Brad Garrod

Self-Assessment Report

Learning objectives and how they were solved:

1. *Describe various forms of technical communication and the reasons for using them;*
   Technical communication was essential in success in this semester and was shown in a variety of manners, including the application note, the written proposal, both the proposal and technical presentation, and many technical meetings with the facilitator throughout the semester. The items listed above were mainly to gain knowledge on where the group was in regards to success in the project, whereas the facilitator meetings were both insight to her on where the group was as well as giving insight as to what needed to be improved upon or items to consider.

2. *Write well-organized technical reports;*
   Well organized reports came up time and time again throughout the semester, both in individual and team efforts. The inclusion of many different varieties allowed for different concepts to be understood about what needs to be included in the variety of

3. *Write a team proposal for a major design project and obtain approval;*
   Completion of a design project proposal was very essential in the Air Force team's objectives since not only was approval from the facilitator and university was needed, but also the Air Force. This was completed early on by dividing the proposal into a part for each team member and adding all of them into one document. This proposal was initially declined by the Air Force because of a lack of budget; however it was more of a learning process rather than a disadvantage because of the lesson on being precise and thorough on something as important as a proposal.

4. *Comprehend appropriate content and style of oral presentations;*
   Presenting both technical and proposal presentations allowed the understanding of both content and style in two very different presentations, where the proposal presentation particularly gains further knowledge and sells someone on the presentation, where the technical goes into great detail about a particular topic.

5. *Access relevant standards and interpret their meaning and application;*
   This semester presented the challenge of many relevant standards, especially while working with the Air Force Research Laboratory. Right away when sensors were trying to be shipped to us there was a long process between the government shutdown and the standard in itself to get any government property to an outside of the laboratory itself. Since the government shutdown lasted a while, by the time we got to speak with the suppliers again and their estimated time of arrival of the product it was too late, and other sensors had to be purchased. The standard of getting material from a governmental association was learned to work with and around.

6. *Delineate the principal design criteria and constraints for an electrical or computer engineering design project—e.g., cost, size, power, environmental factors, reliability, safety, maintainability, and reusability;*
   For the particular project assigned to the group, the main constraints that we worked on were reusability, environmental factors, maintainability, and power. These were directly affiliated with our project and our main focus, since this was supposed to be a developing project over the next few years with the Air Force Research Laboratory to be reusable. Environmental factors and maintainability were the literal constraints of our project, as we were determining the ease of

maintaining these sensor networks corresponding to environmental factors that could affect these sensors. Other additions, the cost, size, reliability, and safety were minor constraints on our project, however were still always being considered when choosing the sensors and getting the best sensors that we could for the project.

7. *Describe and understand the overall engineering design process—e.g., project justification, identification of constraints, establishment of design criteria, establishment of timetables, identification/scheduling of critical path, the partitioning of work, project monitoring, and project evaluation;*
   Between the lectures on the overall engineering design process and the actual implementation of such a process, the understanding and implementation of this was essential to success in the project as a whole. The project justification, identification of constraints, and establishment of design criteria was done in combination with the Air Force Research Laboratories contact with us in a phone conference call there was early on in the semester. Based off of that information we were able to establish timetables, critical paths, and partition the work. Throughout the rest of the semester tri-weekly meetings after class plus any additional meeting times allowed for continuous project monitoring and evaluation.

8. *Describe and understand contemporary industry practices and trends with respect to electrical and computer engineering;*
   The six sigma lectures that were presented in the middle of the semester helped understand what seems to be the most contemporary industry practice. The six sigma practices are especially important in certain areas that are high manufacturing and need to be as lean as possible, especially with expensive parts.

9. *Describe, understand, and apply key tools used in the overall electrical and computer engineering design process;*
   Understanding an engineering design process is essential to in any successful career in engineering, and the voice of customer lecture helped further understand certain design principles and tools. The application of this knowledge throughout the process solidified what was understood in that lecture, especially in understanding customer requirements and specifications that can be presented from the customer. These were applied in every further meeting with the supplier facilitator when trying to understand what needs to be accomplished throughout the design process.

