

ISTE-264, PROTOTYPING AND USABILITY TESTING

HOMEWORK

SPRING 2022

INTRODUCTION

Together, the following assignments constitute a project that determines three quarters of your grade.

1. HW 1, Design problem analysis
2. HW 2, Lo-fi prototype
3. HW 3, Evaluation of lo-fi prototype
4. HW 4, Hi-fi prototype
5. HW 5, Evaluation of hi-fi prototype

The semester long project is the most important as well as the most time-consuming part of this course. Past project groups (in graduate versions of the course) claim to have spent up to 40 hours in meetings to plan and organize their projects, with an enormous time commitment of solitary work between meetings.

The outcome of this project should be a digital prototype that can be shared, preferably via the web. There should be a web presentation even if the design itself is of something that is not inherently web-based, such as an intelligent wheelchair. It should be possible to communicate about the project outcome via the web, both for the class and so that you can use the project outcome in job searching.

Our competitors do this, and you can sometimes find remarkable project websites associated with the top schools. Be on the lookout for similar material from other schools.

It would be best if you would not hand in any paper related to your project, but use a website that develops over the course of the semester and is used to document each homework.

Please *do not* present your homework as a slide show. Please see the introduction and the file `cog-style-ppt.pdf` for reasons to reject the slide show format (e.g., low data-ink ratio, inherent ambiguity of cryptic headings, cognitive dissonance introduced by heavily nested festivals of bullet point levels, etc.). Please use your website to present your homeworks.

Create a project website. RIT provides you with a place to put a website if you don't already have one. I can not find a formal channel through which you learn about it so here is what I know. I can access mine at <http://people.rit.edu/~mjemics> and you can access yours with a similar URL, substituting your username for mine. If you have not put anything there, you will see an error message. I created an `index.html` file containing a link to my website and uploaded it to the site from a terminal, saying

```
sftp mjemics@gibson.rit.edu
cd www
put index.html
exit
```

You can access it from a terminal by saying

```
ssh mjemics@gibson.rit.edu
chmod 755 www
cd www
chmod 755 index.html
exit
```

Again, you would substitute your username where I have entered mine above. One popular GUI for uploading your information is *FileZilla*. You can use it to graphically navigate to your `www` folder and put an `index.html` file there. Where I used the terminal above, you can use menus in FileZilla or another GUI to do the same thing. What I did when I said `chmod 755 www` was to make the `www` publicly readable and executable but not publicly writable. Then I changed to that folder and made the file in it publicly readable and executable. You need to do that for every file you want to share, including your document and pictures. You can link them all in the `index.html` file.

I was quite surprised to find that some students were unfamiliar with how to do this. You may be severely handicapped in your career if you do not know how to use a terminal to accomplish some basic tasks. You may not have time to learn a lot so it may help to use a combination of the terminal and GUI tools.

Diverge, then converge. You must do two things to develop a creative project and meet deadlines. You must first diverge, then converge. Divergence is fun and, in my experience, people spend too much time on it, then go into a frenzy of convergence. You must decide in advance what fraction of your time is spent on each process and be decisive about switching from one mode to the other when your time comes.

The same is true for gathering ideas and implementing them. If you've overused the web for a decade or more you probably remember the meme involving Hitler getting bad news in the film *Die Untergang* (2004). People would subtitle the scene endlessly with bad news affecting different hobbies, occupations, sports, or celebrity foulups.

Did you know that there were even versions for HCI? Yes, HCI is everywhere. And HCI people seemingly have time to

throw up endless websites with internally conflicting advice, eternal truths, urban legends, and the occasional valuable piece of information. During your program here, you need to find a way to better cope with all the HCI information coming at you from every direction. You need to share with each other how you get information as well as how recall information when you need it. As you approach a difficult assignment, it will be tempting to keep gathering information right up to the last minute. Resist that temptation! Instead develop a self-discipline to diverge for part of each assignment, then relentlessly converge.

Making a deadline is a convergent process. You don't want to be open to new ideas. You want tunnel vision near a deadline. Any new information you receive has to be put somewhere you can find it after the deadline. Over half of your classmates probably don't have a good place to put new information right now. So put it anywhere and concentrate on processing the information you have right now.

HW 1. DESIGN PROBLEM ANALYSIS

Establish a website that identifies your team, your customer, the problem, and (most important) an analysis of the problem.

You can use Cooper et al. (2014), chapters 1 and 2, as well as Holtzblatt, Wendell, and Wood (2005), chapter 2, to help you think about the scope of the project, its stakeholders, and your general approach. That text identifies examples of projects with a small, tight scope that can be done rapidly, such as usability fixes, market characterization for new system concepts, website evaluation and redesign, next generation systems, supporting a coherent task, and reporting. There is also a discussion of stakeholders that can inform you. You should briefly identify your proposed stakeholders and consider the

following points about them: goals, worries, ideas, how to involve them, how to communicate progress, how to understand their way of communicating, and how to communicate the design to them. You should include a set of covenants to govern your group. These must be agreed to by all members and must specify grounds for expulsion from the group. Only ten percent of all groups wind up having to enforce these, but they may help stave off disaster, so everyone should form covenants.

