Guide to the 185 EW Team Project

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Preface

This guide is exactly that, a brief overview of the Team Project and is not a substitute for attending lectures or discussion sessions. The guide is written to provide an overview of what your team should be accomplishing each week. Since the lecture material is dynamic, all of the topics may not be covered according to schedule. The guide should provide a reference as to what the teams should be working on that week.

How to use this guide – read ahead by at least a week! When the page says Week 2, it means that these are the activities that should be completed during that week. For example, we state that students will need to invest 4-6 hours reviewing competition and patents. If your discussion session is on Thursday, you team should be doing the research earlier in the week and not starting on Thursday.

Week 0

The Thanksgiving Holiday occurs during UCLA's fall quarter (week 8). Week 0 allows us to "make up" for that lost time. There are no discussion session during week 0, the lecture will concentrate on the overall objective of the Engineering 185 EW as well as provide an overview for the Team Project section of the course. After the lecture, you can start refining and elaborating on you consumer electronics product ideas. Next week, your teams will be forming and it is highly recommended to introduce vetted ideas to the team.

Week 1

Week 1 is all about getting to know your team. We will be reviewing the class roster and will attempt to create teams composed of a uniform mix of technical disciplines as well as years of study. We highly recommend that you do not request to be in a team with people that you already know (roommates, friends, etc). Part of the learning objective for this course is developing team working skills and working with new people will provide a clean foundation to build upon.

Coming into week 1, we require each individual to bring in 3 ideas for a new consumer electronics product. Additionally, each product should have a story that discusses the Unmet Need. Get together in your groups and discuss these ideas in detail starting with the Unmet Need story.

After the preliminary review, the team should get together and discuss their backgrounds including technical emphasis as well as hobbies and interest. The very best projects have been developed when teams have been had a common interest as well as the technical background to support the

effort. An example that comes to mind is a team that developed a machine to optimally brewed tea. Four of the members were tea connoisseur and they had a mix of ME, EE and CS. One of the least effective projects was a team developing a battery charging trekking pole. None of them hiked and they had no EE or Biomechanical members of their team. Selecting the right project for your team is paramount to your success.

After the group has reviewed their backgrounds, you should screen some of the initial ideas with respect to your team's interest as well as ability to provide technical support to develop the concept. You should be focusing on developing the unmet need: what the customer wants that is not currently available. You should start to craft a story as to how this unmet need is impacting that person's life. Creating a strong unmet need statement will set the foundation for developing a strong proposal. About 10% of the class will runs into problems at week 7 because they did an inadequate job of defining the unmet need and had to start over.

There are no deliverables to the TA in week 1. You will need to identify this week's Team Leader and Scribe: 1st week's Leader has the last name closest to the letter A and the Scribe is the second closest. The Team Leader needs to send out Meeting Minute / Action items for the week 1 meeting as well as the Agenda for the week 2 meeting. By the end of week 2 (Friday @ 6pm), the Team Leader will need to submit the completed Project Screening Test including the signatures of all team members (CCLE). A key aspect to the preliminary screen is to develop a convincing story about the unmet need.

Week 2

By week 2, all student enrollment and discussion session changes should be resolved. At the end of the week, the Project Screening test is due (CCLE). The team needs to develop and refine a primary project unmet need as well as starting to look into competition.

The unmet need refers to something that a customer wants that is not currently available. Since their needs are not being met, the customer often finds substitute products. By reviewing the completion, your team can make a better assessment as to how well you are going to satisfy the customer. This is accomplished by researching competitive products. Look at the company website for specification, read reviews, look a blog sites and any other information that you can find about the competition. From all of this information, you should be able to create and prioritize a list of the top 4-6 key attributes that customers are looking for. With respect to these attributes, your team should clearly define what is meant and not leave the attributes vague. Easy to use and faster are vague terms, you will need to clearly define the attributes. Additionally, the key attributes should be directly traceable to your unmet need story.

The second reason to identify the competition is to look at patents. You are required to review patents to make sure that your product does not violate someone else's patent claims. In particular, we have flagged Team Projects in the pass the violated as this is an ethics violation. Here is a link telling you how to read a patent - http://www.waybetterpatents.com/how_to_read_a_patent.html

The search for and characterization of the competition and patent searches will require at least 4-6 hours per person. You should be able to identify completion and develop the initial key attributes pretty quickly. Ensuring that you have patent clearance will take several weeks.

There are deliverables to the TA in week 2, refer to the Design History File (DHF) checklist. By the end of week 2, you should have a good idea as to the types of projects that your team can manage as well as a primary project for the Product Screening Test.

Week 3

We will be screening all projects in the discussion session. We will be reviewing the Project Screen in detail for meeting the criteria, discipline support, managing the scope of the project and verifying the appropriate background and interest in the project. Work will need to be done to further clarify the unmet need: you should be able to write the unmet need as a problem statement. For your final presentation and report, we will be looking at continuity and this all starts with the unmet need.

