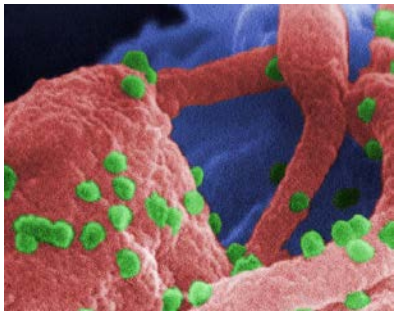
EE15N
The Art & Science of Engineering Design
Winter Quarter 2019

PROFESSOR ANDREA GOLDSMITH
PROFESSOR MY T. LE
MARCH 6, 2019



OUTLINE

- Administrative Details:
  - Due Midnight Tonight: Final Design Choice, Priority Checkmark Chart and Best-of-Class Chart, Weekly Project Meeting Notes.
  - Due Next Week: Detailed description/block diagram(s), Schedule, Cost Estimate, Prototype/model/proof of concept description (Optional).

OUTLINE (Cont)

- Lecture
  - Finalizing and Communicating Design Outcomes
- Speaker
  - Lee Redden

FINAL PRESENTATION

- Date: Thursday 3/21
- Time: 3:30-6:30PM
  - Assignment of Time Slots
- Location: 102 Hewlett
- Format: 30-minute presentation
  - Set up: 5 minutes
  - Presentation: 20 minutes
  - Questions: 5 minutes
  - Presentation by ALL team members
- Guests:
  - Project Advisors
  - Family & Friends

FINAL REPORT AND PRESENTATION

- Date: Thursday 3/21
- Time: 3:30PM
  - Please submit report and presentation electronically to Andrea & My:
    - Prefer that you send files as attachments, or links that are open for download to anyone with the link
    - If shared via GoogleDocs, we may have trouble accessing the documents.
  - No late submission will be accepted – no exceptions!
- Format:
  - Each team member must write at least one section. Please indicate clearly name(s) of author(s) for each section.
  - Please select one member to be the editor of report and indicate in the report who is the editor.

LECTURE

FINALIZING AND COMMUNICATING DESIGN OUTCOMES

FINALIZING AND COMMUNICATING DESIGN OUTCOMES

- Models, Prototypes, and Proofs of Concept
- Design Review
- Presentation
- Report

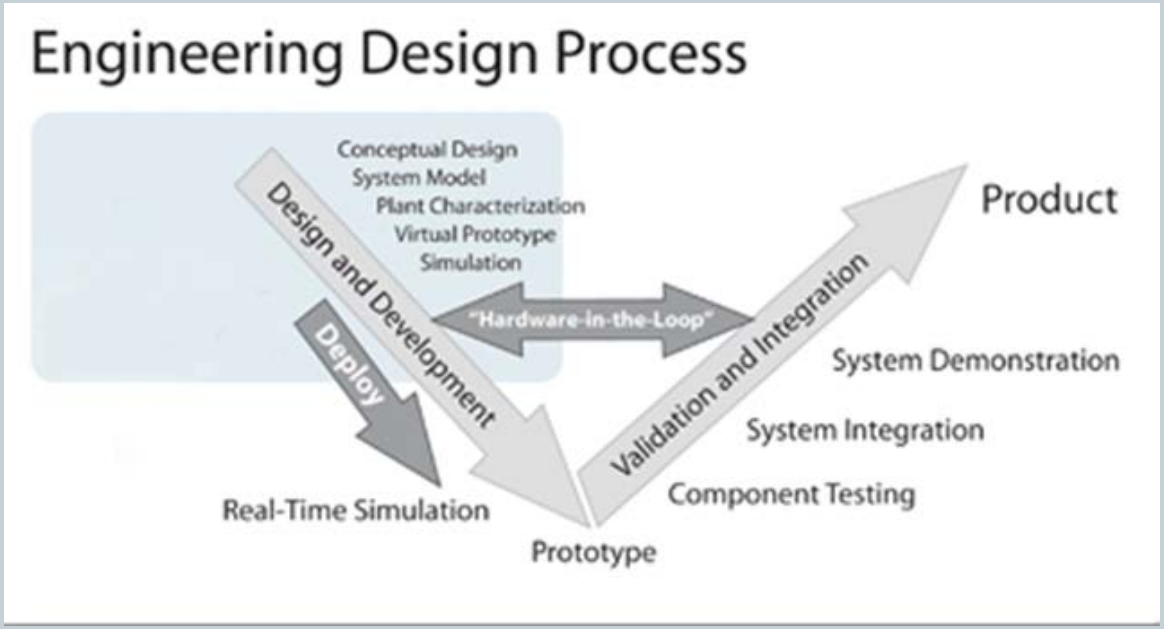
Models, Prototypes, and Proofs of Concept

