How to Write a Professional Technical Report

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Outlines

• Abstract vs. Executive Summary
• Specifications
• Conclusions
• References/citation
• Table of Contents
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Report Outlines

Abstract
1. Introduction
2. Theoretical Background
3. Prototype Design
4. Microcontrollers and Electronic System Interface
5. Fabrication and Assembly
6. Testing Results and Analyses
7. Conclusions and Future Work
Reference
Appendix
Abstract

- First thing in the report, but last thing to write
- One paragraph.
- Word limit (most < 150 words)
- Only the materials absolutely needed to be included.

Executive Summary

- First thing in the report, but last one to write
- One page (multiple paragraphs)
- Summary of key components (assumption, design, test results, conclusion).
“Abstract” by Students

To reduce errors in the assembly of the BSC IntraVascular UltraSound (IVUS) isight catheter telescope assembly. The obstacles are to contact the BSC manager, implement a vision system to locate randomly oriented parts, and create a user-friendly interface with LabVIEW (as requested by BSC),... to satisfy the project objectives.

The scope of this project is the automation of the manufacturing ...

The goal of this project is to provide BSC with the best assembly method for automating the catheter manufacturing assembly line along with a tangible proof-of-concept demonstration assembly system.
Abstract by Students

A half-scale proof of concept for a new model support system at NASA is implemented. The feedback control for a tilt table angle of attack, as well as a way of removing it completely from the stream. The ... design provides the necessary force to each cylinder. Fine control over the tilt cylinder is achieved by incorporating a proportional control valve and an electro-pneumatic pressure regulator. The Compact DAQ controller provides input to the four pneumatic control valves with closed-loop feedback control on the proportional valve via a quadrature encoder position read-out. The overall system performance results in steady state error of 0.05, rise time of 0.10 seconds, settling time of 2.32 seconds and percent overshoot of 19 percent.
Specifications

An explicit set of requirements to be met by your final device. dimensions, materials, functionalities, etc. Example:

**Mechanical System**
- Maximum weight: 200 lbs
- Minimum/Maximum tilt angle (angle of attack): -8° to +8°
- Being able to drop completely out of the flow stream
- 20 year operational life time
- Motion controlled by hydraulic power. Hydraulic components shall be protected by a primary safety relief valve capable of flowing full pump flow at the operating pressure of 600 psi.

**Control System**
- Minimum/Maximum insertion and retraction time = 1 s./999 s
- Minimum/Maximum exposure interval = 0 s/9999 s
- Minimum sweep time and exposure resolution = 0.1 s
- Maximum actuation speed = 1°/s or 2 in./s
“True” Conclusions

– Remind the reader of what you were trying to achieve
– Tie together the theory, method, results, and discussion project
– Meet expectations?
– State which works, which doesn’t work
– Summarize the features, functions, and performance of the final device
– Project to different scale or extension
The Capacitive Sensor Lab Station has met all of the design requirements except for two of them: the ability to adjust the permittivity and a separate test chamber.

Both the bottom and top MSA are able to accurately move the plates.

The system is also able to measure all the properties -- capacitance, temperature, pressure, etc. -- with $\pm 0.3$ pF, $\pm 0.5$ °C, and 0.05 Pa accuracy.

The user interface was able to provide the user with the ability to plot and save the data which they desired.

The initial results obtained from the testbed agree with the theory of a parallel plate capacitor. For the effective area overlap, the testbed shows a linear relation with respect to capacitance. With plate separation, the testbed shows an inverse relation with respect to capacitance.
Bad “Conclusion” Example

• This project is interesting, fun and sexy.
• We purchased 34 motors, 15 gears, and 6 microcontrollers to build this very complex robot.
• The original budget was projected at approximately five thousand dollars. XXX agreed to fund the entire prototype.
• Teamwork provides the ability to brainstorm on how to solve different issues, and allows different engineering backgrounds to be involved.
Numerals vs. Spell Out Numbers

Use Numerals (1, 2, 3...)

• numbers larger than nine

• when the number is connected to a unit of measure
  (3 lbs, 5 Volts, 2 sq. ft.)

• decimal and fractional numbers greater than one.
  (1.5)

• a combination of numerals and words for very large numbers (especially in money)
  (The light rail system in San Jose has cost over $6 billion.)
Numerals vs. Spell Out Numbers

Spell Out Numbers

• A number beginning a sentence

• Numbers less than 10
  Exception: when contain larger numbers referring to the same units:
  (We have two departments with 3 computers in one and 17 in another.)

• Very round numbers
  (About a thousand units have been ordered.)

• Prevent misreading
  (We ordered eleven 8-foot pipes.) ↔ (We ordered 11 8-foot pipes.)
Quotations Using APA Format

APA - American Psychological Association

When not a direct quote
• Jones compared the performance spherical wheels ... (Jones, 2011)
  Jones compared the performance spherical wheels ... [1]
• The new iphone will exceed expectations regarding...
  (“Introducing iPhone,” 2010).

When using the exact words

• If ≤ 40 words, use double quotation marks: “xxx”
  
  She said, "Students often had difficulty using APA style," (Smith, 2007, p. 199).

• If > 40 words (Long Quotations/Block Quotes), use a free-standing block of typewritten lines w/o quotation marks
  
  – In double spacing report, start the quotation on a new line, indented 5 spaces from the left margin. Type the entire quotation in single spacing.

The following explains the procedure:

  Students often had difficulty using APA style, especially when it was their first time citing sources. This difficulty .... (Jones, 2007, p. 199)

  – In single spacing report, start the quotation on a new line indented 10 spaces from the left margin. Maintain single spacing throughout.
Common APA Formatted Reference

Wiki (Wikipedia)

Journal Articles

Books

Blog
Last name, First Initial. Title of individual blog entry. Retrieved November 1, 2011, from http://www.blog.com
Tables and Figures

• Sequence:
  – Tables of Contents
  – List of Tables ($\geq 3$)
  – List of Figures ($\geq 3$)
  – List of Equations ($\geq 3$)

• Arabic Numerals (1, 2, 3, ...)  
  – A table’s number and title: above the table  
  – A figure’s number and title: beneath the figure

• Orientation of Tables and Figures: Up-Left Rule
Common Mistakes

– Using first tone
– Using present tense
– Inconsistent
– Non-smooth transition
– No explanation on figures or tables
– No sources
– No units
  • Temperature units (°F, °C, °R, K)
– No optimization
– No equations or calculations
– No enough theoretical background
Final Writing Checklist

– Organization, Length/Balance
– Contents
– Grammar and Syntax
  • period
– Visuals
  • Section numbers
  • Tables
  • Figures
  • Page numbers
  • Fonts (12 point -- industry standard).
  • Capital