How Do I Review Thee? Let Me Count the Ways: A Comparison of Research Grant Proposal Review Criteria Across US Federal Funding Agencies

Holly J. Falk-Krzesinski, PhD
Northwestern University
Global Academic Relations, Elsevier

Stacey C. Tobin, PhD
The Tobin Touch, Inc.

Abstract: *While Elizabeth Barrett Browning counted 25 ways in which she loves her husband in her poem, "How Do I Love Thee? Let me Count the Ways," we identified only eight ways to evaluate the potential for success of a federal research grant proposal. This may be surprising, as it seems upon initial glance of the review criteria used by various federal funding agencies that each has its own distinct set of "rules" regarding the review of grant proposals for research and scholarship. Much of the grantsmanship process is dependent upon the review criteria, which represent the funders' desired impact of the research. But since most funders that offer research grants share the overarching goals of supporting research that (1) fits within its mission and (2) will bring a strong return on its financial investment, the review criteria used to evaluate research grant proposals are based on a similar set of fundamental questions. In this article, we compare the review criteria of 10 US federal agencies that support research through grant programs, and demonstrate that there are actually only a small and finite number of ways that a grant proposal can be evaluated. Though each funding agency may use slightly different wording, we found that the majority of the agencies' criteria address eight key questions. Within the highly competitive landscape of research grant funding, new researchers must find support for their research agendas and established investigators and research development offices must consider ways to diversify their funding portfolios, yet all may be discouraged by the apparent myriad of differences in review criteria used by various funding agencies. Guided by research administrators and research development professionals, recognizing that grant proposal review criteria are similar across funding agencies may help lower the barrier to applying for federal funding for new and early career researchers, or facilitate funding portfolio diversification for experienced researchers. Grantmakers are furthermore provided valuable guidance to develop and refine their own proposal review criteria.*

Keywords: *Funding portfolio, research grants, proposal review criteria, peer review, federal funding, grantsmanship, proposal development, research development, research administration*

Introduction

The research funding landscape in the United States is highly competitive, with flat or shrinking budgets for investigator-initiated research programs at most federal agencies (American Association for the Advancement of Science (AAAS), 2014). Taking biomedical research as an example, in 2014, the National Institutes of Health (NIH) budgeted $15 billion to fund research project grants, an amount that has essentially remained the same since 2003 (AAAS, 2014; Federation of American Societies for Experimental Biology, 2014). At the same time, the number of research grant applications has steadily increased, from close to 35,000 in 2003 to 51,000 in 2014. The result has been a stunning 30% drop in funding success rates, from 30.2% in 2003 to 18.8% in 2014. Other federal agencies that fund research, including the National Science Foundation (NSF), Office of Veterans Affairs (VA), and Department of Defense (DoD), are feeling the similar sting of budget restrictions.

Within this tenuous funding environment, it has become essential that investigators and research development offices sustain their research programs by continuing to encourage new researchers to apply for grant support and encouraging established researchers to diversify their funding portfolios. New researchers benefit from clear information about the federal grant process, and experienced researchers benefit from considering funding opportunities from federal funding agencies, national organizations and advocacy groups, state agencies, private philanthropic organizations, regional or local special interest groups, corporations, and internal institutional grant competitions that may not be their typical targets for support. With increasing competition for grant funding, investigators who might be accustomed to one set of rules for preparing grant proposals may become quickly overwhelmed by the prospect of learning entirely new sets of rules for different funding agencies.

Yet this process is not as daunting if we start from the perspective that any funder that offers research grants has essentially the same goal: to support research that fits within its mission and will bring a strong return on its financial investment (Russell & Morrison, 2015). The review criteria used to evaluate research grant proposals reflect the funder's approach to identifying the most relevant and impactful research to support (Geever, 2012; Gerin & Kapelewski, 2010; Kiritz, 2007). Thus, planning and preparing a successful grant proposal depends on a clear understanding of the review criteria that will be used. These criteria directly inform how the proposal content should be presented and how much space should be afforded to each section of the proposal, as well as which keywords should be highlighted. It may seem that each funder—federal, state, local, private—has its own distinct set of rules regarding the preparation and review of grant proposals, and that each funder uses specific jargon in its review process. However, because all funders aim to support research that is relevant and impactful, we suggest that the mandatory review criteria used to evaluate research grant proposals are based on a set of fundamental questions, such as: Does this research fit within the funder's mission? Will the results of this research fill a gap in knowledge or meet an unmet need? Do the investigators have the skills and resources necessary to carry out the research?

