

## V. ASSESSMENT OF NSF EFFORTS TO MANAGE PROPOSAL SUBMISSIONS AND FUNDING RATES

Many in the S&E community have voiced concerns about the impact of declining proposal funding rates on the research infrastructure (including both physical infrastructure and human resources). For example, of 35 Committees of Visitors (COV)<sup>33</sup> reports submitted between 2003 and 2006, 80% expressed concern about declining funding rates. Some of these reports recommended strategies to deal with the issue, such as reducing the number of solicitations, providing more information about program research priorities, and providing more constructive feedback to proposers.

Equally concerned with this issue, various NSF organizations have implemented a variety of practices to improve management of increasing proposal submissions and declining funding rates. One of the main strategies has been to enhance communication with external research communities. Directorates and divisions examined solicitations to ensure that they sharply delineated requirements and focus areas. Program officers were encouraged to consult with investigators about taking the time to revise declined proposals significantly before resubmitting them. In addition, a number of practices that limited proposal submissions in some manner (reducing the number of targeted program solicitations, reducing the number of proposal submission target dates per year, replacing open submission of unsolicited proposals with a submission window, limiting the number of proposal submissions an institution and/or PI can submit, placing restrictions on the resubmission of declined proposals and/or requiring preliminary proposals) and/or increased the pool of funds available for a particular competition (increasing the length of the competition cycle and/or increasing the out-year mortgage level) were employed by one or more NSF directorates/offices.

In the following sections, IPAMM looked in more detail at several practices that either limited proposal submission or increased the availability of funds for a given competition.

### **Limiting Proposal Submissions**

Of the various practices mentioned above, the ones that have elicited the most comments are those that limit proposal submissions. As a general rule, NSF does not set any limits on the number of proposals that an institution can submit to NSF. However, submission limitations can be established for specific funding opportunities; if so, NSF policy requires the use of a program solicitation that specifies the submission restriction.<sup>34</sup> In practice, most funding opportunities do not impose submission limitations; when they are used, there are specific reasons for asking the PI or institution to focus their efforts when submitting proposals. As is shown below, only a small proportion of the solicitations that limit submissions are focused on research. However,

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<sup>33</sup> All NSF research programs are regularly evaluated by external Committees of Visitors (COVs) to help the Foundation maintain high standards of program management, to provide advice for continuous improvement of NSF performance, and to ensure openness to the research and education community served by the Foundation. COVs for divisions or programs meet once every three years. COV reviews provide NSF with external expert judgments in two areas: (1) assessments of the quality and integrity of program operations and program-level technical and managerial matters pertaining to proposal decisions; and (2) comments on how the results generated by awardees have contributed to the attainment of NSF's mission and strategic outcome goals. See <http://www.nsf.gov/about/performance/advisory.jsp>.

<sup>34</sup> Proposal and Award Policies and Procedures Guide, Part I.A (GPG), Chapter I.C.4.

because the issue of limiting proposal submissions is of particular concern to the scientific and engineering communities, for the purpose of this analysis, all funding opportunities were included, not just those focusing on research activities.

IPAMM analyzed the use of three primary mechanisms that can be used to limit submission of a full proposal: requiring the submission of a preliminary proposal<sup>35</sup>, limiting the number of proposal submissions from a given institution, and limiting the number of proposal submissions authored by individual investigators. At present, there are over 350 active funding opportunities to which proposers may submit proposals. Of these, 12 require the use of preliminary proposals, 33 limit proposal submissions from a single institution, and 59 limit proposal submissions by an individual investigator. These are not mutually exclusive sets—14 funding opportunities use some combination of two or all three limitations. It should be noted here that when submission limits by PI or institution are used, they apply only to the specific funding opportunity listing the limitation, and do not prohibit submissions of additional proposals to other programs within NSF. In addition, the stringency of the submission limit by PI and/or institution varies. For example, in some solicitations, individuals are limited to submitting one proposal as PI, co-principal investigator (co-PI) or senior personnel while in others the limit is set at two per PI with no limit on the number of proposals an individual can participate in as co-PI or other senior personnel. Similarly, the limit on submission by institutions varies from one proposal in any capacity, to as many as four proposals as the lead institution with no limit on the number of proposals an institution may participate in as a non-lead partner.

In the 2007 NSF Proposer Survey, of those respondents who had been required to submit a preliminary proposal, 55% agreed that preliminary proposals would subsequently save time when preparing a full proposal, 42% agreed that they would save resources, and 48% agreed that they would help increase the quality of the full proposal. Many of the respondents who were aware that NSF had limited the number of proposals that their institution could submit to a particular funding opportunity felt that this practice had a negative impact on their motivation to seek future NSF funding (41%) and on the fair representation of their fields of research (45%). Nonetheless, most believed that these limitations had either a neutral (36%) or a positive (28%) impact on the quality of the proposals submitted.

Over the last several years, the number of solicitations that limit submissions by institution has been decreasing, while solicitations that limit submissions by PI are a relatively new but growing phenomenon (Figure 21, compare A and B).

