A.Hornof - 10-10-2023
CS 443/543, Fall 2023

Project #2
Design a User Interface

In Project 2, you will design two different user interfaces that support the reading of college textbooks, and you will evaluate one of those two designs.

Deadlines:
Monday, October 16, 10PM.
- Step 1 "Understand the Task" must be completed in full.
- Step 3 "Ideate" must be started.
- Step 4 "Specify Two Designs" must be started. As in, there should be an initial sketch of two different designs, with each design explained using a different technique (scenario/ storyboard, and paper prototype).

Monday, October 23, 10PM: Entire project is due.

The Goal of the Project

The goal of this project is to give you the experience of (1) thinking about a task from the user's perspective, (2) learning and practicing established techniques for representing interaction design, (3) designing alternative interactive systems to support a task, (4) using the established techniques to develop and describe your designs, and (5) conducting a formative evaluation of an interaction design.

The Task

The task that your interface will support is using SQ3R to learn the material in a textbook chapter. For this project, the textbook chapter that will be read is be Huckin & Olsen "Chapter 2 Writing Paragraphs", which is available at:
https://canvas.uoregon.edu/files/17013955/download?download_frd=1
SQ3R is thoroughly described here: https://ucc.vt.edu/academic_support/study_skills_information/sq3r_reading-study_system.html
and in a one-page summary here:
https://uafs.edu/academics/academic-resources/academic-success-center/_documents/SQ3R%20Reading%20Method.pdf
and is discussed here:
https://classes.cs.uoregon.edu/23F/cs443/how_to_read_technical_material/

Design a system that supports the problem scenario that follows.

The Problem Scenario

Jun is a first-year undergraduate student, interested in the sciences. She did well in high school, and expects that college will be even more challenging. Jun is a good student, but always wants to do better. To that end, she is interested in further improving her skills at *reading technical material* and at *technical writing*. She visited her university's "learning center" and learned about the SQ3R (Survey, Question, Read, Recite, Review) reading technique. She also learned about a book on technical writing by Huckin and Olsen. She decided to try out the two at the same time, to use the SQ3R reading technique to read Huckin and Olsen "Chapter 2: Writing Paragraphs".

Jun gathers all the materials around her, in an appropriate setting to do the task. She has a one-page summary of SQ3R from the University of Arkansas, a paper notebook, a printout of the chapter, a highlighter, pencils and pens. She sets this all up in a quiet spot in the library, away from other students, where she can focus without distractions. She sends out a text blast of "studying! yay!" so her friends know she'll be out of contact for a while. She turns off her phone, noting the time as she does so, and noting a nearby clock so she can monitor her time on task. She sets a half hour as a goal.

Jun starts to figure out the SQ3R technique. She reviews the entire one-page description of SQ3R. In her notebook, she writes a heading of "Using SQ3R to read Huckin & Olsen" and today's date. She then makes a checklist in her notes of:

- ☐ Survey - Headings, pictures, topic sentences, conclusion.
- ☐ Question - Create questions as you go.
- ☐ Read - Read to answer your questions, and to get the main ideas. Write down.
- ☐ Recite - Answer your questions aloud without looking. State the main ideas aloud.
- ☐ Review - Test your memory on what you learned.

The list is not a perfect summary of SQ3R, but it is good enough to get started.

Jun applies the SQR3 technique. *S*: She reads through the headings and topic sentences, highlighting material that seems important or worth revisiting. *Q*: She writes questions both in her notebook and in the margins of the printout. *R1*: She goes back to the start, and reads primarily to answer questions, and to get the main ideas, highlighting as she goes. *R2*: She recites her answers, quietly so she does not disturb other students. *R3*: She covers the answers to her questions, and tries to answer them from memory.

Jun completes the study session. She looks at the clock and sees she's been working for an hour. She feels confident that she knows more than she did an hour ago. She turns her phone back on and text-blasts "learning achieved!", packs her materials, and heads home. As she leaves, she ponders the material that she just read, thus further reinforcing it in her long term memory. The knowledge is not a confused swirl. It is an organized hierarchy of knowledge on how to write good paragraphs in technical documents, and how to apply SQ3R. Jun feels increasingly confident that she can succeed in college, and in the sciences.

