Executive Vice President for Research and Partnerships

Self-Help Tools for Proposal Preparation

Preparing Major or Shared Research Instrumentation Proposals

A compelling instrumentation proposal needs a clear story for why your expected project outcomes will be valuable to the larger research community as well as society as a whole. You should align outcomes with the agency’s strategic mission, as well as Purdue’s research goals, and convey a maximum amount of impact for the investment with important research and education results within and across disciplines.

In your introduction paragraph, consider a logic flow of: 1) describe how a substantial body of ongoing research at Purdue depends on XXX measurements; 2) state in what ways you are currently attempting to gain those measurements and what instrument options you have across campus (and off campus, if applicable); 3) describe the gap or in what ways you are significantly limited (in scope and effectiveness) in acquiring these measurements; 4) quantify how the instrument will enhance progress/outcomes of existing projects (number of investigators, awards, trainees) and describe how it will enable additional new research.

As always, write with the reviewer in mind.
Team Composition

How many users do you need and who should they be?

- It is difficult to specify a minimum number applicable to all proposals, but the more bona fide users, the better. The number of users may be less important to the review panel than: 1) the number of awards/projects that will benefit significantly from using the instrument; and 2) the involvement of enough users (including staff scientists, post-docs, graduate students) to predict substantial utilization of full capacity. For a general range, however, instruments not specialized to a narrower user group may need between 8-10 users for S10 proposals and 15-30 users for HEI and MRI shared equipment.

- Major users must have critical needs and current projects that require this instrument, and the projects must match the mission of the funding agency/directorate. NIH explicitly focuses the review on the benefits to NIH-funded research. While NSF states “Researchers using this instrument need not be supported by NSF or the Federal government,” it may be an advantage to submit with an NSF-funded PI and show value to NSF-funded projects.

- Users should include strong, published researchers with active, funded research. These users can have different potential applications of the instrument and can represent multiple disciplines. For NIH, the list of users may include funded, "hands-off" collaborators of "hands-on" users as long as collaborator awards will benefit from the instrument. Revealing the profiles of early career researchers and new/projected hires who will increase the instrument's value in the future can help the proposal even if the early career researchers are not funded users yet.

- In most cases, at least one major user should be recognized as an experienced technical expert, or the appropriate expertise can be in staff scientists. A qualified staff scientist can serve as a non-faculty PI or co-PI if authorized (authorization process found at: http://www.purdue.edu/business/sps/preaward/Proposals/pi.html

- For NIH, you will need to identify the major users with R01s or other high-impact NIH awards and minor users with awards such as R03s and R21s. NIH users should require 75% of available instrument time. Users who have grants from other funding agencies or are without current funding add value to the proposal only once the NIH-funded user criteria are met.

- For NSF, the value of the instrument for training research students is a significantly positive factor: This program especially seeks to improve the quality and expand the scope of research and research training in science and engineering, by supporting proposals for shared instrumentation that fosters the integration of research and education in research-intensive learning environments. (NSF13-517)
For the Defense University Research Instrumentation Program, you will need multiple users with a strong record of Department of Defense funding and proven institutional ability to operate and manage equipment.

**What information do you need to provide about your users and their projects?**

- Work with your co-PIs and users to articulate clearly how this instrument will benefit each project. Ask and answer key questions and highlight any unique applications: Why do you need this particular instrument with these particular features? How will you be able to achieve things you cannot achieve now? How will you be able to realize your aims more efficiently and/or with higher reliability?

- Remember that for NIH proposals, extensive development of the background and significance of funded projects is generally detrimental. Again: the impact of the instrument on the projects is the primary issue.

- Highlight users with extensive experience with similar instruments and methods to convince reviewers of the strong track records and technical expertise of your team members.

