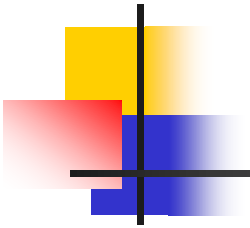


Short Form Technical Reports

Technical Communications Programs
College of Engineering

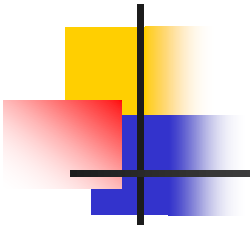
James M. Moran

Adjunct Professor of Communications

Director of

Technical Communications
College of Engineering

University of Massachusetts Lowell



Why Technical Communications?

- ***The review process***
- ***Tips before you write***
- ***Review of the Guidelines?***
- ***Some helpful hints***

Technical Communication Program

Remaining Workshop Activities

Two reports junior year

Capstone NSF Report senior year

Graduate Students

Review empirical reports

Professional journal articles

Review of Requirements

- Must be your original work*
- First draft must be double spaced
- Must be printed – 12pt Times Roman
- Professor submits first draft
- First draft must be handed in with second draft

* Plagiarism the act of passing off as one's own the ideas or writings of another

Review of Requirements

I collect reports:

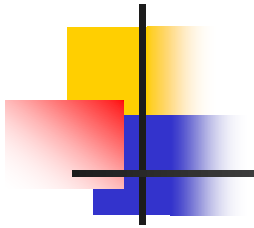
- Assign reviewers
  - Post their schedule (FA 203A)
  - Technical writer reviews your 1st draft
- You **MUST** sign up for consultation
- Reviewer critiques report with you
  - You meet together for 15 - 20 minutes
  - Returns 1st draft to you

Review of Requirements

You have exactly one (1) week to rewrite and submit 2nd draft:

- Drop off 2nd draft with 1st draft attached in my office/lockbox
- 2nd draft reviewed & graded by technical writer
  - you/reviewer can request **3rd** draft*
- NOTE: You Must Hand in **1st** draft with the **Final** draft
  - No 1st with Final = **Failure**
- Reviewer grades – Pass/Fail
- I hand your reports back to your professor with a writing grade

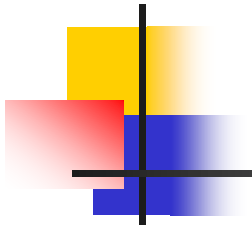
* Time permitting and with concurrence of director and professor



Who are the reviewers?

Who are the Reviewers?

- Professional **Technical** Writers, Editors and Engineers who are meeting with you to help you improve your writing
  - Work for Bell Laboratories, Northern Telecomm, IBM (Watson Laboratories), Xerox, Philips, AT&T etc.
- Numerous awards: STC, SDC, IEEE, SNCR (Society of New Communications Research) etc.



What we are looking for

What we are looking for

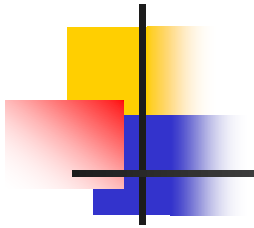
- Your Original Work:
  - Your findings and conclusions
  - Your words
  - Background/supporting data
    - Correct use of attribution
- Adherence to Documentation Standard:
  - "How to Write Technical Reports – Memo Format"
  - Outline and Document Conventions

What we are looking for

- Clear Statement of Technical Objective
- Logical flow of your ideas
- Presentation of evidence supporting your assertions

What we are looking for

- Correct use of English:
  - Grammatically/syntactically
  - Noun verb agreement
  - Subject verb placement
  - Paragraph structure
  - Spelling and punctuation
  - Use of tense and voice
  - Use of the passive voice



*Prepare for the written report as you conduct the experiment**

*Moran, Lectures in Writing Clarity, CoM UMass Lowell, 2009

Begin Documentation as you Experiment/Investigate

Take "documentation" notes *during the investigation*

Place the technical memo outline into your note book:

- Summary
  - Purpose and Scope
  - Conclusions/findings/recommendations
- Experimental Approach
- Discussion of Results
- Appendices/Attachments

Begin Documentation as you Experiment/Investigate

- Carefully read the lab description*
  - Ask yourself the following and highlight
    - What concept(s) is this lab about?
      - Identify the principle(s), theory, law(s)
      - Articulate them

