

2025 JOINT AGINNOVATION AND COOPERATIVE EXTENSION MEETING

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COOPERATIVE
EXTENSION



The Computational Research Imperative

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OUTLINE

- Recognizing signals of federal research shifts.
- Embedded in research, we will:
 - Contextualize implications: funding declines, program closures, institutional downsizing.
 - Explore opportunities in computational innovation, AI, cyberinfrastructure, and simulation.
 - Introduce a framework for institutional adaptation and resilience.
- Synthesis of actions
- Discussion: What can we work on together?

The Case for Change

- Federal priorities are pivoting toward computationally driven research, technologies, and research and development in tech.
- Declines in public R&D funding create financial instability for universities.
- Traditional productivity metrics limit institutional responsiveness and innovation.
- Static planning models hinder adaptation in rapidly shifting research landscapes.
- Research programs must strategically integrate computational approaches into existing strengths to remain competitive and mission-aligned.

Context: The Research Funding Cliff

- Key Context
 - U.S. federal R&D investment declined from 1.2% of GDP in the 1970s to <0.7% in 2023.
 - Parallel declines across OECD (Organization for Economic Cooperation and Development) nations.
 - Universities face rising labor, compliance, and infrastructure costs.
- Result: structural decline in public funding resulting in financial instability, innovation risks, and existential challenges to the research enterprise.

Paper #1

Hubbart, J.A. 2025. The Research Funding Cliff: Why Universities Must Rethink Their Research and Development Business Model. Journal of Research & Method in Education, 15(3), 13-17. DOI: 10.9790/7388-1503061317

The Computational Pivot

- **Key Challenges**

- Declining state appropriations and <20% grant success rates.
- Rising facility costs: \$50B+ deferred maintenance nationally.
- Universities face prolonged fiscal scarcity threatening research & teaching.

- **Emerging Opportunity**

- Federal investment in technological R&D, cloud computing, innovation.
- Affordable cloud cycles, open-source tools, and exabyte-scale data.
- Simulation and AI are recognized as the “third and fourth pillars” of science.
- There is potential to transform scarcity into a strategic advantage.

Benefits of Computational Innovation

- **Cost Efficiency**

- Virtual trials replace costly physical experiments.
- Example: continental hydrologic model run <\$250 vs. \$2M/yr watershed network.

- **Scalability & Speed**

- Large-ensemble simulations accelerate discovery.
- Faster resubmissions within a single funding cycle.

- **Collaboration Economies**

- Shared clusters cut per-flop costs >60%.
- Multidisciplinary use: hydrology, agriculture, engineering, social sciences, humanities.

- **Revenue Diversification**

- Industry affiliates purchase access; NSF/AI institutes fund data-rich campuses.

Opportunities of a Computational Pivot

- **Cost, Speed, and Scope**
 - **Affordable HPC & cloud services:** computing costs have dropped from \$40M/teraflop (2000) to <\$5/hr (2025).
 - Faster, cheaper, reproducible research (e.g., wildfire maps 91% accurate at 70% lower cost).
 - Marginal analyses are nearly free once workflows are containerized.
- **Funding Agency Alignment**
 - NSF, USDA, DOE, NIH, and NIST explicitly **reward cyberinfrastructure readiness**.
 - ROI: each \$1 invested in shared clusters returns \$5–6 in external awards; publication speed ↑ 40%.
- **Workforce Relevance**
 - Data fluency = top hiring criterion.
 - Fewer than 1/3 of non-CS programs require coding → urgent workforce gap.

Pathways & Implementation

- **Disciplinary Examples**

- Forestry: LiDAR + AI cut costs 70%.
- Animal Science: computer vision reduced labor 60%.
- Agriculture: Agricultural Production Systems sIMulator (APSIM) + deep learning → trial costs ↓ \$340/ha.
- Civic Engagement: dashboards saved counties ~\$600K in consulting fees.

