

1. Project Information and Instructions

Please fill out the following information about the project.

Client Information:

Company:

Contact Name:

Contact E-Mail:

Contact Phone:

Project Title:

This rest of this document is reflective of the initial portions of the Project Report that students will complete for their Senior Design Project. It is imperative that, at the beginning of the project, students get a very clear picture of the project definition and specifications.

As the project sponsor (client), prior to the beginning of the school year, the client should complete the initial part of Section 2 - Project Definition – specifically Sections 2.1 - 2.3. When the client and students meet at an initial project meeting, the client will have an opportunity to better explain the details to the students and answer any questions they might have. The more that the client can provide to the students, the faster the students can begin working on the solution to the problem. The other sections in Sections 2 and 3 can be filled out by the client or may be left for student's to fill out *after* meeting with the client. That said, the client should be prepared to discuss these elements with the student team at the initial meeting.

The specification sections attempts to transform the project requirements into measurable criteria. It is helpful for the client to provide as much information as is known at the initial meeting. Each specification should have a corresponding test to validate the specification. The client must give some thought to what these tests might look like as they might require equipment or other resources that need to be provided by the client. Sometimes it involves a site visit to perform the test – this can take extra time and should be factored into the scale of the project.

To summarize – please fill out sections 2.1-2.3. The rest of this document needs to be filled out by either the client or the students working with the client in the initial month of the project.

2. Project Definition

This section gives a description and general overview of the project.

2.1 Problem Statement

Insert a concise description of the specific objective for this project. This should be 2-4 sentences long.

2.2 Stakeholders

This section lists the people who will be affected by this project, either directly or indirectly. This will include both users and non-users of the design. For each stakeholder, enter a new paragraph and give the description of the stakeholder and how this project impacts the stakeholder.

2.3 Project Requirements

ANYTHING that is a project requirement needs to show up here. There has been some confusion about the differences between the Project Requirements and the specifications. Generally speaking, we will say that the Project Requirements are the client's requirements for the system, whereas the Specifications are the engineer's more detailed interpretation that define the parameters of the requirements.

Sometimes the Project Requirements are nebulous ("the device should be easy to use") and other times they can be quite specific ("The device should fit into a 2 inch cube"). At this part of the design phase, we would like to clarify the nebulous statements (have the client change "easy to use" into "can be installed with one hand"), however, we don't want to get into the process of designing the system - just clarifying exactly what the client wants. Sometimes, we need to help the client to broaden their specific requirements to give us more design room. The customer might give us a requirement that is really a specification - like "multiple units should be screwed together using #6 screws." We need to understand what the customer is actually asking for. Are they simply saying "multiple units must be able to attach securely to one another," or are they saying that "multiple units must attach securely to one another in any order, and the bottom unit must attach to a preexisting base that accepts #6 screws."

When we move to specifications, we will convert the requirements into specific details from which an engineer can design. Please AVOID including anything that attempts to answer the question "How?" in this section. It is important to eliminate specific solution attributes from the requirements list as much as possible, as stakeholders will tend to describe WHAT they want instead of properly focusing on the NEED they wish to address.

These requirements should be listed as text, but then should be summarized and ranked in the following table. They should be ranked according to 2 criteria – a Requirement Level and Importance. The Importance is a simple 1-10 scale of how important the criterion is to the Client. However, it is important to recognize that this is a student project and students might not be able to complete all desired requirements within the scope of the project. Therefore, we ask that you also identify each criterion as either "Basic", or "Advanced" (you can also include an "Intermediate" level if the project is quite involved). Students should be able to complete the Basic requirements within the allotted time. Intermediate or Advanced requirements are targets that aggressive teams can choose to attempt. It could be that something that is very important to the Client could be rated as a 10, but it might require that everything else in the system be working – thus, possibly moving it to an Advanced requirement. The client should feel free to work with the student teams and mentors to help develop and agree on what constitutes a Basic, Intermediate, or Advanced requirement.

Objective and Constraints	Requirement Level	Importance
Insert objectives here. These will generally describe the desired behavior or performance of the design. They should NOT answer the question "How?"	Basic	8
	Basic	3
	Intermediate	7
	Advanced	5

2.4 Project Context

This section outlines the overall backdrop against which the design will take place. This is the Big Picture view of everything surrounding the design.

2.4.1 Need Description (Why?)

For each need, insert a description of the pressing needs that are driving this design project.

2.4.2 Current Solutions Description (How?)

Insert a description of the current attempts to meet each of the pressing needs. Discuss why these are insufficient.

2.4.3 User Description (Who?)

Insert descriptions of each user, including any factors that may affect our design.

2.4.4 Functional Description (What?)

Insert descriptions of each function that the design is supposed to accomplish.

2.4.5 Environment Description (Where?)

Insert descriptions of the environment in which the design will be used, including any factors that may affect our design. This should include factors such as area size, temperature, humidity, and concurrent activities

2.4.6 Situation Description (When?)

Insert a description of the situation when the design will be used, answering the questions "when?" and "how often?". The sum of the situation descriptions should account for 24 hours a day and 365 days a year. This means that one of these situations will likely be "Storage".

