Anatomy of a Proposal

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Senior Projects

This was adapted from Al Davis' CE Senior Project course

Anatomy of a Proposal

- Topics
    - Purpose of Proposal
    - Proposal format
    - Details of what is expected for each of the components

Purpose of Proposal

- Demonstrate benefit and motivation for idea

- Show that you understand project:

  - business issues: market, window of opportunity, etc.
  - design requirements
  - personnel skills
  - cost: NRE, materials, etc.
  - risks and rewards

Project: Basic Format

- Title Page

- Introduction and Motivation

- Project Tasks

- Specific Task Interfaces

- Testing and Integration Strategy

- Group management and communication plan

- Schedule and milestones

- Risk Assessment

- Bill of Materials

- Vendor List

- Conclusion

- References
  - cite everything - publications, web, personal advice

Title Page

- Title

- Group List

  - names and email contact information

- Project Web URL

  - include URL in your reports
  - contents of web page
    - repository for design documentation
    - meeting synopsis
    - decision log
    - parts documentation
    - project proposal and reports
  - continue next semester until project completed
    - start web tracking soon (as noted on class web page)

Introduction and Motivation

- **High Level Motivation**

  - motivation for the project
    - why are you interested in this project
    - common: skill development, problem need, future product zeal
    - key: "fire in eyes" - if you're psyched you'll do a better job
    - remember: this project is as important as your transcript
  - functional project synopsis
    - no need to for details on how it will be done
    - describe the scope of what it is and what it will do
  - how completed project will be demonstrated
    - define what you'll need to do to proclaim success
  - note!!
    - aimed at general audience
    - see if your mother can read and understand it

Project Tasks

- Break work into specific tasks
  - each task should:
    - be easily understood
    - you should have confidence that you know what will be involved
  - also include documentation tasks
    - very important in any industrial setting
    - can be parlayed into paper for academic setting
- Individual task descriptions
  - nature of the inputs
  - nature of the function performed
    - this will get more specific as the term progresses
  - nature of the outputs
  - resource requirements
  - manpower assigned
    - task leader must be a single person
  - estimated effort
- Input and Output description
  - HW: physical plugs, current and voltage specs, standards, etc.
  - SW: API: data types, sizes, argument lists, etc.

Specific Task Interfaces

- Each task interfaces to one or more others

  - based on input, output, and resource requirements
  - interfaces need to be defined to ensure compatibility

- HW-SW interfaces

  - specify what capabilities the HW will provide
  - specify the logical interface to the HW
    - e.g. what commands/instructions will the SW control

- hint:

  - the better you think these issues out early:
    the more fun you'll have when you implement
    and you'll vastly increase your chances for success
    - surprises $\Rightarrow$ problems

Testing and Integration Strategy

- Describe testing plan for each task

- Describe integration plan
  - how are tasks brought together to form larger components
    - combinational process continues until whole project done
  - how are these incrementally integrated components tested

- DON'T
  - even attempt to not take this one seriously
  - the "plug everything together and hope" method doesn't work
    . . . and demonstrates to anyone watching that you're a bad engineer
    - good engineers are thorough to a fault
      yup, we're boring but we can make what the world needs
        imagine life with no engineers
          we'd still be hunting food with sticks
      (both paraphrased from a lecture given by Amar G. Bose at MIT in 1966)

Group Communication Plan

- Most projects fail from lack of communication
  - bad ideas persist too long
  - problems seen way to late to fix them properly
  - changes to interfaces not made on both ends
- Hence
  - weekly team meetings are required
  - you will create a log on your project website
    - date, time, duration, attendance
    - completion status of previous tasks
    - substantive points discussed
    - decisions made
    - new tasks assigned
    - assessment of how you're doing on the overall schedule
    - + anything else you feel will also need to track
  - plus write up any additional communication plans that you think are necessary for your project.
  - for single person teams, this documentation will require you think about the issues

Schedule and Milestones

- Complete flow diagram
  - show who does which task and the order they will be done
  - details to show are in the Project Task section earlier
    - This part takes named tasks and assigns flow and schedule

- Milestones
  - terms are 15 weeks long, 30 total
  - AT LEAST EVERY MONTH
    - each person needs to specify a milestone
    - measure against previous project milestones
      - by a functional test
      - by documentation (e.g. here's the schematic)
  - milestones determine the schedule
    - your success rate on completion will be a major part of your grade
    - you will get 2 "get out of jail free" cards since nobody can schedule anything interesting with perfect success
  - present milestones and success at meetings with me

Risk Assessment

- Some tasks will be simple, and others won't

- For each task you need to describe the risk level, nature of risk, and mitigation plan in case of failure

  - risk: high, medium, low
  - risk nature: lack of knowledge, lack of experience, complexity, . . .
    - sometimes you are not in control - e.g. dependent on a vendor
    - need to minimize this with a backup plan
      - vendor second sourcing
  - mitigation plan
    - what happens when the risk causes failure
    - you will be required to have one medium or higher risk task
      - e.g. it would be cool to do this but if we can't pull it off then overall project still works but is just missing a neat feature.
      - alternate method has less risk but less optimal for some reason

Bill of Materials

- BOM

  - complete component list

    - primary vendor

      - part number, lead time, unit cost, quantity, total cost

    - secondary vendor

      - part number, lead time, unit cost, quantity, total cost

- Other resources that will be used

  - describe what you will need from the U

  - any other infrastructure requirements

    - where you will get them

Vendor List

- For every vendor on your BOM
- Provide a list:
  - ◆ vendor name
  - ◆ vendor address, phone, email, web, fax (whatever makes sense)
    - ■ note: I might follow up with spot checks
      - ● intent is not "big brother" but to avoid problems
  - ◆ sales person who is handling your order
    - ■ be wary of sales people
      - ● their job is to sell
      - ● they may not know their product well
        you may want to talk to a more technical person
      - ● sadly, telling the truth seems to e a challenge to sales people
  - ◆ notes on anything special
    - ■ vendor advice
      - ● for anything other than simple parts
        make sure you discuss your functional requirements
        if you communicate badly then bad things tend to happen
    - ■ arrangements made

Conclusion

- assessment of dependencies between milestones

- synopsis of the key risk components and when they will turn low

- final advertisement of why this project is so cool that everybody who sees it demonstrated in the spring will drool themselves into terminal dehydration

- Optional in proposals
  - Customer's view, etc.