Production Model Design Report

F2019 – ECE 298

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| Lab Section: | 5 | Group: | 4 |

[For your project, your group will complete one Production Model Design Report. The audience is your manager and the manager of the Production Engineering team, so the document should be of high quality. Inside this report, you will each individually select two issues that must be addressed when bringing a project to production scale (one STEM and one non-STEM issues – choose different topics than your partner). Delete all the instructions in brackets before submitting this document. Use IEEE format to note any relevant references or links [1]. You do this in Word by going to References 🡪 Citations & Bibliography 🡪 Manage Sources to add a source, and then to Insert Citation to use it.]

# Team Members

|  |  |  |
| --- | --- | --- |
| # | Name | Role |
| 1 | Robert Daniel Toyonaga | [A brief description of your contribution to the team.] |
| 2 | Zain Denno |  |

[Below is an example of a fictional project. Replace the text with your own.]

# Design Overview

## Problem Statement

[Paste the problem description that you chose to pursue from the provided list of problems. You can edit it as you see fit.]

Autistic children sometime have trouble getting the attention of their parents and caregivers, especially those with verbal impediments. Conversely, parents and caregivers are often worried about leaving their autistic child unattended for fear that they will not know when the child needs their attention. Design a solution to this problem that includes at least one sensor and two indicators.

## Design Scope

*[Describe, at a high level, how you solved the problem within the scope of the course.]*

This project solves the problem by giving autistic children a non-verbal means of acquiring their parents’ attention. The solution consists of an ergonomic enclosure with a limited set of buttons that cause their parents’ and caregivers’ smartphones to notify them that the child needs attention.

*[State any assumptions that appropriately limit the scope of the project.]*

It was assumed that the device will operate in a home with reliable Wi-Fi, that the child is at least three years old, and that the child can hold objects.

## Project Design Requirements

[Paste the requirements that you developed and modified from your Feasibility Model Design document.]

1. The device must not be prone to accidentally turning it off
2. The battery must last at least one month while on
3. The device must remain connected to the internet via Wi-Fi
4. The enclosure must be easy for a child of age three and older to hold
5. The enclosure must have an easy means of securing it to a child so they don’t lose it

## System-Level Design (High-Level)

[Include the updated/corrected figures from your Template for Feasibility Model Design document and add appropriate figure captions to explain what each one is.]

## Completed Prototype

[Include one or more pictures of your completed prototype system and add appropriate figure captions to explain what each picture shows.]

## Preliminary Production Design Changes

[Identify any simple enhancements or improvements that should be included in a future revision of the product.]

# Member 1 Production Details

[Robert Toyonaga] – ID# [20663611]

## [Cables and Connectors]

[Replace heading with one of these topics: Design for Test (DfT), Design for Manufacturability (DfM), Design for Reliability (DfR), Cables and Connectors, Mechanical Enclosure, Further Integration.]

[Write one paragraph explaining the topic.]

Cables and connectors are what parts of a system need in order to communicate with each other. Cables allow for the flow of data and power to different parts of the system, and connectors are the interface that allow for incoming/outgoing resources. Often it is important to choose appropriate cables to maintain integrity of data signals or to carry large currents. For example, larger gauge wire (AWG) is required for the longevity of larger current applications and high-quality cables are required to maintain high internet speeds. Choice of appropriate connector is also an important design decision. For example, through-hole connectors often provide more mechanical reliability, while surface-mount connectors have a smaller footprint (desirable in some applications). Choice of connector can also allow or prevent compatibility with certain cables (USB-A vs USB-C).

[Write one paragraph explaining how the topic relates to your project.]

Since the my group’s greenhouse monitoring system project involves many sensors and servo motors (5 4 wired sensors and 4 wired motors), it is important to seriously consider cables and connectors. Currently, our system employs through-hole connectors that do not have mating housings. The absence of mating housings can make it confusing when attempting to correctly insert wires into the female connectors (which individual wire goes where?). For the average consumer, correctly wiring the sensors and actuators might be a challenge. This issue could be addressed by inserting the wires from sensors and motors into housings and choosing appropriate connectors. Mating connectors and housings would eliminate the guess work that might be associated with the average consumer attempting to set up the system by themselves.