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<sup>35</sup> The intent of preliminary proposals is to limit the burden imposed on proposers and the community and/or to increase the quality of the full proposal. One of the following two types of decisions may be received from NSF upon submission of a preliminary proposal. A *binding* (invite/non-invite) decision is the type of mechanism used when the NSF decision made on the preliminary proposal is final, affecting the PI's eligibility to submit a full proposal. A *non-binding* (encourage/discourage) decision is the type of mechanism used when the NSF decision made on the preliminary proposal is advisory only. This means that submitters of both favorably and unfavorably reviewed proposals are eligible to submit full proposals.

**Figure 21**  
**Trends in the Use of Solicitations that Limit Submissions by Institution or PI**

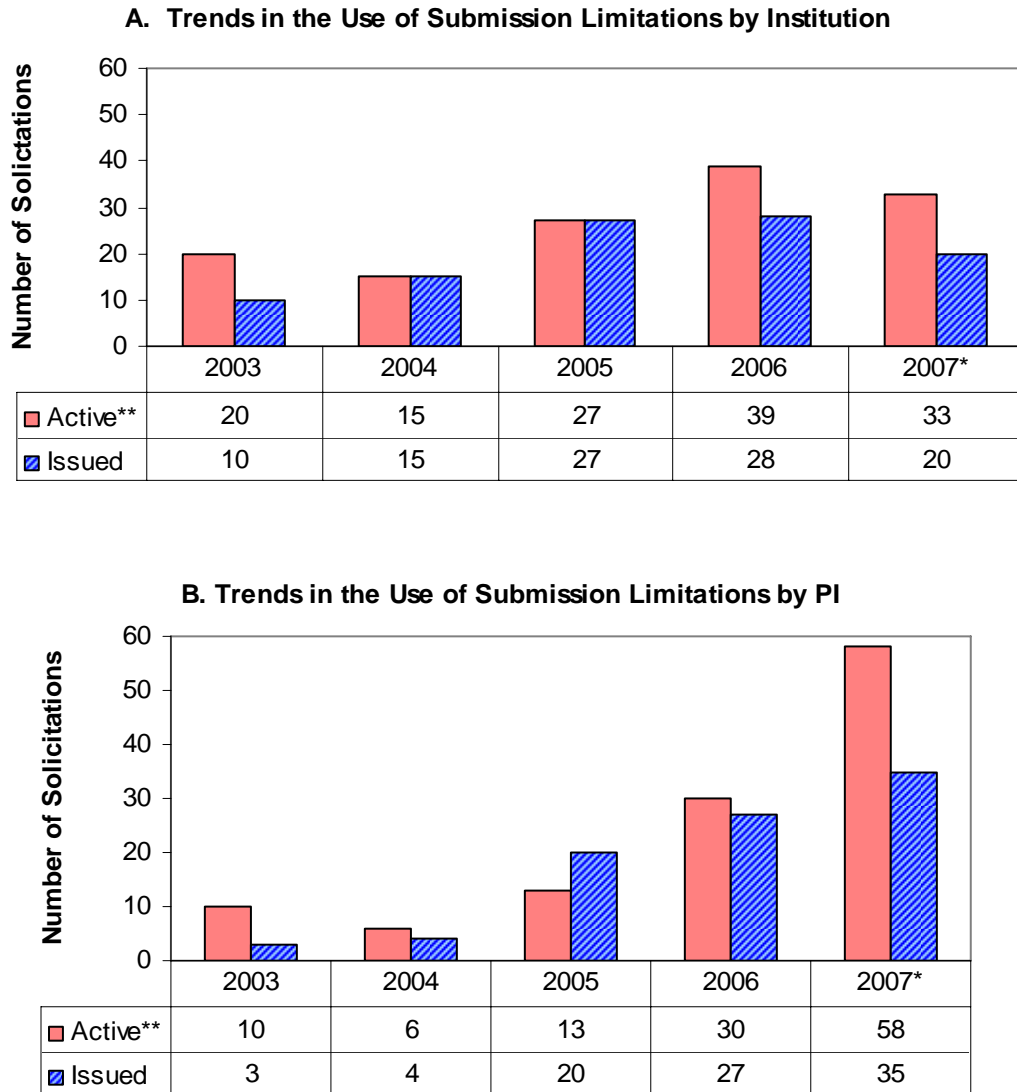


Figure legend. The number of funding opportunities limiting submissions by institution (A) or by PI (B) that were active or were issued in each fiscal between FY 2003 and FY 2007 are shown. For a funding opportunity to be counted in the “active” dataset, it had to have a submission date within the respective fiscal year, regardless of when the opportunity was first issued. The “issued” dataset identifies how many funding opportunities with submission limits were issued each year, whether or not they are still active. \*FY 2007 data include all solicitations issued as of June 20, 2007. \*\*Only those funding opportunities that are published in PIMS (the Program Information Management System initiated in FY 2000) are accessible for this analysis. Any funding opportunities that were published prior to FY 2000 and that were still active between FY 2003 and FY 2007 could not be included. Thus, the number of active funding opportunities shown in these two charts may be an underestimate, however the number of funding opportunities reported in the “issued” dataset is highly reliable.