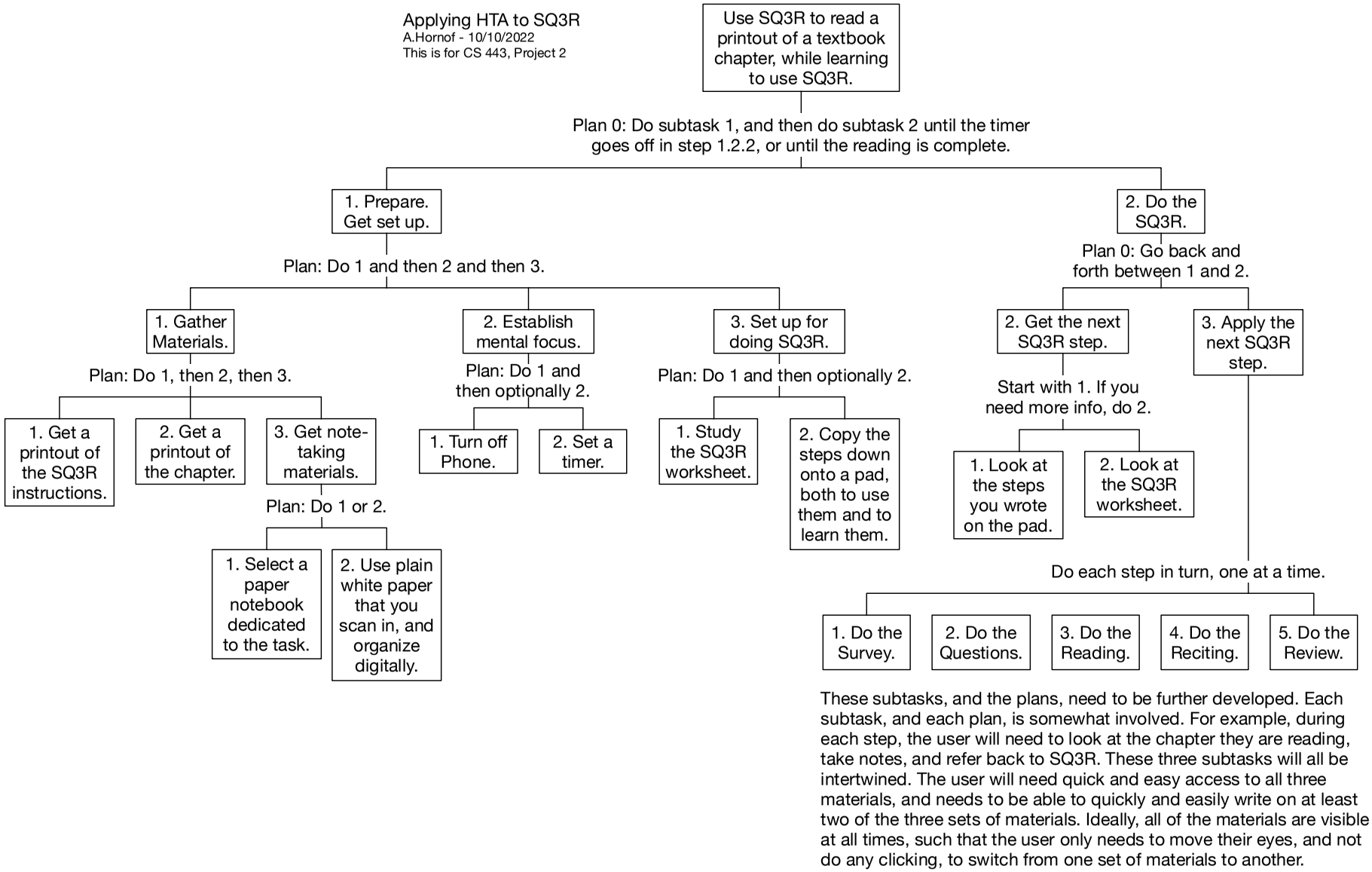

Figure 1. A proposed hierarchical task analysis describing how a novice might apply the SQ3R reading technique to read a textbook.

The Hierarchical Task Analysis (HTA)

Figure 1 shows a quick sketch, an initial proposal, of how a student might apply SQ3R to reading a chapter in a textbook. The HTA presumes the student is still learning SQ3R, and so the student needs to refer back to the SQ3R steps while applying them. With practice, the steps should be committed to long term memory, and the student could just pull the steps from memory.

The HTA focuses somewhat more on getting set up for doing the task than on actually doing the task. Actually applying the techniques, such as to write down questions and answering them, would require the user to have (ideally easy) access to all of the visual and writing materials, and to be able to do each subtask (such as Survey, Question, etc.) with as little movement as possible, ideally just moving the eyes, occasionally turning pages, and writing with as little motion as possible.

One important aspect of doing the task, captured by the HTA, is going back and forth between getting the next SQ3R step from the SQ3R handout, and then doing that step.

