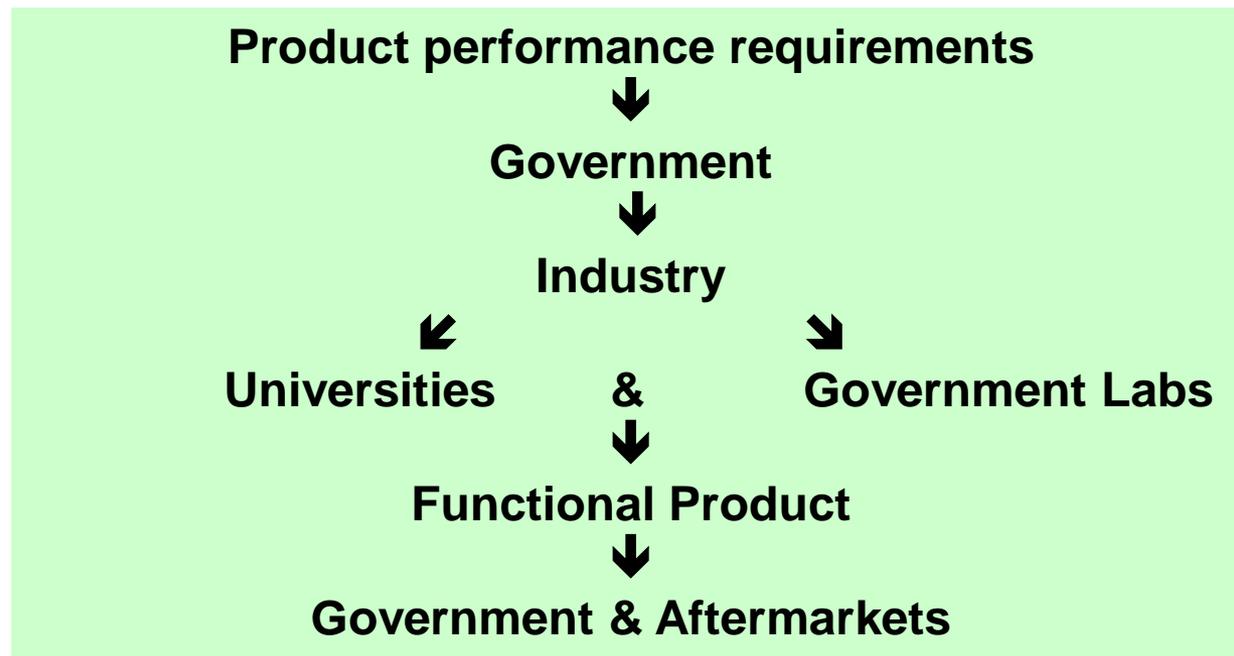
Agency Use & IP Claims



Socio-Economic Impact ???

COMMERCIAL INNOVATION STATE

Laboratories design, build, test and deliver next generation products – according to performance specifications – while governments serve as primary customer for resulting products.



Let's Consider Reality!

- Market innovations come from a combination of all of the above factors.
- Current “STI” policies result from a status quo Academic/Bureaucratic complex.
- ROI from public investment – both social benefit and tax revenues -- comes from private sector delivery of products.
- Society's bottom line is the creation of new net wealth at some boundary.

Delivering Solutions to Problems involves progress across all three Knowledge States

Scientific Research → *Discovery* →

Knowledge Translation → ***Utilization*** ↓

Development → *Invention* →

Technology Transfer → ***Integration*** ↓

Industrial Production → *Innovation* →

Commercial Transaction → ***Lifecycle*** ↓

Innovation & Impact

- Traditionally, each sector defined terms in own narrow context, unconcerned with downstream market activities or broader societal benefits, comfortable in status quo budgets and paradigms. But that appplecart is tipping . . .
- National Science Board (2012) – “*Innovation is defined as the introduction of new or significantly improved products (goods or services), processes organizational methods, and marketing methods, in internal business practices or in the open marketplace.*” (OECD/Eurostat, 2005).

“Innovation” Impact implies Utility

Public support for investment in technology-based *innovations* grounded in 3 expectations:

- ✓ New/improved devices/services with economies of scale that contribute to societal quality of life.
- ✓ Sufficient return on investment through sales to sustain company, pay taxes and compete globally to generate new net wealth.
- ✓ Benefits realized in short-term (5–10 yrs).

