

Virtual Organization of Science

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Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not reflect the views of the NSF.

National Science Foundation

- ❖ "...promote the progress of science... advance the national health, prosperity and welfare... secure the national defense..."
 - National Science Foundation Act of 1950
- ❖ Research and education
- ❖ All fields of science/engineering
- ❖ Peer review
- ❖ Discipline & cross-discipline
- ❖ ~\$5.5 billion 2009



Organization of Scientific Work

❖ Old Science

- Solitary Researcher + Assistant
- Narrow focus of work

❖ New Science

- Complex problems
- Shared resources
- Interdisciplinary teams
- Global operations, distributed, asynchronous
- Collaborative Technologies



VOSS

Virtual Organizations as SocioTechnical Systems

- 2008 - 2014
- Housed in the Office of CyberInfrastructure
- Approximately \$6M per year
- 2 Underpinnings:
 - Proceed from a Socio-Technical Understanding
 - Enable Evidence-based Support for VOs



Sociotechnical Basis

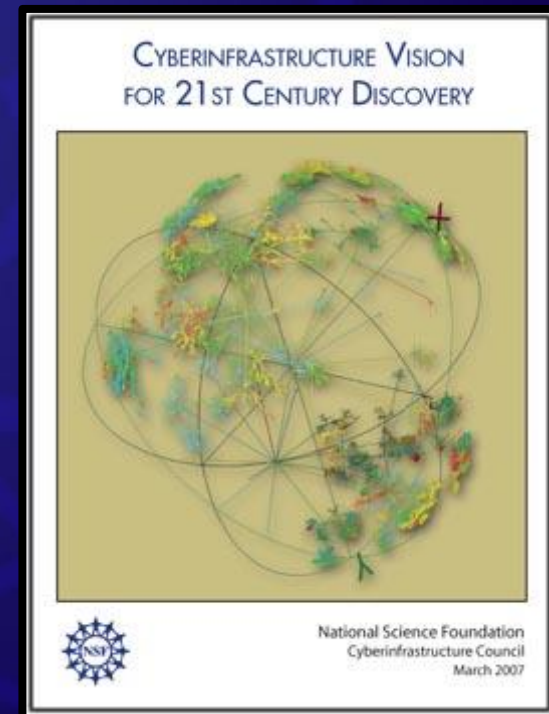
- ❖ Infrastructure development
 - ❖ enabling technologies
- ❖ Organization of work
 - ❖ exploitation of capability



Enabling Cyberinfrastructure

- ❖ Computing power (clusters, grids, clouds?)
- ❖ Simulation and visualization
- ❖ Data acquisition, processing, storage
- ❖ Sensors, instrumentation, remote work
- ❖ Linking people & information
(e.g. virtual organizations)

nsf.gov/pubs/2007/nsf0728/nsf0728.pdf



VOSS

Evidence-based VO Management

- Need a base of research evidence
- Need actors to interpret, adapt and use research evidence
- Need systematic reviews/measures/learning



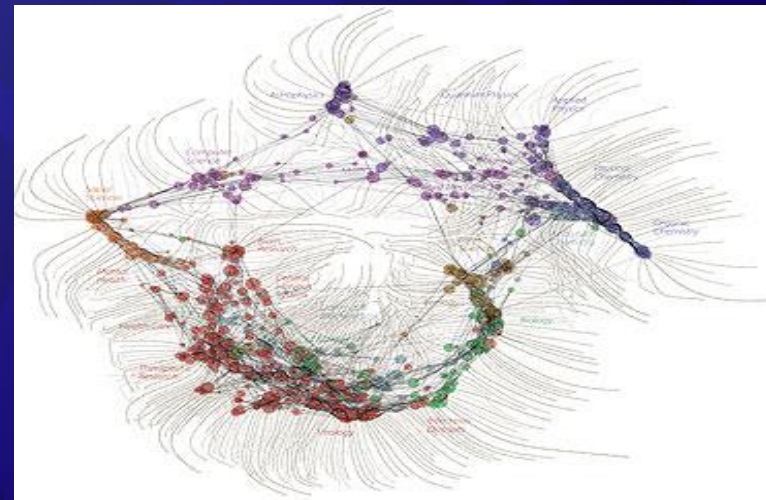
Evidence: Organizing for Scientific Collaborations

- Influences on research organization, productivity and effectiveness
 - Organizational structures, policies, practices and resources
 - Human resource management
 - Cyberinfrastructure
 - Effective research management approaches, partnership models and leadership styles
 - Incentives for academics
- Intellectual property and conflict of interest



Research Findings (Evidence)

- Collaborate to Gain Access to Resources and Capabilities
- Ability to Coordinate and Manage Diverse Resources
 - Induces Coordinated Problem Solving
- Little Research on Effective Center Management and Leadership
- Reasons for failure poorly understood



Research Findings (Evidence)

- Management Practices of Collaboration Organizations often Developed Ad Hoc instead of Pre-Planned
 - “If You Build it, They Will Come” Myth
- Importance of
 - Trust, Proximity
 - Incentives and Alliance Management



VOSS

Evidence-based VO Management

- Need a base of research evidence
- **Need actors to interpret, adapt and use research evidence**
- Research Coordination Network
 - Organizational Researchers & VO Leaders



VOSS

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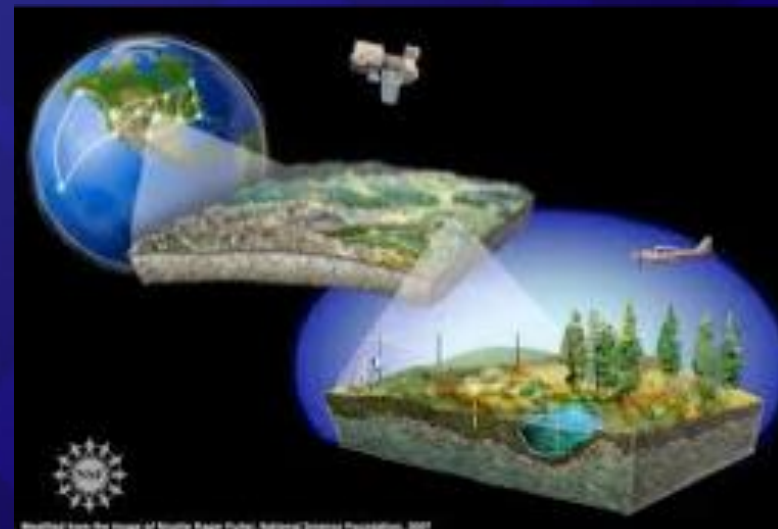
What Have We Learned?

- Traditional Inputs
 - Hardware, Software, Data, Labor
- Traditional Activities
 - Operations
 - Maintenance
 - Inputs Refresh
- Traditional Outputs
 - Cycles Provided
 - Jobs Completed



What Do We Need To Do Differently?

- Enhanced Outcomes
 - Knowledge-Focused: Publications, Citations
 - Property-Focused: Patents, Commercial Products
 - Enhanced Scientific and Technical Human Capital
- Impacts
 - Solving Societal and Scientific Grand Challenges



To Get These, What Inputs and Activities Need To Change?

President's Science & Technology Priorities for FY2016 Budget

- **Promote Economic Growth/Job Creation**
- **Maintain Safe and Sufficient Food Supply**
- **Improve Health of All Americans**
- **Manage Environmental Resources**
- **Address Global Climate Change**
- **Move toward Clean Energy**
- **Ensure National Security**