Source: Program Information Management System (PIMS).

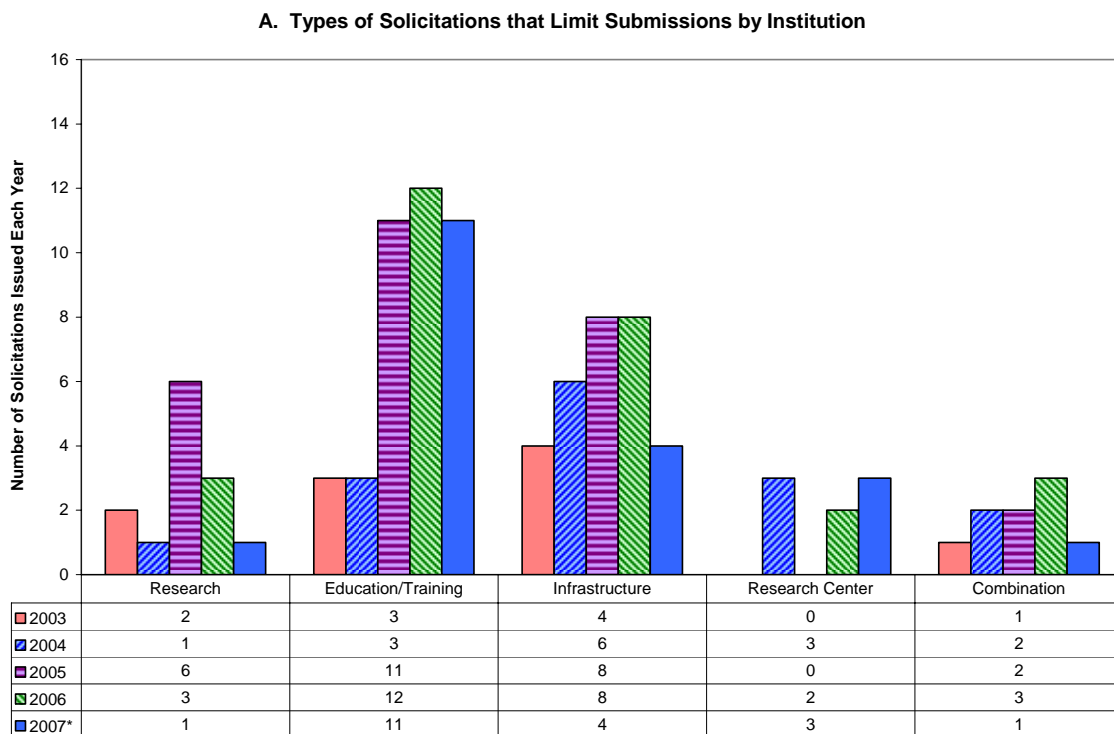
The majority of NSF programs that limit proposal submissions by institution are institution-level awards that focus on building infrastructure, establishing research centers, broadening participation, and/or improving or expanding educational opportunities (Figure 22A). These

programs generally limit submission because proposals to build large infrastructure, develop broad partnerships, and/or establish research centers ought to be done in the context of an institution’s longer-term strategic priorities to ensure that these efforts will be sustained beyond the life of the NSF award. Similarly, scholarships, fellowships and training programs are institutional-level awards, and proposals to establish these programs need to fit within the goals of the institution. For programs with very broad appeal, imposing institutional submission limitations helps to broaden participation to include more, diverse institutions. A concern associated with this practice is that some institutions may not have a credible internal system to evaluate and rank proposals.

Only a small number of research programs impose limits on proposal submissions by institution; these tend to support the development of multidisciplinary centers and/or multi-institutional partnerships. In contrast, funding opportunities that limit the number of submissions by PI are more likely to be focused on research (Figure 22B). This particular mechanism has been employed more heavily in the directorates that experienced very high proposal loads and/or very low funding rates.

There are balancing trade-offs associated with limiting proposal submissions by PI. One rationale for implementing this practice was the hope that PIs would focus their efforts on their strongest ideas and projects, thus increasing the quality of the proposals being submitted. Potential concerns were that PIs would tend to submit “safer” projects, and/or that there could be an unintended negative impact on a PI’s willingness to collaborate (i.e. be a co-PI) on proposals.

