

Innovation Policy 3.0 and ICTs

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Challenges & Opportunities for ICT Innovation Policy

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Ages of the Internet

Internet 1.0 **the platform**

- Web, PCs, LANs, mobile telephony. Microsoft. End of Client-Server.
- Overlay on PSTN, Convergence and the end of silos...
- Internet is the innovation. Wild West frontier.

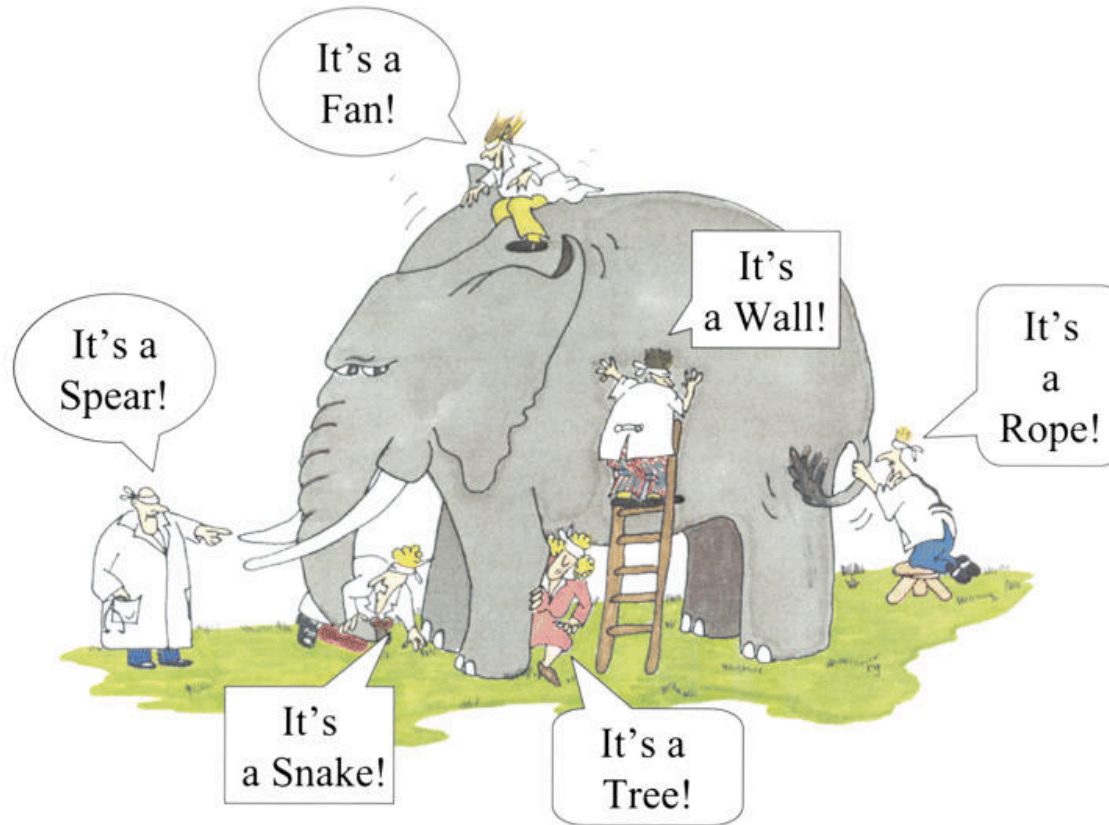
Internet 2.0 **interactive**

- Web 2.0, Facebook, Twitter, Apple, smart phones, tablets.
- Broadband as the new PSTN, Convergence and the end of silos...
- Innovation on the Internet. Coming of the Rail Road.

Internet 3.0 **automation**

- Smart X (transport, energy, healthcare, govt, education).
- Internet is the economy. Global Warming. Snowden. Back to silos???
- Innovate the system. Los Angeles the future we want?

Why would anyone think *Big Data* makes this problem easier?



Policy Goal: Informed Collective Decision-making

- Privacy/security: who controls the data?
- Methods/metrics: understanding data visualizations?
- Big Data is an asymmetric, imperfect information game...