To characterize the unmet need, you will be developing a Price Performance Chart. The performance is derived by evaluating the competition relative to your rank ordered key attributes list. At this point, you should have 4-6 competitors or more. As you fill in the matrix, you may find yourselves elaborating on the definition of the key attributes. This is normal, for as you learn more about the products, the better the resolution of the attributes.

Price, as discussed in lecture is dependent on the type of product that you have chosen and how best to set up the price parameter to best display your products value.

Since you have the key attributes identified, you should also develop the preliminary specification for your target product. These specification need to be tangible and measureable. If your attribute is speed, you need to start defining what speed means relative to this product. Comparative specification can usually be found from your competitors.

You will need to develop a preliminary ConOps. Your team must be able to go through the motions of how the customer expects to use your product. You should be able to act this out in order to demonstrate how your product is used.

In some cases, it would be prudent to perform a quick calculation to see if your product is even technically possible. An example of this was a project proposal to quickly boil 2 cups of water in a car (<5 minutes). A car can output 12 V at 20 A so you have 240 watts available. To boil 2 cups of water in 5 minutes requires ~800 watts so this concept is not viable.

In some cases, it would be prudent to perform a quick calculation to see if your product is even financially viable. A good rule of thumb is that the price should be at least 4 to 5 times the cost. A $50 product should cost $10 to $12 to manufacture (BOM cost only).

At the end of week 3, the team has to commit to a project. The team should be preparing for the 1st Trimester review (see the format in the appendix)

- Unmet Need – tell us the story
- Price Performance Chart & Spreadsheet – Key Attributes and competition
- Primary Concept of Operation (ConOps)
- Intellectual Property Screen
- Key specification

Week 4

1st Trimester Review: all documentation is due (CCLE) 24 hours prior to the start of your discussion session. The documentation will be reviewed and returned in time for your discussion session. All flagged issues will need to addressed, you may need to schedule office hours visits/teleconfrence to verify the issues have been resolved.

A majority of the time this week will be spent responding to the 1st Trimester Review. In general, most teams have a problem with continuity. The flow from the Unmet Need to Specification may be abrupt not clearly defined. If the continuity of your proposal is not robust, your team will have difficulties in the 2nd Trimester. After the 1st Trimester review, you should start peer reviews of your concepts within your discussion session. The outside view will force you to communicate clearly and accurately. Your will probably be refining your Unmet Need, review competition, expanding and refining the 4-6 key attributes, adjusting your price performance charts, continuing to verify IP clearance and refining your key specifications. For the 1st Trimester review, we only required the primary ConOps, the remainder of the ConOps needs to be developed (unboxing, initialization and setup, calibration, usage, maintenance, storage, etc). This is particularly important for products that require initializations and that require data/information from the customer. With phone apps, wireframes will need to be generated.

The documentation for the 1st Trimester review is considered your first release (revision 1). As your project changes, your documents will need to updated (rev1.1 and so forth). Documents include: Unmet Need, Price Performance Chart, ConOps & Specifications.

For teams that decide to pivot, the Design History File (DHF) starts over; this includes meeting all of the deliverables in the DHF. These teams should be scheduling a weekly meeting with me until they are back on schedule.

The team should also start to collect and refine the information that they need to demonstrate proof of concept. With respect to proof of concept, past students ran into problems with the following types of devices: fans, peltier cooler/heater, motors. If you select devices like these, you must fully understand how they work as well as to their limitations. Students have run into problems when they used vision recognition or machine learning as a key feature. If you do this, you must be well versed in the technology. Your team must be well versed in the key technology that makes your product valuable.

Week 5

All elaborations should be defined and resolved. Peer reviews should be conducted, a good peer reviews will keep you on track and catch potential problems.

Identification of all relevant competition should be complete and the Price Performance Chart updated. You should have complete versions of the ConOps, and Specifications (based upon the key attributes). You should have preliminary IP clearance.

Continuing on from last week, you should be developing your proof of concept.

Week 6

FMECA is the probably the largest source of ethics violations. As stated in class, "you can never underestimate the stupidity of people". That being said, a key tenet of the Code of Ethics is:

Hold paramount the safety, health, and welfare of the public

You should use this week's discussion session to break up into brainstorming session. The group should be discussing, "what is the worst thing that can happen?". Create a list of all potential impacts to human life. Refine and detail the list and categorize the list into; Failure Mode, Cause, Effect. Apply numerical evaluations of Severity, Probability and Detectability to create the Risk Priority Number and Rank order the matrix relative to the RPN. This is your first release document (revision 1). Your obligation as an engineer is to identify a vast majority of potential risk to human lives.

Fill out the mitigation plan and vet the solution, keep in mind that adding a label does nothing to change the Severity and little impact to Probability and Detectability. Many of the mitigations will require design changes, these modification need to be noted and resolved. Design changes can alter how the product is used so when the product has been revised, you must conduct another FMECA (rev. 2). Between now and the end of the project, we expect at least 3 versions of the FMECA. If the RPN on a particular Failure Mode remains high, it will need to be noted in the Presentation & Final report.

