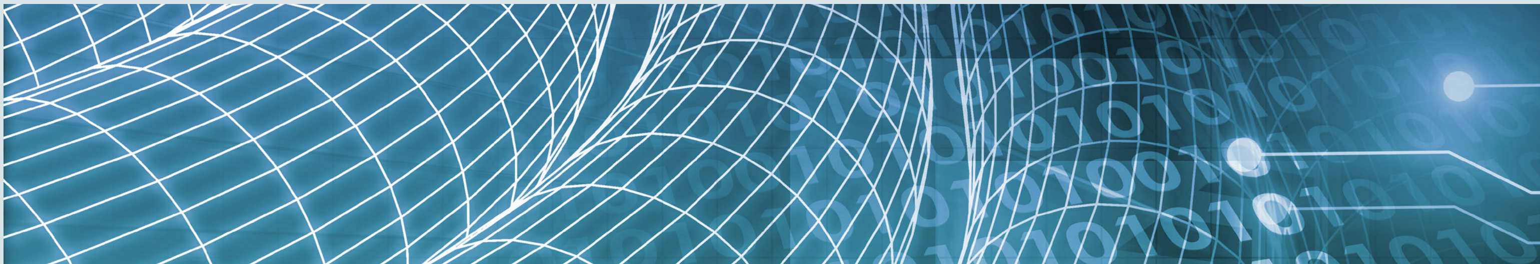
Technical Report: **Cyberinfrastructure for Sustained Scientific Innovation**

ANALYSIS OF COMMUNITY RESPONSE TO NSF CSSI PROGRAM AND SOLICITATION NSF 19-548

JUNE 2020



Report Authorship

Ross Brindle, Nexight Group

Fred Hansen, Nexight Group

Robert Foy, Nexight Group

Rachel Lanspa, Nexight Group

Changwon Suh, Nexight Group

Author for correspondence:

Changwon Suh, email: csuh@nexightgroup.com

8405 Colesville Rd
4th Floor
Silver Spring, MD 20910

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Disclaimer

Any opinions expressed here are those of the authors and do not necessarily reflect the views of the National Science Foundation (NSF) or any of the organizations that are partner to the Cyberinfrastructure for Sustained Scientific Innovation (CSSI) solicitation.

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introduction

This technical report describes the methodology and results of a survey of Principal Investigators (PIs), co-PIs, and others in the Cyberinfrastructure (CI) research community. The survey had two primary purposes:

- To inform decisions about changes to be made to the National Science Foundation (NSF) Cyberinfrastructure for Sustained Scientific Innovation (CSSI) solicitation.
- To inform decisions about the future direction and focus of the NSF CSSI umbrella program.

This survey-based assessment was carried out by Nexight Group under the Office of Advanced Cyberinfrastructure (OAC) Award (#1930025). The grant was intended to benefit the scientific research community by providing insights that enhance CSSI's support of CI for scientific research.

OAC and the CSSI Program

The OAC supports and coordinates the development, acquisition, and provision of state-of-the-art CI resources, tools, and services essential to S&E research. Advances in CI help to drive scientific discovery and innovation by enabling new research capabilities and new pathways for experimentation and theory.

The NSF OAC CSSI umbrella program (NSF 19-548) seeks to enable funding opportunities that are flexible and responsive to evolving and emerging needs in CI. The goal of the CSSI program is to create a CI ecosystem that spans all levels of the data and software stack and scales from individual or small groups of innovators to large community resources. The CSSI program targets services that address all aspects of CI, from embedded sensor systems and instruments, to desktops and high-end data and computing systems, to major instruments and facilities.

Importance of Input from the CI Research Community

In developing investment priorities, the CSSI program considers the needs of the science & engineering community. However, the program also recognizes that the advancement of CI research is best served by engaging not only the capabilities of the CI researchers, but their creativity and energy as well. In other words, research priorities should also be informed by PIs' passions and interests. In addition, feedback from the CI research community helps NSF ensure that PIs are able to write effective proposals and have the support to successfully carry out their projects.

Accordingly, ongoing feedback from and dialogue with PIs from the CI research community is critical. Surveys are an efficient and effective mechanism by which NSF directorates stay connected to the community and maintain a dialogue. Recognizing that surveys place a burden on the time and effort of PIs, OAC established a design imperative to minimize the time and effort required to complete this survey. The average survey completion time was less than ten minutes.

Survey Development

Nexight Group, a small business technical and management consultancy in Silver Spring, MD, worked with NSF to establish a framework for survey design that began with an understanding of the decisions to be informed by the survey. As noted in the previous page, the survey was designed to gather input that would inform decisions about the CSSI solicitation and decisions about the program's direction and focus. Nexight worked with OAC decision makers to specify the structure of the decisions, the inputs to the decisions, and the impact of the decisions. Our three phases of survey design are:

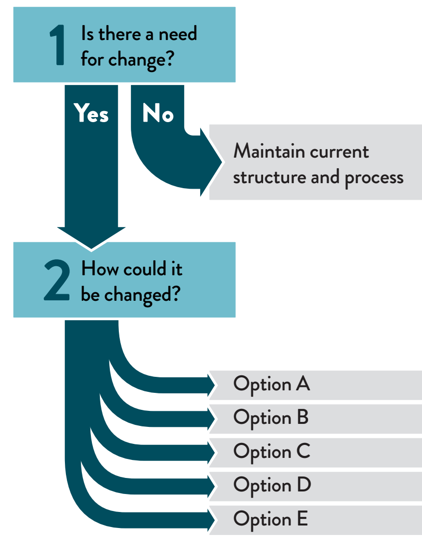
- Determine the nature of the decisions to be made
- Determine the information needed to inform the decisions (who needs to say what about what?)
- Write survey items

The structure for the decisions describes how the decisions are made. The decisions follow a two-stage decision-making process. The **first stage** is focused solely on determining whether change is needed – it represents a simple yes/no decision point. If the determination is **no**, then the decision-making process ends. If the determination is **yes**, then the decision-making process moves to the second stage. The **second stage** is focused on determining how to change. Since the options for change were limited by organizational and practical constraints, the second stage reduced to a choice among options. This decision-making structure is illustrated on the right.

The input to the decisions describes the specific information (e.g., judgments, observations, preferences) that PIs can provide to inform the decisions. In order to keep the survey short, only questions that directly tied to the decisions were included in the survey. Questions that were of interest to the decision makers but not directly tied to a decision were excluded.

Nature of Decision

Decision makers used a two-stage decision-making process.



The impact of the decisions describes why the decisions need to be made and what difference they make. Nexight developed a logic model that described how the CSSI program has impact and achieves its goals. This helped to ensure that the decisions informed by the survey were meaningful and significant. The logic model also provided a conceptual context for framing the survey questions.

Nexight Group developed and finalized both the survey and a survey landing page with information on the CSSI umbrella program, the survey project and outcomes, and a link to complete the survey. The survey and landing page were created using QuestionPro survey software (https://www.questionpro.com).

The survey was launched on December 2, 2019 and closed on January 10, 2020.

Survey Respondents

A total of 251 people provided responses to the survey, 31 of whom supplied answers for solely Section 1: Solicitation. The demographics indicated that the respondents were representative of the target population and comparable to the respondents of other NSF surveys.

97% interact with NSF as PIs or co-PIs. 55% had served as a proposal reviewer in the past year. 98% had previously submitted a proposal to NSF, 57% of whom received NSF funding. 90% listed universities as their primary organization. Survey responses were received from 42 U.S. states.

A more detailed demographic breakdown of respondents is shown on the following page, and in Appendix C (p. 28).

Demographic Breakdown of Respondents

1 Survey respondents primarily interact with NSF as Principal Investigators or co-Principal Investigators.

96.8%	**Principal Investigator (PI) / co-Principal Investigator (co-PI)**
1.1%	Sponsored Projects Office (SPO) staff
1.1%	Authorized Organization Representative (AOR)
0.5%	Research Administrator
0.5%	Other

2 Half of survey respondents have served as reviewers in the past year.

55%	**Have served as a reviewer in the past year, reviewing an average of 10.4 proposals**
45%	Have not served as a reviewer in the past year.

3 The majority of respondents describe themselves as PIs and professors (some respondents selected multiple categories).

49.4%	**Principal Investigator**
42.2%	Professor
19.1%	Faculty/Educator
12.4%	Staff Scientist/Researcher
4.8%	Institutional Administrator
2.8%	Scientific Administrator
2.4%	Laboratory Manager
0.8%	Laboratory Technician
0.4%	Post-Doctoral Fellow
2.8%	Other

4 Nearly all respondents have previously submitted a proposal to NSF, 73% of whom received funding.

98%	**Have submitted**
2%	Have not submitted

Of those who submitted:

57%	Funded
18%	Under review
5%	Rejected
19%	No response

5 The majority of respondents are most related to the Directorate for Computer and Information Science and Engineering (CISE), followed by the Directorate for Mathematical and Physical Sciences (MPS), then the Directorate for Engineering (ENG), and the Directorate for Geosciences (GEO).

34%	**CISE**	**Computer and Information Science and Engineering**
20%	MPS	Mathematical and Physical Sciences
10%	ENG	Engineering
8%	GEO	Geosciences
3%	BIO	Biological Sciences
1%	SBE	Social, Behavioral, and Economic Sciences
1%	EHR	Education and Human Resources
2%		Other

6 90% of respondents list universities as their primary organization, followed by non-profit research organizations at 5%.

90.6%	**University**
5.2%	Non-profit Research Organization
3.1%	Federally Funded Research and Development Center
0.5%	Associate's College
0.5%	No Organizational Affiliation / Independt Researcher

7 Large organizations (1001 or more) form the majority of respondents.

74.7%	**1001 or more**
13.2%	501 to 1000
6.8%	101 to 500
3.2%	25 or fewer
2.1%	26 to 100

8 Most respondents work in research groups, as individuals or as part of research projects.

86%	**Work in a research group**
14%	Do not work in a research group

Of those who work in a research group:

36%	Research project
34%	Individual researcher
19%	Laboratory
10%	Other
1%	Did not indicate

For details and select multi-step analysis, refer to Appendix C (p. 28)

section I: solicitation

THE SURVEY RESULTS ARE PRESENTED IN TWO SECTIONS.

Section I (pages 4-12), described below, presents the survey results intended to inform changes to the CSSI solicitation.

Section II (pages 13-17), described on page 13, presents the survey results intended to inform decisions regarding the future direction and focus of CSSI program investments.

Section I

The survey questions focused on the solicitation were organized around the two-part decision-making process – the **Need for Change** was assessed separately from **How to Change**. Accordingly, the results for Section I are organized around this two-part decision-making process, with the Need for Change results presented first.

