

Task : Reserve a 45-minute slot in the SRC lap pool

Task Steps	Will the user know what to do next to make progress?	Will the user notice how to perform the correct action?	Will the user interpret the system response correctly?
1.1 Make a reservation (Screen 1)	Yes. "make a reservation" is shown as red and bold font. It is easy to see, and users will know they should tap it for making a reservation.	No. Although "make a reservation" is red and bold, it is not a button and there is no notification shows user should tap this content for further actions.	Yes. After user tapped "make a reservation", a new web page with "Reservations" head will show up. Otherwise, other unrelated pages will show up or nothing will happen.
1.2 Select the facility (Screen 2)	Yes. "Student Recreation Center" is right under the "Facility Links" with red color. It is clear.	Yes. "Student Recreation Center" is designed as an independent button rather than hiding in the paragraph content. Users shall know they should tap it to perform the correct action.	Yes. After tapping "Student Recreation Center", "Student Recreation Center(SRC)" webpage will show up.
1.3 Select the SRC Lap Pool (Screen 3)	Yes. There is a note in the middle of the screen shows "Please follow the links below to access the reservation". User will know they should follow the "SRC Lap Pool" link to make a reservation.	Yes. the link of "SRC Lap Pool" is designed like an independent button, so user will notice they should tap that for further actions.	Yes. After tapping on the "SRC Lap Pool" link, the user is taken to next screen to reveal the reservation slots.
1.4 Choose a potential reservation slot (Screen 4)	Yes. On the topside of the screen, users should pick the reservation date first, then user can choose a reservation timeslot for the current day.	Yes. Although there is not clearly notification shows user should tap which button for reservation, it is a touch-screen webpage, user should know they need to tap the date and time slot they want for making the reservation.	Yes. After tapping one date, screen will show all reservation slots for the current day. The date and time for each slot is clear.

1.5 Check the status of the reservation slot and initiate a reservation (Screen 5)	Yes. After tapping "Click For More Information", users will see the status of the chosen reservation slot. If it is unavailable, the button will be labeled "Full". Users will know they should choose another time slot. Otherwise, user should register for reservation. Signifiers on this page are clear.	Yes. Signifiers are clear. User can know they should click that button for more information. On the next page, they should click "x left-Register Now" for further actions.	Yes. Tapping on the "Click For More Information" button will lead user to the next screen with the "Lap Pool Reservation" head. On the next page, "Full" means the current timeslot is unavailable. Otherwise, user will know they should register for reservation.
1.6 Log in to the WSU SRC reservation system (Screen 6)	Yes. It is super understandable for users to type in the username and password for logging in. The note under the log in box is also clear.	Yes. "Log in" button is clear and obvious. Users will know they should tap "Log in" button after typing username and password to log in the system.	Yes. Tapping on the "Log in" button leads to the next page if username and password are correct. Otherwise, users will fail to log in.
1.7 Proceed to sign waivers (Screen 7)	Yes. Signifiers on this page is clear. User will know they can proceed to sign waivers now.	Yes. The button is labeled "Proceed to Sign Waivers". Users will know they should click this button for proceeding to sign waivers.	Yes. After tapping "Proceed to Sign Waivers", the first waiver screen will show up.
1.8 Sign waivers(Screen 8)	Yes. the waivers are too long to complete show up in one screen. Users need to tap-scroll to the bottom of the page to find two action buttons and tap the button.	Yes. Two buttons are labeled clearly, so users will notice they should click one of the buttons.	Yes. After signing all waivers, users will reach "Check out" screen.
1.9 Check out(Screen 9 and Screen 10)	Yes. the "Checkout" button is labeled clearly. If users want to check out, they can tap this button.	Yes. the button is designed as a clickable icon. Users will know clicking it is the right action.	Yes. After clicking "Checkout" button, a reservation confirmation page with sentence "the order is complete" will show up. User will interpret this system response correctly.