10. *Understand the benefits and potential problems of teaming, describe qualities and processes of effective teams, and describe the role of teamwork in system design;*
    Understanding how to successfully work in a team was essential to this course, since the sheer process and amount of work needed for the project would be unreasonable to be completed by anything less than a team that is all working in parallel, but understanding what each other are doing. The potential problems of teaming were easily avoided by good management in the group and also knowledge of the process, which also then ensured the understanding the role of teamwork in system design.

11. *Acquire and understand information contained in contemporary technical literature—e.g., trade journals, magazines, books, conference proceedings, and supplier literature—about hardware components, software, design tools, third-party suppliers, etc.*

There were many concepts that were unknown at the beginning of the project, but were essential to know to successfully accomplish our given task. To do so, reading and understanding many contemporary technical literature was used to not only make the correct justification in a sensor purchase, but also understand many different communication protocols, RF energy harvesting, and other concepts vital to the success of the project.

12. *Browse the web to acquire information about electrical and computer engineering, software, design tools, third-party suppliers, etc.*
    Similarly to understanding contemporary technical literature, most of these findings were online and thus were required throughout the project to search online for not only information, but more importantly liable information. It is very easy to find anything desirable online, however the limiting factor in such research is the trust factor as far as finding information that can be used with confidence. This requires enough dedication to finding a liable or multiple liable sources for any piece of information that is found.

1) In the project proposal my technical task was "Network Firmware Configuration" and "Software Algorithm Development", although these were no bounds by any means throughout the semester. In the initial stages of the design project my portion was to configure the sensor network to retrieve and process correct data. However, this changed upon obtaining a pre-configured sensor network, making this portion very simple. This now consisted more of installing software and simple configurations of the device to work with our laptop. The software algorithm development role looks further into correlations between the data and how we can use the different parameters to determine a failure of a node, or more often in our case, when the radio frequency signal is not reaching the sensor node to be charged. Not only was this found from correlations between distance between packets sent, signal power, and power dissipated in the circuit, but also comparing that to an average from the gathered data. This relative averaging correlation was also used to determine when sensors were malfunctioning. For instance, if a sensor has been displaying 20 degrees for an hour, then 90 degrees for an hour, this can be qualified as suspicious behavior that would require attention to the sensor.
   There were a lot of constraints with this part, especially since we could not find an easy way to make the sensors on the board fail to check power dissipation and resulting incoming packets from failed sensors, mostly for cost reasons. Since this was something that was difficult to work around, the magnitude of correct data that was gathered had to increase so although we don't exactly know what information we would get if it did fail, we would know when it's not the correct information.
2) The first technical communication that was prepared was a proposal to the Air Force Research Laboratory to get approved as quickly as possible, since we needed to get approved by the Air Force, not just our class. For this, the paper was divided out into four sections and I was in charge of proposing our technical approach to the project, outlining a background to our sensors and why we are choosing them as well as the reasoning behind the algorithms we are using. Following this, a final proposal was constructed where I focused on improving the technical approach, helped with the feasibility matrix, and also assisted in constructing a test plan. In correlation with the final proposal was an oral presentation regarding our proposal, where I discussed collecting metrics and creation of the graphical user interface. The next technical communication completed was an application note, which I did about creating a successful and simple graphical user interface (GUI)

using Tkinter, since by that time in the semester I had decided to help David Rogers with that aspect of the project. This outlined what a GUI was, very basic aspects of how a GUI needs to be constructed, as well as how it will be implemented in our design. The next technical communication that was done was the design issues paper, where I focused on how partnering with a governmental group hindered our retrieval of sensors as well as took a lot of time for any sort of information to be passed along or received. The last technical communication was our technical presentation, given about energy harvesting, particularly in the radio frequency realm. My main section of this presentation was talking into further details about radio frequency energy harvesting , why it is used, and how it was applied into our sensor nodes.

3) This course did not greatly affect my future career objectives and goals in a matter of change, but further solidified what I have had in my career and professional goals. For instance, once I found out I was going to work with radio frequency circuits and sensors I started gaining as much knowledge in this field as possible, which solidified the fact that I really desire to be a lifelong learner, especially in pursuing a masters soon after college. This project also helped to show further on how a design process works, solidifying that I would love to work in the research and design phase of any project.
4) From what I have seen throughout the years, my biggest strength is never be satisfied in where I am in any situation. Although I do give myself credit and praise where it is due, I always look for ways I can improve upon my work and not only make me a better engineer, but make any product I have a hand in that much better as well. This has allowed me to strive for very high goals since these goals are always in my foresight when doing any work.