*Innovation’s context is Societal Impact via
Commercial Marketplace.*

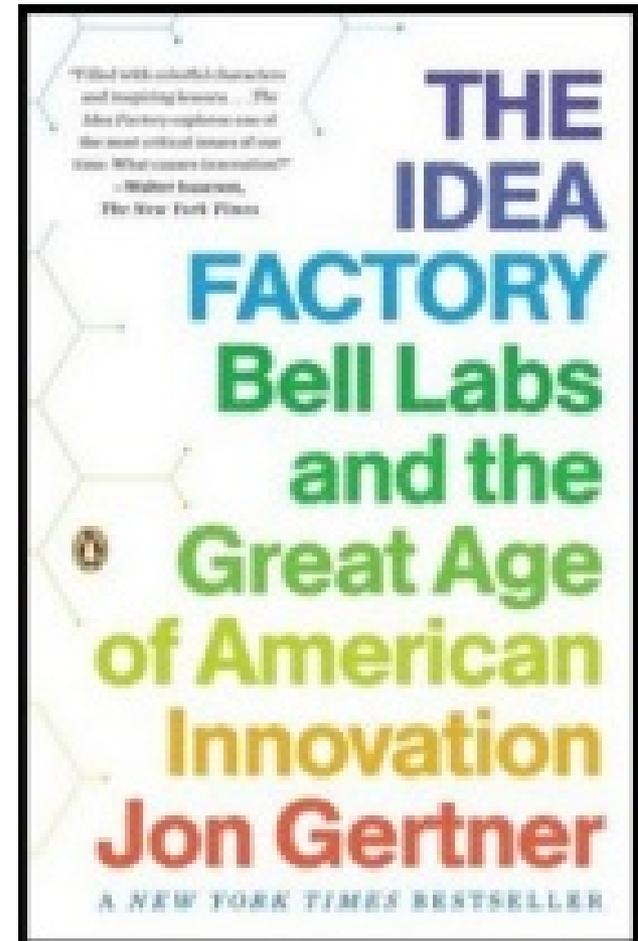
Commercial Market is path to Utility

- Industry survives in competitive system by translating knowledge into market utility through Production methods (beyond R&D).
- Utility = Money to Seller / Function to Buyer.
- **No \$ale** – Research discoveries are freely published and globally disseminated, while Development prototypes lack commercial hardening or economies of scale.

R and D outputs ≠ Market Innovation.

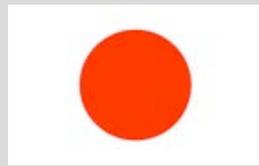
So what am I saying?

- ***Time to return to successful practices!***
- ***Industry leads R&D efforts intending to generate innovations.***
- ***Industry has incentive, expertise and structure to create, retain and exploit new knowledge.***



Related Publications

- Lane, JP, Godin, B. (2013) ***Methodology Trumps Mythology***, Bridges, Office of Science & Technology, Embassy of Austria, Washington, DC, 36. <http://ostaustria.org/programs-projects-english/event-management/2013-04-23-10-55-57/2003-2001/382-categories-all/magazine/volume-36-december-14-2012/opeds-a-commentaries/6002-methodology-trumps-mythology>
- Lane, JP, Godin, B, (2012) ***Is America's Science, Technology, and Innovation Policy Open for Business?*** Science Progress, June 12, 2012, <http://scienceprogress.org/2012/06/is-america%E2%80%99s-science-technology-and-innovation-policy-open-for-business/>
- Flagg, J, Lane, J., & Lockett M. (2013) **Need to Knowledge (NtK) Model: An Evidence-based Framework for Generating Technology-based Innovations.** *Implementation Science*, 8, 21, <http://www.implementationscience.com/content/8/1/21>
- Stone, V. & Lane J (2012). **Modeling the Technology Innovation Process: How the implementation of science, engineering and industry methods combine to generate beneficial socio-economic impacts.** *Implementation Science*, 7, 1, 44. <http://www.implementationscience.com/content/7/1/44>.
- Lane, J & Flagg, J. (2010). **Translating 3 States of Knowledge: Discovery, Invention & Innovation.** *Implementation Science*, 5, 1, 9. <http://www.implementationscience.com/content/5/1/9>.
- Edquist, C, *et al* (2015). **Public Procurement for Innovation.** Cheltenham, UK: Elgar Publishing Inc. <http://www.e-elgar.com/shop/public-procurement-for-innovation>.



- Issues in Science, Technology & Innovation Policies.



- Three States of Knowledge – Origins, Relationships & Transitions.



- Comprehensive Model of Technological Innovation.



- Tools for Effective Knowledge Translation.



- Tools for Successful Technology Transfer.



- Tools for Achieving Invention Commercialization.

- Market Research Resources.



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