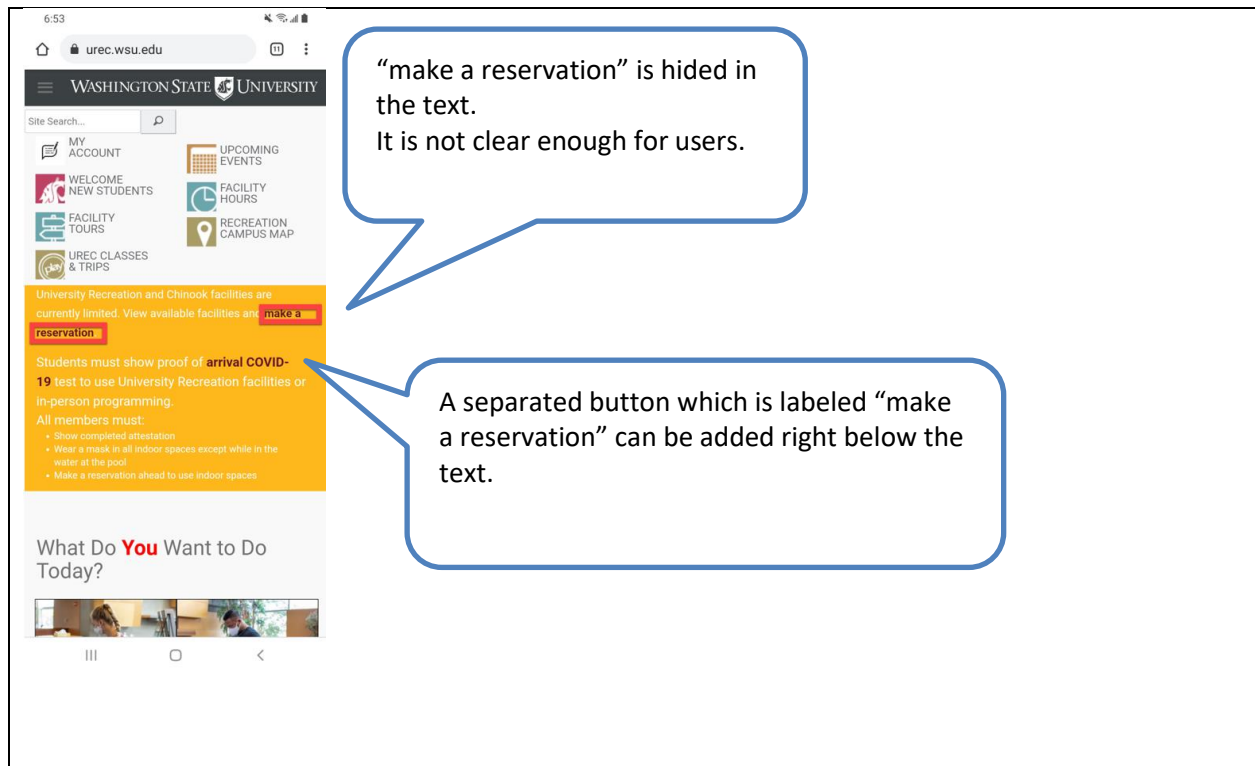
1b. *Apply Norman's Principles* (30 pts—5 pts per box). Fill in the following table by writing a few sentences that evaluate the goodness of the SRC's reservation mobile web interface relative to each principle.

Affordances	The website is designed for making reservations. Users will easily know they can make reservations on this website through tapping or clicking on the screen since the affordances are fairly obvious.
Signifiers	Almost all appeared buttons during the process of making reservations are labeled clearly and understandable. Users can easy follow those signifiers to perform correct actions.
Constraints	Some constraints are designed for keeping users from performing wrong actions. For example, if the timeslots have been fully reserved, users can not make reservations in those timeslots.
Feedback	No matter users perform right or wrong actions, the system will give feedback immediately. All feedbacks are clear and understandable. When users performed right actions, usually a new page for next step of making reservations will show up.
Natural Mappings	The system satisfies natural mappings. For example, when text such as the waiver is too long to show up in one screen, users can scroll down the screen for complete content.
Conceptual Model	SRC's reservation mobile web system is designed for users to make reservations. The conceptual model of this system would be very easy and match the mental model of users. Thus, this conceptual model makes this web application easy to be learned and be used.

1c. *Interface improvements* (36 pts—6 pts per box). Synthesize the results of your cognitive walkthrough and your application of Norman's principles to propose **three concrete changes** that will improve the SRC's mobile website for reserving time slots. For each suggested improvement, provide (a) an annotated screen sketch to illustrate the change and (b) a brief rationale for the change that explicitly cites one or more of your cognitive walkthrough and/or Norman analysis results. Fill in the boxes below with your answers.