CSSI decision makers identified seven aspects of the solicitation for which meaningful change was both allowed and feasible (see the next page of the report for the list of aspects). Only these aspects were included in the survey. Survey respondents were asked to identify three of the seven areas where improvement is most needed and could make the most difference.

The Need for Change results are displayed in a bar chart that indicates the percentage of respondents who chose that aspect (note: the percentages do not add to 100% because people could select more than one option). The Key Takeaway section summarizes the main results displayed in the bar chart and indicates the conclusions that may be drawn from those results.

The How to Change results are presented second. For each aspect they checked as needing change, respondents were asked to indicate the How to Change options that they believed should be made. The How to Change results for each aspect are presented on a separate page. Again, the results are displayed in a bar chart followed by a Key Takeaway section summarizes the main results displayed in the bar chart, which indicates the conclusions that may be drawn from those results.

The How to Change results also include a demographic analysis that breaks the results down in terms of reviewers versus non reviewers. This breakdown is warranted given the fairly even split between the two subpopulations (55% reviewers and 45% non-reviewers). The comment on the demographic analyses indicates whether and how the takeaways change when the reviewers are separated from non-reviewers.

is there a need for change?

Participants were asked to **select three of seven** indicated aspects of the current solicitation where improvement is most needed or could make the most difference. **Multi-step analysis based on this question can be found in Appendix C** (p 28).

Overall solicitation aspects

1 **Types of awards** (see p. 6 for details on how to change)

2 **Combined software/data umbrella** (p. 7)

3 **Presentation of domain-specific interests** (p. 8)

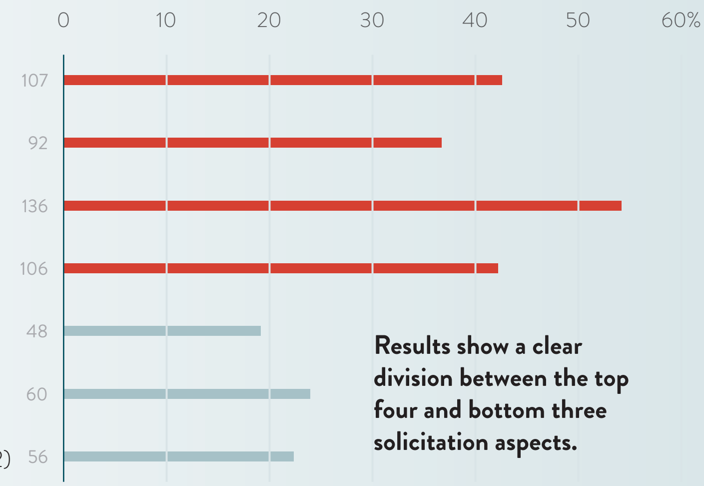
4 **Solicitation-specific criteria** (p. 9)

5 **Solicitation logisitics** (p. 10)

6 **Guidance included in the solicitation** (p. 11)

7 **Support provided beyond the written solicitation** (p. 12)

Percentage of survey respondents who selected at least one aspect for change



Results show a clear division between the top four and bottom three solicitation aspects.

KEY TAKEAWAY Top four aspects of the solicitation where change is needed and would make the most difference:

Types of awards

the two classes of CSSI awards (elements and framework implementations) and the size, duration, and timing of the funding associated with each type

Combined software/data umbrella

the inclusion of both software and data perspectives under a single umbrella scope

Presentation of domain-specific interests

the number of areas, the clarity of the descriptions, and the level of specificity and amount of detail provided

Solicitation-specific criteria

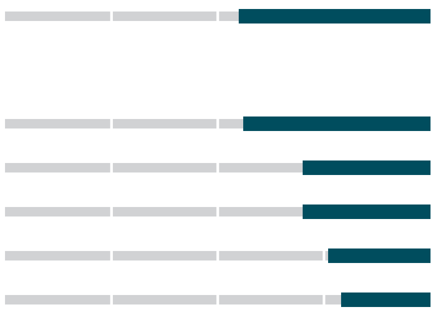
the appropriateness and number of additional solicitation-specific review criteria and the clarity and detail with which they are described

1 TYPES OF AWARDS

This refers to the two classes of CSSI awards (i.e., elements versus framework implementations), and the size, duration, and timing of the funding associated with each type. [Solicitation NSF19548, pp. 6-7]

Respondents selected the changes that they thought should be made to the types of awards offered in the solicitation.

% of those who chose Aspect 1



45% F Add a category of award for initial phase research projects that are more exploratory in nature and that would not have a metrics requirement

44% E Distinguish between data and software awards

30% A Change the dollar amount

30% C Add a smaller category

24% B Change the duration of the award

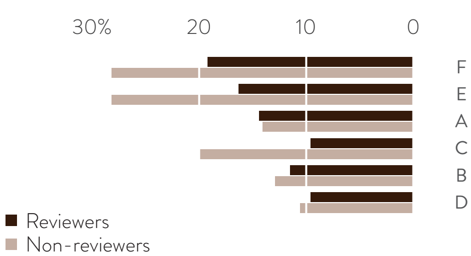
21% D Add an institute-level category

KEY TAKEAWAY **Though all options were selected** by a significant portion of the population, although **the following two stand out as being the most selected** options:

F **Adding an award category for exploratory research**

E **Distinguishing between data and software awards**

DEMOGRAPHIC MODIFIERS (select multi-step analysis available in appendix C, p. 28)



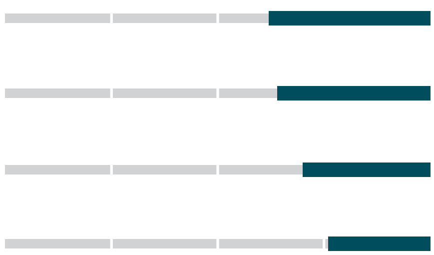
The breakdown analysis does not change the Key Takeaway regarding the top two How to Change options. However, among non-reviewers, **1C: Add a smaller category** would be added to the list of top change options.

2 COMBINED SOFTWARE / DATA UMBRELLA

This refers to the program's inclusion of both software and data perspectives under a single umbrella scope. [Solicitation NSF19548, pp. 1-2]

Respondents selected the changes that they thought should be made to the combined software/data umbrella.

% of those who chose Aspect 2



38% C Create separate software and data solicitations

36% B Require more integration across data and software CI services

30% A Require collaboration across data and software experts/developers

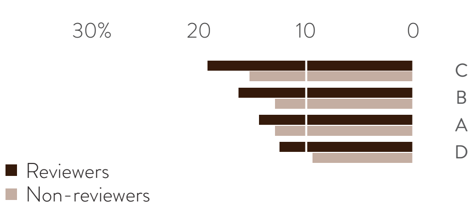
24% D Consider additional perspectives as part of the program

KEY TAKEAWAY

Though all options were selected by a significant portion of the population, **"Create separate software and data solicitations" was the most selected.**

Although respondents recommend separating the solicitations (echoing the key takeaway of "1: Type of Awards" to distinguish between software and data awards), they also advocate for more **integration across data software services** and more **collaboration across data and software developers.**

DEMOGRAPHIC MODIFIERS (select multi-step analysis available in appendix C, p. 28)



The breakdown by reviewers versus non-reviewers does not substantially change the Key Takeaway since the pattern of results for reviewers and non-reviewers is very similar.

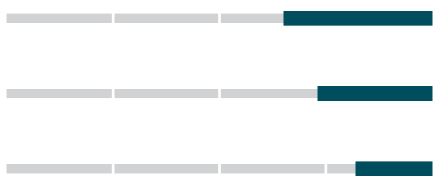
SOLICITATION: HOW TO CHANGE

3 PRESENTATION OF DOMAIN-SPECIFIC INTERESTS

This refers to the way in which the specific interests of domains (i.e., BIO, CISE, EHR, ENG, GEO, MPS, or SBE) are presented, including the clarity of the descriptions, the level of specificity and amount of detail provided, and the number of interest areas listed. [Solicitation NSF19548, pp. 7-10]

Respondents selected the changes that they thought should be made to the presentation of domain-specific interests.

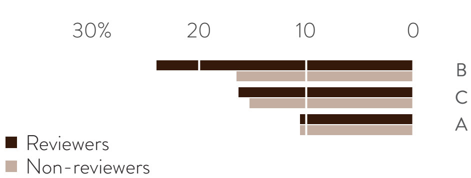
% of those who chose Aspect 3



- **35%** B Eliminate the redundancy across the domain-specific interests
- **27%** C Focus on smaller numbers of topics in each solicitation
- **18%** A Decrease the number and complexity of the domain-specific interest areas

KEY TAKEAWAY All options were selected by a significant portion of the population, indicating that **respondents generally advocate for increasing clarity and simplicity in the presentation of domain-specific interests.**

DEMOGRAPHIC MODIFIERS (select multi-step analysis available in appendix C, p. 28)



The breakdown by reviewers versus non-reviewers does not substantially change the Key Takeaway, although reviewers were more likely to recommend eliminating the redundancy across domain-specific interests.

4 SOLICITATION-SPECIFIC CRITERIA

This refers to the appropriateness and number of additional solicitation-specific review criteria (e.g. science-driven, innovation, metrics, sustainable impacts), as well as the clarity and detail with which they are described. [Solicitation NSF19548, pp. 16-17]

Respondents selected the changes that they thought should be made to the solicitation-specific criteria.

% of those who chose Aspect 4

69% C Provide more guidance on how to meet the criteria (e.g., metrics)

51% D Identify best practices to be incorporated (e.g., FAIR practices, software development guidelines and metrics, OECD-identified sustainability options)

11% A Decrease the number of criteria

9% B Change the criteria (regardless of number)

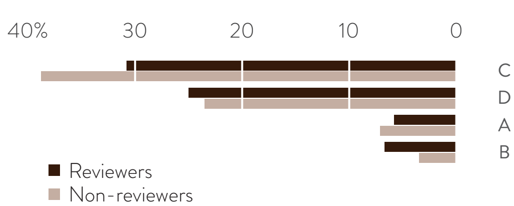
KEY TAKEAWAY

Respondents are advocating for more help on how to meet the soliciation criteria. In particular, they think that the following two changes should be made:

C **Provide more guidance on how to meet the criteria**

D **Identify best practices to be incorporated into a proposal**

DEMOGRAPHIC MODIFIERS (select multi-step analysis available in appendix C, p. 28)



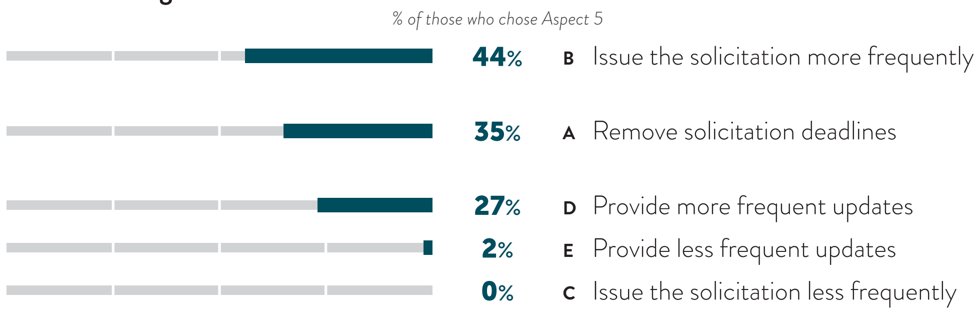
The breakdown by reviewers versus non-reviewers does not substantially change the Key Takeaway, although non-reviewers were more likely to recommend that more guidance be provided on how to meet the criteria.