(Innovation) Policy 3.0

Institution/markets by design

- 1984 or 2001? Customization or homogenization? Autonomy or control?
- Antitrust in n-sided market world? Why isn't everyone a Bayesian?
- Regulation \Leftrightarrow Markets

Multidisciplinary, Cross-layer, Closed System

- Technology is an economic system
- Coordination, not optimization (scarcity allocation)
- Capacity building. Long-term bets when do not know what betting on.

Internet: end of the beginning, or ...?

- ICT is means to an end, not an end in itself.

Back-up slides and material

Disruptive innovation in ICT industries

Smart Everything: mobile, embedded, automated

- Internet of Things, Cloud Computing, Big Data, Robots, Smart X (grids, buildings, energy, healthcare, govt, etc.)
- Software, not hardware; Wireless; Virtualization...
- Smaller, faster, cheaper, everywhere....

Innovation: new things, new ways to make/use/organize

- “Local” decision-making: faster, granular, dynamic, customized
- Empower end-users (edges): crowd sourcing, Science 2.0, etc.
- Complex systems, closed-loop feedback (but not necessarily stabilizing)

Institutions, Markets co-evolve with Technology

- ICT changes *how* we interact with environment
- Market-based regulation \Leftrightarrow public/private partnerships
- Virtual-real world integration: who's in charge of automation?

Smart Innovation: it's a dynamic system challenge

Multidisciplinary, Cross-layer, Public-Private collaboration key!

- ICT enables convergence, breaks down silos while creating new ones
- Technology ⇔ Business models/markets ⇔ Policy Co-evolve
- Test-beds as laboratories for continuous innovation/commercialization
- End-user design, enforcement

e.g., Wireless → new sharing paradigms

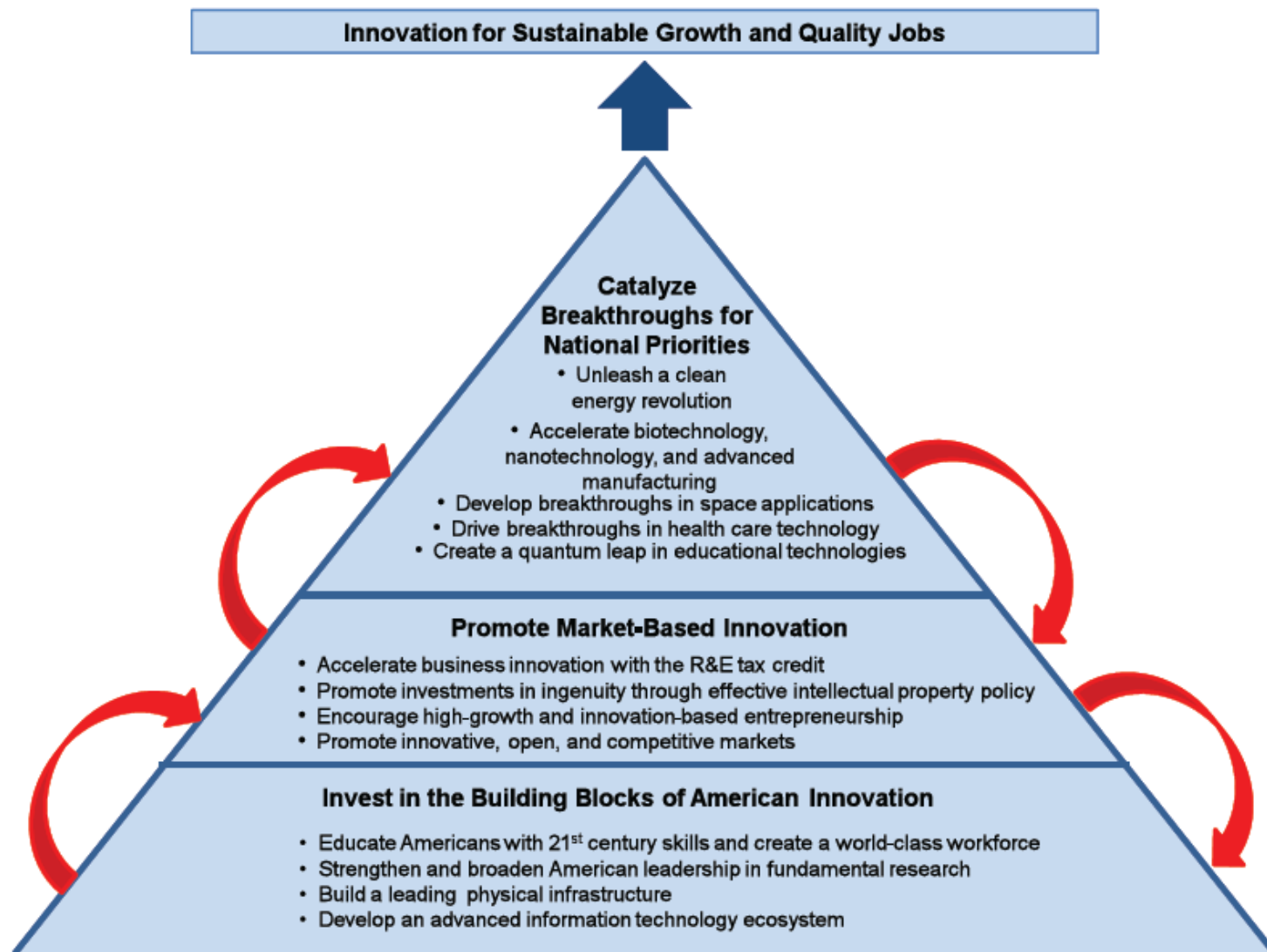
- Spectrum Policy 2.0: design of Spectrum Access System (SAS)
- Small cell ecosystem (Lehr-Oliver paper)