Your Steps for this Project

1. Understand the Task

Study the materials provided, including the problem scenario and the hierarchical task analysis.

Do the task yourself. Use the SQ3R technique to read the chapter, specifically "Chapter 2: Writing Paragraphs" from Huckin & Olsen (1983). Apply SQ3R using paper and pencil, and produce handwritten notes, as is needed when applying SQ3R. Scan the notes (into a compact file, under 0.5 MB), and include them as part of a field study for the project.

The Huckin & Olsen chapter is available here:
https://canvas.uoregon.edu/files/17013955/download?download_frd=1

Reflect on your experience using SQ3R. What did you learn about using SQ3R? What did you notice about SQ3R? Think about how the information flowed from the chapter, into your eyes and brain, and then back out onto your paper notes. Think about how you had to keep track of the SQ3R steps along the way. Think about how technology (beyond paper and pencil) could assist someone in doing this task.

Study and critique the HTA in Figure 1. Compare and contrast the HTA provided with your experience doing the task. Does the HTA accurately capture how you did the task? Explain.

Your notes from applying the SQ3R should be as long as is needed to read the chapter using SQ3R. Your reflection should be about 500 words.

2. Get Familiar with Three Techniques for Describing Interactions.

a. Design Scenarios
b. Storyboards
c. Paper Prototypes

a. Design Scenarios. Scenarios are stories that describe people accomplishing tasks. They typically include a mix of the human aspects (such as social, emotional, and motivation) with some discussion of people interacting with technology. These can be used as a design tool, to explain how a proposed interface would be used in a social context, or in the workplace. The scenarios should use topic sentences, should not describe low-level design details (such as specific buttons) or interactions (such as a sequence of button presses), and should not just be lists of actions in paragraph form. (See Good Writing.)

Rosson & Carroll, Chapter 2, p.68., available in the Project 1 reading on Canvas, shows some scenarios, but these are prior to the introduction of a new, proposed system. Also, please use topic sentences in your scenarios.

b. Storyboards. Storyboards, in user-interface design, are event-by-event descriptions of a person using an interface to accomplish a task. They can take many forms, such the storyboards shown throughout Sharp et al Chapter 12, available in the Project 2 reading on Canvas.

c. Paper Prototypes. These are paper-based (non-computational) simulations of the user-facing elements of interface. A designer can present the paper-based simulation to a user, along with a task, and see how the user might use the system to accomplish a real task, with no assistance from the designer. Paper prototypes are described in Sharp et al Chapter 12 as well as in this MIT User Interface Design class, at http://web.mit.edu/6.813/www/sp17/classes/08-prototyping/ .

3. "Ideate" and Propose Multiple (Very) Different Systems to Support the Task.

Your initial thoughts should be sketchy notes. You should eventually arrive at two systems. The two systems should be very different, but both should support the task very well.

At least one of the two interfaces should maximize the use of a large display and side-by-side viewing of an entire page of the chapter alongside a lot of visual material pertaining to SQ3R.

A smartphone, because of the size of its display, is a probably a poor choice of hardware for this task, similar to how a smartphone is a poor choice of hardware for writing code.

The design exploration can be done with paragraphs of unstructured text, rough sketches, relevant doodles, jumbles of words, and scribbles that relate to the task or interface. Each set of words and drawings should have some sort of heading, and a name and a date. These do not need to be pretty, but I want to see design exploration.

Scan these documents into compact PDFs. On an iPhone, you can use the Notes.app to scan documents. On both iPhone and Android, you can use Adobe Scan.

4. Specify the Two Different Designs, One with a Scenario/Storyboard, and the other with a Paper-Based Prototype.

Design processes generally include considering more than one possible solution to a problem. To this end, you should design *two* very different interfaces to support this task.

One of the designs should be specified with a combination of design scenario (as in the textbook) and storyboarding. These two descriptions of people doing tasks work well together. Be sure that your storyboards explain the *events* that cause a user to enter commands, and what those commands are, and how the device changes as a result of those commands. Notice how the storyboards in Sharp et al. Chapter 12 include this. But also notice how a storyboard could be enhanced with more text describing the context of use, and the social, emotional, and motivational aspects of the task.

A real-world example of a combination of design scenario and storyboard is to some extent embedded in a paper describing the EyeDraw software, at https://classes.cs.uoregon.edu/22F/cis443/P2/ASSETS04_edited.pdf . Just read the paragraphs, on the first four pages, that are marked with red lines in the margins.

The other design should be described with a paper-based prototype, and should have enough detail such that a user could be presented with the prototype, including the Huckin & Olsen Chapter 2, and could use the prototype to really apply the SQ3R technique to *really learn the chapter*.

