TWELVE STEPS TO A WINNING RESEARCH PROPOSAL

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I have been an NSF program director for 18 years. During this time, I have personally administered the review of some 3,000 proposals and been involved in the review of perhaps another 10,000. Through this experience, I have come to see that often there are real differences between winning proposals and losing proposals. The differences are clear. Largely, they are not subjective differences or differences of quality; to a large extent, losing proposals are just plain missing elements that are found in winning proposals. Although I have known this for some time, a recent experience reinforced it.

I was having lunch with a young faculty person who had come to NSF to sit on her first proposal review panel. I asked her what she had learned from the process. She quickly rattled off six or eight lessons she could take home. And they were all good lessons. My response was, "Good, just learn from this experience and don't make the mistakes that the losing proposals made." You can do the same, and vastly improve your chance of success in proposal writing. Just follow these twelve simple steps.

1. Know yourself: Know your area of expertise, what are your strengths and what are your weaknesses. Play to your strengths, not to your weaknesses. Do not assume that, because you do not understand an area, no one understands it or that there has been no previous research conducted in the area. If you want to get into a new area of research, learn something about the area before you write a proposal. Research previous work. Be a scholar.

2. Know the program from which you seek support: You are responsible for finding the appropriate program for support of your research. Don't leave this task up to someone else. If you are not absolutely certain which program is appropriate, call the program officer to find out. Never submit a proposal to a program if you are not certain that it is the correct program to support your area of research. Proposals submitted inappropriately to programs may be returned without review, transferred to other programs where they are likely to be declined, or simply trashed in the program to which you submit. In any case, you have wasted your time writing a proposal that has no chance of success from the get-go.

3. Read the program announcement: Programs and special activities have specific goals and specific requirements. If you don't meet those goals and requirements, you have thrown out your chance of success. Read the announcement for what it says, not for what you want it to say. If your research does not fit easily within the scope of the topic areas outlined, your chance of success is nil.

4. Formulate an appropriate research objective: A research proposal is a proposal to conduct research, not to conduct development or design or some other activity. Research is a methodical process of building upon previous knowledge to derive or discover new knowledge, that is, something that isn't known before the research is conducted. In formulating a research objective, be sure that it hasn't been proven impossible (for example,

5. Develop a viable research plan: A viable research plan is a plan to accomplish your research objective that has a non-zero probability of success. The focus of the plan must be to accomplish the research objective. In some cases, it is appropriate to validate your results. In such cases, a valid validation plan should be part of your research plan. If there are potential difficulties lurking in your plan, do not hide from them, but make them clear and, if possible, suggest alternative approaches to achieving your objective. A good research plan lays out step-by-step the approach to accomplishment of the research objective. It does not gloss over difficult areas with statements like, "We will use computers to accomplish this solution."

6. State your research objective clearly in your proposal: A good research proposal includes a clear statement of the research objective. Early in the proposal is better than later in the proposal. The first sentence of the proposal is a good place. A good first sentence might be, "The research objective of this proposal is..." Do not use the word "develop" in the statement of your research objective. It is, after all, supposed to be a research objective, not a development objective. Many proposals include no statement of the research objective whatsoever. The vast majority of these are not funded. Remember that a research proposal is not a research paper. Do not spend the first 10 pages building up suspense over what is the research objective.

7. Frame your project around the work of others: Remember that research builds on the extant knowledge base, that is, upon the work of others. Be sure to frame your project appropriately, acknowledging the current limits of knowledge and making clear your contribution to the extension of these limits. Be sure that you include references to the extant work of others. Proposals that include references only to the work of the principle investigator stand a negligible probability of success. Also frame your project in terms of its broader impact to the field and to society. Describe the benefit to society if your project is successful. A good statement is, "If successful, the benefits of this research will be..."