- A model is “a miniature representation of something,” or a “pattern of something to be made,” or “an example for imitation or emulation.”
  - Used to represent some device or process.
  - May be paper models or computer models or physical models.
  - Used to illustrate certain behaviors or phenomena to verify the validity of an underlying theory
  - Usually smaller and made of different materials than final design
  - Usually tested in a lab or other controlled environment.
- A proof of concept is a model of some part of a design
  - Used specifically to test whether a particular concept will actually work as proposed.
  - Proof-of-concept tests entail controlled experiments to prove or disprove a concept
- Prototypes are “original models on which something is patterned.”
  - Full-scale and usually functional forms of a new design (such as an airplane).
  - Typically is a working model of the design
  - Typically tested in the operating environments where the design will be used

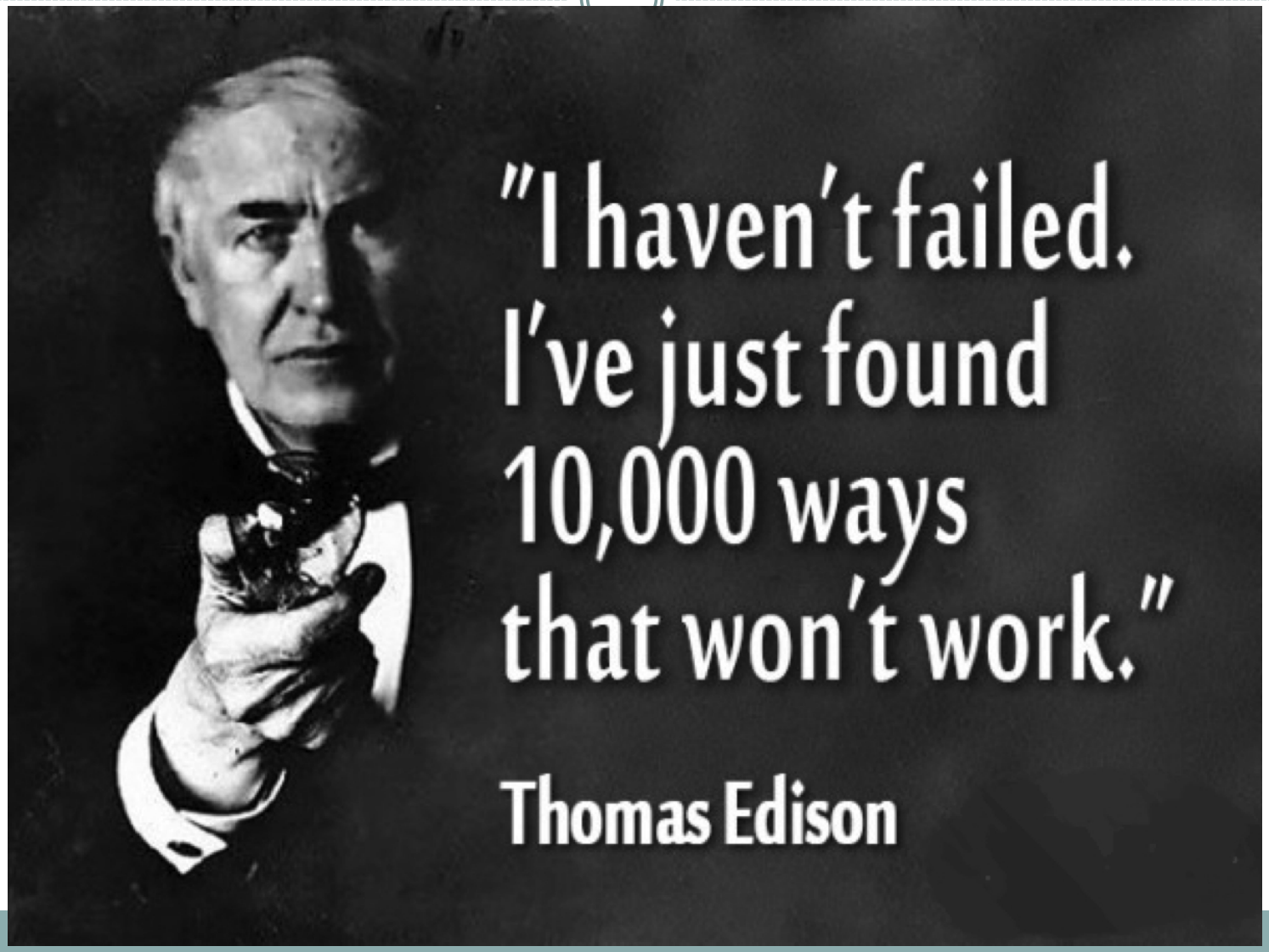
All three can be used to communicate design ideas to clients

When/What to do as part of your design?

- Models typically done early in the design
- Proof of concept typically done mid-way to validate certain aspects of the design and/or to get customers or financing
- Prototypes typically done towards the end to validate the entire design



Purpose of a Prototype



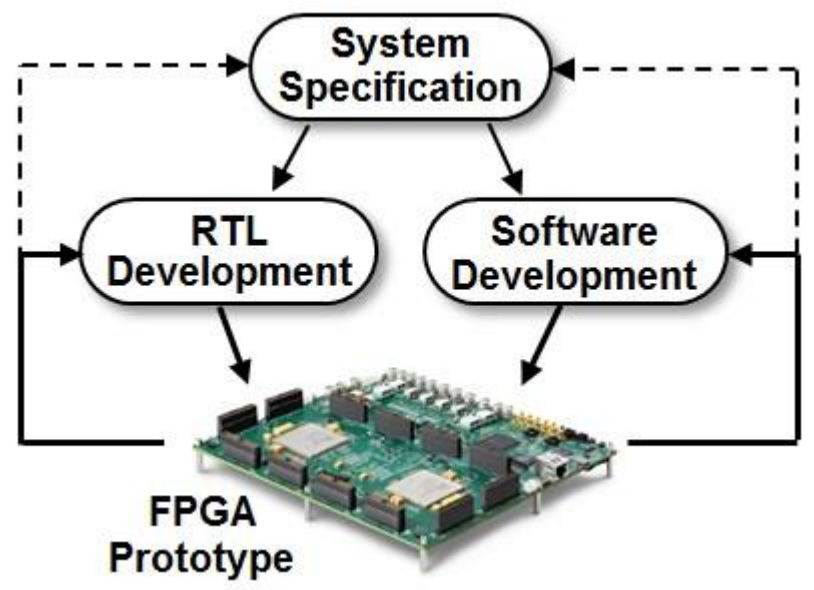
Failed Prototypes

Failed Prototype #2
barrysworld.biz

Failed Prototype #7
barrysworld.biz

Prototyping in Chip Design: FPGAs

- Chip design starts with hardware and software development
- Typically implemented in an FPGA prior to tapeout
- Many bugs in the design caught via the FPGA



Communicating Design Outcomes

GENERAL GUIDELINES

- Know your purpose.
- Know your audience.
- Choose and organize the content around your purpose and your audience.
- Write precisely and clearly.
- Design your pages well.
- Think visually.
- Write ethically!

DESIGN REVIEW

- Purpose: Team presents its design to an audience who can
  - Assess the design;
  - Raise questions;
  - Offer suggestions.
- Audience: Technical professionals.
- Long in duration; detailed in presentation.
- Often have multiple design reviews
  - Preliminary and critical/final design reviews.

ORAL PRESENTATION

Presentations are made for different reasons:

- Before project.
- During project:
  - Initial findings.
  - Alternatives under consideration.
  - Progress toward completion.
- End of project: report to clients, other stakeholders and interested parties.