e.g., Economic impacts of ICTs → new data and metrics

- Impact comes from usage, not availability
- Market definition/power in n-sided markets

e.g., Regulatory reform

- Broadband as the new PSTN – Internet governance, NN
- Patent reform – trolls and giants



A STRATEGY FOR AMERICAN INNOVATION

Securing Our Economic Growth and Prosperity

Source: <http://www.whitehouse.gov/sites/default/files/uploads/InnovationStrategy.pdf>

Table 1 Typology of policy instruments for ICT innovation (Poel and Kool, 2008)

| Government Provision | Financial instruments | Regulation | Information | Demand by public organisations |
|--|-----------------------------------|--|---|--|
| G1 By government institutes | F1 Tax incentives | R1 Laws and regulations | C1 Foresight and priority setting | D1 Demand aggregation for public organisations |
| G2 Dedicated public organisation | F2 Subsidies and grants | R2 Specific decisions, e.g. frequency allocation | C2 Provision of data and information, e.g. market data and best practices | D2 Procurement |
| G3 Public infrastructures and facilities | F3 Guarantees and loans | R3 Co-regulation | C3 Networks and platforms for information exchange and consensus building | D3 Other |
| G4 Public-private partnership | F4 Investments, market principles | R4 Self-regulation | C4 Advice | |
| G5 Other | F5 Other | R5 Other | C5 Demand aggregation, e.g. for SMEs | |

ICT disrupts policy

Regulatory Institutions: communications policy, patents, security

- **Property rights: “Internet access is a basic right”**
- **Jurisdiction/Authority: “ITU v. FCC v. ?” (Internet governance)**
- **Security: “limits to privacy?” “after Snowden, now what?”**

Metrics/data: informed collective decision-making

- **Big Data: why believe more data will lead to better decisions?**

Mobile Broadband Future (*a vision...*)

- **Pervasive computing**
 - always/everywhere/everything connected
 - IoT (M2M) → sensing/real-time decision-making, on-demand video
 - (Internet) Cloud → computing/storage in-network, fat/thin clients
 - FTTx → lots of dense neighborhood fiber
- **Mobility** → all dimensions/scales... geo, time, context (network)
 - “Mobility” ⇔ “Dynamic” ⇔ “Local”
 - Resources able to be allocated on much more granular basis
 - “Customization” : have it your way (when, where, how)
- **Wireless everywhere** → everyone wants more Spectrum!
 - All uses: communication & sensing
 - All users: Feds & commercial, planned & ad hoc
 - All kinds: long/**short** range, high/**low** power, **new**/legacy