**Figure 22**  
**Types of Solicitations that Limit Submissions by Either Institution or PI**



**B. Types of Solicitations that Limit Submissions by PI**

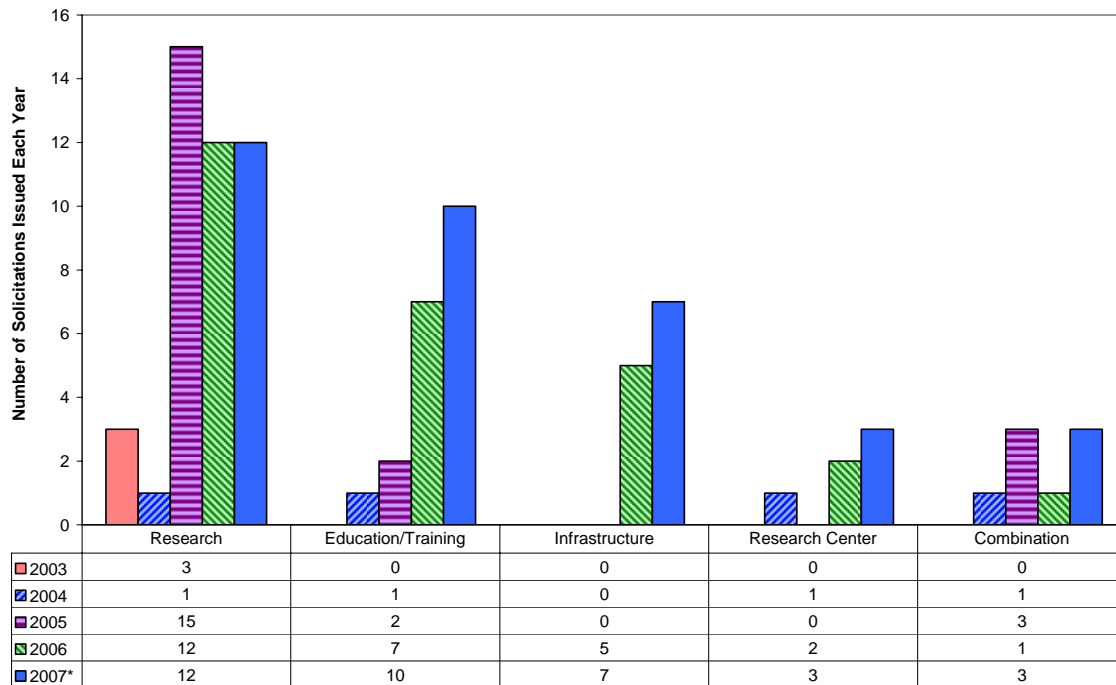


Figure legend. The solicitations limiting submissions by institutions (A) or by PI (B) issued each fiscal year are grouped into categories, characterized by the focus of the solicitation. The “combination” category includes solicitations that have elements of two or more of the other categories (for example, one component focuses on research projects and another component focuses on education and training). \*FY 2007 data include all solicitations issued as of June 20, 2007. Source: Program Information Management System (PIMS).

**Increasing the Available Pool of Funds for Specific Activities**

Another strategy that was employed in various units to increase funding rates was to increase the pool of available funds to allow more awards. Some funding opportunities were organized so that they crossed fiscal years, allowing the use of two years of funds to support proposals submitted to a single competition. In other cases, increased availability of funds in the current year was gained by adjusting the balance of standard and continuing grants<sup>36</sup> within a given program or portfolio. NSF’s long-standing practice of using both funding mechanisms allows greater flexibility in balancing current and future obligations, and can provide a buffer at times when there are greater constraints on the budget. As shown in Table 9, in FY 2006 NSF devoted 22% of its total budget to new standard grants and 17% to new continuing grants.

<sup>36</sup> Grants can be funded either as standard awards, in which funding for the full duration of the project (generally 1-5 years) is provided in a single fiscal year, or as continuing awards, in which funding of a multi-year project is provided in increments (usually one year). For the latter mechanism, the initial funding increment is accompanied by a statement of intent to continue funding the project in yearly increments (called “continuing grant increments”, or CGIs) until the project is completed.

**Table 9**  
**Percentage of NSF Budget by Type of Award**

Fiscal Year	2002	2003	2004	2005	2006
New Standard Grants	26%	23%	23%	21%	22%
New Continuing Grants	21%	21%	17%	16%	17%
Continuing Grant Increments	35%	36%	39%	43%	41%
Centers, Facilities, and Other	18%	20%	20%	20%	20%
100% = \$Billion	\$4.77	\$5.37	\$5.66	\$5.49	\$5.65

Table legend. The distribution of NSF funds by award mechanism is shown here. New grants can be funded as either standard or continuing awards. The continuing grant increments row represents payments for continuing awards that were made in previous fiscal years. Centers and facilities are generally funded through cooperative agreements. The “other” category includes contract activities to support organizational excellence, including program evaluations. Source: NSF Enterprise Information System.

Within the core programs, program directors have the ability to change the percentage of program research funds (mortgage rate) that are committed to future year budgets, by altering the ratio of standard vs. continuing grants in their portfolios. This provided some flexibility in responding to increased proposal submissions, and potentially averted a steeper drop in funding rates. However, increasing the number of new continuing grants as a strategy to increase funding rates can only be employed for a limited time and must be used with discretion. If care is not taken, a large mortgage on future year funds could be accumulated that would severely hamper the capacity to make new awards.

### **Case Studies**

To gain some additional insight into the significant contextual factors involved in making decisions about implementing these various practices, and the desire to understand how various NSF organizations used integrated approaches to the issue, IPAMM identified several “case studies” to review. In its review, IPAMM focused on the following questions:

- Were the practices implemented in a sound and equitable manner?
- Was the external community consulted?
- Were the practices effective in accomplishing their objectives?
- What are the pros and cons of each of the practices?
- Which “preferred practices” should be considered for future use?