Week 7

All documentation for the 2nd Trimester Review is due 24 hours prior to the start of your discussion session (via CCLE). This week the teams should be focusing on conducting peer reviews of the following sections:

- Updated Unmet Need, Key Attributes, Price Performance & Specifications
- Proof of Concept
- FMECA

I will be reviewing the above documents and will issue an evaluation and grade for each team project. Teams that wish to discuss the feedback in detail will need to schedule a meeting: a majority of the team needs to be present.

Most teams will need to make elaborations on their project and this may require you to alter/modify the Unmet Need and all of the subsequent documentation (new rev. number).

Teams should be starting to develop the Bill of Material (BOM) and defining the Work Breakdown Structure (WBS).

If a team needs to pivot, the project starts from the ground up and the DHF is reset.

Week 8

Thanksgiving falls on week 8, all discussion sessions are cancelled that week. The Tuesday lecture will be about Macroethics, there will be no Team Project lecture this week. Since the 2nd Trimester review was conducted in 7th week, your team will probably need to make elaboration on your project. You will need to remain in contact with each other in other in order to keep the projects on schedule.

Elaboration from the 2nd Trimester Review should be resolved all documentation updated (rev.). Teams should be collecting and updating information to fill out the BOM (spreadsheet). Labor estimated should be developed from the WBS (spreadsheet). All other development cost need to be investigated and evaluated: NRE, Capital equipment, MOQ & Risk Inventory. You should have preliminary financial information for the first pass break even calculation. After that, your team has some latitude to optimize the formula to your advantage.

The story from the Unmet Need should evolve into the Abstract/Introduction for your Presentation & Report. You should be focusing on your presentation with a strong focus on continuity. Your presentation should target the non-technical audience. You should be able to present the information to a parent or family member and demonstrate how your team can develop this project. It should be logical and while non-technical, you have to demonstrate that you have addressed all outstanding technical concerns. Your primary goal of the presentation is to influence the audience in a face to face meeting. All eyes will be on the team and as a group; you need to lead us through how you solved the Unmet Need. By watching the audience, you can determine if your message is getting across the way you want and to make adjustment to clarify your message during the talk.

You should be drafting your Team Report; again the primary purpose of the report is to influence the reader. The report is different than the Presentation as your influence is limited to the written word so there is no opportunity to get feedback from the reader. Additionally, the written report is targeted at a technical reviewer so clarity and effective communication is essential. Key technical data needs to be included, however; extremely detailed analysis can be left in the appendix. Note that the appendix can be populated with information from your DHF.

Week 9

The team should be finalizing the financial aspect of the program by detailing out the BOM, WBS and calculating the labor cost. The abstract/introduction should be fine tuned with particular attention focused on continuity. The presentation should flow from the Unmet Need – Key Attributes – Price Performance Chart – ConOps – Specification – Proof of Concept. The presentation is evaluated heavily on your ability to influence the audience. Poor graphics, missing tittles and incorrect displays will detract from your talk and will limit the amount of points that the team can earn. Practice your talk; conduct a peer review within your discussion session. For your team presentation, 75% of the points are earned by your team while 25% of the points will be based upon the average of your discussion session. It is a benefit for all groups to conduct peer review.

Finalize your written report and follow the format!

Week 10

Presentation – Files submitted 24 hours prior to discussion session via CCLE. Students who are late to the beginning of discussion session will earn 50% of the Team score. All files must be loaded on the Desktop or available from a USB drive, no downloading presentations before presentation!

Report and DHF – due 24 hours after the start of your discussion session (Boelter 6417).

Report –1 bound copy (color optional), 1 digital copy submitted via CCLE
DHF – flat folder, not in a binder

Reference Documents & Examples

Unmet Need Story Example

Joe leads a very busy life. He does not want to spend time every morning standing outside his shower waiting for the water to heat up to the perfect temperature. He wants to be able to do his other morning activities during that time, such as preparing coffee out in the kitchen. Our app allows him to go about his morning routine outside of the bathroom until he gets a notification on his phone that his shower is ready. Our showerhead is an Internet of Things device that can communicate with any Smartphone that has the Hydrahead app connected to the Internet.

Josie is an advocate for water conservation, and she knows that her younger cousin has a habit of leaving the shower running while waiting for it to heat up. She wants to buy him an affordable water saving showerhead. Once the shower temperature hits his preferred temperature, our showerhead will stop the flow of water to prevent further wasted water. Our showerhead also tracks water usage using a flow sensor and a shower timer, and encourages awareness of users' water impacts. An in-app competition with other Hydrahead users also fosters competition between users on who can use the least water to further incentivize reduced water use. A shower can be a relaxing moment for many when they can let loose and wash themselves. However, for many with slowly heating showers, they must wait an inconvenient amount of time before the water heats up to a comfortable temperature. Some would leave the bathroom and run the risk of wasting water rather than wait by the tub for what feels like an eternity. With today's environmental crisis, people must balance convenience and environmental responsibility, and our product allows its users to find that balance. Hydrahead, a smart shower head, is now an option to escape from being glued to the shower waiting for water to heat up while also promoting sustainable water use. By closing the open feedback loop started once the user turns on the shower and leaves the bathroom, Hydrahead's notification system and flow stopping feature reduces wasted water.

