

Template for Capstone Project Descriptions

Gerald Recktenwald, gerry@pdx.edu

MME Department
Portland State University

Goals

This document describes the information necessary to initiate a Senior Capstone project for students in the BSME program at Portland State University. Capstone projects involve design, fabrication, testing and reporting on a device that meets the needs of a sponsor. The goals of this document are to

- Allow sponsors to efficiently initiate a project;
- Define the scope of project that will be useful to the sponsor and attainable by student teams;
- Provide information to attract the interest of student teams.

Template

The project description contains the following elements and should fit on one or two pages.

1. Project title
2. Sponsor contact information
3. Project motivation
4. Customer needs
5. Typical operation or user interaction
6. Financial and in-kind support
7. Special requirements

Additional description of the sections is provided on the following pages.

The student design team will be responsible for creating their own detailed list of customer requirements, engineering specifications and project goals. Therefore, the information you provide on the project description need not, and in fact *should not* be exhaustive.

Process

Capstone projects proceed according to these phases.

1. Project is initiated – the purpose of this document.
2. Sponsor and capstone administrator create a project description that is presented to student teams.
3. Student teams develop proposal for work to be done.
4. Sponsor ranks student proposals and a team is selected.
5. Agreement on work statement is finalized (November).
6. Student teams work on the project (December - June).
7. Projects are completed and students make final presentation (June).

After we receive your project initiation data, you will be contacted by the capstone administrator to discuss the project. We then collaborate on a project description that is provided to students in the capstone class.

If you have any questions about the content of the project description template, please Gerry Recktenwald, gerry@pdx.edu, 503-725-4296. I look forward to working with you.

Description of Template Components

1. Project Title

Please provide a compact, descriptive, and unambiguous phrase to identify the project. In addition to identifying your project for our administrative purposes, the title will be used in promotional materials such as flyers, email and web pages. Assume that the title will be read by technically knowledgeable people who are unfamiliar with your company, product or technology.

Good Example:

An autonomous vehicle for distributing parts in a manufacturing plant

Bad Example:

Part delivery system

2. Sponsor Contact Information

1. Name, email and telephone of primary contact at sponsoring company or organization
2. Name of sponsoring company, mailing address and URL (if available).

3. Project Motivation

Give a short (1-3 sentence) description why a new engineered solution is desired or required.

Examples:

- Elephants are gaining weight and becoming unhealthy from a lack of exercise, even though they have large pens.
- Our production welding shop needs higher throughput and greater precision. Currently a certified welder uses clamps and alignment brackets to secure parts and must check positioning with parts with alignment gages before welding.
- Our shipping department is a bottleneck during periods of high sales.

4. Customer Needs

Provide a short (2-5 sentence) description of what you want this device (or system) to achieve. A list of needs is a starting point in the design process and should only include your most important requirements. Student teams will be required to meet with you to develop a more detailed list of customer needs as they work through the design process.

Example 1:

Trainers at the Oregon Zoo desire a device that will humanely induce a bull elephant to exercise in its 20m by 80m pen. The device may utilize food or other rewards or stimuli, but any food rewards need to be recorded and adhere to daily limits. The device should not cause distress to the elephants or interfere with the well-being of animals in nearby pens.

Example 2:

We need an automated, or semi-automated fixture device to align and then clamp steel parts so that the parts can be welded precisely and consistently. The current need is for the welding of flat stock at right angles with a gusset, though we hope that the basic features of the design that can be adapted to other parts in the future. The device should consolidate and replace several manually aligned and secured fixtures, and should have automated actuation of clamps. The device should be adjustable to accommodate a modest range of different flat stock thicknesses and widths.

5. Typical Operation or User Interaction

In one to three sentences, identify how the device (or system) will be used when it is deployed. This is especially important if there are usability and safety issues that are important to the success of the project.

Examples:

- (For the elephant exercise example) Ideally the device would need to be reset or started no more than once per day. Trainers would be able to see, via lights, flags or some other visual cues, that the device is operating properly when they visit elephant pens to feed, water and inspect the elephants.
- The new system will allow the welder to casually place parts in a device that then automatically secures and aligns parts to within tolerance.
- The device will be used in an industrial shipping department to weigh, label and, most-importantly, seal cardboard boxes before pick-up by the shipper (UPS or FedEx). The device must be enable higher throughput than the current manual packaging process, and be easy to use by multiple operators with minimal training.

6. Financial and In-kind Support

Make an initial estimate of the overall budget for materials, sensors, electronics and other consumable supplies necessary to build a prototype. If you have any in-kind support such as raw materials, loaned equipment, or machine shop support, please list that as well. The budget will be refined in at least two phases: first as the project description is developed in collaboration with the faculty administrator, and second when the student team submits their proposal for the project at the end of the Fall term (in December).

We also ask sponsors to make a donation of \$1000 above the cost of materials. This donation is to provide and improve the physical resources (materials, equipment, workbench tools and maintenance) in our Capstone labs. We want to maintain and enhance the workspaces that make it possible for student teams to fabricate prototypes for their capstone projects.

Examples

- Students will have a \$1500 budget for the purchase of materials, electric motors, motor controllers and sensors. In addition, we will provide up to three 0.1 HP DC motors that may be used in the prototype.

- We will provide sufficient bar stock and sheet metal to fabricate two complete copies of the prototype. Light machining and some welding may also be provided, but will need to be scheduled sufficiently in advance, and will have lower priority than our production work.

7. Special Requirements

List any requirements that may not have been conveyed in the preceding items, and that are important in specifying or completing the design.

Examples:

- Intellectual property concerns such as patents or NDAs
- Device must resist corrosion in a saltwater environment.
- Materials must meet food safety requirements.
- Device must weigh less than 20 kg.
- Must be able to fit on a standard shipping palette.
- Must operate up to 3 days without external electrical power.