Appendix K The Business Context: It's About Money

Here's another perspective on doing good reports. Ultimately you are supposed to be preparing to be an engineer in industry, or some comparable position. What kind of money do you expect to earn? Let's say $50,000 a year. After all, you need that to buy or rent someplace to live, pay for a car, utilities, food, some travel, and maybe even support a family sometime down the road. But, in addition to that sum, your company has to pay their share of social security, retirement, medical benefits and such, so your salary actually costs them $65,000 typically. They also have "overhead" expenses of the office you work in, your computer and equipment, the utilities, the secretary that works for your organization, the accounting department, lawyers, and so on. A typical overhead rate is somewhere from 50% to 100% or more, depending on the nature of the business. Let's say 75%, so it costs about $114,000 per year to employ you. The company's client, who hires your company to do work for them, has to pay on top of that a fee, that is, the profit that goes to the shareholders that actually own the business. That varies too; let's say 10%. So, it costs right about $125K to the client, per year, for the work you do. At 52 weeks a year, less 3 weeks vacation, and a week of sick leave, the client pays for about 1920 hours per year at 40 hours per week. That's about $65 per hour. Your work will also need to be reviewed by someone more senior, your manager and perhaps a senior engineer, who also will be paid from the same contract. They cost more than you do, so if their labor on this job comes in at just 10% of yours, and their cost is double. That adds $13 per hour for a total cost to the client, for the work you do, of $78 per hour. Now, ask yourself this: "Am I going to be worth somebody paying $78 per hour for my work as a starting out engineer?" Or, "What do I need to be able to do to justify somebody paying $78 per hour for my time, and hopefully a lot more than that later?"

You will have to be able to do more than just follow directions. You have to be able to think about the overall job that's to be accomplished, and do your part as constructively as possible. Your goal is that your value is seen as worthy of more pay than you are now getting. You should not be going back and having to tell your boss that the reason your work was deficient, or your component failed, was that he didn't give you adequate direction. That's blaming him for your failure. If he has to spend a lot of his time more closely supervising you, say 20% instead of just 10%, and his pay is a lot more than yours, your time becomes much more expensive. Maybe so expensive that it's not worth paying for. So, always try to think as deeply as possible about what you are doing, and how it fits into the grand scheme of things.

Here's an example from a typical introductory laboratory exercise. Say you were measuring Voltage and Current waveforms for a resistor. You ultimately plot a Voltage waveform with a peak value of 16 mV, and a current waveform with a peak value of 1.9 Amperes. The two are in phase, so the peaks occur together. So, is that it? Time to go on to the next part? No! Think about it. If V=IR at any given instant, as it should be, since the resistor does not store energy, then you can use V and I to find R. Dividing gives 8.4 mOhms! Now, is that the actual resistance of the resistor you were using? No! It was about 1.2 K Ohms! So, something is wrong! You don't want to report without thinking about this, and correcting whatever is wrong. Ignoring or continuing after

getting an obviously wrong answer like this conveys that either you don't think or you don't care. Neither inspires confidence that your work is worth paying for at a rate of $78 per hour.