8. Grammar and spelling count: Proposals are not graded on grammar. But if the grammar is not perfect, the result is ambiguities left to the reviewer to resolve. Ambiguities make the proposal difficult to read and often impossible to understand, and often result in low ratings. Be sure your grammar is perfect. Also be sure every word is correctly spelled. If the word you want to use is not in the spell checker, consider carefully its use. Not in the spell checker usually means that most people won't understand it. With only very special exceptions, it is not advisable to use words that are not in the spell checker. Reviewers used to say, "He's just an engineer. Don't mind the fact that he can't spell." Now they say, "He's proposing to do complex computer modeling, but he doesn't know how to use the spell checker..."

9. Format and brevity are important: Do not feel that your proposal is rated based on its weight. Do not do your best to be as verbose as possible, to cover every conceivable detail, to use the smallest permissible fonts, and to get the absolute most out of each sheet of paper. Reviewers hate being challenged to read densely prepared text or to read obtusely prepared matter. Use 12 point fonts, use easily legible fonts, use generous margins. Take pity on the reviewers. Make your proposal a pleasant reading experience that puts important concepts up front and makes them clear. Use figures appropriately to make and clarify

criteria, even marginally, can disqualify your proposal from consideration.

10. Know the review process: Know how your proposal will be reviewed before you write it. Proposals that are reviewed by panels must be written to a broader audience than proposals that will be reviewed by mail. Mail review can seek out reviewers with very specific expertise in very narrow disciplines. This is not possible in panels. Know approximately how many proposals will be reviewed with yours and plan not to overburden the reviewers with minutia. Keep in mind that, the more proposals a panel considers, the more difficult it will be for panelists to remember specific details of your proposal. Remember, the main objective here is to write your proposal to get it through the review process successfully. It is not the objective of your proposal to brag about yourself or your research, nor is it the objective to seek to publish your proposal. Again, your proposal is a proposal, it is not a research paper.

11. Proof read your proposal before it is sent: Many proposals are sent out with idiotic mistakes, omissions, and errors of all sorts. NSF program managers have seen proposals come in with research schedules pasted in from other proposals unchanged, with dates referring to the stone age and irrelevant research tasks. Proposals have been submitted with the list of references omitted and with the references not referred to. Proposals have been submitted to the wrong program. Proposals have been submitted with misspellings in the title. These proposals were not successful. Stupid things like this kill a proposal. It is easy to catch them with a simple, but careful, proof reading. Don't spend six or eight weeks writing a proposal just to kill it with stupid mistakes that are easily prevented.

12. Submit your proposal on time: Duh? Why work for two months on a proposal just to have it disqualified for being late? Remember, fairness dictates that proposal submission rules must apply to everyone. It is not up to the discretion of the program officer to grant you dispensation on deadlines. That would be unfair to everyone else, and it could invalidate the entire competition. Equipment failures, power outages, hurricanes and tornadoes, and even internal problems at your institution are not valid excuses. As adults, you are responsible for getting your proposal in on time. If misfortune befalls you, it's tough luck. Don't take chances. Get your proposal in two or three days before the deadline.

These twelve steps are nothing more than common sense. They are so obvious that they hardly bear mention. What is more, they are all necessary conditions. If you fail on any one of these steps, you will reduce your chance of success to practically nothing. Think about it. If you were a reviewer, would you recommend for funding a proposal that doesn't meet these criteria? So why then do fully half the proposals submitted flagrantly omit them? It's a fact. Most proposals do not follow these simple steps for success. Therein lies your opportunity. If you take the time to follow these steps, your proposal will be that much better by comparison, and you will vastly increase your chance of success.

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an academic researcher. First, you have to know yourself as well as you can. Who are you? Where are you going? Where do you want to go? I strongly urge people, especially young faculty just starting their careers, to write a strategic plan for their life. Where are you today? Where do you want to be in five years, ten years, twenty years? Then create a roadmap of how to get from where you are to where you want to be in the future. The focus of this roadmap should be the things over which you have control, and it should acknowledge the things over which you have no control. If you can't write such a plan, then your goals for the future are not realistic. You can revise the plan as often as you wish. But the fact that the plan exists will influence your proposal in a very positive way, as it will place the research project you propose into the broad context of your life plan.

Finally, no matter how much sense the above steps seem to make, everyone retains a