Other showerheads are either more expensive and/or don't have the ability to remotely control flow to save water. However, Hydrahead's forward-looking design is cost effective and intuitive. For the best price, Hydrahead users can conveniently gain awareness of when their shower is at just the right temperature and how much water they are using in the shower.

Team Project Screening Test

(due by the end of week 2 by 6pm)

Meeting the basic Team Project requirements

1. Is your proposed project multi-discipline? Yes / No
2. Is your project a consumer electronics device that can be purchased at Best Buys, Amazon, Fry's, SkyMall, and Sharper Image? Yes / No
3. Can it be delivered by UPS / FedEx or fit in your car? Yes / No
4. The product does NOT need special skills to set up and use? True/ False
5. The project in not a service, is not entertainment related, does not try to alter human behavior or measure human performance True/ False

If you answered No or False to any of the above questions, your project will not be approved

Note: the following projects are not allowed:

Phone/laptop case with integrated wallet – too many have been done
Smart Door Lock – saturated market / full intellectual property
Smart windows (temperature/pollution) – saturated market / full intellectual property
Automatic drink mixer – saturated market
Automatic alcohol measurer (digital shot glass) – too much competition
Smart Luggage (weight/charger/locator) - saturated market / full intellectual property
Smart spice dispenser - saturated market / full intellectual property
Smart shower head (temperature/flowrate/consumption) – saturated market
Coffee temperature controller – saturated market
Entertainment products
Phone app products without any associated hardware
Smart bicycle locks/locators
Item locators (keys, wallet, laptop) – saturated market (Tile, TrackR)

Products that have little competition

Skateboard enhancements
Smart devices with stripped down functionality/price point
Upgrading archaic devices (mailboxes, washer dryer cycles, toaster)

Describe the Unmet Need for your preliminary project (Plan A)

Meeting the Logistical Requirements

1. Do you have the all of the technical disciplines represented to complete the project? Can your key resources commit to supporting the project as required? Yes / No

   Identify what discipline is needed and who on your team is going to support that effort

Discipline required	Team Member

2. Is there sufficient time to complete your project in 7 weeks (we already used one and the last two weeks should be used for developing and practicing your presentation & report). Yes / No
3. Does your team share a common interest in this project? Yes / No
4. What is your alternative project if the primary one doesn't work out?

Plan B
Plan C

Your project must have adequate technical support in order to be approved. If you answered No to either questions 1, 2 or 3 your project will not be approved.

Team Information

Name	email	Major & Year

Team Commitment

Signature and Dates

Name	Date

Design History File

Week	Sign Off	Design History File Checklist	Notes
1		No deliverables to the TA this week, establish the following:	Create your team and discover a common interest that you can technically support
		Create Team	
		Identify Leader and Scribe	
		Understand leadership rotation and responsibilities	
		Identify common interest	
		Review all ideas and generate new concepts	
		Start to identify Unmet Needs and Attributes	
		Team Leader – send out meeting notes and week 2 meeting agenda	
2		Meeting Minutes for week 1	Finalize your preliminary product concept and make sure that you have the background to support it
		Meeting Agenda for week 2	
		A list of <u>all</u> of the ideas and concepts developed by the group	
		Top 3 ideas for the Team Project identified	
		Preliminary search of competition & Intellectual Property	
		The Team Project Screening test is due by Friday at 6 pm. Late and rejected submission will earn a maximum of 85%	
3		Minutes week 2 & Meeting Agenda week 3	Refine the Unmet Need and characterize it using the Price Performance Chart
		Unmet Need clearly defined: Problem Statement	
		List of Competitors (5-6)	
		Rank ordered 5-6 Key Product Attributes (must match unmet need)	
		3-4 (minimum) Intellectual Property Screen Results (first page)	
		POC- Back of the Envelope Calculation (technology & cost)	
		Decision Gate: Go forward, elaborate or pivot	
4		Minutes week 3 & Meeting Agenda week 4	Quickly make elaboration and move forward
		All Documents for 1st Trimester Review (24 hours in advance)	
5		Minutes week 4 & Meeting Agenda week 5	Complete the full ConOps and Specification
		Concept of Operation rev1 (complete)	
		Specifications rev1 (complete)	
		IP Clearance Documented (no claims violations)	
		Draft Proof of Concept	
6		ConOps finalized rev 2	Update 1st Trimester materials and finalize draft of POC & FMECA
		Proof of Concept rev 2	
		Detailed specifications rev 2	
		Peer review - continuity check: Unmet Need to Specifications	
		Launch work on FMECA	
7		Minutes week 6 & Meeting Agenda week 7	Elaborate on changes form 2nd Trimester review
		Peer review: 2nd Trimester	
		All Documents for the 2nd Trimester Review (24 hr advance)	
8		**No Team Project lecture or discussion sessions this week**	Peer review and practice your presentation
		Minutes week 7 & Meeting Agenda week 8 FMECA 2nd release	
		BOM rev1	
		WBS Rev 1	
9		Minutes week 8 & Meeting Agenda week 9	Peer review your report
		Break Even Calculations rev 1	
10		Team Presentation and Document (24 hr advance)	
		TA does not sign off on these activities	