#### *1. Human and Social Dynamics Priority Area (HSD)*

In FY 2004, a new priority area in Human and Social Dynamics (HSD) was launched. The response to the first solicitation was very high: PIs submitted a total of 694 projects<sup>37</sup> and while reviewers placed 113 projects in the “highly recommended/must fund” category, only 37 of these were awarded. As a result, the proposal funding rate for the HSD program was only 5.3%.

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<sup>37</sup> A total of 1061 letters of intent were submitted to HSD in FY 2004, far exceeding NSF expectations based on previous Priority Area competitions.

In FY 2005, NSF significantly increased the HSD budget (from \$17.5M to \$32.5M) to better meet this demand. In addition, HSD management implemented several changes to increase proposal funding rates. These were:

- Requiring all projects to have three or more senior personnel from at least two different disciplines;
- Limiting researchers to a single HSD submission (i.e., allowing any one person to serve as a PI, co-PI, or other senior researcher on only one HSD proposal);
- Eliminating the infrastructure component from the competition; and
- Setting a deadline earlier in the fiscal year (January/February) in order to allow the use of both FY 2005 and FY 2006 funds to fund worthy projects submitted in FY 2005.

In FY 2005, 93 of the 363 projects submitted were awarded, resulting in a funding rate of 25.6%. HSD Program Officers were able to fund all of the projects in the “highly recommended/must fund” category. The number of submissions was much lower than in FY 2004; the reduced proposal pressure was likely a result of both the changes outlined above but also the low funding rate in FY 2004.

A comparison of the range of institutions that submitted proposals in FY 2004 and FY 2005 indicated that the overall distribution of institution types (top 100 research intensive Ph.D. institutions, non-research intensive Ph.D. institutions, masters, 4-year, 2-year, and business/other) was similar in both years. However, while the number of top 100 institutions that submitted proposals in FY 2005 did not drop appreciably as compared to FY 2004 (approximately 3% decrease), significantly fewer institutions in each of the other categories submitted proposals in FY 2005 as compared to FY 2004 (ranging from 23% to 56% decrease).

## 2. *Integrative Graduate Education and Research Traineeship Program (IGERT)*

IGERT proposals are reviewed using a two-stage competition format in which the first stage is the submission of preliminary proposals. The preliminary proposals are merit reviewed, after which invitations for full proposals are sent to the selected principal investigators. From the outset in FY 1998, when the program was initially established, a proposal submission limitation was included such that an institution could not submit more than two single institution full proposals and one multi-institution proposal (where that institution served as the lead institution; there were no limits on the number of multi-institutional proposals an institution could participate in as non-lead partners). Although the number of submissions from a given institution is limited in these solicitations, the number of active awards that an institution may have at any one time is not.

From FY 2000 to 2006, the number of preliminary proposals submitted annually to IGERT nearly doubled. The increase in proposal load raised concerns about potential impacts on the merit review process.<sup>38</sup> To effectively manage the increasing proposal submissions, and to encourage PIs and institutions to think strategically about their goals and investment priorities, a few additional limitations were introduced over time, as follows:

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<sup>38</sup> For example, creating effective review panels was increasingly difficult because the reviewer pool became taxed beyond its capacity with regard to conflict of interest issues and reviewer expertise.



- Instituted in FY 2004: In addition to the institutional submission limits, principal investigators or co-principal investigators were limited to participating in only one proposal submission. This limitation applied to both preliminary proposals and full proposals.
- Instituted in FY 2006: In addition to the institutional submissions limits on full proposals, a new limit on the number of preliminary proposals was included, such that no more than four preliminary proposals could be submitted by an institution as the lead institution.

There was no significant negative feedback from the community on the PI limitations instituted in FY 2004. The preliminary proposal submission limitation instituted in FY 2006 has resulted in institutions that historically submitted multiple preliminary proposals now using internal competitions to decide which preliminary proposals should be submitted to the IGERT program. The program officers report that this activity has had the effect of enhancing the focus on the IGERT program’s goals in the preliminary proposals that are now being submitted to NSF.

Since IGERT’s inception, a funding rate of 25-30% (based on the full proposal count) has been the target range.<sup>39</sup> As Figure 23 shows, this was largely accomplished.