- **** North Carolina State University, - Sponsored /Funded by NSF, 2004***

Begin Documentation as you Experiment/Investigate

- Write down what you know about the concept based on the lab manual, textbook, class notes and handouts
  - Brainstorm what you know
- What are the objectives?
  - Write the specific actions you will take to perform the experiment - measuring, analyzing, testing something

Writing process as aid

- What is the overall purpose of the experiment?
  - **Briefly write** what you will learn/understand as a result of this experiment
- What is your hypothesis for this experiment?
  - **Articulate an outcome** for the experiment based upon the application of theory as you understand it
    - Pencil these into the "Discussion" section of your outline
    - Identify and comment on the variables

Writing process as aid

Document the variables:

- What is measured/manipulated in the experiment
  - Variables provide the means by which you structure your observations and understand the experiment and your findings.
- Independent variable = The **thing you manipulate** that affects the dependent variable
- Dependent variable = **What you measure** in the experiment and what is affected during the experiment
- There may be multiple independent and dependent variables

Writing process as aid

For example:

You are interested in the relationship between a circuit and resistance:

- Independent variable = the circuit
  - *The thing you manipulate*
- Dependent variable = resistance
  - *The thing you measure*

Writing process as aid

Capture the following in your notes:

Your hypothesis, based upon your knowledge, describes the relationship between the variables in the experiment

Writing process as aid

Your findings juxtaposed against your hypothesis (which is based upon your understanding of the theory) *forms the basis of your discussion in your report.*

Writing process as aid

- *In your notes, rough-out a paragraph or two describing what happened and why based upon the technical concept you investigated.*
  - *Pencil notes into each "Memo" section:*
    - Summary
      - Purpose and Scope
      - Conclusions/findings/recommendations
    - Experimental Approach
    - Discussion of Results
    - Appendices/Attachments

Writing process as aid

Critical questions to ask yourself :

- *What happened?*
- *Are these data valid?*
- *Why did this occur?*

Writing process as aid

A very rough 1st draft will originate from your notes

But

!!! This <u>definitely is not</u> the 1st draft you will hand in to me !!!

Technical Communication Program

The Engineering Technical Memorandum Format

You are required to use this Format

(Follow along using "Guidelines" handout)

Technical Memo Format

Look on the back of page one:

Review of the structure of the Format

Follow it exactly

Review of the Requirements

Turn to 2nd page of Guidelines

Format for your report:

- Heading
- Summary
  - Purpose and Scope
  - Conclusions/findings/recommendations
- Experimental Approach
- Discussion of Results
- Appendices/Attachments

Review of the Requirements

Headings must contain the following: (Pg 2)

To: *Professor/Instructor/Teaching assistant)*

From: *Student's name*

Subject: *Descriptive title and experiment number*

Date: *Date report submitted*

May also require date(s) of experiment

Course: *Course and Section Number*

Partners: *List Partners, if any*

Review of the Requirements

- The Summary: *(Pg 2)*
  - Written in the past tense
  - Appears under the heading on page 1
  - Contains the experiment's *Purpose* and *Scope*

Review of the Requirements

The summary continued …

- Contains a description of the investigation
- Contains your *Conclusions/ Findings*
- Does not reference other report sections
  - May contain recommendations

Review of the Requirements

The summary continued …

- Purpose: *(Pg 3)*
  - Requires a specific technical objective(s)
- Scope: *(Pg 3)*
  - Defines the boundaries/limits of the investigation
  - Provides the criteria/standards you based your judgments upon

Review of the Requirements

The summary continued …

- Description of Experiment:
  - What was done

Review of the Requirements

The summary continued …

- Conclusion: *(Pg 4)*
- ***Your conclusion must be at end of your Summary***

- Your answers to questions raised in the purpose and scope
  - Your, judgments, opinions, interpretations
  - Number of conclusions must be same as number of objectives

Review of the Requirements

The summary continued …

- Recommendations:
  - A course of action you advise based upon your conclusions

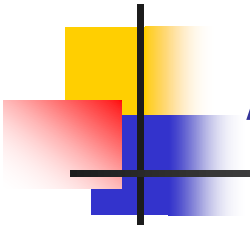
You may not have any recommendations to offer and, depending upon the nature of the investigation, that is okay.