In this article, we examine the research grant proposal review criteria used by 10 US federal agencies to demonstrate that there exist only a small and finite number of ways that federal research grant proposals are actually evaluated. Our goal is to help research administrators and research development professionals empower investigators to more confidently navigate funder review

criteria, thereby lowering the barrier to first-time applicants or to grant portfolio diversification for more established researchers. Recognizing that research proposal review criteria are aligned across federal funding agencies can also help proposal writers who might be faced with other funding opportunities in which the review criteria are not clearly defined. On the flip side of that equation, understanding that review criteria are based on the same core goals can help grantmakers as they develop and refine review criteria for their funding opportunities.

Observations

We performed an online search of 10 US federal agencies' (NIH, NSF, VA, Department of Education [ED], DoD, National Aeronautics and Space Administration [NASA], Department of Energy [DOE], United States Department of Agriculture [USDA], National Endowment for the Humanities [NEH], and National Endowment for the Arts [NEA]) websites to identify policies and procedures related to their research grant proposal review process. The NIH Office of Extramural research (OER) website provided the greatest detail and transparency with regard to the review criteria and review process used for evaluating research grant proposals (National Institutes of Health, 2008a; 2008b; 2015a), and served as a starting point for our analysis of the review criteria for the other nine agencies. We developed key questions corresponding to each of the NIH review criteria, and then aligned the review criteria of the remaining nine agencies with these key questions.

Federal grant program guidance and policy changes occur frequently; the links to online resources for research grant proposal policies for each of the various funding agencies included in our analysis were current as of August 10, 2015. Note that our analysis includes information from the National Institute on Disability and Rehabilitation Research (NIDRR) program as administered by ED. On June 1, 2015, the NIDRR was transferred from ED to the Administration for Community Living (ACL) in the US Department of Health and Human Services (DHHS), and is now called the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR) Field-Initiated Program. Our analysis of NIDRR was current as of May 4, 2015.

Also note that there is variability between different research grant programs within each federal agency. We included in our analysis review criteria from the DoD Congressionally Directed Medical Research Programs (CDMRP), the USDA National Institute of Food and Agriculture, the NEH Digital Humanities Start-up program, and the NEA ART WORKS program. Criteria for NASA research programs were compiled from numerous NASA Research Announcements.

The NIH review criteria

The NIH criteria emphasize clinical, interdisciplinary, and translational biomedical research (National Institutes of Health, 2008a). Reviewers are instructed to evaluate research grant proposals based on how well five *core review criteria* are met: Significance, Innovation, Approach, Investigator(s), and Environment (Table 1) (National Institutes of Health, 2015a; 2015b). Assigned reviewers consider each of the five core review criteria and assign a separate score for each using a 9-point scale. These ratings are included in a summary statement that is provided to the researcher, whether or not the entire study section ultimately discusses the proposal.

Each of the five core review criteria can be simplified into a general question. The Significance criterion asks reviewers to consider "Why does the research matter?" Reviewers look for whether the proposed project will address an important problem or critical barrier to progress in the field, and whether the knowledge gained from the proposed research will advance scientific knowledge, technical capacity, or clinical practice to drive the field forward. Innovation translates into "How is the research new?" Reviewers consider how the proposed research challenges current thinking with novel concepts, approaches, tools, or treatments. Approach asks, "How will the research be done?" Reviewers assess the proposed research strategy, methodology, and analyses and determine whether they are appropriate to achieve the aims of the project, and how riskier aspects of the proposal might be handled with alternative approaches. The remaining two core criteria evaluate the context in which the research will be done—defined as the collective set of resources, equipment, institutional support, and facilities available (Environment)—and what is special about the people doing the research (Investigator). For the Environment criterion, reviewers evaluate whether the resources and institutional support available to the investigators are sufficient to ensure successful completion of the research aims, including any unique features such as access to specific subject populations or collaborative arrangements. For the Investigator criterion, reviewers determine whether the primary investigator (PI), other researchers, and any collaborators have the experience and training needed to complete the proposed research, as well as how collaborators will combine their skills and work together.