Use the paper-based prototype for a design that you are curious to see if it could work.

5. Evaluate a design.

Conduct a Formative User Observation Study Using the Paper-Based Prototype

Recruit three participants (not from this class) and have them test your paper prototype using the "think aloud" protocol (described in Apple's Ten Steps, see the link below) while they try to do a few specific tasks. Present the test users with a set of tasks, written down on paper, and ask them to "use" your system to do the tasks. Everything that the user needs to do the task should be written down in advance. You should not explain anything about the task once they start the task.

Your will need to be organized and ready to visually show the system's response after every user input. Nothing should be described to the user verbally. If it is a standard GUI, for example, you

could write a little number next to each button, and have a set of numbered screenshots that you pull out of a folder and present to the user after each input.

Follow the Ten Steps for Conducting a User Observation (PDF, by Apple Computer) except that by necessity there will have to be silent interaction as you play the role of the system. At the start, tell the participant that you are testing the system, not the participant, and that the participant can quit any time with no problem. When running the study, do not discuss the design of the system. Just focus on how seeing how the participant would use the system to do the task, given the visual information provided to the user.

Ideally, work with someone else in the class so the same users can test both of your systems. To compensate for any practice effects, have some participants use one system first, and the other participants use the other system first.

If working in pairs, one student should "run" the meeting and do most of the talking with the user. The other student might silently play the role of the computer, running the simulation, or silently observe and take notes about what works, and what does not work. You can both also write these things down immediately after the test, while your observations are fresh in your memory. You do not have to record every user-system interaction, but you should take notes on confusion and "errors" that occurred.

Write a ***Formative Evaluation Report*** that documents what did and did not work in your design, comparing it to what did and did not work in the other design, if you like. Propose modifications to your design based on the report. Discuss the process of building the paper-based prototype, and conducting the formative evaluation.

Graduate students will also conduct a Cognitive Walkthrough.

Graduate students will also conduct a "Cognitive Walkthrough" of the storyboard/scenario design. The "Cognitive Walkthrough" is described around p.20 of the lecture notes, and at "The cognitive walkthrough method: A practitioner's guide" (Wharton et al., 1993) at https://www.colorado.edu/ics/sites/default/files/attached-files/93-07.pdf

Deliverables

You should have a section for each of the following. The number of words listed for each section is meant as a rough guideline.

1. Reflecting on the Task. This will include:
- Your notes from applying the SQ3R (as long as is needed to learn the chapter).
- Your reflection on applying SQ3R, taking a task-analytic perspective (500 words).

2. Rough Design Ideas. No specific word count, but I should be able to clearly see you exploring many different ideas and approaches.

3. Two Interaction Designs. Each should be long enough to show how the interface will support a complete SQ3R task.
- A complete design combining a design scenario and storyboarding.
- A complete design using a paper-based prototype.

4. Formative Evaluation Report (500 words)

5. For graduate students, a Cognitive Walkthrough, including conclusions drawn.

6. A Reflection on what you learned in the project (300 words).

Evaluation Criterion

1. Conducting the SQ3R Task.

When you apply the SQ3R to read the chapter:
- Do your notes demonstrate a correct use of SQ3R?
- Do the notes cover the most important topics from the chapter?

2. Reflecting on the SQ3R Task.

Does your reflection on applying SQ3R show an understanding of how to do the task, including? For example:
(a) The flow of information from the paper, to your brain, to your notes.
(b) How you keep track of the current step you are working on.
(c) How the HTA shown in Figure 1, and the scenario that was provided, relate to your experience.
(d) How technology could support the task.

3. Rough Design Ideas.
- Do the sketchy notes demonstrate a creative exploration of design ideas? (The notes can take many forms.)

4. Two Interaction Designs.
- Are there two very different designs proposed?
- Is one design a storyboard/scenario, and the other a paper prototype?

5. Storyboard/Scenario Design.
- Is the design correct and complete? For example:

(a) Does the design show, at each step, the information that would be presented to the user, and the interactions that would occur between the user and the system?
(b) Could the design document be given to a skilled programmer, and the programmer would have all the information needed to build the user interface?

6. Paper Prototype Design.
- Same criteria as in #5 above, plus...
- Is it clear how to "execute" the task using the prototype?

7. Formative Evaluation Report (500 words)
- Was the study run in a valid manner, including by following Apple's Ten Steps?
- Are useful observations made and reported?
- Does the report adequately describe how the study was conducted, and what was learned?

8. A Reflection on what you learned.
- The reflection should demonstrate an understanding of the project, and its learning goals.