One metaphor for the grant writing process is gem cutting, the central idea being the gemstone. An excellent grant proposal resembles an excellent cut gem in that they both have crystal clarity and present distinct facets over an underlying architecture that attracts the buyer (reviewer). The proposal facets (key components) include the question (hypothesis), justification (background), specific aims, study design type, sample size, case accumulation, methods, and budget.

Proposal crafting resembles gem cutting in that crystal clear material (an excellent question) is rough cut from a raw stone, the crystal architecture determined, and facets evenly developed until they emerge together into the final gem of excellent science. The end is mounting this gem in a setting, publishing a refereed primary scientific paper. While being the right material, much gemstone is not worthy of being cut into gems.

Developing facets unevenly results in a misshapen, weak and sometimes shattered product. No amount of work (polishing) can create a quality proposal out of a poor, indistinct, fuzzy question and if the key components aren’t carefully aligned with the underlying architecture, the flawed result is a tough sell. Investing in a small stone precludes unearthing a larger, more worthwhile stone. Some excellent raw stones (questions) are too big (not feasible) for the equipment at hand (the budget, time, or case limits). A smaller, well faceted clear stone is always worth much more than a larger, poorly faceted opaque one.

**Research Question:**

Grant writing is an iterative, recursive process that clarifies your thinking. The first step is defining the research question from which you can derive a concise, clearly testable causal hypothesis. As soon as you can, word the question specifically, including the predictor and outcome variables, and testable.

As long as any component of your question remains fuzzy or in your head, your hypothesis development will be weak and no amount of writing will eliminate fatal uncertainties in sample size, in case accumulation, in procedure, in evaluation or in budget adequacy. What is the knowledge gap that needs filling? What assumptions need empirical support? Revise your question until you have developed a hypothesis that you can convince the reviewer is clearly and definitively testable, that obtaining the answer is important, that the study is feasible, and that the only uncertainty is the outcome of the test. Common problems are mistaking a research focus or an interest for a research question and starting too big and ambitious. With experience, this process of honing down to a doable question becomes easier. Using the Vee heuristic or Vee diagram, developed by Gowin and Novak, is proposed to help the process (pgs. 56-66 in Stock, MA (1985). A Practical Guide to Graduate Research, pdf)

“If I had only one hour to solve a problem, I would spend up to two-thirds of that hour in attempting to define what the problem is.” Yale IE Department Chair (not Einstein!)

**Research Framework:**

The second step is to develop your research outline. Another metaphor for grant writing is selling a house, the reviewer being the house buyer. The title is the curb appeal, providing the reviewer their first impression. Do they like the looks before they step inside? The underlying grant structure is the house framework. Framing determines the house layout, the layout being the number and location of the bedrooms, the number of bathrooms and so on. Just as house buyers are looking for specific components, so are grant reviewers. Are these easily identified, clearly stated and do they meet the reviewer's expectations? If not, fine finish work (excellent writing) may sell an okay framework but no amount will overcome a poor one.

Poor frameworks result in weak grant proposals that are denied. Start by developing at least approximate answers to the questions under the headings of the outline framework, refining answers until you have the major study components clearly and concisely defined. Then apply the FINER acronym developed by Hulley et al. (2014). If you find this framework isn’t feasible due to time, case accumulation rate, budget limitations or other resource constraints, revise the question, find different methods, reduce measurement variation, or otherwise adjust facets
until everything fits together. Once everything fits, you have a framework on which to construct a proposal. The quicker you complete designing the architecture, the more time you have to write and polish your full proposal (do the fine finish work).

**Feasible** - Is the research question answerable?
- Adequate number of subjects accumulated within study time frame
- Adequate ‘state of the art’ technical expertise
- Affordable in time and money
- Manageable in scope (within time frame)
- Fundable
- **Will reviewers be convinced that you know what you are doing and that you will complete this study?**

**Interesting**
- Getting the answer intrigues the investigator and her colleagues
- **Will your study question engage the reviewers?**

**Budget**
- Funds requested are sufficient to accomplish the study but not excessive (e.g. padded)
- **Will reviewers value your expected results as the ‘best bang for their buck’?**

**Novel and Important** - Has the study been done before?
- Provides new findings filling a knowledge gap that matters
- Necessarily confirms, refutes, or extends previous weak findings
- May lead to innovations in concepts of health and disease, veterinary practice, or methodologies for research
- **Will reviewers find your answer to their concern of ‘So What?’ strong?**

**Ethical and Safe**
- A study that all the institutional review boards (IACUC for animals, IRB for human subjects, IBS hazards for staff) will approve
- **Will reviewers remain concerned about welfare issues?**

**Relevant** - Will the answer advance veterinary science?
- Likely to contribute to scientific knowledge, clinical practice, or health policy through primary refereed publications
- May influence directions of future research and provide pilot data for future proposals
- Is not a dead-end study but supports a clear next step
- **Will reviewers be confident that a primary refereed publication justifying their investment will appear in the end?**

Further references:
- [ASHP AJHSP](#) - Research Fundamentals article series
- [paper](#) - Defining the primary research question in veterinary clinical studies
- [paper](#) - Formulating a researchable question: A critical step for facilitating good clinical research
- [handout](#) - Formulating the research question, JD Campbell, U Missouri
- [chap 1](#) - Asking the Right Questions, PS Blair, A Barton