**Figure 23**  
**Trends in Funding Rates for IGERT Full Proposals**

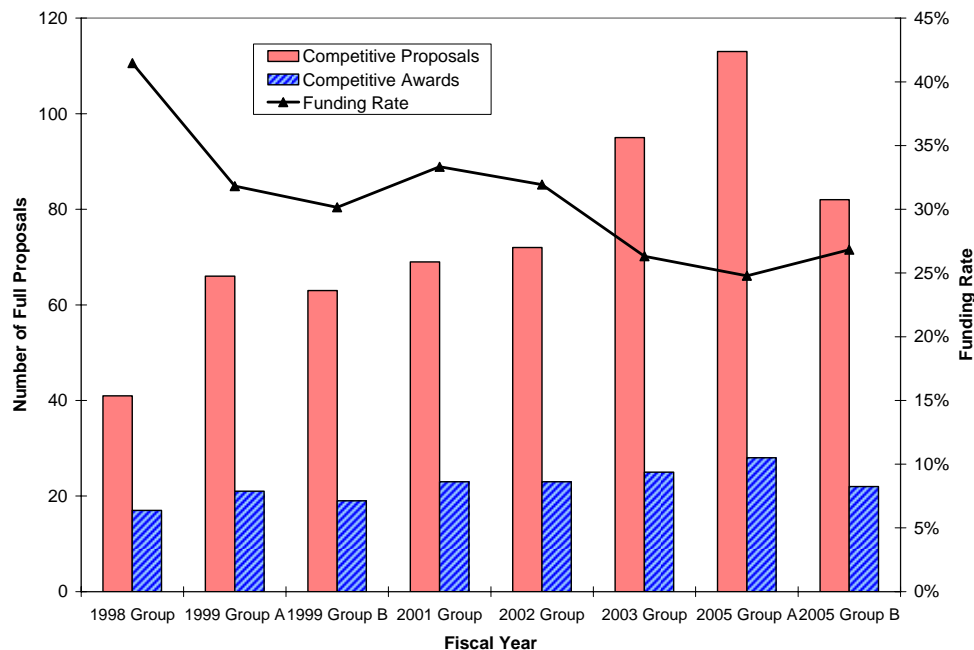


Figure legend: Data shown here reflect the number of full proposals and awards that were made per competition. Note that two sets of proposals were received in FY 1999 and FY 2005—in both cases the latter set were received near the end of the fiscal year and were funded in the subsequent year (i.e., FY 2000 and FY 2006, respectively). Source: NSF Budget Division

<sup>39</sup> This target was based on historical experience plus discussions with the community.



### 3. *CISE/Division for Information and Intelligent Systems (IIS)*

From FY 2000 to 2004, IIS received large numbers of proposals (as did all divisions in CISE) submitted to the Information Technology Research (ITR) Program, a Foundation-wide Priority Area for which CISE served as the lead. At the same time, there was a threefold increase in the number of proposals submitted to the division's core programs. During this period, the overall research proposal funding rate in the core programs declined from 26% in FY 2000 to 10% in FY 2004 (see Figure 24).

During this period, IIS developed and used a number of strategies to manage increasing proposal submissions in ITR and its core programs. The proposal management strategies implemented by IIS over this period were intended to balance the needs of its scientific and engineering communities with rising proposal submission rates and declining funding rates.

In 2001, the division published a "Dear Colleague" letter announcing a shift from two target dates per year to two deadlines within the core programs.<sup>40</sup> As anticipated, the reaction of the scientific communities to this new policy was negligible. By decreasing the uncertainties related to when proposals were submitted, staff members were better able to manage the merit review process.

By 2003, it was apparent that two deadlines per year had not curbed the rise in proposal submissions. In anticipation of the continuing increase in submissions and to further help balance workload, IIS changed from two deadlines a year to one deadline. In addition, the division developed program announcements for all of its core programs.<sup>41</sup> Principal investigators could still submit to multiple programs in IIS (as well as across the Foundation) and there were no additional restrictions. The feedback from the research communities was mixed; the switch to using announcements met with favor because more information was now available about the programs, but the single deadline meant that submission opportunities within a particular program were limited to one time a year, which may or may not be convenient for any given PI.

Proposal actions continued to rise in FY 2004, and then held steady in FY 2005. In an attempt to encourage PIs to prioritize their research efforts, and simultaneously help ease the proposal submission pressure, IIS limited the number of proposals a PI could submit to a single solicitation to two. This change resulted in mixed reactions from the research communities. Some thought that it helped them better focus on their highest quality proposals; others felt that the policies were too constraining. To increase the funding rate for proposals submitted to the FY 2005 competition, program funds from FY 2005 and FY 2006 were used to fund FY 2005 awards. In 2007, IIS held another competition for its core programs, and will use program funds from FY 2007 only to make awards. It is not yet clear what the effect will be on division funding rates.

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<sup>40</sup> Target dates allow proposals to be submitted for a short period of time after the published date (as well as on or before the date). Deadlines require that proposals be submitted on or before the published date. Proposals submitted after the deadline are "late" and are returned without review.

<sup>41</sup> At the time, this practice was a general trend throughout the NSF.