Table 1. The NIH core review criteria for research project grant proposals[a]

Review Criterion	Key Question
Significance	Why does the research matter?
Innovation	How is the research new?
Approach	How will the research be done?
Environment	In what context will the research be done (e.g., facilities, resources, equipment, and institutional support)?
Investigator	What is special about the people doing the research?
Overall Impact[b]	What is the return on investment?

[a] See National Institutes of Health, 2015a; 2015b.
[b] While Overall Impact is not considered as a core review criterion, it asks reviewers to take into consideration the five core review criteria as they assess the likelihood of the project to have a strong and sustained influence on the research field.
NIH, National Institutes of Health.

The five core review criteria ratings, in addition to other proposal-specific criteria, are then used to determine an Overall Impact/Priority Score (National Institutes of Health, 2015a; 2015b). This score reflects the reviewers' assessment of the "likelihood for the project to exert a sustained, powerful influence on the research field(s) involved." An application does not need to have exemplary scores in all criteria in order to be judged as likely to have a high overall impact. For example, a project that by its nature is not highly innovative may nevertheless be deemed essential to advance knowledge within a field. A 2011 study by the National Institutes of General Medicine Science (NIGMS) examined the correlation between the core review criteria scores and the

Overall Impact score and found that reviewers weighted certain criteria more heavily than others, in the following order: Approach > Significance > Innovation > Investigator > Environment (Rockey, 2011). Thus, the quality of ideas appeared to matter more than investigator reputation, a particularly good finding for new investigators (Berg, 2010a; 2010b; 2010c). These findings of relative importance of the core review criteria by reviewers also suggest that, in terms of space, it makes sense for proposers to utilize more pages of the proposal narrative to address aspects of their approach and the research project's significance than on the environment supporting the project.

Other agencies have formalized systems for weighting grant proposal review criteria. For example, the ED NIDRR standard selection criteria are weighted using a points designation (US Department of Education, 2014): Design of Research Activities (50 pts); Importance of the Problem (15 pts); Project Staff (15 pts); Plan of Evaluation (10 pts); and Adequacy and Accessibility of Resources (10 pts). Similar to NIH reviewers, ED weights research design and the importance of the problem more heavily than staff or resources when evaluating grant proposals (Committee on the External Evaluation of NIDRR and Its Grantees, National Research Council, Rivard, O'Connell, & Wegman, 2011).

How do the NIH review criteria compare to those of other federal agencies?

The most straightforward comparison of research grant review criteria is between the NIH and NSF, which together make up 25% of the research and development budget in the US (AAAS, 2014). The NSF criteria emphasize transformative and interdisciplinary research (National Science Foundation, 2007), and involve three (3) *guiding principles*, two (2) *review criteria*, and five (5) *review elements* (National Science Foundation, 2014). The two review criteria used by the NSF are Intellectual Merit, which encompasses the potential to advance the field, and Broader Impacts, which encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes. Within each of these two review criteria are five *review elements* (Figure 1). These five review elements line up remarkably well with the NIH core review criteria (Table 2), with both agencies' criteria addressing a similar set of concepts but using distinct language to describe each criterion.

- What is the potential for the proposed activity to (a) advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and (b) benefit society or advance desired societal outcomes (Broader Impact)?
- To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
- Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
- How well qualified is the individual, team, or institution to conduct the proposed activities?
- Are there adequate resources available to the PI (either at the home institution or through collaborations) to carry out the proposed activities?

Figure 1. NSF Merit Review Criteria (National Science Foundation, 2014)

Table 2. Comparison of the NIH and NSF research grant proposal review criteria

Key Question	NIH Core Review Criteria[a]	NSF Review Elements[b]
Why does the research matter?	Significance – project addresses an important problem or a critical barrier to progress in the field	Intellectual Merit - Potential of the activity to advance knowledge and understanding Broader Impact – Potential of the activity to benefit society
How is the research new?	Innovation – project challenges current paradigms by utilizing novel theoretical concepts, approaches or methodologies, instrumentation, or interventions	Creative, original, and transformative concepts and activities
How will the research be done?	Approach - overall strategy, methodology, and analyses well-reasoned and appropriate to accomplish the specific aims of the project	Well-reasoned, well-organized, rational plan for carrying out proposed activities and mechanism to assess success
In what context will the research be done?	Environment - scientific environment in which the work will be done contribute to the probability of success	Adequate resources available to carry out the proposed activities
What is special about the people doing the research?	Investigators - PD/PIs, collaborators, and other researchers are well suited to the project	Qualified individual, team, or institution conducting the proposed activities
What is the return on investment?	Overall Impact[c] - likelihood for the project to exert a sustained, powerful influence on the research field(s) involved	The potential to benefit society and contribute to the achievement of specific, desired societal outcomes