- Consult the NIH parent announcement for good advice regarding preliminary data as it pertains to the judgment of the value of the instrument to a project: *Sufficient technical detail (preliminary data and/or supplemental information) should be included to evaluate whether the instrument is appropriate, would be effectively employed, and would provide advantages over other methods.* (NIH 13-008)

- Carefully identify and justify the need for special features or upgrades, particularly costly ones: *Individual projects that require a specific option or upgrade ... should describe the specific studies that utilize this option.* (NIH 13-008)

- Use a table as an easy-to-read method to present user information and include the grant numbers for each PI:

<table>
<thead>
<tr>
<th>User</th>
<th>Department</th>
<th>Brief Project Title</th>
<th>Grant Number(s) as PI</th>
<th>Estimated % Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

**Table X. Summary of Major Users**
How do you identify potential users?

- Consult with previously identified users.
- Consult with directors of Purdue core facilities that have related instruments.
- Consult with appropriate department heads and associate deans for research.
- Use award database searches such as NIH eReporter to identify abstracts of researchers at Purdue who used a similar instrument.
- Consult the program guidelines for specific requirements or restrictions on users from outside Purdue.

Instrument Information and Justification

Do you need this particular instrument to answer a significant science question?

- Make an enthusiastic case for how this particular model of the instrument will enable you to do novel, transformative work that would not be possible without this instrument. Describe the resulting national and regional impact for your larger research community. Your proposed instrument should enhance projects the agency has already funded. How will it increase campus researcher capabilities? Will it speed up enrollment of research subjects? Will it enhance new grants or enhance capability to get new grants?
- For an NIH proposal, focus tightly on how this research instrument will enhance NIH research on the campus.
- If similar instrumentation is available, provide documentation of the barriers to the use of or inadequacies of existing instruments. Include a letter that documents why a similar instrument is not available to you, for example, because the instrument is obligated to an exclusive research team or project or else current instrument demand does not allow for expanded use. Consider using a graph to show usage trends over time. You must show reviewers you have exhausted other reasonable options for instrument use.
- Do not argue that your PIs cannot perform their previously funded research without this instrument or that you need to have this instrument because others have it.
• Explicitly itemize instruments on campus and in the nearby area that could do this work, and explain why you do not have access to these instruments or how your proposed instrument would be a major upgrade over the existing scenario. Are you replacing a heavily used but aging instrument that does not have the accuracy you need? Has the instrument reached the end of its useful lifetime as indicated by frequent repair issues or vendor statement about the end of parts and service assurances? What type of improved performance will the new instrument provide?

Do you know all the instrument capabilities and constraints?

• Clearly describe the exact instrument brand and model and its accessories, and do not use marketing text for your description. State why you are using this particular company. Appropriate quote? Good service in the past? Special features?

• Present a budget that matches what you need. Do not under budget in order to look like a good deal because you will only look uninformed. Do not over budget in anticipation of funding negotiations. Ask for exactly what you need and justify it.

• Verify with appropriate colleagues that you are indeed choosing the right instrument. Use a table whenever possible to describe functionality:

Table X: Justification for the 9.4T system accessories based on specific sensitivity and functional needs in targeted animal models and materials.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Functional Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ST00321 Temperature system</td>
<td>Mice and rats monitoring</td>
</tr>
</tbody>
</table>
• Justify all the “bells and whistles,” and be explicit as to who needs to use which accessories/capabilities. Use a table to show instrument features and justify how each component will be used by at least one and preferably multiple users. Map users to accessories as in this example:

**Table X: Major user needs for specific instrument quote items (listed by Item Number)**

<table>
<thead>
<tr>
<th>Major User</th>
<th>Animal Model</th>
<th>Instrument Item Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Smith</td>
<td>Rat</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17</td>
</tr>
<tr>
<td>Carol Jones</td>
<td>Mouse</td>
<td></td>
</tr>
<tr>
<td>Laura Miller</td>
<td>Mouse</td>
<td></td>
</tr>
<tr>
<td>Ji-Xin Liu</td>
<td>Mouse</td>
<td></td>
</tr>
<tr>
<td>Ricardo Porter</td>
<td>Chinchilla</td>
<td></td>
</tr>
</tbody>
</table>

• Be prepared that some agencies want you to provide data that show the need for/benefits of that type of instrument. In these cases, you will need real data and not just information acquired from vendor interactions. Travel to a laboratory or ship your samples. Show that you made the effort to acquire the necessary data.

