

## Chapter 1 Motivation

A laboratory report assignment is a typical school assignment intended to help students develop their skills at technical writing. Technical reports are very important in the professional world of engineering; it's the primary means of technical communication. During my own 15 or so years in industry, much of that time was spent developing technical reports of various types. The pervasiveness of the computer in the present day has not changed this. In fact, written reports are likely to have greater circulation, and affect your career more, now that the internet has provided a vehicle for wider and less expensive distribution.

The writer of a technical report needs to consider who he is writing for. Is it for the Senior Technical Staff, Financial Folks, Customer Engineering, Software Engineering, or System Engineering, some particular client, or a prospective client? Or, perhaps some combination of those audiences? In the case of a student writing a laboratory report, the recipient of the report is the instructor of the course or laboratory section. That is somewhat of an artificial situation, since the intent of the exercise is educational rather than to provide technical information of vital interest to a company or its clients.

I recommend that you view your laboratory assignment as an instance of “role-playing.” You are assuming the role of a junior engineer in a company that is trying to develop new products or technology, and needs the information your experiment or prototype design may provide. That information would be used to inform decisions by management whether to take the approach or use the principles developed and tested in the laboratory exercise. So, the audience for your report includes management, which in industry would be your boss or your boss’s boss, and the more senior technical people who advise him or her based on your report. Thus, you are writing for technically informed people who are competent to understand what you are writing about, but have limited time available for review. Your instructor is, in effect, role-playing that audience. In the world of business and government, reports come in many varieties, and the roles suggested above are just one of these. But for purposes of both learning the technical material in your courses and in writing and interacting with your instructor in a professional way, this “junior engineer” role should be helpful.

A technical report typically has several purposes, some explicit, some not. Each purpose is described in some detail below:

- Convey information
- Convey methodology to allow checks for correctness
- Convey methodology to allow repetition
- Demonstrate competence
- Impress Superiors

## **1. Convey information**

As your top priority, you want your technical report to convey the most important information to come out of a project. This is the "bottom line" that management looks for first. Does the prototype work? Should the new design be incorporated into the product line? Will the new method save money on parts or labor? The busy executive is unlikely to read the whole report. He will look at the abstract (which should summarize what the report says) and might look at the Conclusions and Recommendations sections. He's trusting that all the stuff in the middle is correct. Someone else will let him know if it isn't. The executive is really the "customer" for the report; he's the one that will or won't act on the information.

## **2. Convey methodology to allow checks for correctness**

A second important role of a good report is to convey your methodology so someone can check it against theory or for procedural correctness. This will likely be done by the executive's senior technical people, and perhaps your professional peers (and perhaps rivals). These folks will look at how you did the work reported in the report. If it is incompletely explained, or wrong, they have the responsibility to let the executive (your boss or your boss's boss) know before a decision is made based on what you have done. If what you have done contains a major error, this likely will have job security repercussions. If it is poorly written or incompletely explained, you will have to rewrite it (and possibly miss the deadline for having the report in, also with possible consequences).

## **3. Convey methodology to allow repetition**

Your methodology also needs to be sufficiently clear that someone can check your results by repeating your analysis, experiment or prototype. If the decision or issue is important enough, your results need to be checked by someone else repeating your work, possibly using a different technical approach or tools. Thus, your procedure and results need to be complete enough so that this can be done. If it is a circuit, for example, all of the equipment and parts need to be completely specified. It just might turn out that, for example, your power supply was different from the usual, resulting in abnormal results that affected the outcome. This kind of checking is intended to verify the results.

## **4. Demonstrate competence**

You would like to convince others that you are competent in doing the project. The professional tone and the presentation of results will impress those reading it that you were methodical and comprehensive in your approach, or not. This is somewhat independent of the actual procedure and results, since good work poorly presented will cause the reader to distrust the conclusions. Your boss will use what he learns about you in reading your reports when it is time for him to do performance evaluations.

## **5. Impress superiors**

Closely related to the above, a report is a major opportunity to impress others, especially senior technical people in your company, with your competence, insight, and cleverness. If the report is on a project you proposed or suggested, it is all the more important. This is how you sell yourself and build confidence in your value to the

company or organization. It also gives you the chance to recommend effectively a technical approach or project that you want to do, and which may ultimately lead to your career being more rewarding.

A school laboratory report, especially a formal report, should be developed with those same goals in mind. The abstract and conclusions should be concise and explicit. What was the point of the exercise? Did the (prototype) circuit or system work? Did it do what was expected? Are there recommendations that should come from what was learned? This is the kind of bottom line information the executive expects.

At the next level of detail, in the background, procedure, and results sections that make up the body of the report, is there enough detail to understand the principle of operation, how the circuit or system was built, what the conditions of the testing were, how results were obtained, and exactly what the results are? You don't need to put in more detail than a competent professional would need. For example, a good schematic will convey exactly how to build it, unless there are some additional details, such as the physical relationship of inductors to prevent coupling, or shielding necessary to minimize noise. Too much detail can be insulting to the technically competent reader. Always ask yourself if someone could repeat the exercise and get the same results by following the procedures described in your report without talking to you about how you did it.

Be sure to use a professional style. Use figure and table titles, numbers, and callouts. Put peripheral details in appendices. Be sure diagrams and figures and equations contain all the information necessary to follow the work or derivations step by step. It's usually best to use third person, passive voice. This makes it sound like the experiment or project did the work all by itself. It removes "I" from the report. That's a good thing. In technical research, it should not matter who did the work; the results should be the same. That's the essence of good science or good engineering. You are not claiming a magic touch. If it is a good report, and well done, people will notice who wrote it.

I hope this helps provide a bit of insight into why these laboratory reports are important, and how they relate to what you are likely to find yourself doing later in your professional journey.

The following two chapters describe how to go about writing a lab report. Chapter 2 focuses on the process: what to do first, then next, and so forth. Chapter 3 focuses instead on organization. There is a fair amount of overlap. For a simpler report, you could just follow the process in Chapter 2, and refer to Chapter 3 for a fuller explanation where necessary. For a more complex report, it's good to think long and hard about organization first. Read both chapters. The following chapters address style and other details of the report, including what to do if things don't work. Finally, there are several appendices that provide additional details, including example reports.