

There are some important questions that every proposal is expected to answer. One version of these questions known as Heilmeier's Catechism, is attributed to George H. Heilmeier during his service as director of ARPA. His seven questions are analogous to the instructions in the NSF GPG, though they are stated somewhat differently. For each of Heilmeier's questions, the corresponding NSF language appears in quotes below.

1. What are you trying to do? Articulate your objectives using absolutely no jargon.

"...reviewers will be asked to consider what the proposers want to do..."

"...projects should include clearly stated goals..."

2. How is it done today, and what are the limits of current practice?

3. What's new in your approach and why do you think it will be successful?

"...reviewers will be asked to consider ... how they [the proposers] plan to do it ...

"...projects should include ...specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities..."

"To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?"

"Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale?"

"How well qualified is the individual, team, or organization to conduct the proposed activities?"

4. Who cares? If you're successful, what difference will it make?

"...reviewers will be asked to consider ... why they [the proposers] want to do it ... "

"... reviewers will be asked to consider ... what benefits will accrue if the project is successful ... "

"What is the potential for the proposed activity to:

a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and

b. Benefit society or advance desired societal outcomes (Broader Impacts)?"

5. What are the risks and the payoffs?

For payoffs, see the quotes from the NSF GPG for question 4 above. Technical risks should be covered in the Research Plan, with appropriate fallback plans if risky aspects of the initial approach should fail.

There are also management risks. One of the biggest risks in a collaborative project is that the collaboration will degenerate into a collection of independent activities, with no synergistic effect. A strong collaborative proposal needs to explain how every component will contribute, and how they will be coordinated and integrated throughout the project. Some solicitations emphasize this by calling for an explicit “management plan”, “coordination plan”, or “collaboration plan”.

6. How much will it cost? How long will it take?

“Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?”

7. What are the midterm and final "exams" to check for success?

“... reviewers will be asked to consider ... how they [the proposers] will know if they succeed ... ”

“Does the plan incorporate a mechanism to assess success?”

“Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics.”

Some solicitations emphasize this requirement by calling for an “evaluation plan” or “validation plan”.

The GPG makes it clear that all the review criteria, including the need for assessment of success, “apply both to the technical aspects of the proposal and the way in which the project may make broader contributions”, including proposed educational and outreach activities.