Meeting Agenda: Team Project XXX

Date: 10/02/17

Leader: Annabel A.
Scribe: Bob B.
Attendees: Annabel A, Bob B, Cyndi C, Dale D, Irma I, Young Y

1. Review of last week's action items *(issues that need resolution form last week's meeting)*

Issue	Status	Owner	Due
Need to define additional competitors	Have 2, need 4 more	All	10/09/17
Concerned about IP protection of the drive system	Need to review claims 3) & 5). Need more help	Bob B & Young Y	Late
Last week's Action Items captured and meeting agenda distributed	Done	Annabel A	-

2. New items to discuss / breaking information:

3. Meeting Objective (*most of your meeting objective will come from next week's DFH deliverables*)

Issue	Status
Behind on IP search	Need to get help from Librarian Need more keywords! Need more people to help read patents!
Price / Performance Chart looks weird	Need to discuss with TA / Faculty
Need to decide on the Project name	3 names in the running
ConOps	Who is drafting this?, due next week

Minutes / Action Items: Team Project XXX

Date: 10/02/17

(For the Minutes, list all of the decisions that were made by the team)

Minutes

1. We agreed upon the Movable Widget as our Team Project
2. We decided against using an app to control the Movable Widget
3. Our Team name is Pro-Widget

(Action Items contain a list of issues, status, owners and due dates of unresolved issues that are due in the near term)

Action Items			
Issue	**Status**	**Owner**	**Due**
Need to define additional competitors	Have 2, need 4 more	All	10/09/17
Concerned about IP protection of the drive system	Added Young to help close this issue	Bob B & Young Y	10/16/17
Send out Action Items list	Done, you're reading it	Annabel A	10/09/17
Send out next week's meeting agenda	Drafted	Bob B	10/14/17
New item added to discussion: Need product weight	Estimate weight	Cyndi C	10/16/17
Behind on IP Search	Schedule meeting with Librarian	Cyndi C	10/14/17
Behind on IP Search	Developed 30 more keywords at meeting	All	–
Behind on IP Search	Read more patents	Dale D & Annabel A	10/19/17
Project Name	Done: selected Karma	All	–
Price Performance Chart looks weird	Meet at Office Hours	Bob B	10/9/17

1st Trimester Review

The document will be emailed to Don and Jon. The documents will be a single file (MS Word / PDF) and will be submitted 24 hours prior to the start of your discussion session. Late papers will earn 85% of the maximum grade. Students who do not attend the 1st Trimester review will receive 50% of the team score. We can ask any member of the team any question. The documents should include the following sections:

- Unmet Need – Provide a story that emphasizes the unmet need. The story should discuss how not solving the unmet need leads to problems and how it impacts the user.
- The Price Performance Chart – Landscape, fit to a single page
- Key Attribute Matrix – Rank ordered by attribute – Landscape, fit to a single page
- Concept of Operation (primary)
- Intellectual Property - Copies of your search (copies of the first page)
- Initial Specifications (based upon your key attributes)

Engineering Ethics – we will point out violations for the following:

- Lack of continuity (misleading)
- Spreadsheet errors (rigour and accuracy)
- Missing significant competition (rigour and accuracy)
- Intellectual Property lapse -(rigour and accuracy)
- Specification not matching key attributes (misleading)
- Incorrect formatting - (rigour and accuracy)

1st Trimester Review (10 pt.)

- On Track / Confidence
- Defined Unmet Need
- Customer Attributes / Price Performance
- Key Specifications
- IP Clearance Scope

2nd Trimester Review

The document will be emailed to Don and Jon. The documents will be a single file (MS Word / PDF) and will be submitted 24 hours prior to the start of your discussion session. Late papers will earn 85% of the maximum grade. The documents should include the following sections:

- Updated versions of the Unmet Need, The Price Performance Chart, Key Attribute Matrix, ConOps (complete), Intellectual Property, Specifications (complete): same format as the 1st Trimester
- Proof of Concept
- FMECA

Engineering Ethics – we will point out violations for the following:

- Updated 1st Trimester material - Lack of continuity (misleading)
- Appropriate use of POC
- FMECA -Rigour and accuracy

2nd Trimester Review (15 pt.)

- On Track / Confidence
- Proof of Concept demonstrated
- FMECA thoroughness

Presentation Format

Presentation (10 pt.) – The purpose of the presentation is to convince them that you have a great solution: you should be able to do this in the first 1-3 minutes. After the introduction, you are presenting information to back up your claims. As this is an oral presentation, you are probably not going to present extensive analysis but focus on results. All team members must speak during the presentation.