- **Implementation Roadmap**

- **Audit & Align** – inventory needs & align with grant calendars.
- **Pilot Projects** – containerize workflows with RSE support.
- **Scale Sustainably** – adopt community cluster cost-share models.
- **Embed Skills** – data science core + micro-credentials.
- **Revise Incentives** – value data, code, & reproducibility in promotion.

- **Strategic Takeaway**

- Computational capacity is mission-critical, on par with farms & labs.
- Institutions must embed it across research, teaching, and extension to remain relevant.

How do we make this Massive Pivot? & The Problem with Traditional Strategic Planning

- **This Massive Pivot** ... **ment**

- How do we strateg

- **Challenges with**

- Rooted in mid-2
 - Relies on exhaus
 - Results in **rigidit**
 - Strategic plans b
 - environments.

- **Impact**

- Stifles innovatio
 - Creates disenga



centralized control.
Decision-making.
with rapidly changing

Key to a Hard Pivot: A Lean & Agile Strategic Framework

• Core Principles

- **Clarity:** concise, measurable goals aligned with stakeholders' needs.
- **Focus:** prioritize a few high-leverage initiatives for disproportionate value.
- **Action:** short execution cycles, real-time feedback, and decentralized decision-making.

• Theoretical Foundations

- Lewin's Change Model.
- Kotter's 8 Steps.
- McKinsey 7-S.
- Objectives & Key Results (OKRs).
- Psychological safety as a foundation for agility.

Hubbart, J.A. 2025. *In Press*. Lean and Agile Strategic Planning: Reframing Organizational Strategy for Competitive Advantage. International Journal of Innovation, Management and Technology, xx(x), xx-xx. DOI:

Hubbart, J.A. 2025. Leading Through Change: Overcoming Resistance and Building Trust in Organizations. Ethics Press, ISBN (Hardback): 978-1-83711-457-3, ISBN (eBook): 978-1-83711-458-0.



Benefits & Strategic Impact

- **Outcomes of Lean & Agile Strategic Planning**

- **Faster decision-making** & adaptability during shocks (e.g., digital disruption, COVID-19).

Enables us to plan and make abrupt changes & rapid transitions as we learn

- **Higher employee engagement** through inclusivity & psychological safety.

Energizes employees and stakeholders via agility and success

- **Resilience & innovation capacity** via continuous learning & short feedback loops.
- Transforms strategy into a **living document** that continuously aligns intent with reality.

- **Strategic Takeaway**

- Lean and agile planning is both a **governance mechanism** and a **learning system**, enabling organizations to thrive in volatile, uncertain, complex, and ambiguous (VUCA) environments.

It may enable the kinds of progress we need to see in higher education right now and the foreseeable future. A Computational Pivot is just one example.

Synthesis: Key Needed Strategies and Leadership

- Embed computational capacity and vision into institutional strategy as a mission-critical priority.
- Invest in shared cyberinfrastructure and build a skilled Research Software Engineer (RSE) workforce.
- Integrate data science across curricula to prepare a computationally fluent workforce.
- Incentivize innovation and entrepreneurial thinking in annual productivity metrics, including promotion & tenure*.
- Pilot and scale high-visibility projects to demonstrate ROI and drive adoption.
- Adopt sustainable cost-share and partnership models to diversify resources and resilience.
- Reframe strategic planning as a living system, driven by feedback, adaptability, and reproducibility.

Let's Discuss a Strategy for the NE Together

In the next year

- Can we nudge the computational research imperative forward together for the northeast?
- Can we develop a menu, a host of initiatives that could be pursued? What might those initiatives be? How might they help serve the Directors?
- A couple of examples:
 - Could we develop a recommendation for a multi-institutionally driven computational impacts database?
 - Could we develop a plan to embed computational R&D innovation and entrepreneurial thinking into the research and curriculum of our institutions?
 - E.g., A strategy – A Roadmap – Implementation Pathway



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science that feeds the world

THANK YOU

Jason Hubbard