2.5 Context References

The items listed in this section are references that help elaborate on the Project Context outlined above. For each reference cited, give a brief description of the reference document and a list of the important facts related to the context of this project.

2.6 Potential Solutions

This section outlines any commercially available solutions to the problem (or portions of the problem) and evaluates them in terms of the Project Requirements. For each commercial solution, provide an account of how the commercial solution does or does not address each of the project objectives.

2.7 Time Constraints

This section contains any deadlines or other time constraints affecting the completion of this project.

2.8 Deliverables

This section describes what will be delivered at the end of this design project. Include sections for hardware, software, documentation, and any other major category for which your project requires deliverables.

2.9 Resources

This section describes what resources will be made available to the group from the various stakeholders. What client physical resources are available to the team, and what monetary resources will be made available. Include both material and financial resources and the source of the resources.

3. Specification Development

The goal of this section is to develop measurable criteria in which design concepts can be evaluated. Each criterion should, if at all possible, have a corresponding test that can be developed to validate that the specification was met.

3.1 Project Usage Scenarios

This section describes each of the possible usage scenarios, focusing on how a user will interact with the design.

3.1.1 Primary Usage Scenario

Insert a thorough and well-defined description of the primary way that a user will interact with this project. Answer the question, "How will someone use this design to solve the stated problem?"

3.1.2 Secondary Usage Scenarios

If the design will also fulfill a secondary need, or if there will be a secondary method of using the device to address the primary need, insert a thorough and well defined description of the way the user will do this here.

3.2 Design Specifications

This section contains a numbered list of the objective, quantifiable, and testable design specifications that will be used to drive the design process.

3.2.1 Functional Specifications

[[Functional requirements specify what the device does, focusing on the operational capabilities of the device and processing of inputs and the resultant outputs.]]

(e.g. "The device will alert the user when the angle of their heads drops below an adjustable threshold.")

(e.g. "The device will scan US Dollars and identify the denomination of each bill.") - This one needs sub-points to constrain which bills to identify...

3.2.2 Physical Specifications

Physical requirements specify the physical qualities of the device, such as the size and weight. This includes a quantitative characterization of the use environment, including, for example, temperature, humidity, shock, vibration, and electromagnetic compatibility.

(e.g. "The device will weigh less than 8 ounces.")

(e.g. "The device will operate from 10 degrees Celsius to 50 degrees Celsius.")

3.2.3 Performance Specifications

Performance requirements specify how much or how well the device must perform, addressing issues such as speed, strength, response times, accuracy, limits of operation, etc. Requirements concerning device reliability and safety also fit into this category.

(e.g. "The device will identify a US Dollar within 10 seconds of scanning it.")

(e.g. "The device will continue to operate following a 1 meter drop onto a hardwood surface.")

(e.g. "The device will respond to a postural change within 1 second.")

(e.g. "The analysis algorithm should have the following sensitivity and specificity performance for each US Dollar denomination...")

3.2.4 Interface Specifications

Interface requirements specify characteristics of the device which are critical to compatibility with external systems; specifically, those characteristics which are mandated by external systems and outside the control of the developers. One interface which is important in every case is the user and/or patient interface.

(e.g. "The device will provide a means of manually adjusting the postural threshold by touch alone.")

(e.g. "The device will provide a means of determining whether or not the device is on.")

(e.g. "The system will connect to the External Call System by means of a 1/4" TS connector.")

(e.g. "The system will communicate with the External Call System by shorting the two signals on the 1/4" TS connector.")

(e.g. "The system will uniquely indicate the denomination of the US Dollar using the sense of touch alone.")

3.2.5 Economic Specifications

Economic requirements specify production costs, operating costs, and service or maintenance requirements. It may be in part governed by the existence of competitive solutions on the market.

(e.g. "The design must cost less than \$50 to build in quantities of 100.")

(e.g. "The design must cost less than \$0.05 per use.")

3.3 Test Procedures

This section contains a numbered list of the procedures used to evaluate the design for compliance with the Design Specifications listed above. If a single test will evaluate multiple specifications, it will be described in its first instance on the list and then referenced for each further specification that it may be used to test.

3.3.1 Functional Tests

Functional tests are used to evaluate what the device does, focusing on the operational capabilities of the device and processing of inputs and the resultant outputs.

3.3.2 Physical Tests

Physical tests are used to evaluate the physical qualities of the device, such as the size and weight. This includes a quantitative characterization of the use environment, including, for example, temperature, humidity, shock, vibration, and electromagnetic compatibility.

3.3.3 Performance Tests

Performance tests are used to evaluate how much or how well the device must perform, addressing issues such as speed, strength, response times, accuracy, limits of operation, etc. Tests concerning device reliability and safety also fit into this category.

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