- Continuous & Logical 50%
- Confidence & Mastery 30%
- Effectiveness 20%

Continuous & Logical – This is really a metric on how well your team presents information to the audience. Done correctly, the audience will be following your talk with interest and enthusiasm. You will have answered their questions before they think of them.
Confidence and Mastery – An entertaining speaker can keep an audience captivated, regardless of the material. Since you are giving an engineering presentation, your team will need to be convince the audience that you fully understand and have addressed all of the outstanding issues.
Effectiveness - At the end of the presentation, did you influence the audience? A good sign is if the audience ask derivative questions and not questions to clarify your statements.

Format – The audience should be focusing on the speaker, the slides should be used to support points and not dominate the talk. You are here to influence the audience, dress the part (business casual: no jeans or T shirts please). As a speaker, all eyes will be on you; practice your talk and avoid reading from the slides.

The PowerPoint text slides shall be black text on a white background. You should be able to read all text from 20 feet away. Graphics and colors are acceptable, but keep in mind that too much color can break up the continuity of your presentation and just be a distraction. Download your presentation to the Desktop or store on a thumbdrive on the PC.

Layout – the presentation will contain the following sections.

Introduction

Introduce all team members as well as your project. Tell the story about the Unmet Need and how it impacted your life. Remember, you should be able to "sell" your product concept in the first 1-3 minutes. Give a brief overview of your talk.

Market Overview: Price / Performance

Show us the Price Performance Chart. Contrast and compare your product to your closest competitors: used the key attributes to help bolster your product. Show us the rank ordered Key Attributes matrix (with numbers). Demonstrate how your Key Attributes matrix is fair and just. You may need to add resolution to your Price evaluation if it evaluated over time or involves consumables.

Product Overview: Technical Presentations Featuring Strategic Features

Demonstrate how the product is used and how it solves the Unmet Need. Build our confidence by resolving any POC concerns regarding your implementations

Program Risk & Mitigation

All programs have risks; explain yours and the mitigation strategy. Some high ranking FMECA issues may need to be addressed at this time. High risk include: complex POC, POC based solely upon analysis, single source vendors, relying on technology is not readily available or in prototype phase, and so forth. While you need to recognize risk, do not tell us about every minor risk as that will cause you to lose momentum and plant doubt in the minds of the audience.

Financial Summary

Give us an overview: Break Even Volume and Total Development cost. Provide information on the Labor cost as well as the rest of the variables for the development cost.

Delivery Date and Key Milestones

Provide a quick overview of key milestones and delivery dates

Summary & Recommendation

Wrap up the talk by explaining how you lead us step by step through the new product development process, how you minimized risk and how your product makes financial sense. Then tell us what we should do with the information.

Written Report

Team Report (25 pt.) – The purpose of the presentation was to influence the reviewer at a high level. The typical audience would be an investor or senior manager. Along with the presentation is a written report. If the presentation is successful, the report is handed down to a team of senior engineers for review (due diligence). Being a technical review, the tone of the document is shifted to focus on facts and supported with analysis.

- Continuous & Logical 60%
- Due Diligence 40%

Continuous & Logical - Your primary object is influence the reader and to get your points across. As stated in class, *this comes down to not making your reader work to get the information they need.* If your document is continuous and flows well, it will be easy to read. The pathway from Unmet Need to the Price Performance Chart to the ConOps and Specifications should be smooth and easy to follow. If the document is hard to read, the reviewer will become increasingly critical of your statements and your document will lose effectiveness.

Due Diligence - As a technical reviewer, your job is to quickly verify if the information is correct or not and to assign a level of risk associated with the POC. The truth of the matter is that is easier and quicker to find holes and flaws in POC and once you do that, the paper is usually rejected. A well prepared document takes a lot longer time to review.

Format - The report will be written single spaced, 12 point font (Times or Cambria), use only black text and a white background. Graphics (color) can be included to help tell the story, but do not use watermarks, backdrops or colored paper: duplex printing is acceptable. 2 copies will need to be turned in and only 1 needs to be bound.

Layout – the written report will contain the following sections

Abstract & Signature page (250 words)

The Abstract should answer the question "why should I read this document?". The Unmet Need should be clearly outlined (a story is highly recommended to emphasize your key points). All team members are to physically sign and date the document representing their affirmation that they fully stand behind the proposal.

Table of Contents

Self explanatory

Body of Report

Introduction (500 – 1000 words)

Describing the Unmet Need in more detail and more of a technical focus that the Abstract. A quick overview of: the Unmet Need, advantage over competition, solution, implementation, risk and financial overview.

Market Overview: Price / Performance (500-1000 words)

The Price Performance Chart should lead off this section followed by the rank ordered Key Attribute matrix (quantified). The body of the text should focus on comparing and contrasting your top two competitors and why your product justifies its position on the Price Performance Chart. Discuss the Key Attributes matrix in order to assure fair evaluation and if required, insight into how the Price was derived (consumables, multi-year, etc).