**Figure 24**  
**Trends in Funding Rates for the Core Programs in CISE/IIS from FY 2000 to FY 2006**

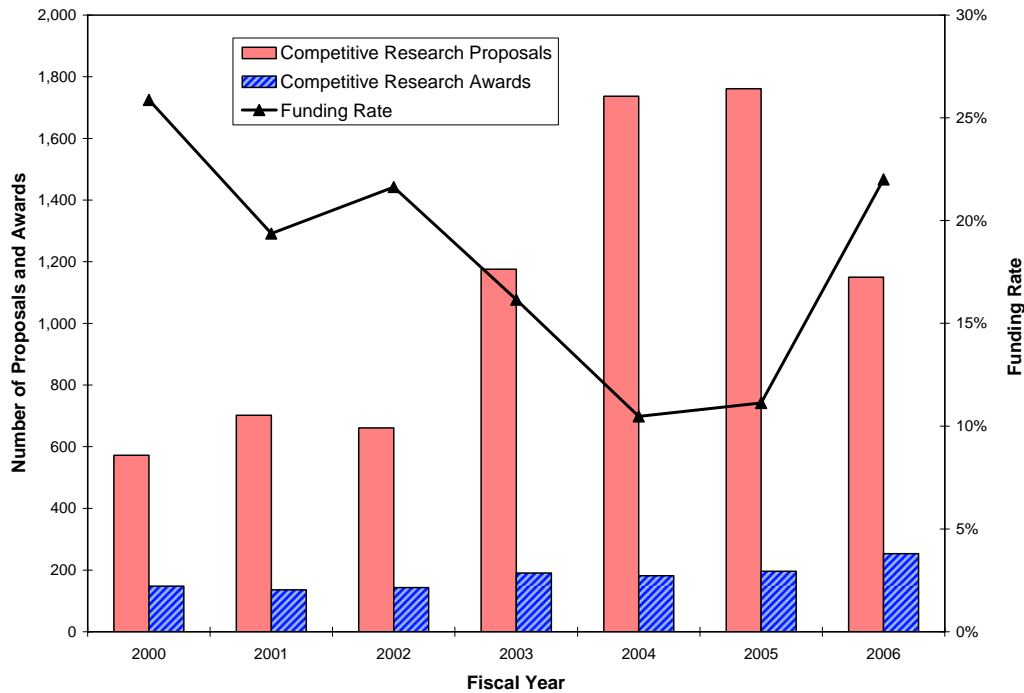


Figure legend. Data shown here reflect the number of research proposals and awards for the core programs in CISE/IIS, excluding any of the ITR proposals, shown by the fiscal year of decision. Source: NSF Budget Division

#### 4. Directorate for Engineering (ENG)

As shown in Figure 8, the proposal funding rate in ENG is among the lowest; for the last four years ENG has received the largest number of proposals (Figure 9). Concerned about this trend, ENG leadership discussed the issue with the ENG Advisory Committee and several internal management groups.

As a result, ENG leadership is currently implementing the following practices:

- Improve proposal-generating documents. All documents used to communicate with the researchers are carefully crafted, more focused, and reviewed on a regular basis for relevance and the potential elimination of dated or imprecise text.
- Reduce the number of solicitation topics to improve communications among similar efforts and reduce possible duplication of efforts.
- Publish no more than five to six new ENG solicitations (with two to four interdisciplinary solicitations) per year. \$3 million is the minimum investment in a solicitation. Solicitations that involve only a single ENG division are being discouraged.

It is too soon to fully evaluate the success of these measures. The recent trends are somewhat promising, in that they show that, while ENG research proposal submissions steadily increased from 3,997 in FY 2000 to 6,610 in FY 2005, they leveled off in FY 2006 to 6,628. In addition,

while the ENG proposal funding rate steadily declined from 24% in FY 2000 to 13% in FY 2005, it increased in FY 2006 to 14%.

#### 5. *The Mathematical Sciences Priority Area (MSPA)*

The NSF-wide MSPA was active between FY 2003-FY 2006. During this time it was able to maintain an overall funding rate above 20%, while similar programs experienced rapidly rising proposal submissions and falling funding rates. From the beginning, the MSPA was managed by a working group (MSPA-WG) composed of representatives from all NSF directorates in research and education. During the initial planning activities held in late FY 2000, the MSPA-WG developed a draft management plan that stated:

“Funding will be through multiple, distinct, focused sub-competitions in the overall program announcement. Each sub-competition will be a collaboration between one or more of the S&E directorates and MPS/DMS and each will target the most compelling research areas that have been identified.” . . . “The various collaborative activities should be partitioned to target the various communities with special focus aimed at a discipline or a specific type of research topic common to a group of disciplines and each competition should have a separate budget *in order to foster more responsive proposals and higher funding rates.*”

Because of budgetary uncertainties during the initial year of the MSPA (FY 2003), funds were targeted to existing solicitations and collaborative funding of unsolicited proposals. For FY 2004, the MSPA-WG produced an “umbrella” solicitation, *Mathematical Sciences: Innovations at the Interface of the Sciences and Engineering* (NSF 04-538) that described all opportunities, new and ongoing, for the MSPA. The new activities described by this solicitation covered competitions for both FY 2004 and FY 2005, with a revised solicitation (NSF 05-622) issued for FY 2006.

These competitions were conceived with the philosophy that different interdisciplinary interactions might require a diversity of approaches. A serious attempt was made to craft the competitions to (a) avoid receiving huge numbers of proposals resulting in an unacceptably low funding rate and (b) keep the workload of the community (both investigators and reviewers) and the NSF staff at a reasonable level.

The overall funding rate for the seven competitions was around 20% from FY 2004 to FY 2006. There was considerable variation in proposal submission and funding rate by competition, however no competition received more than about 140 proposals.