• Describe how you will connect with network organizations such as the NIH Indiana Clinical and Translational Sciences Institute (CTSI) if it is relevant and advantageous. Is this an instrument CTSI researchers also do not have access to and would use?

• Describe the location for the new instrument. The more mature your plans are, the better this will review. Provide details on specific space allocated. Show room plans and adjacencies (what is nearby with a correlated function. This can show synergies). Be specific regarding when space will be ready for the instrument, e.g. six months prior to award arrival. Provide a strong institutional commitment letter assuring reviewers, for instance, that all necessary renovations will be completed before the award date. If the instrument will go into a new building, you need to document the institutional commitment to construct the building and include building plans depicting a specific room or space and a timetable for completion.

Use tables generously and make it easy for reviewers to identify users and their research areas, distinguish between major and minor users, and map instrument accessories to users.
Writing an instrument management plan

- Your management plan is just as important as your science. A clear management plan shows that the instrument will be well utilized and well maintained. Demonstrate that you have the campus infrastructure and technical expertise to effectively use the instrument. This includes describing the leadership skills of the PI.
- Describe where this instrument will be physically located and highlight any key infrastructure provided by Purdue. Why is this a great space for your instrument?
- For development projects, use a Gantt chart to show a realistic timeline of project tasks during each phase. This timeline should show deliverables for each phase of activity.

- Management questions you need to address include:
  - How much will it cost to maintain the system?
  - What technical expertise do you need in order to maintain and operate the system?
  - What are your plans for routine maintenance and/or calibration of the instrument, to sign up to use the instrument, and to resolve disputes over access and usage policies?
  - How will you divide instrument time among major and other users and facilitate multi-user access?
- How will you prioritize usage?
- How will you advertise the instrument for new users and train them?
- Is there a plan to increase usage through outreach?
- How will you archive data and ensure access to this data?
- How will you handle emergency or major repairs and equipment upgrades?
- Are your safety issues addressed?

- State what training will occur and by whom. On-line? In person? For technical training of your instrument operator, use vendor training that is often available at installation. Also take advantage of workshops at scientific meetings or elsewhere for novice users and consider developing a workshop.

- Consider addressing data management needs for your newly generated data, and, in particular, look at Purdue University Research Repository (PURR) as a win differentiator. Your plan should address types of data, standard formats and content, policies for accessing, archiving, and preserving. See https://www.purdue.edu/research/vpr/rschdev/proposal_prep_resources.php for NSF-style data management plan templates. If you need any data management training for your team, describe training in your proposal.

- Describe a mechanism to deal with warranties and safety issues as well as all potential risks. How will you deal with any biohazards?

- Address both repair and routine maintenance. They are not the same thing.

- State how your calculated use rates will compare to relevant peers.

- Describe responsibilities of the facility director and key technical personnel. Justify each position and state their contribution to meeting project goals.

- Check funding announcement requirements and consider identifying an oversight committee or steering committee and describe responsibilities, plans for regular meetings, rationale for choice of membership, and plans for how the membership will rotate or evolve. An oversight committee can be a group of deans and department heads who are administratively responsible for the faculty users. They can meet infrequently to help manage user conflict and help navigate higher-level campus issues. A steering committee provides day-to-day operational functions such as rate setting and review, user scheduling, policies, and training.

- For NIH proposals, describe your mechanism to ensure instrument priority for NIH-funded users. For example, your instrument reservation system can open earlier for the NIH users.

- Describe your process for evaluating instrument success. What metrics will you track and use for determining effectiveness?