SOLICITATION: HOW TO CHANGE

5 SOLICITATION LOGISTICS

This refers to the proposal deadlines, frequency of solicitation, and the overall submission timeline. [Solicitation NSF19548, pp. 1, 14-15]

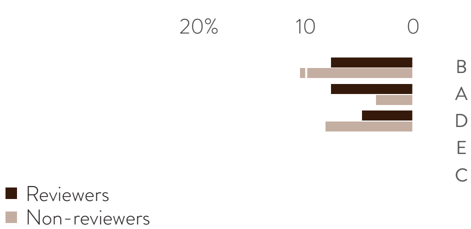
Respondents selected the changes that they thought should be made to the solicitation logistics.



KEY TAKEAWAY Solicitation logistics was not one of the top areas where a Need for Change was indicated so caution should be exercised in drawing conclusions from the results.

Nevertheless, it is clear that **respondents would prefer that the solicitation deadlines be removed** and that the **issuance of the solicitation and solicitation updates should occur more frequently.**

DEMOGRAPHIC MODIFIERS (select multi-step analysis available in appendix C, p. 28)



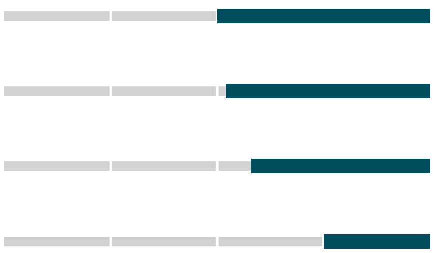
The breakdown analysis does not change the Key Takeaway regarding the changes that should be made in regard to solicitation logistics.

6 SOLICITATION: HOW TO CHANGE
GUIDANCE INCLUDED IN THE SOLICITATION

This refers to the background information, instructions, and guidance included in the solicitation document regarding how to prepare a project and write a proposal.
[Solicitation NSF19548, pp. 11-14]

Respondents selected the changes that they thought should be made to the guidance included in the solicitation.

% of those who chose Aspect 6

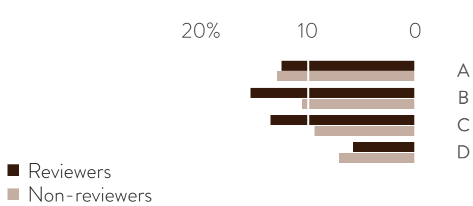


- **50%** A Provide more background and rationale regarding CSSI targets
- **48%** B Provide more information about exisiting, recognized capabilities
- **42%** C Provide more guidance on options for partnerships and collaboration
- **25%** D Provide more guidance on how to find and engage partners

KEY TAKEAWAY Guidance included in the solicitation was not one of the top areas where a Need for Change was indicated so caution should be exercised in drawing conclusions from the results.

Nevertheless, it is clear that **respondents would like more background information, instructions, and guidance** to be included in the solicitation document.

DEMOGRAPHIC MODIFIERS (select multi-step analysis available in appendix C, p. 28)



The breakdown analysis does not change the Key Takeaway regarding the changes that should be made in regard to the guidance included in the solicitation.

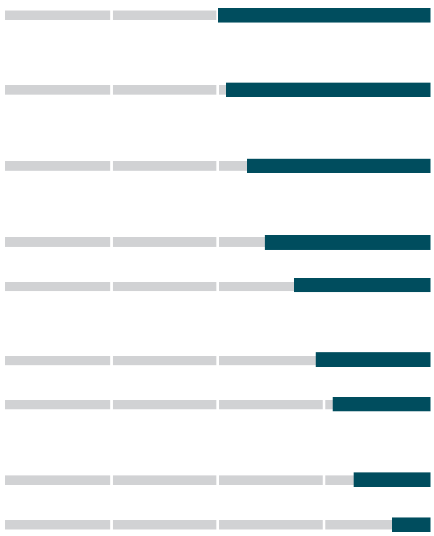
SOLICITATION: HOW TO CHANGE

7 SUPPORT BEYOND THE WRITTEN SOLICITATION

This refers to the support and guidance provided through the PI webinars, the feedback provided on submitted whitepapers, the common email for submitting questions, and the answers provided.

Respondents selected the changes that they thought should be made to the guidance included in the solicitation.

% of those who chose Aspect 7

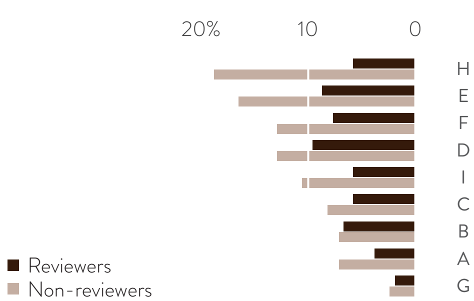


- **50%** H Provide a template for the whitepaper with more structure on what PIs should submit
- **48%** E Provide access to the materials from PI meetings and other workshops
- **43%** F Include specific advice on proposal writing in feedback for submitted whitepapers
- **39%** D Document the Q&A provided during the webinar
- **32%** I Provide a FAQ page for the solicitation on the CSSI or OAC website
- **27%** C Provide access to the webinar materials ahead of time
- **23%** B Add more Q&A within the webinar / make it more interactive
- **18%** A Add additional webinars
- **9%** G Create a separate email address for different types of questions and/or expertise needed for the answer

KEY TAKEAWAY Support beyond the written solicitation was not one of the top areas where a Need for Change was indicated so caution should be exercised in drawing conclusions from the results.

Nevertheless, it is clear that **respondents would advocate for all of the How to Change options** except for creating a separate email address for different types of questions/expertise.

DEMOGRAPHIC MODIFIERS (select multi-step analysis available in appendix C, p. 28)



The breakdown analysis revealed that non-reviewers were nearly three times more likely to recomment that CSSI provide a template for the whitepaper with more structure on what PIs should submit.

section II: CSSI program

Section II

Section II presents survey results intended to inform decisions about the direction and focus of the CSSI program and its investment priorities going forward. The survey questions were organized around the two-part decision-making process – the **Need for Change** was assessed separately from **How to Change**. Accordingly, the results for Section II are also organized around this two-part decision-making process, with the Need for Change results presented first.

The Need for Change was assessed from multiple perspectives. First, respondents were asked to indicate whether they thought the assumptions of the CSSI program will still apply in the near future. A need for change would be indicated to the extent that respondents believe that those assumptions are no longer valid.

Next, respondents were asked to rate the degree to which the CSSI program has been successful in achieving its objectives. A lack of effectiveness would suggest a need for change at the program level.

The final Need for Change question asked respondents to rate the degree to which the CSSI program has been successful in implementing its guiding principles. Again, a lack of effectiveness would suggest a need for change at the program level.

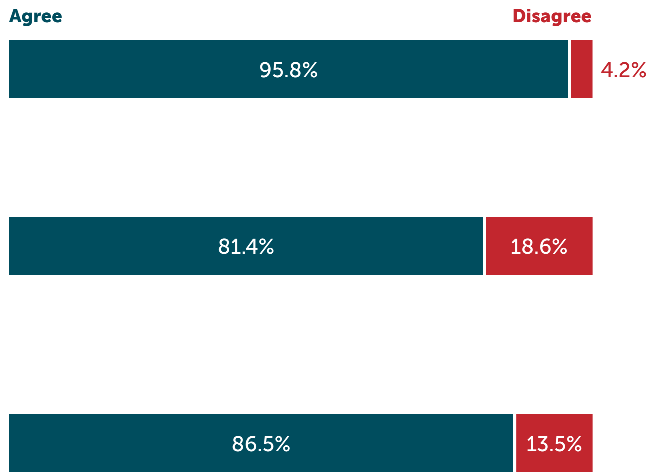
The How to Change questions focused on the allocation of funding over the next 1-5 years. Respondents were first asked to identify three investment priorities for the next 1-5 years. They were then asked to indicate the allocation of funds across those priorities.

CSSI PROGRAM: NEED FOR CHANGE

1 NEAR-FUTURE ASSUMPTIONS

NSF's CSSI program is based on certain assumptions about how infrastructure (i.e. software and data infrastructure) can support science and engineering (S&E) research and enables new thinking and transformative discoveries.

Respondents indicated the extent to which they agree with the following assumptions as they apply to the near future (1-5 years) for the CSSI program.



A The ongoing development and deployment of cyberinfrastructure is a key catalyst and enabler for transformative discoveries across all areas of S&E research.

B Beyond the development of software and data infrastructure specific to a given area of science, there is a need for a national CI ecosystem that addresses the broad and diverse needs of stakeholders across the entire S&E community.

C A program focused on the devlopment and deployment of integrated software and data CI and services and community creation is critical to a robust and sustainable national CI ecosystem.

KEY TAKEAWAY There was a high level of agreement for each of the three assumptions on which the CSSI program is based. This indicates that **the rationale for the CSSI program is still valid, and that there is no need for change in regard to the overall direction and focus of the program.**

2 SUCCESS IN OBJECTIVES

The CSSI program aims to support CI development and deployment to support scientific innovation and discovery.

Percentage of respondents who would classify the CSSI program's achievement of the following objectives as...