#### 6. *GEO Division of Earth Sciences (EAR)*

In 1997 EAR instituted a policy intended to encourage investigators to take the time to significantly revise declined proposals rather than rush to resubmit for the next deadline. EAR has two proposal submission deadlines per year, but requires the PI to skip the next deadline before submitting a revised proposal. This policy was implemented to avoid the hasty revision of proposals in order to meet a deadline which followed very shortly after notification of a declination.

Annual proposal actions decreased by nearly 16% for the four years following the implementation of this policy (an average of 1430 per year between FY 1994 and FY 1997,

compared to an average of 1235 per year between FY 1998 and FY 2001). Program staff reported that the quality of revised proposals was better, and that more thought and care has been taken by the PI in responding to reviewer criticisms and suggestions. EAR PIs initially expressed concern with this policy but they rapidly adjusted to it; those concerns have virtually disappeared.

### Dissemination of Information

The charge to IPAMM included the following question: *How can NSF data regarding funding rates, award amounts, and award duration be disseminated more effectively?*

Many proposers to NSF take such data into account when deciding whether or not to apply to NSF for research support. This information is usually obtained from NSF staff members, NSF publications, and NSF external databases, such as the Budget Internet Information System (BIIS). Proposers also often take anecdotal data into account, which may or may not be accurate. The research community needs access to official data developed by NSF using standard definitions, to avoid misconceptions about NSF statistics. As Figure 25 shows, respondents in the 2007 NSF Proposer Survey for the most part underestimated the funding rates of the programs to which they had submitted their most recent proposal.

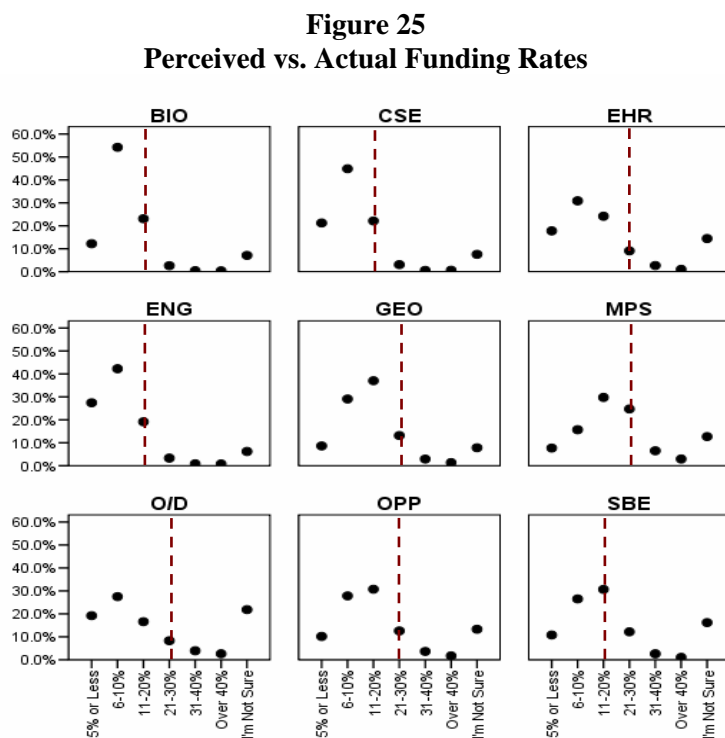


Figure legend. The plots show the responses, sorted by directorate/office, to the 2007 NSF Proposer Survey question “Reflecting on your most recent proposal submitted to NSF, what do you think the success rate was for the program you submitted to?” The funding rate ranges that the respondents could choose are shown on the X axis (5% or less, 6-10%, 11-20%, 21-30%, 31-40%, over 40%, or “I’m Not Sure”), and the percentage of respondents choosing each option is indicated on the Y axis. The dotted red line shows the actual weighted average funding rate for each directorate/office. With the exception of SBE, the majority of respondents for all other directorates/offices underestimated the actual funding rate of the programs reviewing their proposals.

The annual Report to the National Science Board on the NSF's Merit Review Process contains a number of charts and tables showing funding trends. In addition, the BIIS provides interactive access to NSF statistical and funding information. However, both of these resources appear to be underutilized by both the NSF staff and the external research community.

### **Conclusions**

While it is difficult to single out one particular proposal management practice as better than another, there are a number of preferred practices with respect to the *implementation* of these practices. They include the following:

- Because of important contextual factors<sup>42</sup> the decision to use any of the practices described above should be made on a case-by-case basis among the program, division, and/or directorate leadership.
- NSF management should inform the appropriate internal and external communities when implementing new proposal management practices and should monitor the concerns of the communities during the implementation phase.
- In many cases, the use of multiple management strategies may be necessary; integrating these strategies with one another can be effective in achieving the desired outcomes. Changes to these strategies should be based upon annual evaluations of proposal data and feedback from the research community.
- Preliminary proposals can be a useful management tool and save the research community from a burdensome process when there is little chance of success. However, they increase the complexity of the review process (and possibly NSF and reviewer workload). The decision to use preliminary proposals should be made after a careful evaluation of the trade-offs.

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<sup>42</sup> Important contextual factors include program staff workload, the budget environment, and the need to preserve the agility and responsiveness of NSF to emerging needs and opportunities.