   My primary weakness is my lack of very applicable work in an electrical engineering standpoint, since I am a computer engineering major and had a number of programming internships and work throughout the years. This has taken away a few of the circuits classes I wish I would have taken, however with my drive to learn more I believe that I can gain this within a few years of working in a professional standpoint.
5) After graduation I am working as an Advanced Quality Engineer at Stryker Corporation in the Instruments division working on micro-drill department. In this role I will be analyzing circuits for failure detection and possible improvements to be made before the final build of the circuit. Over the course of the next five years I would like to extend my degree to a Master's in Electrical Engineering and proceed into the Research and Design department at Stryker. I have always wanted to be in the research and design group at a company, so working as a quality engineer will allow me to reach this easier.
6) In order to achieve this goal I need to take the work I do as a quality in a learning manner rather than just completing the projects assigned so I can learn from the circuits that the research and design group have designed. In association with this, extending into my master's degree will allow my knowledge to increase into a path that will allow me to be a research and design engineer. In accompaniment with this, taking extra time to have extra meetings and get to know engineers in the research and design group will allow my learning to increase throughout the entire process. Adding all of these steps together will make achieving this goal within five years not necessarily easy, but I will be in a better place than if any of these were not present.

Brad Garrod

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OBJECTIVE

Obtain a full time engineering position in the field of electrical and computer engineering

EDUCATION

Michigan State University **December 2013**

East Lansing, MI

- Bachelor of Science, Computer Engineering, Biomedical Engineering Concentration
- Dean's List **Spring 2010, Spring 2011, Fall 2012**
- GPA 3.51/4.0

SKILLS PROFILE

- Programming Languages: Python, C++, Perl, Matlab, FAMOS, LabVIEW, VHDL
- Electrical Engineering Knowledge: Circuitry analysis with lab (2 yrs), digital logic fundamentals, VLSI
- Other related skills: Simulink, Linux, Microsoft Office, Adobe Photoshop & Premiere, Blender

EXPERIENCE

System Z Millicode Intern **Summer 2013**

IBM, Poughkeepsie, NY

- Translated and updated code from Perl to Python to parse data and create a JSON dump
- Optimized performance of script to parse through data dumps of over three hundred thousand lines
- Learned about basic System Z processor hierarchy and how it applied to each particular division

iCER Student Intern **August 2012 – May 2013**

Institute of Cyber Enabled Research, Michigan State University, East Lansing, MI

- Supporting the needs of the High Performance Computer through software and hardware reinforcement

Test Lab Engineering Intern **Summer 2012**

Stryker Instruments Test Lab, Portage, MI

- Designed and constructed a test fixture to test lifetime of surgical helmets' electrical components
- Developed a corresponding LabVIEW program to control a power supply and NI equipment for the fixture
- Processed validation and qualification documents of test lab fixture components
- Composed meetings and presentations on design ideas, updates, and changes

Research Assistant **January – May 2012**

Hydrogeology Department, Michigan State University, East Lansing, MI

- Translated Microsoft Visual Basic code for research to Matlab Code in a suitable manner

EMSP Intern (Eaton Multicultural Summer Program) **Summer 2011**

Eaton Corporation, Clutch Division, Galesburg, MI

- Programmed code in Matlab to run Simulink models, predict clutch temperature, and further analyze data
- Constructed histogram models based on data that was procured to assist in predicting clutch life
- Assembled script to fluently update truck information to check if transmission algorithms are correct

ACCOMPLISHMENTS & ACTIVITIES

- Michigan State Spartan Marching Band **– Band President (1 yr), Section Leader (2 yrs), Squad Leader (3 yrs)** **2009-present**
- Spartan Brass **2009-2013**
- Audio Enthusiasts and Engineers – **Team Leader** **2011-2012**
- Jazz Orchestra **2009-2011**