[a] See National Institutes of Health, 2015a; 2015b.
[b] See National Science Foundation, 2014.
[c] While Overall Impact is not considered as a core review criterion, it asks reviewers to take into consideration the five core review criteria as they assess the likelihood of the project to have a strong and sustained influence on the research field.
NIH, National Institutes of Health; NSF, National Science Foundation; PD, program director; PI, principal investigator.

Table 3. Comparison of research grant proposal review criteria used by the NIH, NSF, and NEH

Key Question	**NIH Core Criteria**[a]	**NSF Merit Review Elements**[b]	**NEH Application Review Criteria**[c]
Why does the research matter?	Significance	Intellectual Merit - Potential of the activity to advance knowledge and understanding Broader Impact – Potential of the activity to benefit society	Humanities Significance
How is the research new?	Innovation	Creative, original, and transformative concepts and activities	Quality of Innovation
How will the research be done?	Approach	Well-reasoned, well-organized, rational plan for carrying out proposed activities and mechanism to assess success	Project Feasibility and Work Plan
In what context will the research be done?	Environment	Adequate resources available to carry out the proposed activities	Project Feasibility and Work Plan
What is special about the people doing the research?	Investigators	Qualified individual, team, or institution conducting the proposed activities	Project Staff Qualifications
What is the return on investment?	Overall Impact[d]	The potential to benefit society and contribute to the achievement of specific, desired societal outcomes	Overall Value to Humanities Scholarship

[a] See National Institutes of Health, 2015a; 2015b.
[b] See National Science Foundation, 2014.
[c] See National Endowment for the Humanities, 2014; 2015.
[d] While Overall Impact is not considered as a core review criterion, it asks reviewers to take into consideration the five core review criteria as they assess the likelihood of the project to have a strong and sustained influence on the research field.
NIH, National Institutes of Health; NSF, National Science Foundation; NEH, National Endowment for the Humanities.

What about a non-science funding agency like the NEH? While there is some variability between individual NEH grant programs, the NEH *application review criteria* are: Humanities Significance, Project Feasibility and Work Plan, Quality of Innovation, Project Staff Qualifications, and Overall Value to Humanities Scholarship (National Endowment for the Humanities, 2015a; 2015b). The significance of the project includes its potential to enhance research, teaching, and learning in the humanities. The quality of innovation is evaluated in terms of the idea, approach, method, or digital technology (and the appropriateness of the technology) that will be used in the project. Reviewers also examine the qualifications, expertise, and levels of commitment of the project director and key project staff or contributors. The quality of the conception, definition, organization, and description of the project and the applicant's clarity of expression, as well as the feasibility of the plan of work are also assessed. Finally, reviewers consider the likelihood that the project will stimulate or facilitate new research of value to scholars and general audiences in the humanities. Table 3 shows the NEH review criteria compared with those used by the NIH and NSF. Though there is not an exact match for the key question "In what context will the research be done?" (i.e., the research environment and available resources), this is evaluated in NEH proposals as part of the Project Feasibility and Work Plan.

Comparing review criteria across federal agencies: Eight key questions

In addition to the core review criteria mentioned above, funding agencies also typically ask reviewers to consider the project budget and the approach that will be used to evaluate project success. When we expanded the comparison of research grant proposal review criteria across 10 US federal agencies, and included the budget and evaluation criteria, we revealed that all of the agencies' review criteria aligned with a consistent set of eight key questions that reviewers consider when evaluating any type of research proposal (Table 4).