We do not want or need to see market size, market share or revenue calculations; you are approaching this from the engineering side! Do not do a Shark Tank presentation ($$$ for % equity) as it adds no value.

Product Overview: Technical Presentations Featuring Strategic Features (500-1000 words)

The reader wants to know if you have technical mastery and confidence in your solution. This is where you want to discuss the technical nature of your solution. This should be done at a high level with enough detail that that the reader can trust the document. This is where you should discuss your approach to POC. The key is to answer the reader's questions before they think about it. Explicit details are contained in the appendix and can be referred to in the Product Overview. Keep in mind that you do not want to have the reader flip back and forth between the Body of the Report and the Appendix to understand the story.

Program Risk & Mitigation

All programs carry risk, otherwise the product would already exist. Investors know this and do not expect you to have a total solution to every problem. It will be your responsibility to point out potential risk and your mitigation plan. The tricky part is to leave the reader feeling confident that you know what you are doing. Pointing out too few risk and they will think that you are glossing over the topic, pointing out too many risk and they will think that you are risk adverse or you will lose continuity of your document. You will need to find the right balance.

Financial Summary

The two key numbers to highlight are the Break Even number and the total Development Cost. You will need to show all of the numbers that went into the Beak Even calculation: Labor Cost, NRE, Capital, Risk Inventory, BOM, etc.

Delivery Date and Key Milestones

From the WBS, you should be able to estimate the time required to build a prototype part. List the key milestones and total time needed to produce a part so the reader can see how long it will take to see results

Summary & Recommendation (125 - 250 words & 125 words)

You started with the Abstract and Introduction and they were written to tell us where you are taking the reader. The Summary is designed to close the loop and summarize to the document that they just read. In a sense, you are telling the reader how you crafted and met the deliverables to your story.

Close the deal! The purpose of this document was to influence the reader. You have told your story; now tell the reader what you want them to do with the information with your recommendations.

Appendix

All of the information to needed to support your statements in the body of the report should be here. The report was written for a high level investor / senior manager. Going forward, the report would be turned over to a technical team for due diligence. All of your claims and references stated in the body of the report are supported with detailed analysis in the appendix. In general, you should be able to collect most of the information from your DHF.

- Unmet Need – all documentation leading you up to the final revision
- Price Performance Chart and Key Attribute: derivations and justifications
- All intellectual property reviews / proof of clearance
- Complete ConOps
- All Specifications
- All POC documents
- Full FMECA including revisions
- Complete BOM
- Complete WBS
- Labor calculations
- Remaining development cost (NRE, Risk Inventory, Capital, etc)
- Detailed Financial derivations

Glossary of Terms
(Team Project)

Action Items / Minutes – is a document that details all of the decisions that were made at a meeting as well as documenting the action items/minutes

Concept of Operation (ConOps) - is a document describing the characteristics of a proposed system from the viewpoint of an individual who will use that system. It is used to communicate the quantitative and qualitative system characteristics to all stakeholders.

Back-of-the-envelope - calculation is a rough calculation, typically jotted down on any available scrap of paper such as the actual back of an envelope. It is more than a guess but less than an accurate calculation or mathematical proof. The defining characteristic of back-of-the-envelope calculations is the use of simplified assumptions

Bill of Material (BOM) - is a list of the raw materials, sub-assemblies, intermediate assemblies, sub-components, parts and the quantities of each needed to manufacture an end product.

Break Even – for 185 EW this is a number that corresponds to the number of units that need to be sold in order to pay for the development cost

Capital - any single asset which has an acquisition cost of $1,000 or more and a useful life of more than one year, whether purchased outright, acquired through a capital lease or through donation. It also includes certain constructed or fabricated items and certain component parts

Customer Driven Attributes - Customers are trying address the Unmet Need by selecting alternative products. By reviewing the competition, you can determine the features that add value to those customers. By refining this list down to major themes, you can define the top 4-6 attributes that are important to this particular group.

Draft – this is the initial version of a document that has not been formally released. It is a working document that captures the main body or concept that you wish to express.

Design History File - Is a compiled folder that documents all decisions, data and analysis used to develop the Team Project. The document includes all Meeting Agendas, Action Items / Minutes

Elaborations - is the process of adding more information to existing, relatively simple information to create a more complex, emergent whole. It involves developing an idea by incorporating details to amplify the original simple idea. Elaboration enhances ideas and objects by providing nuance and detail. Elaboration may involve planning or executing a task with painstaking attention to numerous parts or details.

Expense - an expense consists of the economic costs a business incurs through its operations to earn revenue (see Capital)

FMECA (failure modes, effect and criticality analysis) - is a bottom-up, inductive analytical method which may be performed at either the functional or piece-part level. FMECA extends FMEA by including a criticality analysis, which is used to chart the probability of failure modes against the severity of their consequences. The result highlights failure modes with relatively high probability and severity of consequences, allowing remedial effort to be directed where it will produce the greatest value.