A. Supporting the *development* of robust, reliable, and sustainable data and software cyberinfrastructure

B. Supporting the *deployment* of robust, reliable, and sustainable data and software cyberinfrastructure

C. Bringing innovative capabilities to S&E community that enable scientific innovation and discovery

D. Supporting robust, reliable, and sustainable data and software cyberinfrastructure that supports and advances sustained scientific innovation and discovery

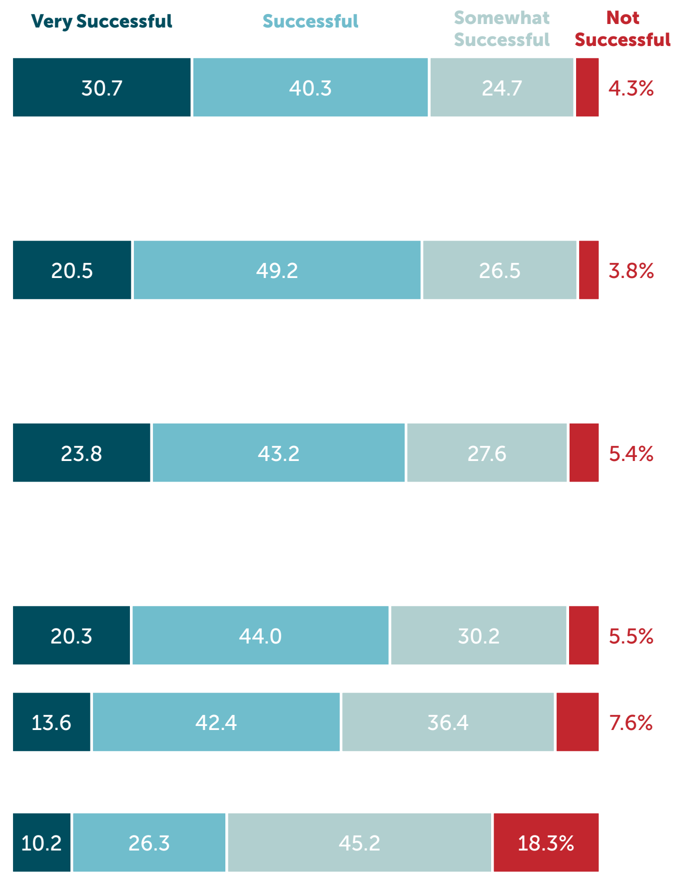
KEY TAKEAWAY **The majority of respondents indicated that the CSSI program has been successful in achieving each of the four objectives. Respondents rated CSSI's success higher on supporting the development of CI relative to the deployment of CI.**

There is also a slight indication of a need for change given that a significant percentage of respondents indicated that **CSSI has only been somewhat successful.** In particular, the results suggest that **CSSI may want to adopt an increased focus on deployment and supporting scientific innovation.**

3 SUCCESS IN GUIDING PRINCIPLES

The CSSI program is based on six guiding principles. a lack of effectiveness would suggest a need for change at the program level.

Percentage of respondents who would classify the CSSI program's implementation of its guiding principles as...



SCIENCE-DRIVEN
Promoting science excellence, enabling fundamentally new scientific advances, benefits science and engineering communities beyond initial participants

INNOVATIVE
Emphasizing unique NSF contributions; builds the capability, capactiy, and cohesiveness of a national CI ecosystem; considers both the human and technical aspects of the CI.

COLLABORATIVE
Fostering partnerships and community development; actively engages CI experts, specialists and scientists working in concert with the domain scientists who are users of CI.

LEVERAGED
Building on existing recognized capabilities.

STRATEGIC
Encouraging measurement of progress and sharing of results.

SUSTAINED
Providing benefits beyond the participants and the lifetime of the award.

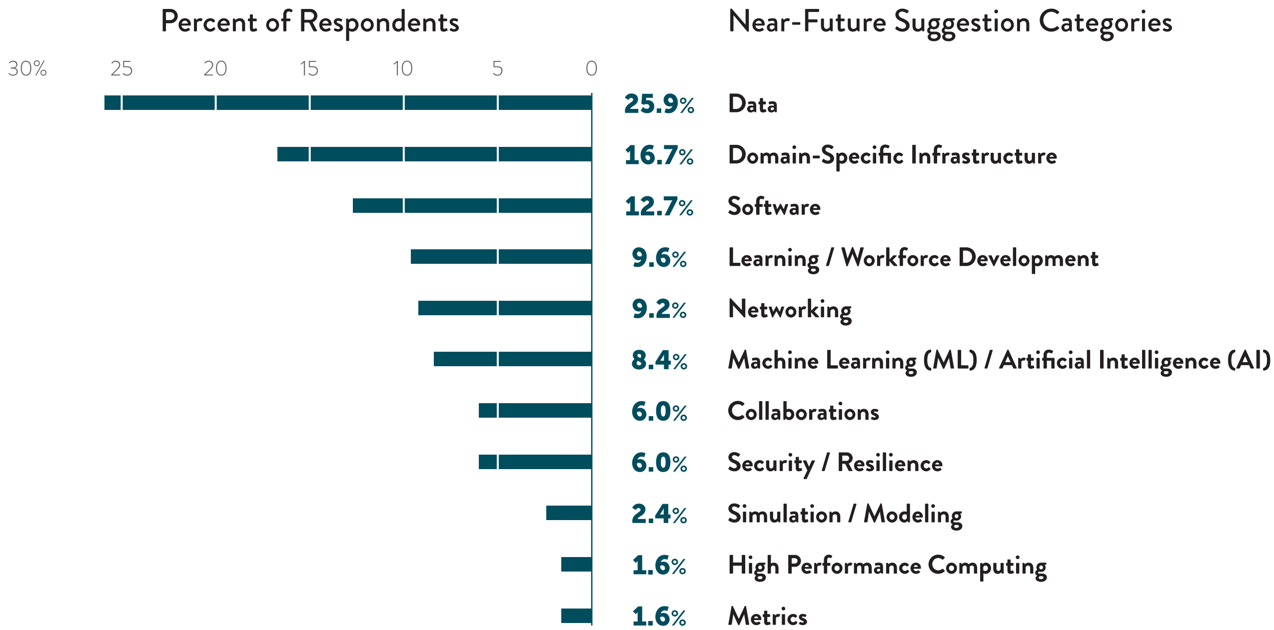
KEY TAKEAWAY **The majority of respondents indicated that the CSSI program has been successful in implementing all of its guiding principles except for SUSTAINED.** Less success was also indicated in regard to the principle of STRATEGIC. In contrast, **a large majority of respondents indicated success in implementing the principles of SCIENCE-DRIVEN, INNOVATIVE, and COLLABORATIVE.** Only a very small percentage indicated that CSSI has not been successful in implementing its guiding principles.

Again, **there is some indication of a need for change, especially in regard to implementing the principles of SUSTAINED and STRATEGIC.** It is worth noting that these two principles are the most difficult to implement.

4 NEAR-FUTURE SUGGESTIONS

Respondents indicated up to three areas in open response where they thought CSSI funding should be directed in the next 1-5 years in order to have the most impact or best serve the S&E community.

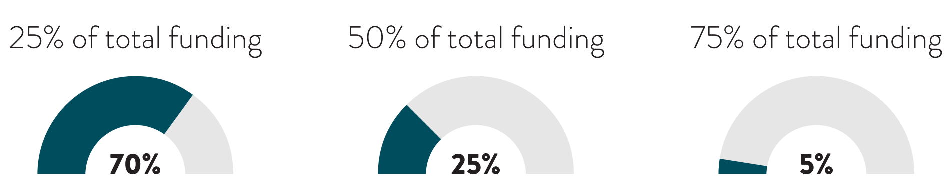
Responses were assigned a category according to CSSI investment priorities, charted below. **For a full list of open response answers, refer to Appendix B (p. 20)**.



5 NEAR-FUTURE SUGGESTIONS FUNDING

Respondents also indicated the amount of total funding (out of 100%) that NSF should allocate for each of their near-future suggestions.

Percentage of respondents who recommended allocating X amount of total funding to their near-future suggestions:



KEY TAKEAWAY Few respondents recommended allocating large percentages of funds to their near-future suggestions. Rather, **the large majority of respondents favor broader funding, at lower allocation levels.**

list of acronyms

AI	Artificial Intelligence
AOR	Authorized Organization Representative
API	Application Programming Interface
BIO	NSF Directorate for Biological Sciences
BLAS	Basic Linear Algebra Subprograms
CI	Cyberinfrastructure
CS	Computer Science
CISE	NSF Directorate for Computer and Information Science and Engineering
CSSI	Cyberinfrastructure for Sustained Scientific Innovation
DFT	Density Functional Theory
DIBBs	Data Infrastructure Building Blocks
EHR	NSF Directorate for Education and Human Resources
ENG	NSF Directorate for Engineering
FAIR	Findable, Accessible, Interoperable, and Reusable
FFT	Fastest Fourier Transform
FFRDC	Federally Funded Research and Development Center
GB	Gigabytes
GEO	NSF Directorate for Geosciences
GIS	Geographic Information System
HBCU	Historically Black Colleges and Universities
HPC	High-Performance Computing
HTC	High-Throughput Computing
HW	Hardware
IT	Information Technology
IoT	Internet of Things
LAPACK	Linear Algebra Package
MPS	NSF Directorate for Mathematical and Physical Sciences
MSI	Minority-Serving Institution

List of Acronyms (cont.)

NIH	National Institutes of Health
NSF	National Science Foundation
OAC	Office of Advanced Cyberinfrastructure
OAU	Other Authorized User
OECD	Organization for Economic Co-operation and Development
OSS	Open Source Systems
PI	Principal Investigator
RSEs	Research Software Engineers
S&E	Science and Engineering
SBE	NSF Directorate for Social, Behavioral, and Economic Sciences
SGCI	Science Gateways Community Institute
SI2	Software Infrastructure for Sustained Innovation
SPO	Sponsored Projects Office
SW	Software
TCP-IP	Transmission Control Protocol/Internet Protocol
THz	Terahertz
USDA	United States Department of Agriculture
XSEDE	Extreme Science and Engineering Discovery Environment

near-future suggestions

Open responses to Section II, Question 4: Near-Future Suggestions, organized by categories chosen by Nexight to map with CSSI goals and investment priorities

CATEGORY	RESPONSE
Data	Adopting big data technologies
	Algorithms for quantum computing
	Algorithms for scalable computing
	Any innovative approach to data generations, analysis, etc. as long as it will be open source
	Big data processing
	Big omics data
	Blueprinting a secure cyber infrastructure which can easily share relevant data and best practices
	Broad open source infrastructure - data analysis
	Broad open source infrastructure - data visualization
	Broad open source infrastructure - numeric computation
	Broadly applicable storage and curation approaches to diverse data sets
	Building data repositories for standardized benchmarking of physics software (e.g. Phase transitions in lattice models)
	Cloud data storage
	Collocated data and tools to re-use data
	Creating and publicizing a resource library that contains existing CSSI projects - to help other researchers solve CI problems
	Cyberinfrastructure that integrates databases and makes them more accessible/usable
	Cyberinfrastructure to support completely open data for large projects (e.g. In astrophysics)
	Data Access, storage and management
	Data analytics
	Data and AI
	Data archiving
	Data assimilation
	Data curation
	Data infrastructure hardware for institutions
	Data management for the long term
	Data mining
	Data quality
	Data repositories are being funded with high $$ amount, but those are just storage with a few tools developed at a very high cost, without knowing they are useful for the domain. Big projects, big funding really need better user requirements collection processes up front before an investment is made in something the computer scientists 'think' needs to be done.