The research grant proposal review criteria used by the 10 federal funding agencies are associated with these eight key questions (Table 5). We have already demonstrated that the question, "Why does it matter?"—which addresses the importance or significance of the proposed project—applies to similar review criteria from the NIH (Significance), NSF (Intellectual Merit), and the NEH (Humanities Significance) (National Endowment for the Humanities, 2015a; 2015b; National Institutes of Health, 2015a, 2015b; National Science Foundation, 2014). Likewise, ED evaluates the "Importance of the Problem" (US Department of Education, 2014); the DoD application review criteria includes "Importance" (Department of Defense, 2015); the VA and NASA each evaluate "Significance" (National Aeronautics and Space Administration, 2015; US Department of Veterans Affairs, 2015); the DOE looks at "Scientific and Technological Merit" (US Department of Energy, 2015); the USDA evaluates "Project Relevance" (United States Department of Agriculture, 2015); and the NEA assesses "Artistic Excellence" (National Endowment for the Arts, 2015). There are also parallels in the language used by each of the funders as they ask reviewers to assess proposed research project innovation or novelty, the approach or methodology to be used, the investigators or personnel involved, the environment and resources available, and the overall impact or value of the project (Table 5).

Table 4. Eight key questions considered by reviewers of research grant proposals and the associated review criteria terms used by 10 US federal funding agencies

Key Question	Review Criteria Terms
Why does it matter?	Significance Importance
How is it new?	Innovation Novelty Creativity
How will it be done?	Approach Plan Methodology Objectives Aims
In what context will it be done?	Environment Resources Populations Facilities
What is special about the people involved?	Investigators Organization People Researchers Personnel Partners Collaborators Staff
What is the return on investment?	Impact Value Relevance
How effectively will the financial resources be managed?	Budget
How will success be determined?	Evaluation Assessment

Table 5. Comparison of research grant proposal review criteria across 10 US federal funding agencies

Key Question	Federal Agency									
	NIH	NSF	VA	ED[a]	DoD[b]	NASA[c]	DOE	USDA[d]	NEH[e]	NEA[f]
	https://grants.nih.gov/grants/guide/notice-files/NOT-OD-09-025.html	http://www.nsf.gov/pubs/policydocs/pappguide/nsf15001/gpg_3.jsp#IIIA	http://www.research.va.gov/services/shared_docs/merit_review.cfm	https://www2.ed.gov/programs/fip/2014-133g1-2.doc	http://cdmrp.army.mil/funding/prgdefault.shtml	http://www.hq.nasa.gov/office/procurement/nraguidebook/proposer2015.pdf	http://energy.gov/management/downloads/merit-review-guide	http://nifa.usda.gov/resource/nifa-peer-review-process-competitive-grant-applications	http://www.neh.gov/files/grants/digital-humanities-start-sept-16-2015.pdf	http://arts.gov/grants-organizations/art-works/application-review
Why does it matter?	Significance	Intellectual Merit: potential of the activity to advance knowledge and understanding Broader Impact: potential of the activity to benefit society	Significance	Importance of the Problem Responsiveness to Absolute Priority	Importance	Significance	Scientific and Technical Merit	Relevance	Humanities Significance	Artistic Excellence: artistic significance
How is it new?	Innovation	Creative, original, and transformative concepts and activities	Innovation	Responsiveness to Absolute Priority	Innovation	Unique and innovative methods, approaches, concepts, or advanced technologies	Innovative methods, approaches, concepts, or advanced technologies	Scientific Merit: novelty, innovation, uniqueness, originality	The quality of innovation in terms of the idea, approach, method, or digital technology	Artistic Merit: extent to which the project deepens and extends the arts' value
How will it be done?	Approach	Well-reasoned, well-organized, rational plan	Scientific Approach	Quality of Project Design Technical Assistance Design of Dissemination	Research Strategy and Feasibility	Overall scientific or technical merit	Technical Approach	Scientific Merit: conceptual adequacy, clarity of objectives, feasibility	Project's feasibility, design, cost, and work plan	Artistic Merit: quality and clarity of project goals and design
In what context will it be done?	Environment	Adequate resources available to carry out the proposed activities	Feasibility: environment available to conduct the studies	Adequacy and Accessibility of Resources	Environment	Capabilities, related experience, and facilities	Feasibility: Technical and Management Capabilities	Adequacy of Facilities and Project Management	N/A	Artistic Merit: resources involved
What is special about the people involved?	Investigator	Qualified individual, team, or institution conducting the proposed activities	Feasibility: expertise of the PI and collaborators	Project Staff and Training	Personnel	Qualifications, capabilities, and experience of the PI, team leader, or key personnel	Feasibility: Technical and Management Capabilities	Qualifications of Project Personnel	Qualifications, expertise, and levels of commitment of the project director and key project staff or contributors	Artistic Excellence: quality of the artists, art organizations, arts education providers, works of art, or services Artistic Merit: project personnel

