Class Team Project

This exercise includes the selection of a product, development of a conceptual design, and planning of an engineering project for subsequent design and development. It is intended to provide a team experience on an engineering endeavor and to require consideration and application of engineering project management methodology.

The class will be organized into several teams. Each team will select a product that is in some way innovative in today's marketplace. The product should be sufficiently complex that it involves multiple engineering disciplines and a number of subsystems, but not so complex that it is beyond the capability of a small team for initial systems engineering and conceptual design.

The team activity will include setting technical requirements; this involves an integrated evaluation of marketing, financial, engineering design, and project considerations. The team will produce a conceptual design that defines subsystems and derives subsystem-level requirements from the system requirements. And the team will provide an engineering plan that will result in a product that satisfies these requirements. (The plan will be consistent with a winning strategy developed as a result of the market analysis, and developed in context with an assessment of risks and techniques for their mitigation.) The team will communicate its results in a series of both written and oral reports. The written reports should be prepared in a standard Memorandum format. Progress Reports are due on Sunday evening, ~~beginning Sunday, April 5.~~ unless stated otherwise.

Progress Report 1: Please provide a list of three products that your group might like to develop, including a one paragraph description of each project.

Progress Report 2: Please pick one project from your list of three, and describe why you chose that project. In addition, please choose a team leader and let the instructors know who that individual is.

Progress Report 3:

Oral Interim Report: Preliminary; Product Identification, Market Assessment, Design Concept and Technical Requirements

Progress Report 5:

Progress Report 6:

Progress Report 7:

Oral and Written Final Report; Product Description, Market Assessment, Conceptual Design, Technical Requirements, Project Plan, Financial Plan

Product Identification: Identify the need you are addressing, a **clear description of your product idea** and present information that establishes its physical and financial viability. This information will also establish part of the basis for the detailed technical requirements to be addressed in the engineering effort.

Market Assessment: Present and discuss such issues as: What is the projected market (be quantitative)? What is driving the creation of this market? What are the barriers to the creation of your product and its introduction to the marketplace? What are the uncertainties? What will be the timing (how fast does the project have to proceed)? Who are your customers and what do they want? What will users (who may not be your customers) want? Who are the competition? What are their designs and strategies likely to be? What governmental regulations and laws affect design and development of this product? What are the physical and technical limitations for this product? What are the major risks for development? What are the alternatives? What appears to be a winning **strategy** for product design, development and introduction? What requirements must be placed on the design and project content from these considerations of market, consumer, regulatory and technical needs?

Design Concept(s) and Technical Requirements: Consider your market assessment and strategy and then describe a **conceptual design** for your product, including the definition of the system, and its breakdown into subsystems, assemblies, components, etc. Consider and discuss: the design alternatives; the advantages and disadvantages among them; backups and upgrades to plan for; the risks inherent in the design. Given this background and the market assessment, develop a set of **detailed technical requirements** for the system, and for the subsystems/primary assemblies or components. Show that they are physically and financially reasonable. Also show that they fit your market and product strategy. (You may have to iterate among strategy, design concepts, and requirements to get to this point)

Project Plan. Present the tasks required to finalize requirements, develop, design, manufacture, test and verify your product. Show the logic, major milestones and decision points of your plan. Discuss performance, schedule and financial risks and the approaches and program content to mitigate these risks. The plan will include the project organization, the systems engineering plan and the overall developmental logic consistent with your marketing strategy. Provide detailed task content, schedules, and milestones for the initial phase of your project.

Financial Analysis. Provide a first order evaluation that indicates that the project is financially desirable. This requires an estimate of the costs associated

with your project and the time domain over which they occur; costs of design and development, of manufacture, of marketing, and of other capitalizations. Each of these areas requires detailed consideration of content. For instance, to estimate the cost of development requires the above program plan and its associated work breakdown structure and budgets. To estimate manufacturing costs requires a design and manufacturing plan. To estimate a return requires a market and sales analysis and strategy. Since the activities are spread out in time, a time value of money analysis is required to determine the financial return. Obviously all of the required plans are not available in detail at the outset of a project, so the estimates are crude initially, and become more accurate as the work progresses. One reason to conduct a program in phases is to revisit the project's financial viability as the details of design, development, manufacture and marketing data become better known. Show that your requested funding for a first phase is reasonable with respect to potential financial return versus risk prior to a pertinent decision point.

Progress Reports: The progress reports should be short (one page) reports in memorandum format (see format at the end of this document). Additional material may be appended as an appendix to the one page report.

Final Report: This report will include the final version of the product description, market assessment and strategy, technical requirements, conceptual design, and development strategy and the associated project plan and financial analysis.

At the end each team must focus on the selected design and project approach to arrive at a consistent set of market, product, engineering, and financial considerations. To accomplish this, the team members must communicate and coordinate among themselves. To get there requires iterative and interactive activity.

As a first exercise in team brainstorming and consensus formation, the teams will select their own products. The only requirement is that the product involves at least three disciplines or specialties of engineering.

Consider that the end result is a proposal for a worthwhile endeavor. The work and information being transmitted is intended to support an informed decision to fund and initiate the project. Any executive or venture capitalist faced with such a decision needs to know that the idea has merit in the marketplace, will triumph over competitors, is physically doable, can be accomplished with capital investment on a time scale that promises a desirable return on investment, and is a truthful assessment. You are providing the data in detail to convince him or her to proceed. Be ethical; present an honest evaluation, credit sources, including full quotations where material is used verbatim, and reveal uncertainties.

You will be graded on your **Final Report**

The completeness and clarity of your considerations, conclusions and presentation (written) of:

Your product idea.

The market assessment and strategy.

The product requirements and your product conceptual design.

The risks assessment and risk mitigation approach.

Your project organization and plans

The realism of your approach and plans.

How truthful and ethical your presentation is.

How convincing you are that your recommended approach and course of action are sound and superior under the circumstances.

This project is an opportunity in two directions:

To understand the complexity and intricacies of an engineering project by considering and planning the next step in a representative case.

To experience a team engineering effort by working together to produce a common report and plan.

The team project reports will follow class content and discussions that lay foundations for the activity. In accomplishing this team project it will be helpful to employ some of the project engineering principles that will be discussed in class. Specifically it will be helpful: to have a clear organization and assignment of tasks within the team; to have a logical set of milestones, and schedules for completion of tasks; to monitor progress and adjust tasks and assignments accordingly; and to have clear and frequent mechanisms for communications between individuals, and the team as a whole.

The team will receive a single grade representative of the excellence of the 'team' effort, and how convincing and advantageous is the recommended course of action.

If your team is having difficulty or is dysfunctional in some way please talk to us early so we can help.

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Hint: Make a checklist from the above descriptions of the reports and the grading criteria and make sure you address every item in each report to assure a good grade.

MEMORANDUM

To: Engineering 185 Instructors

From: Group No. ##

Date: January 14, 2008

Subject: Progress Report No. 1

During our first discussion meeting, Group No. # came up with ideas for the following products that we might like to develop:

1.

2.

3.