CATEGORY	RESPONSE
Data (cont.)	Data repository access and development.
	Data science
	Data services
	Data standardization: Formats and APIs
	Developing CI to assure high quality data and services
	Developing CI to provide quality data and services to the community
	Developing infrastructure to make data available and useful on a large scale
	Developing methods and tools to evaluate data and services quality
	Enable data-driven initiatives
	Ensuring cost effective access to massive scale digital data assets across all domains and to all members of the global research ecosystem
	Frictionless data packages and data preservation in a machine-readable and interoperable way
	High-quality data generation, curation, and dissemination
	Infrastructure and tools for data sharing and interoperability.
	Infrastructure for data sharing that include 'found' data
	Integration of FAIR guidelines in CI projects
	Integration of mechanisms to verify and collect metadata on input data and computation
	Libraries of tools
	Linked data
	Long term support (i.e. NSF-supported) for high-value data sets and services across science & engineering
	Maintenance of existing, well-used tools (not adding novel capabilities, but rather user support, bug fixes, refactoring, etc.)
	Management, curation, and reuse of data (which is gathered at high cost) need to be emphasized (viz. Fair principles)
	Math libraries (e.g., BLAS, LAPACK, FFT, Sparse matrix, etc.) For the modern computer architectures.
	Methods to more easily integrate variable data types into larger analysis frameworks
	New AI and big data algorithm that does not required centralized data
	Numerical libraries
	Open Data / Encouraging Release of Data
	Questions of data permanence/how do we not lose data in old and legacy formats?
	Science data management infrastructure
	Science-driven data alignment and integration
	Secure storage technology and infrastructure (compliance oriented)
	Semantic interoperability
	Standards development for digital object representation of scientific data
	Support CI that enables FAIR principles
	Visualization Tools
	Data science DATA
	Development of a federation of data repositories in various disciplines

CATEGORY	RESPONSE
Data (cont.)	Creating a solicitation geared towards creating community-specific data standards in all S&E communities
Domain-Specific Cyberinfrastructure CI for a specific domain (e.g., Sociology, Chemistry, etc.)	Domain-specific cyberinfrastructure
	Earth sciences
	Agriculture
	Smart cities
	Social sciences
	Sociology
	Research infrastructure for particular scientific communities (like Astropy)
	Renewable energy
	Quantum chemistry
	Particle physics
	Nuclear physics
	Nanotechnology
	Polar science
	Materials discovery
	Materials research
	Materials science
	Materials Science and Nanotechnology
	Interfaces with research in material science and soft matter in particular
	Infrastructure development for biology-specific disciplines, e.g., Neuroscience
	Highly efficient implementation of new algorithms for game changing accuracy in predicting fast (THz) response of materials to electromagnetic pulses
	Health
	Geography/GIS
	Geophysical domain
	Global change
	Discipline focus
	Crystal structure prediction
	Computational biology
	Computational materials science
	Computational materials science and quantum chemistry tools
	Computational mechanics
	Computational physics
	Computer Infrastructure and methodological innovation for next-generation research in life sciences
	Climate change
	Climate variability and adaptation to climate change
	Astronomical surveys
	Atomic and molecular physics, including strong-field interaction and relativistic theory of heavy atoms
	Biology

CATEGORY	RESPONSE
Domain-Specific Cyberinfrastructure (cont.)	Biophysics
	Biosciences
	Electric power systems
	Energy efficiency
	Power and energy grid edges
	Building data repositories for standardized benchmarking of physics software (e.g. Phase transitions in lattice models)
Software	Adding functionality to third-party open source software packages
	Common software frameworks
	Community-driven open source software
	Defining a software lifecycle and what success in sustainability looks like
	Develop better tools to broaden access to hero type scientific computing simulations
	Development of large-scale multiprocessor software
	Early-stage software/algorithm development
	Exascale domain-specific software
	Hardware/software co-design for scientific and commercial advancement
	Highly efficient implementation of new algorithms for game changing accuracy in predicting drug-protein binding site and energy
	Highly efficient implementation of new algorithms for game changing accuracy in predicting electrocatalytic conversion of solar energy to fuels and CO2 to chemicals
	Hybridized approaches to software which blend web-hosted applications with local software
	Long term sustainability of large-scale software systems supporting research
	Maintenance of existing, well-used tools (not adding novel capabilities, but rather user support, bug fixes, refactoring, etc.)
	Middleware for domain applications
	More on the relationship between hardware and software, i.e. Support algorithms optimized for specific hardware and task.
	More support for existing, widely used software; less on speculative small awards for PIs with no history of providing CI
	OSS (open-source software) for S&E Problems that do not have current OSS solutions.
	Program level activity to establish and require standards and protocols across funded components such that the ecosystem can be realized independent of specific implementations of software (analogous to the Internet with TCP/IP, HTTP, HTTP and the fact that any browser can be used/any web server can be used and it all still works).
	Program level activity to increase exposure and dissemination of CI components. As discussed in the DIBBS '18 PI meeting the best way for someone to find information about the past 50 DIBBS activities is to search NSF award search site for the 50 abstracts. This is not sufficient. There should be a central index with required basic information (e.g. Documentation, code, demonstration instance, and activity information indicating whether or note the effort is still active as time goes on). This goes beyond the SGCI effort which is too narrow, and beyond the Big Data Hubs which doesn't have the resources for this. This likely belongs as part

CATEGORY	RESPONSE
Software (cont.)	of the next iteration of XSEDE.
	Scalable software
	Shared software development
	Software development for next-generation high performance computers
	Software engineering within disciplines falling behind
	Software infrastructure for all of science (like NumPy and SciPy)
	Software maintenance
	Software support for new hardware
	Software sustainability efforts (i.e., improvements such as refactoring, writing documentation, and maintenance of existing code)
	Sustainable and sustained scientific software development, as broadly as possible and/or as driven by proposed research. This continues to be as critical as ever
	Tools that support research on decision making in complex systems
	Usability and accessibility of scientific software
	User-friendly and accessible resources to use software tools
Learning/Workforce Development Preparing the future CI workforce by supporting new knowledge and training programs.	CI education infrastructure?
	Developing CI professionals that are fully committed to fully open source development, open collaboration and modern, evolving practices
	Educational domain
	Educational tutorial documentations and videos.
	EHR
	Encouraging the sharing of human resources between R1 and smaller institutions.
	Environment and education
	Funding exploratory work and young investigators will ensure a healthy pipeline of fruitful research and CI development for the future
	HBCUs (Historically black colleges and universities) and MSIs (Minority-serving institution) centric solicitation
	Human resource development in ways that keep S&E professionals available to academia and science in general
	Human resource development that helps cross the divide between 'domain scientists' and IT and/or CS experts
	Integration of education for all sectors of the science community including professors
	Knowledgeable workforce that can assist in the development of software located anywhere in the country
	Non-solicited workshop/training proposals
	Outreach, communication and training to help those outside of CI leverage new capabilities developed in CSSI
	Reaching out to communities that are not currently using or are less likely to use/understand CI as a resource and set of tools
	Small and medium size institutional assistance
	Software/database infrastructure specialists to develop APIs, manage servers, etc.
	Support more young researchers
	Support personnel

CATEGORY	RESPONSE
Learning/Workforce Development (cont.)	Training scholars and students to use more advanced ecostructure
	Transdisciplinary training with respect to data science and software engineering targeting domain scientists
	With crossover into classroom efforts, student and faculty development
	Workforce development
Networking Domestic and international efforts to build data transfer capability and computer networks capacity.	100Gb connectivity
	Cloud services
	Community microgrids and networked microgrids
	Data science is changing the way we do research using what Jim Gray stated as the 4th paradigm. Emphasize building ecosystems to meet this grand challenge in the way we are doing new science
	Dynamic cloud computing
	Elastic compute service (like those available in the commercial cloud) for S&E
	Extending existing successful CI in significant ways
	How to develop mid- to large sized community owned software capabilities
	Intelligent infrastructures to optimize services
	IoT
	Leveraging the public cloud for scientific innovation
	Long term infrastructure sustainability
	Long-term, sustained support for gateways and networks
	Networking
	Portable, cloud-native data and code
	Promote widespread utilization of 1GB/sec data transfer between institutions, facilities and science endpoints (last mile CI)
	Propagating good practices learned in some part of the ecosphere to others
	Redundant and accessible storage (with management) for S&E in a cloud model
	Secure and private cloud computing
	Should focus on sustenance of services and deployments
	Sustainability through containers
	Sustaining and advancing existing CI
	Use of Cloud services and funding models
Machine Learning (ML) / Artificial Intelligence (AI)	Super AI computers for local communities
	Super AI computers
	Robust and Reliable Machine Learning
	Real-time machine learning e.g. For complex instrument control solutions
	Physics driven machine learning
	Machine learning
	Machine learning deployment cyberinfrastructure
	Integrated AI Algorithms and Sciences
	Infrastructure embedding AI algorithms for chemical and bio/material discovery and design
	Frameworks for ML & AI methods development and deployment over data and computing resources that could serve interdisciplinary communities