Key Question	Federal Agency									
	NIH	NSF	VA	ED[a]	DoD[b]	NASA[c]	DOE	USDA[d]	NEH[e]	NEA[f]
What is the return on investment?	Overall Impact[g]	Broader Impact: potential to benefit society and contribute to the achievement of specific, desired societal outcomes	Relevance to the healthcare of veterans	Design of Dissemination Activities	Impact	Relevance	N/A	Relevance and Importance to US agriculture	Likelihood of stimulating or facilitating new research in the humanities	Artistic Merit: potential impact on artists, the artistic field, and the organization's community
How effectively will the financial resources be managed?	Budget	N/A	N/A	Adequacy and Reasonableness of the Budget	Budget	Evaluation of cost	Reasonableness and appropriateness of the proposed budget	N/A	Project's feasibility, design, cost, and work plan	Artistic Merit: appropriateness of the budget
How will success be determined?	N/A	Mechanism to assess success	N/A	Plan of Evaluation	N/A	Evaluation against the state-of-the-art	N/A	N/A	N/A	Artistic Merit: appropriateness of the proposed performance measurements

[a] Evaluation criteria are from the 2014 ED National Institute on Disability and Rehabilitation Research (NIDRR), now called the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR) Field-Initiated Program. As of June 1, 2015, the NIDILRR was transferred to the Administration for Community Living (ACL) in the US Department of Health and Human Services (DHHS). Information on ACL can be found at www.acl.gov.

[b] There is variability between DoD grant programs. The review criteria here are representative of the DoD Congressionally Directed Medical Research Programs (CDMRP).

[c] There is variability between NASA grant programs. The merit score criteria here are compiled from numerous NASA Research Announcements.

[d] Evaluation criteria will vary among USDA programs. Criteria specific for the National Institute of Food and Agriculture (NIFA) are noted in the resource file.

[e] The review criteria may vary from program to program. The Application Review criteria here are from the Digital Humanities Start-up program.

[f] The review criteria vary between programs. The Application Review Criteria here are from the ART WORKS program.

[g] While Overall Impact is not considered as a core review criterion, it asks reviewers to take into consideration the five core review criteria as they assess the likelihood of the project to have a strong and sustained influence on the research field.

NIH, National Institutes of Health; NSF, National Science Foundation; VA, Department of Veterans Affairs; ED, Department of Education; DoD, Department of Defense; NASA, National Aeronautics and Space Administration; DOE, Department of Education; USDA, US Department of Agriculture; NEH, National Endowment for the Humanities; NEA, National Endowment for the Arts; N/A, not applicable.

While all the agencies' collective review criteria fall within the eight key questions, there is some variability across agencies. For example, the DOE does not have a clear review criterion for evaluating the overall impact or value of a project, equivalent to the key question "What is the return on investment?" Some agencies to do not explicitly include the budget as part of their review criteria, such as the NSF, VA, and USDA, while other agencies do not specifically ask for a plan to evaluate success of the project, including the NIH, VA, DoD, DOE, USDA, or NEH. Funders may also have unique review criteria. Unlike the other nine agencies evaluated, the DoD uses the review criterion "Application Presentation," which assesses the writing, clarity, and presentation of the application components. Agencies may also have mission- or program-specific review criteria; for example, for certain applications, the NEA may evaluate the potential to reach underserved populations as part of "Artistic Merit." Despite these differences, it is clear that for the 10 federal funding agencies examined, the review criteria used to evaluate research grant proposals are extraordinarily aligned.

If we remember that all funding agencies are trying to evaluate research grant proposals to reach the same goals—to determine which projects fit within their mission and will provide a return on their financial investment—it is perhaps not all that surprising that the review criteria that federal funding agencies use are aligned. We further propose that funding announcements from any funder, including state agencies, local groups, and private philanthropic organizations, similarly ask for research grant proposals to answer some, if not all, of the eight key questions that emerged from our analysis of US federal funding agencies. Keeping these key questions in mind can help research administrators and research development offices, as well as proposal writers, decipher research grant proposal review criteria from almost any funding agency, thereby facilitating proposal development.

