Finding our Future: A Research Agenda for the Research Enterprise

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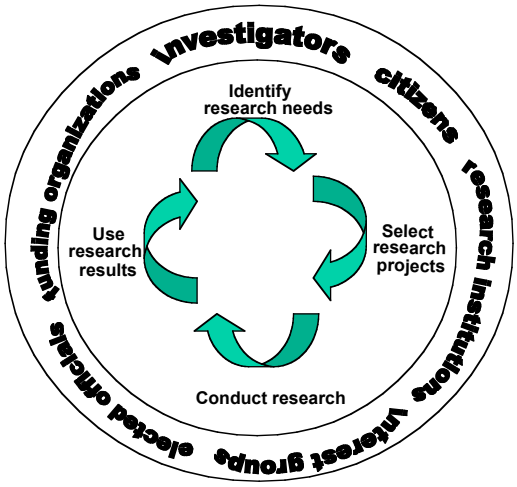
Abstract

The NSF Digital Government research program helps to develop new research themes by sponsoring preliminary explorations and workshops to outline emerging areas of inquiry. One area which was recently explored in this way is the grants making and grants management process by which the federal government distributes more than $100 billion each year. The project included focus groups and interviews with grants-making organizations, investigators, and grants management professionals and culminated in a multidisciplinary workshop to produce a recommended research agenda. This investigation identified the characteristics of an ideal grants-supported research enterprise and discussed the challenges that the enterprise faces today. It offered thematic and integrative research agendas, as well as action recommendations that could generate near-term benefits. This paper is drawn from the final project report, *Finding our future: A research agenda for the research enterprise.*

1. Introduction

For more than 50 years, the U.S. government has supported and encouraged scientific discovery through grants to researchers in laboratories and educational institutions around the nation. From its modest beginning in the late 1940s, this research enterprise has grown, matured, and evolved into a $112-billion endeavor involving thousands of organizations and investigators representing every scientific discipline and field of knowledge. More than 20 government agencies contribute to federal investments in basic and applied research, development, and supporting equipment and facilities. Total federal R&D spending has increased 11-fold since records began in 1949, rising from $940 million to over $100 billion.

The research enterprise is not only large, complex, and important in its own right, it is also embedded in a political, economic, and social environment that exerts strong influences on research topics and priorities, methods and principles, and opportunities for involvement. The figure below suggests the complexity and diversity inherent in the research enterprise. It can be thought of as an ongoing cycle of overlapping activities, each involving influential stakeholders in a variety of relationships.



The process of identifying research needs involves all stakeholders and reflects collectively the concerns of society, the priorities of political leaders, and the intellectual commitment to the discovery and pursuit of new knowledge. Selection involves the process of soliciting and encouraging research proposals, evaluating them, and choosing a portfolio of projects that collectively addresses the needs from a variety of perspectives, using different approaches and methods. Research is conducted in a variety of settings by trained investigators whose goals include discovery, testing and validation of concepts and theories, knowledge building within and across disciplines, and the production of new tools, methods, and devices for practical use. Research results are used to advance theoretical knowledge, to generate practical solutions to problems, to train the next generation of research scientists, and to enhance the knowledge and education of the public. None of these activities is in the domain of a single stakeholder. As a result, each domain can encompass competing values, delicate negotiation, and ongoing conflict.

Given the size, scope, complexity, diversity and growth of the research enterprise in the U.S., the mechanisms that support research have come under increasing stress and increasing scrutiny. Systems, staff, and processes that were designed to handle smaller, simpler programs are now straining to support new, high-volume, high-cost programs such as those in information technology, bioterrorism, and climate change. At the same time, management and accountability requirements have been strengthened with special emphasis on performance measurement. Given these trends, what knowledge and action are needed to shape the future of grant-supported research?

2. The ideal research enterprise

The research enterprise is essential to continued economic growth, global competitiveness, and societal well-being. In an ideal form, it would:

- invest in work that impacts significant social and scientific challenges and responds to new discoveries
- foster a wide network of relationships that generates relevant questions, recognizes emerging issues, and sustains significant, cutting-edge programs of work
- put resources into the hands of qualified grantees through value-added decision processes that are fair, quick, and open
- develop and nurture the human and organizational capacity to conduct research
- take investment risks that encourage discovery while managing administrative risks associated with accountability
- use rules-based business processes that are clear and seamless for all involved
- put management and support work in the hands of well-prepared individuals and organizations
- strive for excellence and welcome innovation in its own operations
- understand, represent, and advocate for its community
- recognize and communicate its impact on the world

3. The challenges

Today, the grants-supported research enterprise is an amalgam of highly interdependent organizations, different value systems, multiple business processes, and competing priorities.