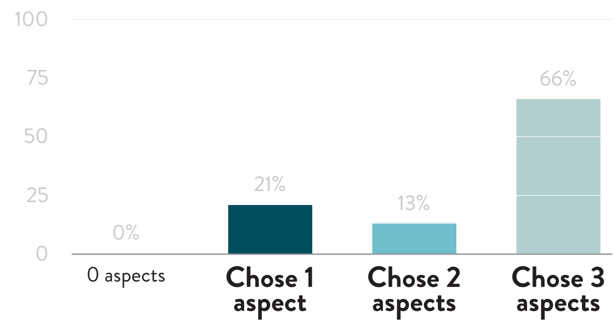
CATEGORY	RESPONSE
Machine Learning (ML) / Artificial Intelligence (AI) (cont.)	Elements for Machine Learning & AI methods development that could serve a broad interdisciplinary community
	Development and deployment of machine learning models
	Comprehensive knowledge representation of scientific data to enable AI and ML
	Combination of NVIDIA and Intel AI chips
	Advancing applications of AI/ML for scientific innovation
	AI
	AI & machine learning
	AI for good
	AI/Machine Learning and Adversarial Learning
	Application of AI and Machine Learning innovations to orchestrate and manage CI effectively and efficiently
	Application of artificial intelligence in science and engineering that can generate new knowledges
	Focus on innovative high-risk high-rewards software and data analysis development, such as large-scale realistic supercomputer simulations and machine-learning analysis
Collaborations	Interdisciplinary research involving computer scientists and domain scientists
	Science / engineering collaborations
	Interagency research topics, such as NSF+NIH or NSF+USDA
	Integrated frameworks that bring capabilities together
	Incentive funds for collaborations with existing centers, institutes, and successful projects or for other behaviors that exemplify other NSF goals than scientific excellence
	Foster more collaboration with domain scientists and computer scientists
	Create an environment to strength collaboration and no competition
	Consider joint events and teams between academic CI researchers and industry CI researchers, e.g., University CI team and Amazon AWS team working jointly towards academic CI for science in cost-effective and sustainable fashion
	Collaboration between domain scientists, computer scientists, data scientists, and software engineers.
	Collaboration between software/hardware developers, data producers and data consumers
	Collaboration. Encouraging and enabling multidisciplinary access to and use of CI capabilities at an institution, and between institutions
	Collaborations with industry to bring in industry-led advances to the science CI
	Collaborative programs between large and smaller institutions
	Brand new innovative, science driven, collaborative CI that leverages new technologies/advances.
	Harmonization of different CI communities of practice
Security/Resilience	Consider investment into cyberinfrastructure that supports aging scientific equipment
	Cybersecurity
	Data science / AI in identifying and predicting cyber threats.

CATEGORY	RESPONSE
Security/Resilience (cont.)	Documentation
	Long-term persistent infrastructure for the computing and storage
	Networking and Security
	Phishing
	Secure and private cloud computing
	Secure storage technology and infrastructure (compliance oriented)
	Secure tools
	Natural hazard Security/Resilience
	Hazards Security
	Cyber physical resilience in microgrids and urban power distribution grids Cybersecrity
	Extreme events – security/resilience
	Disaster Recovery and Resilience Security
Simulation/Modeling	Predictive and deterministic simulations
	Methods to ensure reproducibility of simulations
	Multiphase flow simulation
	Multiphysics and multiscale modeling
	Cyber infrastructure for multiscale simulation in chemistry, physics, materials and bioscience, especially from nanometers (excluding quantum) to microstructure
	Coupling existing codes to enable multi-physics simulation
	Modeling for additive manufacturing
	Focus on innovative high-risk high-rewards software and data analysis development, such as large-scale realistic supercomputer simulations and machine-learning analysis
High Performance Computing (HPC)	Tools and software for HPC (High Performance Computing)
	High performance computing HPC
	High-performance computing infrastructure, increased capacity, shorter wait times HPC
	Domain agnostic enabling technologies, especially enabling modern tooling for high performance computing
Metrics	Recognizing value by not just download count but by criticality of end-use Metrics
	Demonstrating or measuring impact of CI
	Automatic metrics of effective deployment: what can we measure to determine if a system is current successful and in wide use by a scientific community?
	Provide best practice metrics to show improvement. Perhaps allow research into this.
	Developing methods and tools to evaluate data and services quality

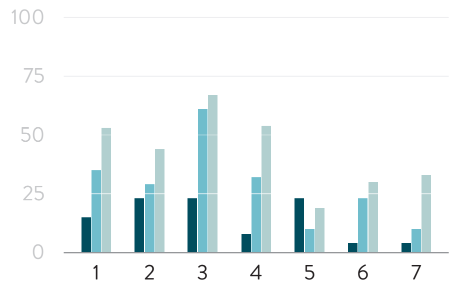
multi-step analysis

A Answers to the survey's solicitation and selected demographic questions, sorted by groups determined by how many aspects for change respondents voted for.

Participants were asked to **select three of seven** indicated aspects of the current solicitation where improvement is most needed or could make the most difference.

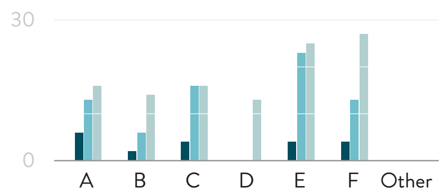


Overall solicitation aspects (p. 5)



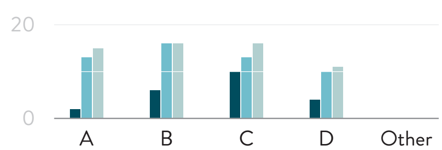
1	15%	35%	53%
2	23	29	44
3	23	61	67
4	8	32	54
5	23	10	19
6	4	23	30
7	4	10	33

1 **Types of awards** (p. 6)



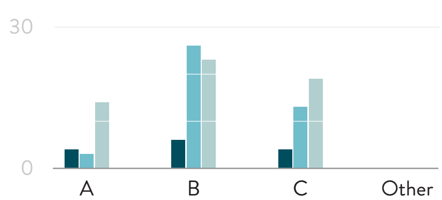
1a	6	13	16
1b	2	6	14
1c	4	16	16
1d	0	0	13
1e	4	23	25
1f	4	13	27
Other	0	0	0

2 **Combined software/data umbrella** (p. 7)



2a	2	13	15
2b	6	16	16
2c	10	13	16
2d	4	10	11
Other	0	0	0

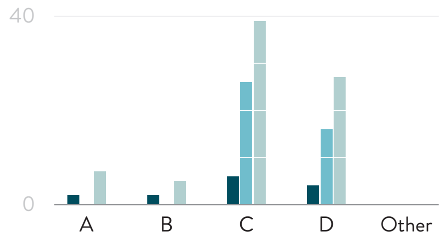
3 **Presentation of domain-specific interests** (p. 8)



3a	4	3	14
3b	6	26	23
3c	4	13	19
Other	0	0	0

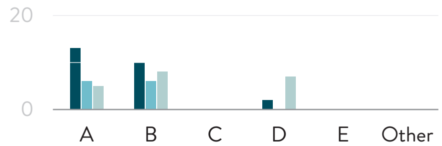
Chose 1 aspect | Chose 2 aspects | Chose 3 aspects

4 **Solicitation-specific criteria** (p. 9)



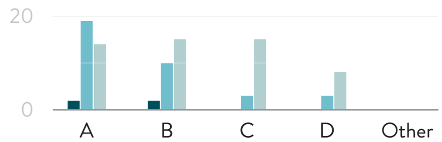
	Chose 1 aspect	Chose 2 aspects	Chose 3 aspects
4a	2	0	7
4b	2	0	5
4c	6	26	39
4d	4	16	27
Other	0	0	0

5 **Solicitation logisitics** (p. 10)



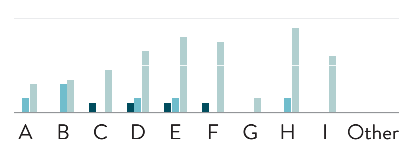
	Chose 1 aspect	Chose 2 aspects	Chose 3 aspects
5a	13	6	5
5b	10	6	8
5c	0	0	0
5d	2	0	7
5e	0	0	0
Other	0	0	0

6 **Guidance included in the solicitation** (p. 11)



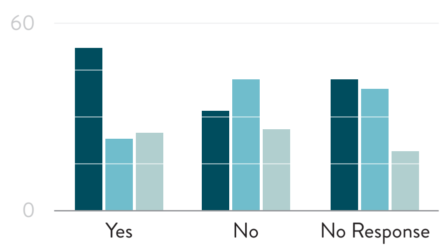
	Chose 1 aspect	Chose 2 aspects	Chose 3 aspects
6a	2	19	14
6b	2	10	15
6c	0	3	15
6d	0	3	8
Other	0	0	0

7 **Support provided beyond the written solicitation** (p. 12)



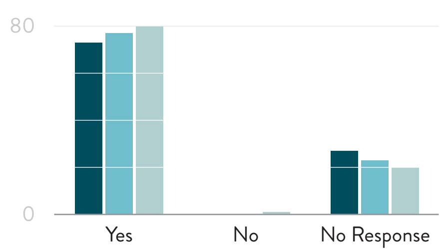
	Chose 1 aspect	Chose 2 aspects	Chose 3 aspects
7a	0	3	6
7b	0	6	7
7c	2	0	9
7d	2	3	13
7e	2	3	16
7f	2	0	15
7g	0	0	3
7h	0	3	18
7i	0	0	12
Other	0	0	0

D2 **Served as Reviewer** (p. 3)



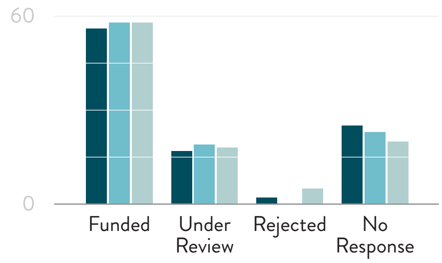
	Chose 1 aspect	Chose 2 aspects	Chose 3 aspects
Yes	52	32	42
No	23	42	39
No Response	25	26	19

D4a **Have you submitted a proposal to NSF?** (p. 3)



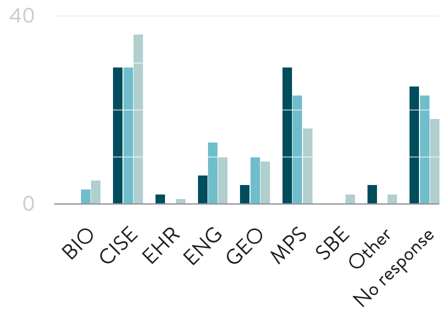
	Chose 1 aspect	Chose 2 aspects	Chose 3 aspects
Yes	73	77	80
No	0	0	1
No Response	27	23	20

D4b Status of proposal (p. 3)



	Chose 1 aspect	Chose 2 aspects	Chose 3 aspects
Funded	56	58	58
Under Review	17	19	18
Rejected	2	0	5
No Response	25	23	20

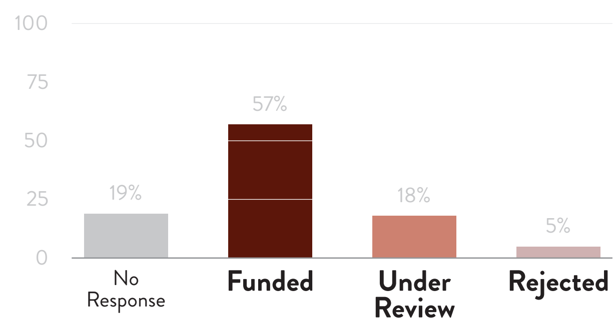
D5 Directorate (p. 3)



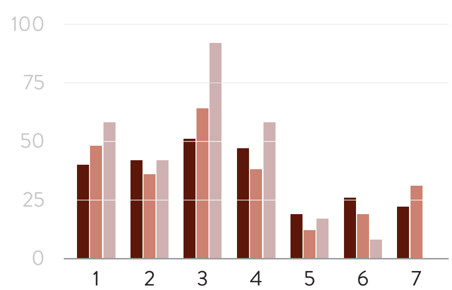
	Chose 1 aspect	Chose 2 aspects	Chose 3 aspects
BIO	0	3	5
CISE	29	29	36
EHR	2	0	1
ENG	6	13	10
GEO	4	10	9
MPS	29	23	16
SBE	0	0	2
Other	4	0	2
No Response	25	23	18

B Answers to the survey's solicitation and selected demographic questions, sorted by groups determined by the status of proposals submitted by respondents (demographic question 4b).