[Propose a high-level set of next steps and state any thoughts or issues that should remain top-of-mind for the production engineer who will take your prototype through to a production-ready product. Refer to any codes, standards, or parts that should be noted by the engineer.]

In terms of next steps, new connectors and mating housings should be chosen. The JST XH series connectors and housings might be of interest because of their ubiquity in common household electronics and small footprint. These new connectors should replace the servo motor and sensor connectors on board. Additionally, the wires in the sensor cable harness should be crimped into the JST XH series housings. This will make the presentation of the system much cleaner and more intuitive for an end user.

## [RoHS/Environmental Safety]

[Replace heading with one of these topics: Energy Efficiency, Sustainability, Supply Chain Management, Cost Analysis at Volume, RoHS / Environmental Safety, Ethical Considerations, Safety Considerations.]

[Write one paragraph explaining the topic.]

RoHS stands for restriction of hazardous substances. Products are said to be RoHS compliant and will be certified if they contain less than the amount of hazardous substances than outlined in the RoHS guidelines. Environmental safety is important because hazardous materials that are often used in electronics can pollute the environment and harm workers that make such electronic products. Companies with environmentally friendly images also become more appealing to consumers.

[Write one paragraph explaining how the topic relates to your project.]

Environmental safety and RoHS compliance is very relevant to our project. Our project centres around growing plants and will be in direct physical contact with the natural environment. As such, it is especially important that our project be RoHS compliant and environmentally friendly. Currently, our project is not RoHS compliant because leaded solder was used to create electrical connections on the PCB. In the field, this lead could contaminate the soil that our system is monitoring. This could have serious environmental consequences.

[Propose a high-level set of next steps and state any thoughts or issues that should remain top-of-mind for the production engineer who will take your prototype through to a production-ready product. Refer to any codes, standards, or parts that should be noted by the engineer.]

When this project goes into production, lead free solder should be used to create electrical connections and all components used should be RoHS compliant. This means that the solder joints used to connect components to the PCB should be made with lead free solder. The new connectors that are to be chosen should also be checked for RoHS compliancy. It might be especially important to ensure that no part of the sensor bundle (which contacts soil) be a risk to the environment.

# Member 2 Production Details

[Member 2 Name] – ID# [Member 2 ID#]

## [STEM Issue]

[Replace heading with one of these topics: Design for Test (DfT), Design for Manufacturability (DfM), Design for Reliability (DfR), Cables and Connectors, Mechanical Enclosure, Further Integration.]

[Write one paragraph explaining the topic.]

[Write one paragraph explaining how the topic relates to your project.]

[Propose a high-level set of next steps and state any thoughts or issues that should remain top-of-mind for the production engineer who will take your prototype through to a production-ready product. Refer to any codes, standards, or parts that should be noted by the engineer.]

## [Non-STEM Issue]

[Replace heading with one of these topics: Energy Efficiency, Sustainability, Supply Chain Management, Cost Analysis at Volume, RoHS / Environmental Safety, Ethical Considerations, Safety Considerations.]

[Write one paragraph explaining the topic.]

[Write one paragraph explaining how the topic relates to your project.]

[Propose a high-level set of next steps and state any thoughts or issues that should remain top-of-mind for the production engineer who will take your prototype through to a production-ready product. Refer to any codes, standards, or parts that should be noted by the engineer.]

# References

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| [1] | "IEEE Style," 2019. [Online]. Available: https://pitt.libguides.com/citationhelp/ieee. |

# Appendix – Detailed Design

*[Include design documentation here. The idea is for this document to be a fully detailed snapshot of the prototype. Include the four tables from your Template for Prototype Design document, schematics, layouts, code or a link to a repository, mechanical drawings, etc. I put a Section Break before this part, so you can put the pages landscape if that works better and it won’t affect those pages up front.]*