Your analysis of the design problem should suggest how prototyping can help to illuminate the problem. You should say what you plan to prototype and why. You have to find aspects of the design problem that are amenable to prototyping. For example, if your problem is to sell something online, you would likely prototype the checkout process. You may decide to prototype wishlists, shopping baskets, comparison tables, or other artifacts of shopping. You'll need to be specific about which artifacts you should prototype and why you should prototype them. You should choose artifacts whose design will matter. To continue with the shopping example, there are certainly aspects of online shopping that do not matter, such as whether you offload credit card processing to a third party. You want to avoid dealing with credit cards in online shopping because the decisions about their presentation are usually made for you based on agreements with third parties over which the designer has no control.

One analysis activity can be the search for *pain points* and an effort to understand whether design can help ease the person's pain. Your own interactions with software have doubtless uncovered many pain points. The challenge you face now is to determine which of these pain points can be eased by design. Some are matters of budget and can't be fixed. Your understanding of technical, economic, and administrative fea-

sibility can help to guide you here.

Many tools are available to help you brainstorm, such as mind-maps, mood boards, and empathy maps. It is up to you to identify and use enough tools for brainstorming that you are not bereft of ideas.

A student asked the following questions, and they're relevant for everyone:

My group is currently meeting to discuss the homework, and we have a website established together, but we are confused on the design problem. How large of a problem should this be? A redesign of an entire app, or just one process? Could we get some examples?

My answer is:

There are two main questions here, about the scope and examples of success.

The scope is the hardest and most central question you have to answer. I see four possibilities based on whether you “go big”, which is more risky, or “go small”, which is less risky, and on whether you succeed or fail. If you “go big” and succeed, you earn an A. If you “go small” and fail, you probably earn a C. The other two combinations probably lead to Bs.

This method of categorizing projects raises two questions. What does big and small mean? And, of course, what constitutes success and failure?

You'd like to see examples of “A” projects so you can use them as a gauge or template for the size of your projects, and as a measure of what success looks like. I've done that in the past and gotten “cookie cutter” results, projects that look too much like the template project. This may be a good exercise, but it won't win you any competitions. I've coached teams at another university to enter design competitions. We often won because our projects were more creative, more original than those of our main competitor. They required more in-

dependent thought and struggle on the part of our students, but it paid off in the end.

So I resist giving examples, but I'm willing to compromise. I'll give you one example of a successful project. This is a link to its hi-fi prototype. I wouldn't take too much away from it, though, because a lot of what was great about it was how thoughtful it was, more than the number of screens prototyped.

<https://www.figma.com/file/Csz6o5AV5mt16Mg9seN1tY/Interpreter-Request-App-Hi-Fi?node-id=0%3A1>

Be careful of overusing that example, though. A lot of its success is not visible by walking through it. Developing your process is more important than recognizing success in someone else's project at this stage in your development.

HW 2. LO-FI PROTOTYPE

You can use Holtzblatt, Wendell, and Wood (2005), chapter 13, to complete this milestone. The lo-fi prototype is supposed to generate discussion and to be something you can readily throw away and rework.

It should be a prototype you can develop quickly. That does not mean you should spend very little time on this homework. You may develop a number of thrown-away prototypes before the one you ultimately turn in. The point of this homework is to work on a process for quickly generating prototypes, not to spend a brief period of time on the homework as a whole.

You should use a technique amenable to quick redoing. One issue students sometimes have to face is that they do work that is not turned in for credit. Students often feel that they should show everything they did and are reluctant to go through

multiple iterations without saving all the in-process work and submitting it for credit. Musicians don't play scales for the audience and football players don't do pushups as part of the game. You have to come to terms with the fact that you will do work that is not shown. It is part of the process of maturing to recognize this.

The lo-fi prototypes should generate discussion. Expect to discuss them a lot! Expect to rethink them and make better designs because of having rethought them.

Your prototypes should be added to your website for review and grading but they should be paper or interactive prototyping tool-based for easy testing in hw 3. There should be enough to test. For example, if you have about three or four main screens, there should be a total of about a dozen connecting screens. There should also be a flow diagram.

The two things you are deciding for this prototype are layout / placement of objects and flow of action. Your prototypes should be based around specific tasks or activities that a test participant might want to do, such as buying a thing or successfully obtaining a service of some kind. You need enough auxiliary screens to support these tasks or activities. It should be possible to run a usability test of your prototype with a minimum of talking / explanation, so keep that in mind as you sketch your prototype.

HW 3. EVALUATION OF LO-FI PROTOTYPE

You should test your lo-fi prototype on at least two users per team member. You should then compare your results among team members. Your analysis of results should lead to either refinements toward a hi-fi prototype or a change of direction for a hi-fi prototype. Either outcome is valid depending on your test results.

Add a page to your website where you document your process and analyze your results. Your documentation should include your test protocol, which can be like a script that you read from to ensure that you test each person the same way. The page should also include an analysis of your results. This could include descriptive statistics and pictures. For example, if you asked Likert scale questions, you could include a copy of the questionnaire with an icon showing where each participant checked off on each question. You could also feature revealing quotes from your participants, along with explanations. Finally, you should include your future directions as informed by your analysis.