Respondents were asked to indicate whether or not they had previously submitted a proposal to NSF, and if yes, then asked to indicate the status of their proposal.

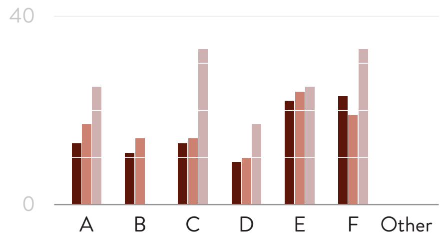


Participants were asked to **select three of seven** indicated aspects of the current solicitation where improvement is most needed or could make the most difference.



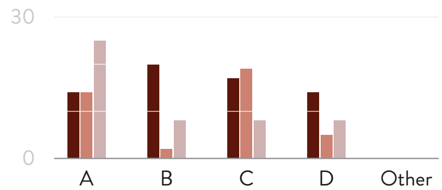
1	40 %	48 %	58 %
2	42	36	42
3	51	64	92
4	47	38	58
5	19	12	17
6	26	19	8
7	22	31	0

1 **Types of awards** (p. 6)



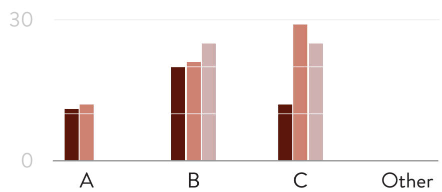
	Proposal Funded	Under Review	Proposal Rejected
1a	13	17	25
1b	11	14	0
1c	13	14	33
1d	9	10	17
1d	22	24	25
1d	23	19	33
Other	0	0	0

2 **Combined software/data umbrella** (p. 7)



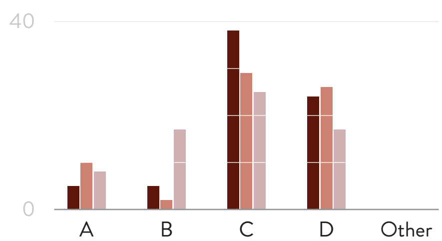
	Proposal Funded	Under Review	Proposal Rejected
2a	14	14	25
2b	20	2	8
2c	17	19	8
2d	14	5	8
Other	0	0	0

3 **Presentation of domain-specific interests** (p. 8)



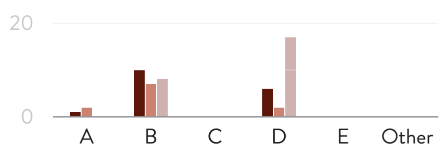
	Proposal Funded	Under Review	Proposal Rejected
3a	11	12	0
3b	20	21	25
3c	12	29	25
Other	0	0	0

4 **Solicitation-specific criteria** (p. 9)



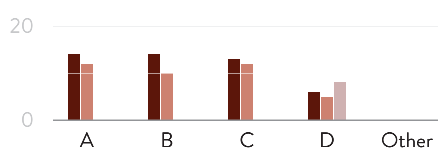
	Proposal Funded	Under Review	Proposal Rejected
4a	5	10	8
4b	5	2	17
4c	38	29	25
4d	24	26	17
Other	0	0	0

5 **Solicitation logisitics** (p. 10)



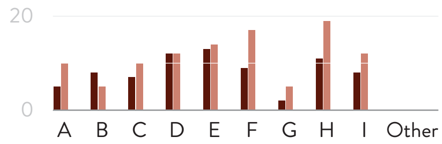
	Proposal Funded	Under Review	Proposal Rejected
5a	1	2	0
5b	10	7	8
5c	0	0	0
5d	6	2	17
5e	0	0	0
Other	0	0	0

6 **Guidance included in the solicitation** (p. 11)



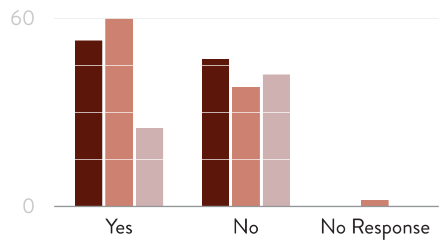
	Proposal Funded	Under Review	Proposal Rejected
6a	14	12	0
6b	14	10	0
6c	13	12	0
6d	6	5	8
Other	0	0	0

7 **Support provided beyond the written solicitation** (p. 12)



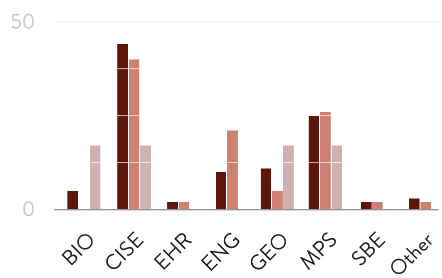
	Proposal Funded	Under Review	Proposal Rejected
7a	5	10	0
7b	8	5	0
7c	7	10	0
7d	12	12	0
7e	13	14	0
7f	9	17	0
7g	2	5	0
7h	11	19	0
7i	8	12	0
Other	0	0	0

D2 **Served as Reviewer** (p. 3)



	Proposal Funded	Under Review	Proposal Rejected
Yes	53	60	25
No	47	38	42
N/R	0	2	0

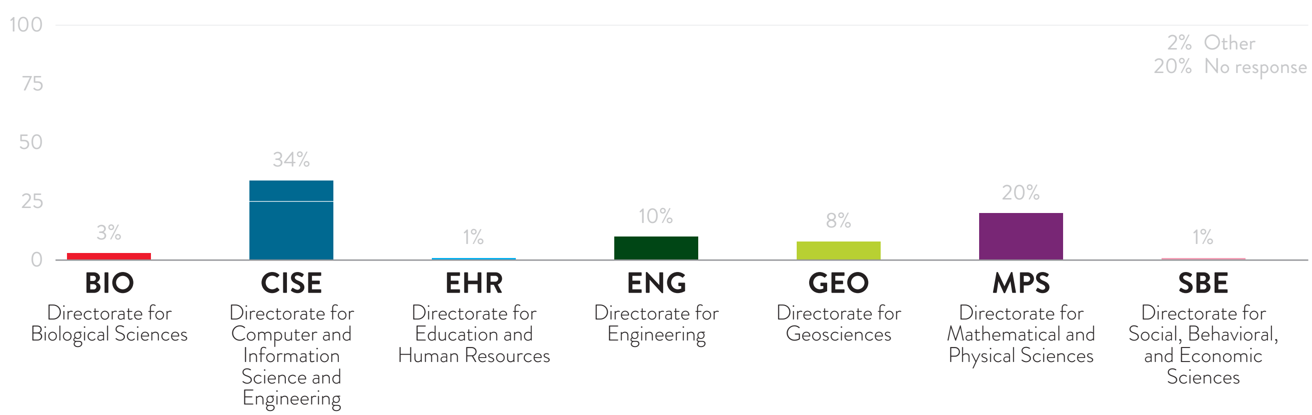
D5 **Directorate** (p. 3)



	Proposal Funded	Under Review	Proposal Rejected
BIO	5	0	17
CISE	44	40	17
EHR	2	2	0
ENG	10	21	0
GEO	11	5	17
MPS	25	26	17
SBE	2	2	0
Other	3	2	0

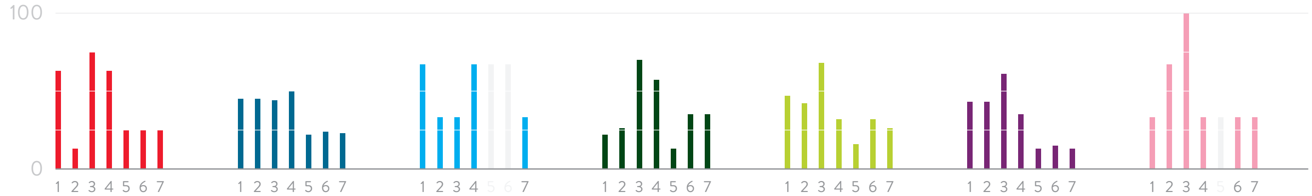
C Answers to the survey's solicitation and selected demographic questions, sorted by groups determined by respondent directorates (demographic question 5).

Respondents were asked to indicate which NSF Directorate is most related to their field:



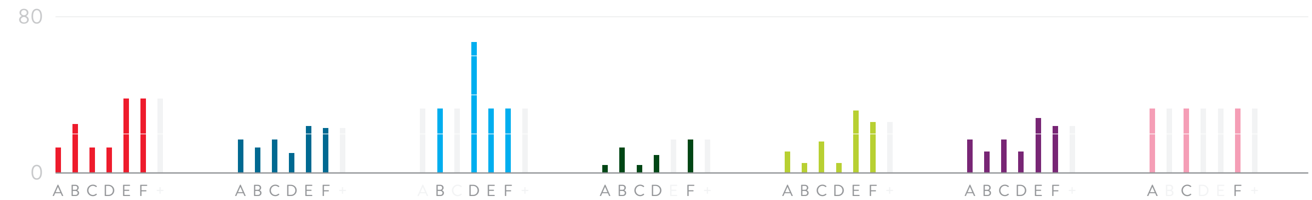
BIO | CISE | EHR | ENG | GEO | MPS | SBE

Participants were asked to **select three of seven** indicated aspects of the current solicitation where improvement is most needed or could make the most difference.



