Chapter 6

Technical writing and publishing

Importance of Writing

New knowledge is something that can be read by someone else. Writing communicates thoughts, ideas or new knowledge and is the only primary method by which a researcher is known to the community. Writing is not only about communicating ideas, but the creative discovery and an integral part of the research process.

Technical writing is integral to research methodology and it is connected to a variety of documents related to various aspects of engineering, and can be grouped into four major categories:

1. Reports and communications
2. Technical papers, articles, and books for purposes of education, teaching, and information sharing
3. Patents
4. Operational manuals, instructions, or procedures

★ **Free writing and mining for ideas**

During a writing process, generally two processes occur i.e the creative part which is trying to give idea or insight on something and the critical part which gives verdict on whether the written work sounds correct or not. Free writing is a technique where researchers only focus on the creative part and write thoughts, discover new aspects, and combine those thoughts & discovery to generate new ideas without worrying about the critical analysis of the writing. After creative writing is done, it is followed by the critical analysis part to keep the good & main idea, filter out unwanted parts, and highlight promising findings for future Investigation. The raw thoughts are mined to extract meaningful ideas and questions that are drafted in the format which can be read by others.

★ **Attributes and reasons of technical writing**

The message conveyed from the technical writing should be understandable and it is important to understand the readers as well. It should be backed up by some

supporting evidence which must support the message of writing. If the evidence is not supportive enough, including it may dilute the core message for the reader.

Technical writing in Engineering deals with a structured and formal writing on a specific topic with the objective of sharing useful information or technical knowledge concisely while citing contributions of others. It should clearly explain what and why including research reports and recommendations. Grammatically, it should be written using third person pronouns, should state message in fewest words and must follow the structured approach of organized sequence consisting of (i) Introduction, (ii) Procedure, (iii) Results (iv) Discussion (v) Conclusions, (vi) Recommendations or Future Work, and (vii) References

★ **Writing strategies**

The writing strategies of a technical paper mainly consists of three fundamental elements: **Readership**, **Scope** and **Purpose & objectives**.

The written document should emphasize more on the intended readers so that there is no communication gap and thus increase the fruitfulness of the work. It should be within the boundaries of the research domain and clearly consider the factors like: Number of ideas/experiments/studies, Depth of writing, and Level of detail with a clear understanding and statement of the purpose and objectives of the research work. A good research document should contain useful and meaningful information within the research domain with the targeted audiences in mind. It should be free from plagiarism and use of online technical writing tools would be a plus point which allows supervisors to comment on the manuscript. The document should be supported by required data and illustrations to catch the attention of the readers. Using catchy lines for starting paragraphs would be a good approach for that. While using one's own work, the researcher should be polite and not use superlatives of praise.

★ **Language Skills, Writing Style, and Editing in technical writing**

- The overuse of complex words or jargon should be avoided.
- Sentences should be neither too short (presents a choppy type of writing) nor too long (difficult to read)
- Spelling or punctuation errors can destroy perfect technical document and the reviewers may question the credibility of the work
- Proofreading by a trusted peer is the best way to correct grammatical errors

- Writing style should reflect mannerisms in the consistent and unconscious choice of words, sentence formations, the alignment of ideas and thoughts to create a document that meets its stated goals
- Special attention should be given for paragraph construction
- Successive sentences with “Our”; should be avoided to present authors contribution and repeated use of the word “our” should be avoided

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★ Rules of mathematical writing

Mathematical writing should follow the specific and consistent rules while writing equations and should avoid the habit of using inappropriate words like “Thus,” “Consequently,” “Therefore,” or “So,” in the starting of the sentences. The rules include appropriate representation and separation of symbols and removal of extraneous brackets from formulas which are distracting and should not use long formulas to create unnecessary confusion.

★ Publish Articles to Get Cited, or Perish

Research methodology should include the ways and means of appropriate publications, because **what is not published is as good as not done**. The publication process should include the steps as follows: (i) **Submission to an appropriate outlet**, (ii) **Review reports and editorial decision**, (iii) **Submit revised version**, or **select alternative journal for submission**.

The choice as to where to get the paper published is another important consideration. Specific journal-related factors like (i) **time to publication and/or decision** and (ii) **circulation among the relevant community** are important attributes to consider. A researcher should note that the idea is to submit a final manuscript, not a first draft.

Chapter 7

Contributions, Arguments, and Dealing with Criticisms

Several factors like contributions, ability to make convincing arguments, dealing with criticism and the distillation of the feedback adds the degree of effectiveness in the research output.

Argument is the central claim to ensure the integrity and state the core findings of the research. It plays a fundamental role in the actual research design process. Arguments in the research would never end and "**why this particular statement should be accepted**" type of challenge may repeat again and again but a good researcher provides adequate reasons and the conclusion might add a new body of knowledge which does not need further justifications. The verification of the new knowledge further requires strong arguments to provide the **evidence and how that evidence is arranged.** The two most common types of arguments are **inductive and deductive** arguments. Argument may not always succeed and the reasons for the failure of the research arguments can be (i) an **insufficient foundation** when attacked fails, and then everything that was built upon it fail as well, (ii) **good evidence that is irrelevant**, and (iii) **not matching the scope of the claims** to the scope of the evidence.

Research contributions involve the addition of new knowledge that is beneficial and accepted to the community or customers. Conducting and completing the research does not always mean that a contribution or new knowledge has been created but instead it should be verified by the **community.** The availability of good evidence, conclusions and reasonable arguments is not always sufficient to claim the new knowledge unless it is accepted by the beneficiaries.

Dealing with criticisms is another significant part of the research process. Most researchers face criticism at some point, being able to accept criticism **assertively** is the key quality in the career of a successful researcher. Criticism can arise from the **reviewers**, **research advisers,** and **research lab managers.** The ability to take criticisms from the reviewers or advisers as an opportunity to improve and taking

criticism positively is the key quality of a matured researcher. All attempts should be made to ensure that criticism is not taken personally but should be a catalyst for improved future behavior in order to gain the maximum advantage from the feedback.

The feedback from the criticism should be distilled out and always use them for one's benefit. The main rule of thumbs here are as follows:

1. Detach the criticism from associated ambiance: It is natural to be defensive when insulted but should accept this assertively and check it if that can be used for personal growth
2. Filter out the actionable and repeatable items from the subjective opinions
3. Never miss those useful parts and taken an opportunity to turn specific and actionable tips into the measurable goal
4. Take criticism as an opportunity to get better and possibly surpass even the critic