Review of the Requirements

The summary continued …

The summary should <u>not</u> include:

- Tables or figures
- References to tables, figures, or attachments
- Basic or general information
- Step-by-step procedures



Review of the Requirements

The Body of the Report

Technical Memo Format

Experimental Approach: *(Pg. 4)*

- Equipment and Materials
- Procedure

Review of the Requirements

Experimental Approach continued …

- Equipment and Materials
  - What you used to get your results
    - May be a list of *equipment and materials* used
      - Must contain an opening sentence to place list into context for reader
    - Contains a schematic/diagram
    - May require descriptions of equipment/configurations
  - Usually contains apparatus schematic/line-drawing/graphic

Review of the Requirements

Experimental Approach continued …

- Procedure *(Pg 4)*
  - Must be written in passive voice, past tense
  - What you did to get your results
    - *"The ball was hit by me" – Passive Voice*
    - *"I hit the ball" - Active Voice*

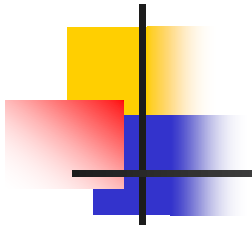
Review of the Requirements

Procedure *(Pg 4)* *continued …*

- Explains how you arrived at your results
- May use a number list of the steps you took
  - May contain subordinate alpha list
    1. First step in list
       a. Subordinate step
  - If using a list - must contain an opening sentence to place list into context for reader

Review of the Requirements

- Discussion of Results *(Pg 4)*
  - Does two things:
    - Reports your experimental results
      - Uses tables and graphs to support your argument
    - Gives your interpretation of those results
      - *What do results tell me about my objective?*
        - *Do they confirm theoretical expectations?*
        - *If not, Why not?*



Document Back Matter

Review of the Requirements

Appendices and Attachments (Pg 5)

- *Complete the report by attaching any useful appendix material as needed:*
  - Sample calculations
  - Derivation of an equation
  - Computer printouts
  - Raw data
  - Complicated formulas and equations needed to support the conclusions but not necessary to understand them
  - Tables of data that support the graphics used in the body of the report
  - Reprints from other documents

Review of the Requirements

Appendices/Attachments continued …

Do not put into appendices:

- Figures that show the apparatus
- Tables that give important results *(information reader needs to know)*
  - Large amounts of important tabulated data should be summarized into a smaller table(s) and placed into the main body of the report
  - Reference to this larger mass of data is made in the main body of the report when discussing the data in the summary table(s)

Review of the Requirements

Tables and Figures continued …

(Board for Upper Classmen)

Rules for Tables and Figures:

- Refer to every table and figure in the text.
- Give the reader some idea of what the table or figure contains
- Locate the table or figure as close as possible <u>following</u> the reference.
- Give each table and figure a descriptive title.

Review of the Requirements

Tables and Figures continued …

Requirements for Tables:

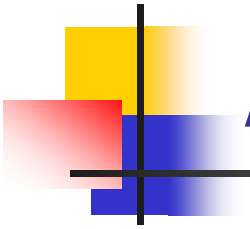
- Capitalize the **T** in Tables
- Table numbers and titles go above the tables
- Capitalize the first letter of each word and all other words except: articles (a, an, the), conjunctions (and, as, but, if, or, nor) and prepositions (at, by, for, in, of, off, on, out, to, up)
- Tables in the appendices contain the letter of the appendix, for example, Table A-1.

Review of the Requirements

Tables and Figures continued …

Requirements for Figures:

- Capitalize the **F** in Figures
- Spell out Figure **don't use "Fig."**
- Figure numbers and titles go below the figures
  - Figure titles are treated as sentences.
  - Capitalize the first word in the figure title
  - All other words except proper nouns are in lower case.
  - Put a period at the end of each figure's title.
- Figures in the appendices contain the letter of the appendix, for example, Figure B-3.



Review of the Requirements

See sample handout Appendix A

- *Abbreviations:*
  - Be consistent, for example:
    - *Don't use **sq ft** on one page and **ft2** on another page*

Review of the Requirements

- *Numbers: (Pg 6)*
  - Spell numbers one through ten and use numerals for 11 or greater
  - Exceptions to this rule:
    - References to pages, Tables, and Figures are expressed in numerals
    - Numbers at the beginning of sentences are spelled
    - Use numerals with abbreviated units of measurement
      - For example, 8 mm, 9 cu ft
    - When expressing a series of quantities, express them in numerals for uniformity, i.e.
      - The farmer shot 23 quail, 16 sheep, and 2 traveling salesmen

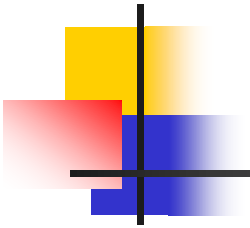
Technical Memo Format

- **Equations**:
  - Center equation on its own line

    Number equation in the right margin of that line, i.e.

    $$wavelength = 300/\lambda \ MHz \qquad (1)$$

    where λ is 28.185 MHz …
  - Put equations in body of report and the work into an appendix



Technical Memo Format

- Helpful Hints -

Write in the Active Voice

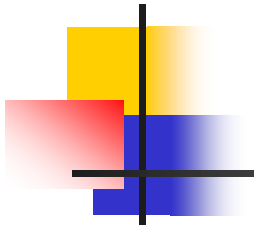
*Write in the **active** voice. It forces clarity in your writing …*

Write in the Passive Voice

(Procedures)

*Selectively write in the **passive** voice.*

It facilitates objectivity in your writing …



- Do Not Write in the 1st person

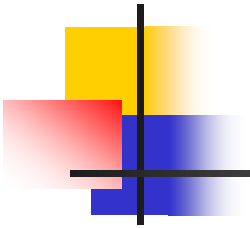
Writing for Clarity

Vary sentence length and use an economy of words.

Example of a published 82 word sentence taken from a document:

> *Due to the fact that the production of reports involves considerable cost to our organization, it can easily be seen that the reduction of the time spent in writing and reading them, a shortening of the reports themselves, would represent an appreciable gain in reducing our general operating expenses, although the matter of length of the report should naturally be considered in relation to the complexity of the material and its adequate coverage keeping in mind the requirements of the specific situation**

* Raman, Meenakshi and Sharma, Sangreeta, *Technical Communication: Principles and Practice,* Oxford University Press, New York 2004



Writing for Clarity

*Fix wordy sentences by:**

- *Highlighting the key words*
  - Look for redundancies
- *Organizing the words/information in order of importance*
- *Write short concise sentence.*
  - In the active voice

*Moran, Lectures in Information Theory CoM UMass Lowell, 2009

Writing for Clarity

Highlight the important words in the message:

*Due to the fact that the production of reports involves considerable cost to our organization, it can easily be seen that the reduction of the time spent in writing and reading them, a shortening of the reports themselves, would represent an appreciable gain in reducing our general operating expenses, although the matter of length of the report should naturally be considered in relation to the complexity of the material and its adequate coverage keeping in mind the requirements of the specific situation**

*Moran, Lectures in Information Theory CoM UMass Lowell, 2009

Writing for Clarity

Fewer words … clearer message …

Report production is expensive.

We must shorten them relevant to the report's requirements and content complexity. By shortening the time spent writing and reading reports, we reduce the organization's operating expenses.

Thirty-one words in three sentences, longest sentence 16 words

Writing for Clarity

Fewer words … clearer message …

- *Our office has been provided with the authority to make a determination about the selection of a computer system.*

Writing for Clarity

Fewer words … clearer message …

- *Our office has been provided with the authority to make a determination about selection of a computer system.*

  Rewritten

- *Our office was authorized to select a computer system.*

Writing for Clarity

Make passive voice active to clarify the message !!!

- *Delegation is a means of lessening the manager's workload*

Fewer words and to the point:

- *Managers who delegate reduce their workload*

Writing for Clarity

Fewer words … clearer message …

Keep sentence subject and verb close together.

Use a high verb-to-word ratio.

"The more verbs in a sentence, the sharper and more direct the sentence"*

* Houp, Pearsall, Tebeaux, Dragga, *Reporting Technical Information, Oxford University Press, New York, 2006*

Writing for Clarity

Verb ratio examples:

[verb/word ratio = 1/12]

Mary's inheritance of money was one of the reasons for John's interest in Mary.

better

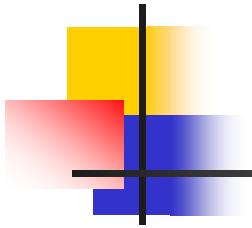
[verb/word ratio = 2/7]

John loves Mary because she inherited money.

Writing for Clarity

Before you hand in your first draft:

- *Follow the writing tips in the "Guidelines"*
- *Use the suggestions in Appendix A*
- *Use the check list in Appendix B*



- Questions -