HW 4. HI-FI PROTOTYPE

The outcome of this homework should be something viable for user testing. You should not have to modify this so you can use it for testing. Therefore, the definition of hi-fi may be relaxed. This may well be a mid-fi prototype. The goal is to prepare something you can use to gain relevant knowledge about the design from users.

HW 5. EVALUATION OF HI-FI PROTOTYPE

This is similar to your lo-fi evaluation with one exception. You should have in mind tasks and goals by now. So you should ask your participants to complete some task or tasks in service of some goal. You should document both participants and provide a summary of lessons learned. Think of this as more of a summative test than a formative test. In other words, you have expectations and it is possible for participants to do something wrong based on your design, leading you to refine your design or implementation. Note that the prototype functionality need not be complete. You can provide the

participant with a task that is only supposed to exercise the completed portion of your prototype.

Your website should have a page devoted to this milestone, organized as follows.

- Overview (one paragraph saying how many participants and what functionality was tested)
- Details about each participant's tasks and results (could be a table or narrative or both)
- Summary of findings based on tasks and results (should include both what you found out and what you will do next)
- Link to your documentation (scripts, consent forms, check-lists)

HW CRITIQUES

Someone in a group working on a shopping cart device asked if they should change direction or scale back because I said that I thought it would be too expensive to put a device in each shopping cart. Here's what I said in reply.

I would like you to think about this in a different way. Instead of trying to decide what to do based on what I have said, try to find evidence that supports or refutes what I have said.

There is a major grocery store chain headquartered near here, Wegman's. They donate a lot of IT equipment to RIT so I know they are friendly to RIT. When I visit there, I often see the employees themselves shopping for groceries. I'll bet you could interview them to find out about the needs of shoppers that might be helped by having a device on the grocery cart or perhaps an app that might help.

For now let me just add that the needs of the shoppers as perceived by the employees may differ from the needs of the

shoppers as perceived by the shoppers and ALSO from the needs of the shoppers as EXPERIENCED by the shoppers. In other words, even the shoppers themselves may perceive differently from their experience.

A famous quote from Henry Ford, explaining why he did not listen to his customers was that, if he had, they would have just told him to invent a better horse and buggy.

PROJECT MANAGEMENT

Many teachers agree that no project management skill is required to work on a project with a group of four or fewer people. This is a major reason teachers who are not teaching project management advocate groups of four or fewer for class projects. Nevertheless, many students are unaware of or don't believe this claim, and ask about project management. There are two things I can share about project management without diverting much attention from our purpose. One is the individual interactions between team members. I will discuss that later. For now, I would like to make a few remarks about the practice of project management in the IT workplace.

The Project Management Institute (PMI) has become the most popular focal point worldwide for best practices in project management. Some universities devote entire departments or even, as in the case of Stevens Institute of Technology, entire business schools to PMI education. PMI practices are inescapable in information work.

The main reference guide to these practices is called *The Project Management Body of Knowledge Guide*. It offers some general definitions for project management. In addition, the *Guide* lists all the non-controversial processes in project management and provides lists of their inputs and outputs. By *non-controversial* I mean all the processes that the project man-

agement profession agrees upon as a baseline. Innumerable project management consultants offer proprietary extensions to this body of knowledge and these extensions are not covered in the guide, nor are the basic processes covered in any great depth. The *Guide* simply serves as a brief summary of the current state of agreed best practice in the field.

The significance of project management for information work is that information intensive activities are organized as projects. Productive organizations may be managed as functional areas, operational areas, a matrix of these kinds, or entirely as projects. This latter category is extreme but it can be seen in the organization of Hollywood movies and in the activities of BP, one of the world's major oil companies.

I had the good fortune to interview a vice president of BP in 2006 and learn that BP was then trying to discover best practices from Hollywood blockbusters in order to reduce its exposure to operational management by outsourcing as much of each oil rig as possible and treating each oil rig as if it were a Hollywood feature film. Each oil rig is as large and complicated as a 70 story skyscraper, although it is meant to be used for far less time and for only one purpose. Interestingly, BP had just experienced a catastrophic oil spill (6,000 barrels) at the time and I could not help but wonder how large a role exposure to litigation may have motivated its project focus. Alert readers will note that, just four years later, BP experienced a vastly more important oil spill (5 million barrels), known as the Deepwater Horizon oil spill. That event and its aftermath are far too complex to even summarize here. I just want to note that the project management approach to organization may be tied to other considerations but that they feature prominently in contexts other than information work.

REFERENCES

You should use a variety of sources to inform your work. Following are sources we'll be sure to refer to in class.

Cooper, Alan, Robert Reimann, David Cronin, and Christopher Noessel. 2014. *About Face 4.0: The Essentials of Interaction Design*. Indianapolis, IN: Wiley.

Holtzblatt, Karen, Jessamyn Burns Wendell, and Shelley Wood. 2005. *Rapid Contextual Design: A How-to Guide to Key Techniques for User-Centered Design*. San Francisco, CA: Morgan Kaufmann.