Intellectual Property - refers to creations of the intellect for which a monopoly is assigned to designated owners by law. Intellectual property rights (IPRs) are the rights granted to the creators of IP, and include trademarks, copyright, patents, industrial design rights, and in some jurisdictions trade secrets. Artistic works including music and literature, as well as discoveries, inventions, words, phrases, symbols, and designs can all be protected as intellectual property. The first 5 students that send in the response below will receive full credit on one quiz. To receive this credit, email jjfong@ucla.edu a message with the subject line "I read the Guide to Team Projects!". This offer expires on 10-9-18). This credit cannot be combined with a previous credit from the syllabus.

Macroethics - concerned with the collective, social responsibility of the engineering profession and societal decisions about technology

Meeting Agenda – is a document that defines the resolution of action items, new items that need to be discuss and what decisions need to be made. The meeting agenda is distributed 24 hours prior to the meeting so that all participants know what to expect and what information is needed to conduct a successful meeting.

Metric - is the measurement of a particular characteristic of a performance or efficiency. A metric must have a quantifiable characteristic and have property (units).

Microethics - concerned with individuals and the internal relations of the engineering profession

Minimum Order Quantity (MOQ) – when purchasing a part, the supplier may stipulate that an minimum quantity must be ordered in order to obtain the requested price

Non-recurring Engineering cost (NRE) -refers to the one-time cost to research, design, develop and test a new product or product enhancement. When budgeting for a new product, NRE must be considered to analyze if a new product will be profitable. Even though a company will pay for NRE on a project only once, NRE costs can be prohibitively high and the product will need to sell well enough to produce a return on the initial investment. NRE is unlike production costs, which must be paid constantly to maintain production of a product. It is a form of fixed cost in economics terms. Once a system is designed any number of units can be manufactured without increasing NRE cost.

NPD –New Product Development. Is a methodology for developing a product/project. For 185 EW we are using a modified Stage Gate approach. Other methods include Agile and Waterfall

Pivot – If the product business plan that you are pursuing all of a sudden turns out to not be the one that you should be executing, then the solution is for you and your product team to pivot. "Pivot" is a business term that was first coined by Eric Ries in his book "The Lean Startup". Eric defines a pivot as being ""structured course correction designed to test a new fundamental hypothesis about the product, strategy, and engine of growth."

Price Performance Chart – This chart can be used to compare and contrast products that attempt address the Unmet Need. You can use this chart to quickly identify how your product compares to the competition and to evaluate how changes in price and or performance impact your relative value.

> **Performance** – the performance is determined by evaluating the top 4-6 customer driven attributes. Use a spreadsheet to quantify and compare different options
> **Price -** is the cost to acquire and use the product over a specific timeframe. The elements and timeframe that contribute the evaluation are determined by the Team. Price may include, the purchase price, consumables, maintenance cost and support hardware

Proof of Concept - evidence, typically derived from an analysis, experiment, model or pilot project, which demonstrates that a design concept, business proposal, etc., is feasible.

Revision – When a document is officially released, it is given a revision number. The first release is Rev 1 and subsequent releases are incremented: Rev 2. All documents and revisions are kept in the DHF.

Return on Investment (ROI) – a performance measure used to evaluate the efficiency of an investment or to compare the efficiency of a number of different investments. ROI measures the amount of return on an investment relative to the investment's cost. To calculate ROI, the benefit (or return) of an investment is divided by the cost of the investment, and the result is expressed as a percentage or a ratio.

Scribe –is the person responsible for documenting all decision made during team meetings. The Scribe works with the Team Leader to document the Action Items / Minutes

Sign off - when a team member signs and dates a document it means that they have read, understood and agree with contents of the document. It also means that they have accepted responsibility and accountability for that document.

Specifications - are quantitative, measurable criteria that the product is designed to satisfy. In order to be measurable and unambiguous, specifications must contain a metric, target value and engineering units for the target value.

> **Left Column –** Customer requirement, derived from the ConOps
> **Right Column –** Engineering response, must be measureable

Team Leader – is the person that is responsible for organizing, managing and documenting the team progress on a weekly basis. They are also responsible for attending the Team Leader weekly meeting and turning in the DHF. List the team member's last names in alphabetical order (A-Z). The first team leader is at the top of the list and each week, the leadership cycles to the next name down on the list

Team Project – is a proposal to develop a multi-discipline, consumer product. The goal is to influence the audience that the team has developed a viable development strategy that is worth advancing to the next stage. As this is not a design class, we will be monitoring the progress of the team navigating the NPD process. The Team Project is the vehicle that we are using to teach and emphasize the importance of Engineering Ethics. The culmination of the project is a presentation as well as a written report.

Unmet Need - (with respect to 185 EW) is a consumer product that a customer desires/wants and is currently not available in the marketplace

Work Breakdown Structure (WBS) -is a deliverable-oriented breakdown of a project into smaller components. A work breakdown structure is a key project deliverable that organizes the team's work into manageable sections. A hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables.