

CHAPTER 9: CONDUCTING DESIGN REVIEWS

Chapter outline

- Preparing the review
- Presenting the review
- Organizing feedback from the review
- Offering useful feedback as a reviewer

A design review is a scheduled, systematic evaluation of a design by knowledgeable people, particularly fellow designers. These people can also include the client, members of the client's organization, and outside experts. The purpose of the review is to help the design team ensure that the design meets client and user requirements.

A typical review begins with the team briefly discussing client and user requirements. The team then presents its design (or design alternatives, if a single design concept has not been decided on). The reviewers' role is to evaluate the design critically: ask questions, identify problems, and make suggestions.

Design reviews are an important way for a team to get an informed outside perspective and to keep the project on track. In industry, they are often done at several points during a project. Each review helps designers to rethink and refine their concepts.

In presenting your design for review, your goal is not to persuade the reviewers that it is wonderful. Instead, your goal is to encourage them to uncover possible problems in the design, to offer suggestions for improvement, and to help ensure that you have followed the design process rigorously with your client and users constantly in mind. Since you have invested so much time and energy in the design, your natural tendency may be to justify what you have done and to deflect criticisms and suggestions. Doing that may make you feel good, but down the road it will hurt you, especially when you go to your client, who will demand that your design have no flaws and that it meet every single requirement. So use the design review as an opportunity to ensure quality control at a point in the process when it's not too late to correct mistakes.

The following three sections discuss how to prepare and present the review as well as how to organize the feedback you receive. A final section discusses how to offer useful feedback as a reviewer.

9.1 PREPARING THE REVIEW

Design reviews can be formal or informal. Follow these guidelines to plan your design review for EDC:

1. Outline the key points you will make. Design reviews generally last from 20 to 30 minutes; ask your instructors beforehand how long you will have. It's important to plan carefully to ensure that you leave plenty of time for discussion. Make your presentation brief, devoting most of it to describing the design itself. Present background information on the client and users only as needed. For instance, if everyone in the class is working on the same project, there is no reason to spend time going over client background and user requirements. Conversely, when the rest of the class is unfamiliar with the project background, you may have to spend time explaining the client's organization and the problem, using visual aids—such as photos and brief video clips—as needed.
2. Prepare visual aids. These may include your latest mockup(s). For features that are hard to see in the mockups, use graphics on handouts, flip charts, and/or PowerPoint slides. However, don't think of your design review as a presentation, for which you would prepare elaborate or extensive PowerPoint slides. Your visual aids just need to help reviewers understand the design problem and the key features in your latest solution(s).
3. Prepare a questionnaire that you want reviewers to answer about your design. Make enough copies for all reviewers. Ask general questions about the strengths and weaknesses of the design as well as specific questions about areas that particularly concern you.
4. Prepare an analysis of failure modes and effects. In spring quarter, you will be required to include a Failure Modes and Effects Analysis (FMEA) as part of your design review (see Chapter 8). One crucial function that design reviews serve is to alert you to the reliability and safety issues raised by your design. Reliability has to do with the likelihood of the design and its subsystems to fail. Since all systems and subsystems fail at some point (the battery dies, the handle snaps, etc.), your job as an engineer is to delay that failure and minimize its impact. Similarly, all designs have safety hazards. That's why the instructions for your hair dryer and TV set begin with long lists of cautions and warnings. As an engineer, you are obligated to eliminate, guard against, and/or minimize the effect of these hazards.
5. Assign responsibilities: Who will speak and in what order? Who will take notes (you should not rely solely on the notes reviewers put on the handouts since they may be incomplete)?

9.2 PRESENTING THE REVIEW

To get the most from your reviewers, follow these guidelines:

- **Distribute questionnaire.** At the start, distribute the sheet with your questions about the design, and ask reviewers to fill it out and return it to you at the end. Emphasize, however, that you are interested in getting suggestions and criticisms of all aspects of the design, so reviewers need not confine their comments to your specific questions.
- **Ask for oral feedback.** Encourage reviewers to ask questions, offer suggestions, and make criticisms during and after the presentation of the design.
- **Respond non-defensively.** Just as you did in your user testing, in a design review you should respond to questions, criticisms, and suggestions without defending your design or design decisions. Instead, probe for more information. For instance, the appropriate answer to the criticism that your design has a flaw is not, “Well, we’ve tested that, and it works,” but “Why do you see that as a flaw?” and “How can we eliminate it?” Similarly, the appropriate response to a suggestion is not, “We tried that, and it didn’t work,” but “Here’s what happened when we tried that feature. Can you suggest a way to improve on what we did?” In other words, give your reviewers a chance to help you think of possibilities you may have missed.
- **Record all comments.** Listen carefully and write down reviewers’ comments and suggestions. At least one team member should be a scribe during the review.

9.3 ORGANIZING FEEDBACK FROM THE REVIEW

After the design review is over, you will need to organize and discuss the feedback you received in order to decide how best to apply it to your design. To accomplish that goal, follow these guidelines:

- **Have a team member categorize all feedback.** Include those comments you received orally during the review and those written on the review sheets you distributed. Post this categorized list so that it’s available to other team members and to your instructors. Below is an example of a design review summary written by a team designing an automobile passenger seatback so that it can be used as a workspace and for storage (Shiao, Chen, Lee & Srinivasan, 2003).

Example 9.1: Summary of design review results

Design review results

Reviewers like	Reviewers dislike	Features to be added	Features to be removed/modified	Additional comments
ACCESS	EASE OF USE	Cover	Mirror-safety issue	USABILITY Most useful if driver is alone in vehicle. VERSATILITY Make it usable when it's upright as well. Prioritize user needs.
Can see what you want. Equally accessible for driver and rear seat. Easily accessible from front seat. Allows driver access to all items on seat.	Don't like having seat down. Too cumbersome to access from driver seat. USABILITY Only useful for drivers. Cannot be used by back seat.	Better places to put CD case		 COMPONENTS Try not to be so specific with the pouches—more versatility.
COMPONENTS	Can't be used when there is a front seat passenger.			Only things I would use would be the Kleenex, pencil holder, and expandable file.
Lots of stuff to use. Kleenex.	Not accessible while seat is upright.			 OTHER People usually unlock the front door first; getting the ice scraper would be a pain.
Good if you are doing a lot of work in car.	FUNCTIONALITY Too cluttered. Too much stuff. Hard to see all of the items. Cup holder is too far away. Safety issues.			

- Have a meeting as soon as possible to discuss the feedback. Make decisions about how you will act on the feedback from reviewers. Below is a table written by a team after they made these decisions (Hwang, Jessop, Sze & Vetter, 2005). The team's project involved designing a cart to store gym equipment for a local school.

Example 9.2: Decisions made after design review

Implementation of Design Review Advice

Suggestion/criticism	Implementation
Side joints do not seem strong enough. Suggest triangular supports.	Add metal L-brackets between side panels and base.
Round off sharp corners or add rubber padding for safety.	Add rubber strips on corners.
Add lip on bottom shelf.	Add lip on one side of cart.
Bungee cord seems unsafe; use mesh.	Add mesh netting on both sides of cart.
Objects on bottom shelf may obstruct stick storage extending through shelf*.	Use indentations in a wood block to secure new stick configuration—work in progress.
Make sure all the games fit in cart, including Team 2's large games.*	Continue to work with Team 2 on their games.
Cart needs a design and/or paint.*	Add some type of finish: paint, varnish, or oil. Ask Prof. Jacobson which is best.
Use peg dividers instead of wood slats.*	A simpler divider system is needed—work in progress.

*Solution still needed—immediate action item

9.4 OFFERING USEFUL FEEDBACK AS A REVIEWER

When you are a reviewer, your job is to offer constructive feedback and probing questions that will help your fellow designers improve their design. To do that, keep in mind the following guidelines:

- Say what you like and dislike. You don't have to be an expert, or even familiar with the design problem, to offer criticisms and suggestions.
- Ask basic questions that get the designers to explain their design: Who, What, Why, How, When, Where? In particular, probe the how and why of the design: Why did you incorporate this feature? How would I perform this particular task if I were using your design? If you can get the designers to explain their design clearly and carefully,

they will discover a great deal about its strengths and weaknesses on their own.

- Be on the lookout for “latent defects”—design flaws that are not obvious and that may surface during the product’s use. You will be very helpful to the designers if you present scenarios for the product’s use that may uncover a defect they have not anticipated. The Y2K problem is a classic case of a latent defect that had enormous repercussions. Many software engineers believed that on January 1, 2000, computers around the world would crash because they represented years by using only the last two digits and would therefore misinterpret “00” as “1900.” It is estimated that over \$300 billion was spent in order to solve the problem.
- Ask questions about the design’s reliability and safety issues. In particular, ask probing questions about the team’s FMEA. Add items to it where possible.
- Fill out the review sheet passed out by the designers.

9.5 REFERENCES

- Hwang, M., Jessop, B., Sze, N. & Vetter, J. (2005). *Implementation of design review advice*. Engineering Design and Communication, Northwestern University.
- Shiao, C., Chen, S., Lee, C. & Srinivasan, S. (2003). *Progress report #4*. Engineering Design and Communication, Northwestern University