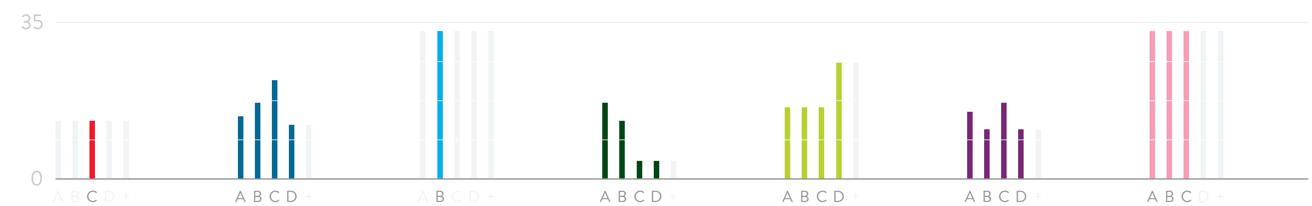
	BIO	CISE	EHR	ENG	GEO	MPS	SBE
1	63	45	67	22	47	43	33
2	13	45	33	26	42	43	67
3	75	44	33	70	68	61	100
4	63	50	67	57	32	35	33
5	25	22	0	13	16	13	0
6	25	24	0	35	32	15	33
7	25	23	33	35	26	13	33

1 **Types of awards** (p. 6)



	BIO	CISE	EHR	ENG	GEO	MPS	SBE
1a	13	17	0	4	11	17	33
1b	25	13	33	13	5	11	0
1c	13	17	0	4	16	17	33
1d	13	10	67	9	5	11	0
1e	38	24	33	0	32	28	0
1f	38	23	33	17	26	24	33
Other	0	0	0	0	0	0	0

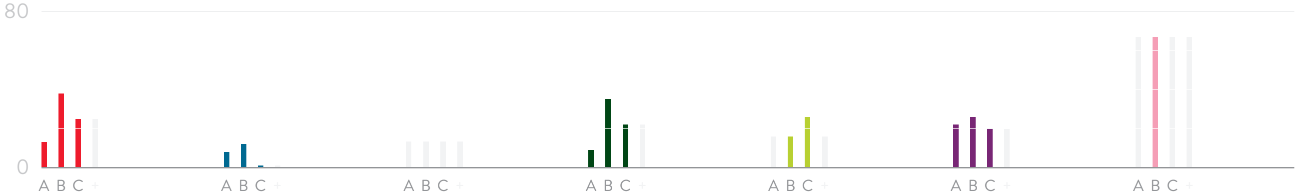
2 **Combined software/data umbrella** (p. 7)



	BIO	CISE	EHR	ENG	GEO	MPS	SBE
2a	0	14	0	17	16	15	33
2b	0	17	33	13	16	11	33
2c	13	22	0	4	16	17	33
2d	0	12	0	4	26	11	0
Other	0	0	0	0	0	0	0

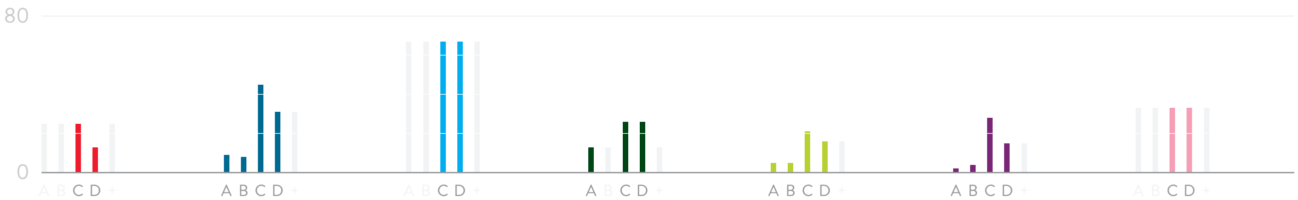
BIO CISE EHR ENG GEO MPS SBE

3 **Presentation of domain-specific interests** (p. 8)



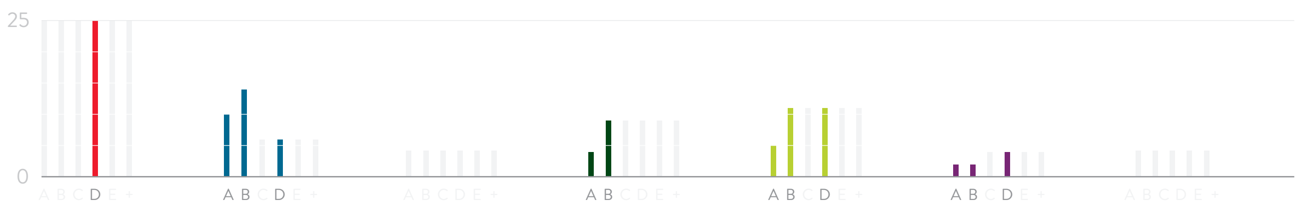
	BIO	CISE	EHR	ENG	GEO	MPS	SBE
3a	13	8	0	9	0	22	0
3b	38	12	0	35	16	26	67
3c	25	1	0	22	26	20	0
Other	0	0	0	0	0	0	0

4 **Solicitation-specific criteria** (p. 9)



	BIO	CISE	EHR	ENG	GEO	MPS	SBE
4a	0	9	0	13	5	2	0
4b	0	8	0	0	5	4	0
4c	25	45	67	26	21	28	33
4d	13	31	67	26	16	15	33
Other	0	0	0	0	0	0	0

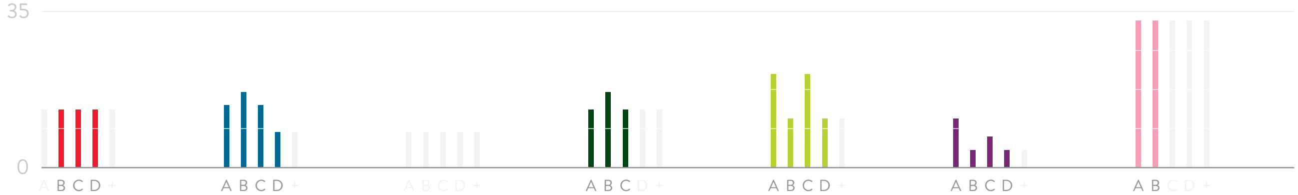
5 **Solicitation logisitics** (p. 10)



	BIO	CISE	EHR	ENG	GEO	MPS	SBE
5a	0	10	0	4	5	2	0
5b	0	14	0	9	11	2	0
5c	0	0	0	0	0	0	0
5d	25	6	0	0	11	4	0
5e	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0

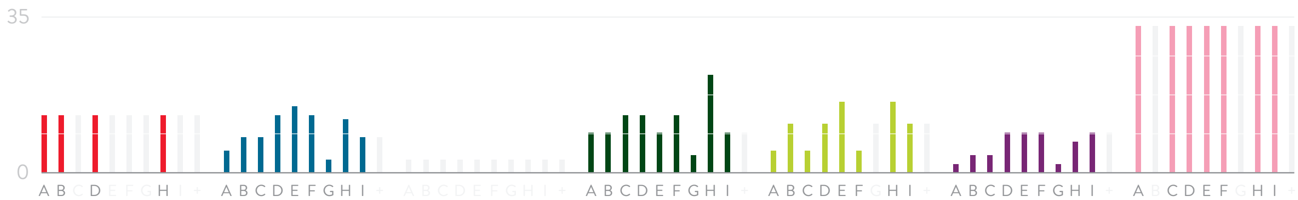
BIO CISE EHR ENG GEO MPS SBE

6 **Guidance included in the solicitation** (p. 11)



	BIO	CISE	EHR	ENG	GEO	MPS	SBE
6a	0	14	0	13	21	11	33
6b	13	17	0	17	11	4	33
6c	13	14	0	13	21	7	0
6d	13	8	0	0	11	4	0
Other	0	0	0	0	0	0	0

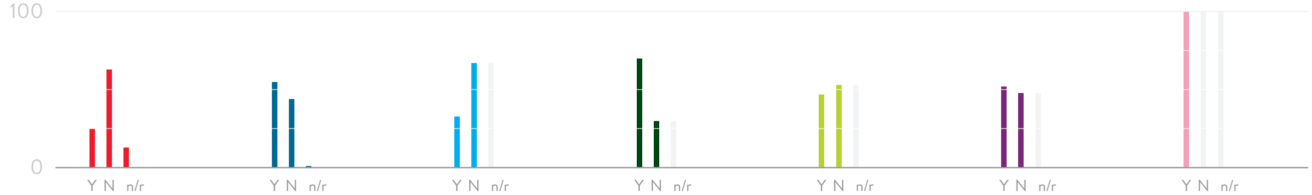
7 **Support provided beyond the written solicitation** (p. 12)



	BIO	CISE	EHR	ENG	GEO	MPS	SBE
7a	13	5	0	9	5	2	33
7b	13	8	0	9	11	4	0
7c	0	8	0	13	5	4	33
7d	13	13	0	13	11	9	33
7e	0	15	0	9	16	9	33
7f	0	13	0	13	5	9	33
7g	0	3	0	4	0	2	0
7h	13	12	0	22	16	7	33
7i	0	8	0	9	11	9	33
Other	0	0	0	0	0	0	0

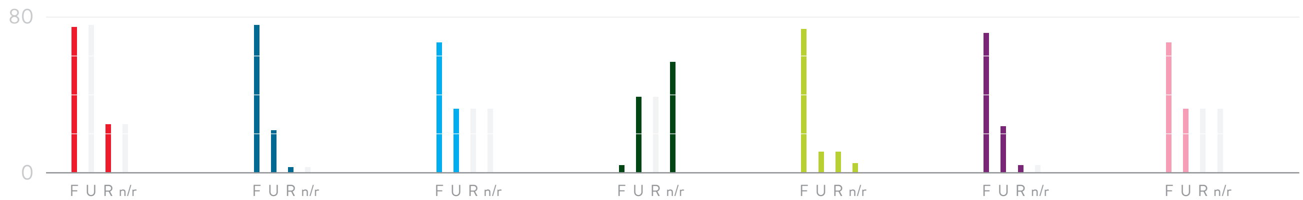
BIO CISE EHR ENG GEO MPS SBE

D2 Served as Reviewer (p. 3)



	BIO	CISE	EHR	ENG	GEO	MPS	SBE
Y	25	55	33	70	47	52	100
N	63	44	67	30	53	48	0
no response	13	1	0	0	0	0	0

D4b Status of Proposal (p. 3)



	BIO	CISE	EHR	ENG	GEO	MPS	SBE
Funded	75	76	67	4	74	72	67
Under Review	0	22	33	39	11	24	33
Rejected	25	3	0	0	11	4	0
no response	0	0	0	57	5	0	0