These characteristics create opportunities for the enterprise, but they also present significant challenges. Some of these challenges are inherent in the nature of the enterprise; others reflect trends in the environment and their influences on the way research is conducted. These challenges include:

Organizational complexity and diversity - Thousands of organizations with different management, technology, and policy frameworks and a wide variety of overlapping and distinct goals come together to make up the research enterprise.

Rapid technological change - Modern technical tools and the work we can do with them are part of the legacy of scientific research. But technological change is also a source of organizational and operational frustration.

Slow organizational and interorganizational adaptation to change - The ways organizations define themselves, relate to the environment, approach their work, and select processes, tools, and techniques all evolve more slowly than the technology around them. This is compounded when multiple independent organizations must work together.

Conflicting Approaches to risk - The juxtaposition of two very different approaches to risk presents an ongoing conundrum for the enterprise. It needs policies, procedures, and processes that assure public trust, but also the freedom to take the risk of investing in new and untried ideas.

Interdisciplinarity and research partnerships - Today's societal needs and scientific challenges demand interdisciplinary studies to uncover new knowledge not discoverable using traditional approaches. This kind of research can be powerful, but it is also complicated, expensive, and counter to prevailing traditions.

Increasing accountability and performance requirements - Research agencies are struggling to find useful ways to address these requirements in the context of long-term, uncertain investments in science. At the same time, these initiatives may encourage agencies to better meet another long-standing need--to communicate in plain language about the value and the progress in science.

Misalignment of multiple policies and operating cycles - The policy and regulatory frameworks governing organizations throughout the enterprise are increasing in both quantity and variety. Repetitive but misaligned business cycles, such as the federal budget cycle and traditional academic calendars, regularly challenge the operational capacity and goals of the enterprise as a whole.

Since the mid-1980s, federal agencies and their research partners have worked to address these challenges in programs like the Federal Demonstration Partnership, various electronic grants administration projects at state and federal levels, and a new federal e-government initiative focused on grants-making. Despite the progress made by these efforts, the challenges persist. The emergence of the ideal research enterprise will require better knowledge of its components and dynamics, and appropriate action to integrate that knowledge into practice. To make further progress, new streams of research as well as several practical actions are warranted.

4. Thematic research agenda

The complexity of the research enterprise cannot be understood through the lens of a single discipline or analytical model. No one viewpoint or perspective provides a complete picture. However, five themes consistently emerge as useful for studying and improving the enterprise:

- Understanding the multiple value propositions that stakeholders bring to the enterprise and how they are aligned, are complementary, or conflict
- Understanding how work is done by individuals and groups within and across organizations
- Understanding how individuals, groups, and organizations collaborate across the boundaries of structure, time, and place
- Understanding how knowledge is captured, managed, and used within the enterprise
- Understanding how to choose, use, manage, and support information technology investments

5. Integrative research agenda

While each theme above suggests important research questions of its own, a different set of questions emerges from a more holistic look at the research enterprise. These questions highlight the interdependencies among the themes. They might be thought of as integrative goals that span the thematic areas and move us toward practical applications. These include research that will generate and test:

- New ways to identify and define the substantive goals of research initiatives
- New models of the grants-supported research process that make different assumptions about roles, relationships, and responsibilities of the various players
- Alternative strategies and new technologies to support the review and selection of research proposals
- Incentives for collaboration across disciplines, roles, and organizations
- New technologies for multimedia proposal development, submission, and management
- Information-centric processes as tools for an enterprisewide orientation

6. Action recommendations

Finally, we offer the following recommendations to initiate and inform discussions about action that can begin today to move the research enterprise toward the ideal state.

- Document and evaluate the existing models and philosophies of grants making
- Support and improve communication across research and administrative professions within the enterprise
- Identify and share best practices in communicating within the enterprise and with the public about science
- Continue to invest in the identification and diffusion of best practices in communicating with the public about science
- Continue to invest in the development, deployment, and adoption of standards for common data, tools, and activities
- Experiment with business models that reflect different assumptions about institutional relationships
- Continue to experiment with virtual collaboration work models and technologies
- Identify and apply the knowledge gained through funded research to the needs of the research enterprise itself.
- Coordinate announcements of focus areas across the enterprise.

Together with the research agenda, these recommendations comprise a balanced strategy for building future knowledge while acting on today's promising ideas.