PRESENTATION OUTLINE

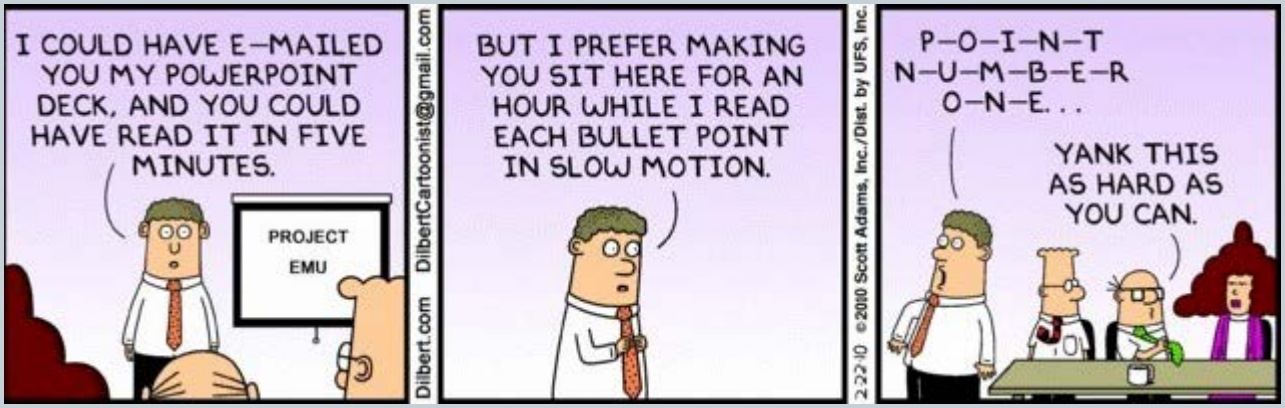
- Beginning
  - Title Slide.
  - Overview.
  - Problem statement.
  - Background material on problem.
  - Key objectives.
  - Functions that design must perform.

PRESENTATION OUTLINE (CONT)

- Alternatives
  - Design alternatives.
  - Highlights of evaluation procedures and outcomes.
- Choice
  - Selected design.
  - Features of design.
  - Proof of concept testing.

PRESENTATION OUTLINE (CONT)

- Ending
  - Demonstration of prototype.
  - Conclusion(s).



FINAL REPORT

- Purpose: to ensure client's thoughtful acceptance of team's design choices.
  - Results should be summarized in clear, understandable language.
- Goal: lucid description of design outcomes.
  - *Not chronologies of team's work.*
  - *Want to clearly convey design choices and why made.*
- The larger the writing team, the greater the need for a single editor.

WRITING FOR THE CLIENT

- The report is written for the client
  - Conveys to client reasoning behind the team's design choices.
- The report requires:
  - Clear presentation of design problem and needs to be met.
  - Discussion of design alternatives to meet these needs.
  - Clear presentation of chosen design and basis for this design choice.

PROJECT REPORT

Design reports typically include the following:

- Abstract.
- Executive summary.
- Introduction and overview.
- Analysis of the problem, including relevant prior work.
- Design alternatives considered.
- Evaluation of design alternatives and basis for design selection.
- Results of alternatives analysis.
- Design selection.
- Supporting materials: drawings, fabrication specs, etc.

FROM ROUGH OUTLINE TO FINAL REPORT

- Rough outline should look like a table of contents with section, subsection, and subsubsection titles.
- Start with the titles of the sections
  - Include a few sentences of what should be described in that section.
- Then create titles of subsections
  - Include a few sentences of what is described there.
- Then create titles of subsubsections
  - Include a few sentences of what is described there.
- If subsubsections are not sufficient to organize your ideas, then reorganize your paper structure.

WORKING TOWARDS FINAL REPORT

- As you write your final report, you will realize things that are missing or should be moved to another section
  - Do not feel obligated to stick to your outline.
  - There is not necessarily an optimal organization, but some are better than others.
- It is often wise to write the abstract and executive summary last
  - These are also the hardest parts to write.
- It's a good idea to write your introduction first.

PUTTING IT ALL TOGETHER

- In a team project, you will often have different people contributing to different sections.
- This can create discontinuities, repetition, and heterogeneous styles.
- The report should read as if one person wrote it.
- Often its best if one person does write it, or at least takes full responsibility for integrating all the pieces. This is the document editor.
- It is also good to assign an editor for each section that integrates the various pieces into a coherent whole before handing off to the document editor.

GROUP EXERCISE

- You are team leader and editor for your team's design report.
- One of your team members does not submit their required documentation.
- Another has a very poor writing style.
- A third severely criticizes contributions from others.

How would you handle these issues?

TODAY'S SPEAKER

LEE REDDEN