- Describe dissemination if you are going beyond the normal activities of publishing and poster presentations. Include any interesting initiatives that could be to your advantage, for example, yearly town hall discussions to train users and promote new collaboration or brown bag lunches for topical discussions and community building.
Details Regarding Writing the Proposal

- Since this is a new instrument by definition, the PI or a technically knowledgeable co-PI will need to help every user with their user write up. Plan to spend months for proposal preparation and up to a year if you need to go outside the university to find users or get preliminary data or if you need cost sharing. Start early in order to have time for all the communication that must happen with other faculty and administration.
- A clear description of the instrument is critical. Make sure the descriptions of user research projects are in sync with the justification-of-needs text.
- Consider following the same template for each user: summary paragraph of research projects, user/project specific needs for the instrument, and how the instrument will accelerate/enable the research.
- Pay attention to broader impacts on science and training if required. Describe any outreach to investigators nationwide or even worldwide. Describe how the instrument would be used to educate graduate students or integrated into the classroom. Include also the numbers of graduate students and undergraduates, if appropriate, who will be impacted in their studies. For NSF, address if any researchers will represent minority-serving institutions or underrepresented populations or if students will benefit.
- For resubmissions, you must show responsiveness to reviews.
- Prepare your proposal early and have it reviewed by colleagues prior to submission.
Institutional Involvement and Support

- Start early!

- You need a compelling support letter from the university/department with explicit mention of financial and/or administrative support and a description of infrastructure available or planned to support and sustain the instrument. Consider: a pledge to backstop service costs if you do not generate enough fees to cover them; technician salary support; or space renovations.

- Your proposal should state a case for the historical institutional support for comparable instruments or facilities.

- Reviewers will not necessarily see it as a negative if the PI is an assistant professor, but they will want to see more support from the university to make sure the PI can manage this as a junior faculty member. A university could provide operations or regulatory support, for example, by committing to hire a staff person.

- Preliminary data can be critical to showing you know how to use the instrument. If you need to acquire data at a national lab, for example, consider asking for travel support from the university to build your case. It can be a significant bonus to show you went through the effort to go someplace to get the data.

- Reviewers want to know about sustainability. One of the biggest reasons instrumentation proposals are not funded is lack of sustained support from the university. What are the continuing costs to support the instrument, and how will they be covered? User fees often recover revenue less than the recurring costs, so you will need to have university agreement to make sure the instrument is supported long-term for maintenance and operation regardless of use. Part of your sustainability plan could include user fees from external users, including for-profit entities.

- Support in the form of committed cost share may be required or prohibited. If it is required you must start early on cost share discussions, which should begin with appropriate department heads—those whose faculty will benefit from the award. Here is an overall flow of the cost share process:
Once you know sponsor expectations, work with your SPS Pre Award Specialist to develop a full draft budget that includes both expenses that can be charged to the sponsor and expenses that need to be covered internally. Estimate the cost of support over a multi-year period that is consistent with the minimum practical or technological lifetime of the instrument (for example, five years).

Once you know the fiscal gap, begin conversations with campus representatives. With the full budget in hand, you can begin to identify the fiscal gap that exists between what the sponsor provides and what you will need. Some (or all) of that gap may be recovered from user fees through a recharge system. If this is part of the plan, be sure to consider how revenue will change over time—in some cases, use and revenue ramps up as the trained user base grows.

Whatever costs are not covered by the sponsor or users should be the target for institutional support. That fiscal support can take the form of mandatory cost share (as in the case of an NSF MRI proposal), outside the project period institutional support (as in the case of an NIH HEI proposal that will need sustainable support for any number of years after acquisition), or anywhere in between.

Meet with your department or unit head to seek their support and identify how the department may be able to help.

The Office of Research and Partnerships (ORP) also has resources available for both mandatory cost share and highly strategic institutional support requirements. If you expect to need ORP-level support, contact Mary Millsaps as soon as possible (millsaps@purdue.edu). For large complex proposals involving multiple units or colleges, Mary Millsaps can also assist you in developing a plan for approaching the appropriate heads and associate deans for research. In addition, the OPR has developed a website that provides both a process guide and online request form for OVPR resources (http://www.purdue.edu/research/vpr/policies/costsharing.php).