Senior Design 1 Final Report

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ECE405
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Table 1 Document Revision History

Revision	Date	For Revision Change(s) Reason

Contents

1 Introduction

2 Problem Statement

What is the problem that you are solving and what do you expect the project to accomplish?

2.1 Literature Survey

Review the Current Literature regarding your Problem Statement and Project Description. What have other people / companies done with respect to your problem statement and description? Provide at least five references.

2.2 State Customer Need(s)

Define Customers and Customer Needs. Who are the customers and what are their needs? Consider both internal and external customers. Internal customers are the users of the product while external customers are within the company(ies) developing, selling, and distributing the product.

2.3 Define Use Case(s)

Develop Use Cases that define the actions or steps taken by an individual to interact with your system. Who will operate the system and what must they be able to accomplish?

2.4 System Boundary

Define the System Boundary with respect to your project. The system boundary distinguishes between what you can control and what your system must interface with (i.e., can't control, but assume to be provided). Poorly defined interfaces are the number one reason for system failure! Define the information that is passed across the system boundary for each of the interfaces.

2.5 Interface Requirements and Definition

2.6 State Customer-Defined Constraints

Determine the Constraints and Given Parameters. A constraint or given parameter affects the selection of all or most of the Functional Requirements and Physical Solutions (PSs) / Design Parameters that your design uses. (i.e., weight, cost, size)

2.7 Requirements and Specifications

Translate Customer Needs to your design's Functional Requirements (FRs). A Functional Requirement establishes the design specification (i.e., what the system / product must be able to achieve) based on loosely defined Customer Needs (CNs) - (i.e., "easy to use"). An FR should have a measurable outcome (FRm).

3 Detailed Design

3.1 Product Design Map

Develop your high-level (to level 3) design decomposition. This is the process of taking high-level FRs and defining detailed PSs in a way that the design is predictable and the sequence and dependencies in hardware/software module implementation is known. Your knowledge of the sequence of module implementation is the consequence of applying Design Axiom 1: The Independence Axiom to Maintain Independence of the Functional Requirements.

3.2 Conceptual Design Alternatives

Develop Conceptual Design Alternatives (i.e., different Physical Solutions (PSs) / Design Variables / Design Parameters (DPs) to achieve the same FR (i.e., a solution-neutral requirement specification).

Conceptual Design Analysis may be based on (can use any combination of these approaches):

- **Pugh Concept Selection Matrix** (using FRs from decomposition as evaluation criteria) - the drawback is that the weighting criteria is subjective and results can often be biased.
- **Process Capability -** the drawback is that it requires time to build a detailed model (i.e., Computational Fluid Dynamics (CFD), Finite Element Analysis (FEA), solid model, etc.) and/or physical test to verify whether alternative PS1a, PS1b... PS1n is the best solution to FR1.[1] A capable process is the Consequence of applying Design Axiom 2: The Information Axiom to Minimize the Information Content (i.e., select design with highest probability of success).

3.3 Criteria for Selection and Testing Among Alternatives

3.4 Design Alternatives Verification Plan

3.5 Design Alternatives Validation Plan

3.6 Risk Mitigation

Develop a Risk Management Plan to help understand the potential risks along with a corresponding mitigation plan.

[1] Suh, Nam P. Complexity: Theory and Applications. Oxford: Oxford UP, 2005. Print.

4 Component Definition and Planned Build

5 Test Plan

5.1 Test Procedure

5.2 Physical Testing and Analysis

5.3 Full System Testing and Analysis

6 Cost

6.1 Bill of Materials

Define the Bill of Materials (primary emphasis here is to know what parts must go into your design) and an Estimate of Cost.

6.2 Cost Analysis

7 Project Plan and Timeline

- Develop your design and development schedule that includes both semesters.
- Define all activities leading up to key Milestones and Milestone Presentations.
- Define the date you will order materials prior to the conclusion of semester 1. Include in your report's appendix the receipts from ordering material (reference the BOM).

8 Conclusions

9 Lessons Learned

10 References

11 Appendix A - Design Process Decomposition

12 Appendix B - List of Tables

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13 Appendix C - List of Figures

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14 Appendix D - Proof of Purchase