

Technical Reports for the Supercomputing Challenge

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Adapted from a previous workshop by Nicholas Kutac.

Outline

- About Me
- The Purpose of a Technical Report
- Some Common Mistakes and Key Advice
- The DMAIC Framework
- A short workshop exercise

About Me

Education

- BS Information Technology, New Mexico Tech
- MS Electrical/Computer Engineering, Iowa State University

Work

- Professional Services Technical Architect, GitLab

Writing

- *LWN, Fast Company*, upcoming work at CU Boulder
- *Computers Are Bad*

The Purpose of a Technical Report

Why write a report?

- Catch the interest of your readers
 - Demonstrate value
 - Relate to their problems or experiences
- Provide technical detail
 - Allow others to reproduce your work
 - Allow others to *improve upon* your work
- **Win**
 - Stand out from the competition
 - Don't give your readers a reason to mistrust you

Catching Interest: Storytelling

- Stories are more than a beginning and end
 - Character development
 - Worldbuilding
 - Conflict and achievement
 - Lessons learned along the way
- Stories are *interesting* and they are *easy to read*—they are *human*
- Good writing almost always tells a story
- A compelling story can make up for a weak result

Catching Interest: Relatability

- Give your reader a reason to care about your project
 - Does it solve a problem they have?
 - Does it explain a phenomenon they have noticed?
- Not every report matters *directly* to your reader, but it should matter to *someone*
 - Tell your reader who that person is

Technical Detail: Context

- The reader should understand the *why*, *what*, and *how* of your project without needing to ask questions.
 - Why did you investigate the problem?
 - How is the problem currently solved?
 - How did you investigate it?
 - What assumptions did you make?
 - What did you discover?
 - What should be done next?
- The key question: would someone you haven't met understand your project after reading the report?

Technical Detail: Reproducibility

- People will better trust your work if they know how to verify it (even if they don't end up doing so)
- People are more likely to build on your work if they can quickly get at least as far as you did
- Think of your report as providing a toolkit for someone else to do the same research.
 - What tools did you develop? Include a description, and have source code available.
 - What data did you use? Describe the data and its source. Unless something specific stops you, make the data available.
 - What sources/references did you rely on? If you started with something and modified it, exactly how did you modify it?

Some Common Mistakes and Key Advice

Artificial Intelligence

- LLMs have not defeated the rule of *garbage in, garbage out*
- LLM-generated text is now very obvious to most people in technical fields
- LLMs have a strong tendency to produce overly verbose, repetitive output with an ad copy structure (call-to-action). “Prompting it out” or editing it later can be a lot of work.
- Many readers will see LLM-generated text as demonstrating a *lack of care* and will judge you harshly for it.
 - This is not an argument that you want to start when people are evaluating the quality of your work.

Shortcomings of Past SCC Reports

- Mechanics
 - Spelling, grammar, and formatting errors are distracting to readers and reflect poorly on the quality of the rest of your work.
 - This is a great place to lean on tools, but you also need to proofread!
- Giving credit
 - Citations are a key part of professional work—they help the reader understand the work, and head off conduct problems.
 - A bibliography helps the reader learn more *and* it demonstrates your expertise in the field.

Shortcomings of Past SCC Reports

- Graphs and tables
 - As a general rule, include visualizations (graphs, pictures, etc) in the body and data tables as appendices.
 - Visualizations are best used sparingly. Needing a lot of figures is usually a sign that they aren't very good.
 - Make sure that figures are well-labeled. They should generally be captioned with a source and brief interpretation.
- Data is just data. Analysis is a *project*.
 - Analyze and interpret the data that you present.
- Go into detail
 - There is no page count to hit—but there are questions to answer.

Key Principle: Keep It Simple

- Academic and professional writing guides are shifting towards *plain language* and *readability*.
- Do not add text just because you think you need more text. Every sentence should *mean something*.
- Do not make your work sound bigger than it is—you'll disappoint. Demonstrate incremental progress.
- I do not believe in the passive voice, but you must be *intentional* about voice.
 - The singular “I” is rarely appropriate. Your goal is to convey teamwork.

The DMAIC Framework

DMAIC

- Define
- Measure
- Analyze
- Improve
- Control

Define

- What is the problem?
- Where? When? Who?
- What has been done so far?
- What is the current situation?
- What is already known, and what is unknown?
- Why is any of this important?

Measure

- What real-world data are you using?
- How was that data collected?
- What problems does the data have?
- What assumptions are you making?
- How did you validate your data?

Analyze

- What does your model test or explore?
- What variables are you modifying as an experiment?
- Why are you modifying those variables?
- What are the real-world reasons for your experimental parameters?

Improve

- What did you discover?
- What are the differences between the current state and the situations you investigated?
- What actions would you recommend?
- What evidence supports your findings?

Control

- What went wrong?
- What would you do differently if you started over?
- What questions were left for future analysis?
- What data should be collected going forward?
- How can your recommendations be validated over time?

Workshop

Answer the core DMAIC questions for *your proposed project*.

- Define: What is the problem that needs to be solved?
- Measure: What is the current situation? What data can you collect?
- Analyze: What variables will you try changing? What will you investigate?
- Improve: What differences do you expect between the current situation and your proposed solution?
- Control: What pitfalls do you need to watch for? What further work could be done?

Thanks for coming!

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