

## PhD Seminar

### Thoughts on PhD Proposals

Jeff Offutt

<http://www.ise.gmu.edu/~offutt/>

## A Typical Outline for a SWE Proposal

1. A statement of the problem and why it should be solved
2. Reference to and comments on relevant work by others
3. The candidate's ideas and insights for solving the problem and any preliminary results
4. A statement or characterization of the solution being sought
5. A plan of action for the research
6. A description or rough outline of the dissertation

## Problem Statement

- Hardest part: separating the problem from a solution
- We are trained in school to be good at solving problems, but not at defining problems
- The difference is very close to the difference between requirements and design

## Example

This dissertation will present the development and justification for the "charm coupling" metric. Charm will meet the intuitive characteristics described by Fenton. An appropriate scale (nominal, ordinal, interval, or ratio) for Charm will be developed, and an initial assignment of numerical values will be made.

This is a statement of what the student will do, not what the problem is.

## Example (2)

I will add side air bags to the doors of cars. The bags will be installed in such a way as to not injure the occupants of the car when they deploy.

That is not a problem, but something I plan to do.  
It is a solution. What is the problem?

## Example (2A)

A significant number of people are severely injured or killed in side impact collisions. This has been documented in several studies [1,2]. Safety belts, front airbags, and other passive restraint systems offer little or no protection from these kinds of collisions.

- The first sentence describes the problem.
- The second sentence documents the problem (I didn't just dream this problem up).
- The third sentence motivates the problem and explains a little bit about why it exists. I would criticize this problem statement on one point -- the term "significant number" is vague ... I would like to see percentages if possible.

## Needs Statement

A way to protect occupants of cars from injury and death during side impacts.

- Then the first paragraph I wrote about side airbags becomes the solution
- There are other possible solutions:
  - Not drive
  - Collapsible bumpers
  - Reinforced side door panels

## Thesis Statement

A thesis statement lays out my thesis – what I believe will solve the problem

My thesis is that the problem of injuries on side impacts can be partially solved by adding side air bags to the doors of cars.

- It is possible for a thesis proposal to identify the problem, but not suggest a solution
- The final solution of the thesis may not match the proposal

## Evaluation

- Evaluation must decide if the solution is adequate
  - Proof
  - Controlled experiment
  - Industrial demonstration
- How will I convince people that air bags protect passengers?
- Are they better than collapsible bumpers?

## Other Contents

- Rough plan for research
- Tentative description of dissertation – outline
- Literature survey

## NSF Model

- The NSF requires that a proposal be condensed into 15 pages
- Don't tell us everything – tell us the important things
- Elevator test: Can you describe your thesis in the time it takes to ride up an elevator?

## A Thesis Proposal

You have to convince your advisor (and committee) that you can produce publishable solutions to your problem