For this article, we limited our analysis to the review criteria used across different US federal funders to evaluate research grant proposals, and did not include criteria used for other federal funding mechanisms, such as training grants or contract proposals. NIH has compared the review criteria used across their various funding mechanisms, including research grants, grants for conferences and scientific meetings, small business innovation or technology transfer grants, fellowship and career development grants, and training grants, among others (National Institutes of Health, 2014). Again, while there are differences in the language used to describe each core review criterion across the various grant mechanisms, the concepts being reviewed—what is being done, why it is being done, how it is new, who is doing the work, and where it will be done—are essentially the same across each mechanism.

Conclusion

We have demonstrated that research grant proposal review criteria are remarkably aligned across 10 US federal funding agencies, despite the differences in their missions and the terminology each uses for its own review process (Table 5). Moreover, a set of only eight key questions summarizes the collective research grant proposal review criteria across all these federal agencies. While the sheer number of non-federal funding opportunities makes a similar comparative analysis of their review criteria impractical, we suggest that the eight key questions emerging from our analysis provide a starting point for researchers, research administrators, and funders to assess the review criteria used by most, if not all, other research funding opportunities. This is reasonable given that each funder is trying to achieve the same goal during the grant review process: find those research projects that fit the funder's mission and are worth its investment. Through this lens, the review criteria used for research proposals across agencies are easier to understand and address, which may encourage new investigators to apply for funding, and seasoned investigators and research development offices to consider a diversified set of funding sources for their research portfolios. We also hope that this analysis provides guidance to other grantmakers as they develop review criteria for their own funding opportunities. For the 10 US federal agencies included here, we hope that the analysis serves as a starting point to develop even greater consistency across the review criteria—perhaps even a single canonic, cross-agency set of review criteria—used to evaluate federal research grant proposals.

Author's Note

The work is based on material developed by HJF-K for the Grantsmanship for the Research Professionals course at Northwestern University School of Professional Studies (SCS PHIL_NP 380-0), and was presented in part at the National Organization of Research Development Professionals 7th Annual Research Development Conference in Bethesda, MD, April 29-May 1, 2015.

The authors would like to thank Amy Lamborg, MS, MTSC, for providing invaluable insights and for reviewing the manuscript.

Holly J. Falk-Krzesinski, PhD
School of Professional Studies
Northwestern University
Chicago, IL, USA
Global Academic Relations
Elsevier
New York, NY, USA

Stacey C. Tobin, PhD
The Tobin Touch, Inc.
Arlington Heights, IL, USA

Correspondence concerning this article should be addressed to Holly J. Falk-Krzesinski, PhD, Vice President, Strategic Alliances, Global Academic Relations, Elsevier, h.falk-krzesinski@elsevier.com.

References

American Association for the Advancement of Science. Intersociety Working Group. (2014). AAAS report XXXIX: Research and development FY 2015. Retrieved from http://www.aaas.org/page/aaas-report-xxxix-research-and-development-fy-2015

Berg, J. (2010a). Even more on criterion scores: Full regression and principal component analysis. *NIGMS Feedback Loop Blog*. Retrieved June 17, 2015, from https://loop.nigms.nih.gov/2010/07/even-more-on-criterion-scores-full-regression-and-principal-component-analyses/

Berg, J. (2010b). Model organisms and the significance of significance. *NIGMS Feedback Loop Blog*. Retrieved June 17, 2015, from https://loop.nigms.nih.gov/2010/07/model-organisms-and-the-significance-of-significance/

Berg, J. (2010c). More on criterion scores. *NIGMS Feedback Loop Blog*. Retrieved June 17, 2015, from https://loop.nigms.nih.gov/2010/07/more-on-criterion-scores/

Committee on the External Evaluation of NIDRR and Its Grantees, National Research Council, Rivard, J. C., O'Connell, M. E., & Wegman, D. H. (Eds.). (2011). *Review of disability and rehabilitation research: NIDRR grantmaking processes and products.* Washington, DC: National Academies Press.

Department of Defense. (2015). Congressionally directed medical research programs: Funding opportunities. Retrieved June 17, 2015, from http://cdmrp.army.mil/funding/prgdefault.shtml

Federation of American Societies for Experimental Biology (FASEB). (2014). NIH research funding trends: FY1995-2014. Retrieved June 17, 2015, from http://www.faseb.org/Policy-and-Government-Affairs/Data-Compilations/NIH-Research-Funding-Trends.aspx

Geever, J. C. (2012). *Guide to proposal writing* (6th ed.). New York, NY: The Foundation Center.

Gerin, W., & Kapelewski, C. H. (2010). *Writing the NIH grant proposal: A step-by-step guide* (2nd ed.). Thousand Oaks, CA: SAGE Publications, Inc.

Kiritz, N. J. (2007). *Program planning and proposal writing.* Los Angeles, CA: Grantsmanship Center.

National Aeronautics and Space Administration. (2015). *Guidebook for proposers responding to a NASA Research Announcement (NRA) or Cooperative Agreement Notice (CAN)*. Retrieved June 17, 2015, from http://www.hq.nasa.gov/office/procurement/nraguidebook/proposer2015.pdf

National Endowment for the Arts. (2015). ART WORKS guidelines: Application review. Retrieved June 17, 2015, from http://arts.gov/grants-organizations/art-works/application-review

National Endowment for the Humanities. (2015a). NEH's application review process. Retrieved June 17, 2015, from http://www.neh.gov/grants/application-process#panel

National Endowment for the Humanities. (2015b). Office of Digital Humanities: Digital humanities start-up grants. Retrieved August 10, 2015, from http://www.neh.gov/files/grants/digital-humanities-start-sept-16-2015.pdf

National Institutes of Health. (2008a). Enhancing peer review: The NIH announces enhanced review criteria for evaluation of research applications received for potential FY2010 funding. Retrieved June 17, 2015, from https://grants.nih.gov/grants/guide/notice-files/NOT-OD-09-025.html

National Institutes of Health. (2008b). Enhancing peer review: The NIH announces new scoring procedures for evaluation of research applications received for potential FY2010 funding. Retrieved June 17, 2015, from http://grants.nih.gov/grants/guide/notice-files/NOT-OD-09-024.html

National Institutes of Health. (2014). Review criteria at a glance. Retrieved June 17, 2015, from https://grants.nih.gov/grants/peer/Review_Criteria_at_a_Glance_MasterOA.pdf

National Institutes of Health. (2015a). Office of Extramural Research Support: Peer review process. Retrieved September 10, 2015, from http://grants.nih.gov/grants/peer_review_process.htm

National Institutes of Health. (2015b). Scoring system and procedure. Retrieved June 17, 2015, from https://grants.nih.gov/grants/peer/guidelines_general/scoring_system_and_procedure.pdf

National Science Foundation. (2007). Important notice no. 130: Transformative research. Retrieved June 17, 2015, from http://www.nsf.gov/pubs/2007/in130/in130.jsp

National Science Foundation. (2014). Chapter III - NSF proposal processing and review. *Grant proposal guide*. Retrieved September 10, 2015, from http://www.nsf.gov/pubs/policydocs/pappguide/nsf15001/gpg_3.jsp#IIIA

Rockey, S. (2011). Correlation between overall impact scores and criterion scores. *Rock Talk.* Retrieved June 17, 2015, from http://nexus.od.nih.gov/all/2011/03/08/overall-impact-and-criterion-scores/

Russell, S. W., & Morrison, D. C. (2015). *The grant application writer's workbook: Successful proposals to any agency*. Buellton, CA: Grant Writers' Seminars and Workshops, LLC.

U.S. Department of Agriculture. (2015). National Institute of Food and Agriculture (NIFA) peer review process for competitive grant applications. Retrieved June 17, 2015, from http://nifa.usda.gov/resource/nifa-peer-review-process-competitive-grant-applications

U.S. Department of Education. Office of Special Education and Rehabilitative Services. (2014). FY 2014 application kit for new grants under the National Instutite on Disability and Rehabilitation: Field initiated program (research or development). Retrieved July 8, 2015, from https://www2.ed.gov/programs/fip/2014-133g1-2.doc

U.S. Department of Energy. (2015). Merit review guide. Retrieved June 17, 2015, from http://energy.gov/management/downloads/merit-review-guide

U.S. Department of Veterans Affairs. (2015). Office of Research & Development BLR&D/CSR&D merit review program. Retrieved June 17, 2015, from http://www.research.va.gov/services/shared_docs/merit_review.cfm