Change 1 Sketch

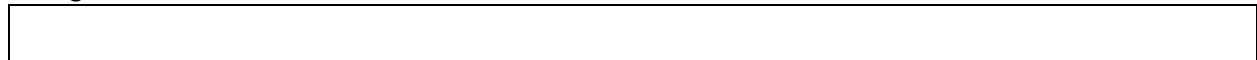
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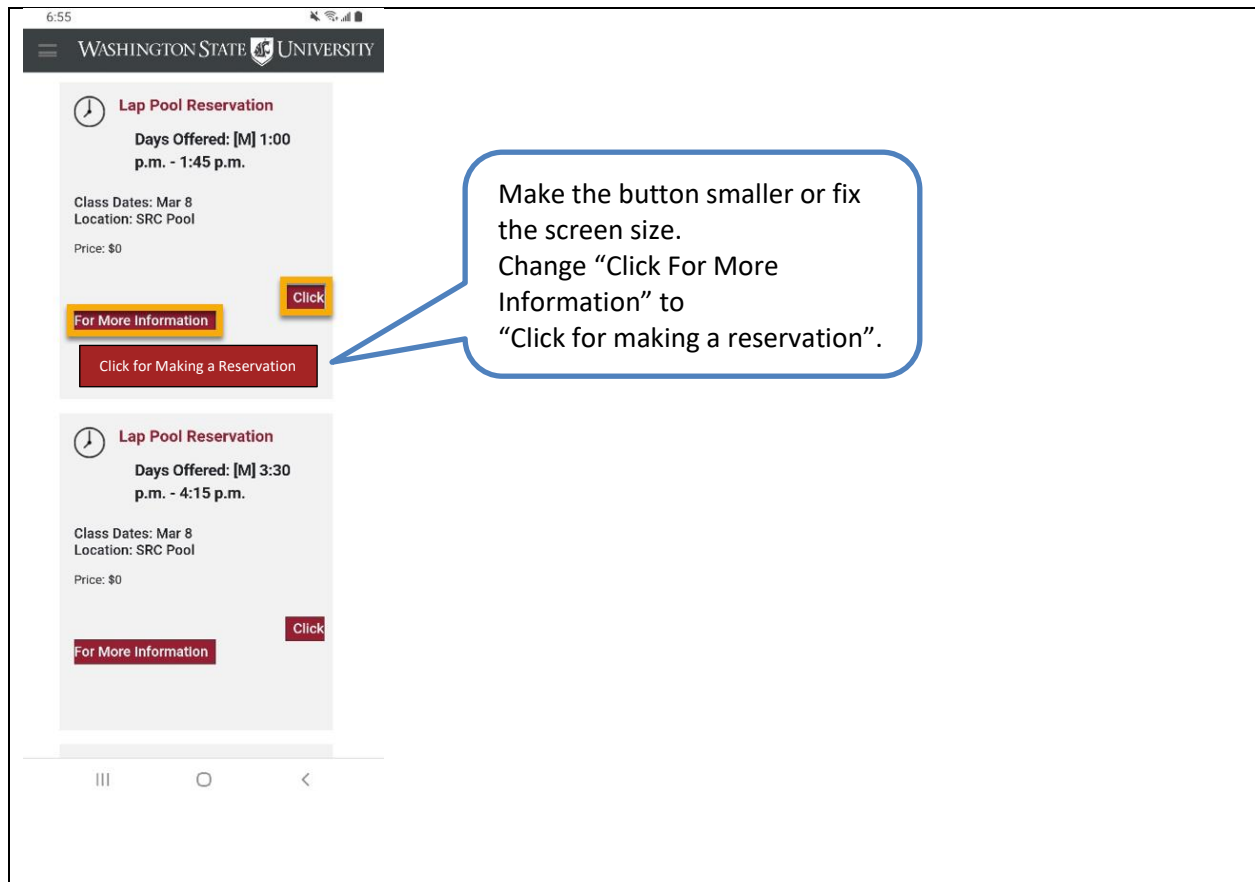


Change 1 Rationale

In walkthrough step 1-1, affordance here is weak. "Make a reservation" is hidden in the text. Although it is bold and clickable, users might not notice they should click there to start making a reservation. In this case, I would like to add a separated button which is labeled "make a reservation" right below the text to ensure users will be able to perform right actions.

Change 2 Sketch

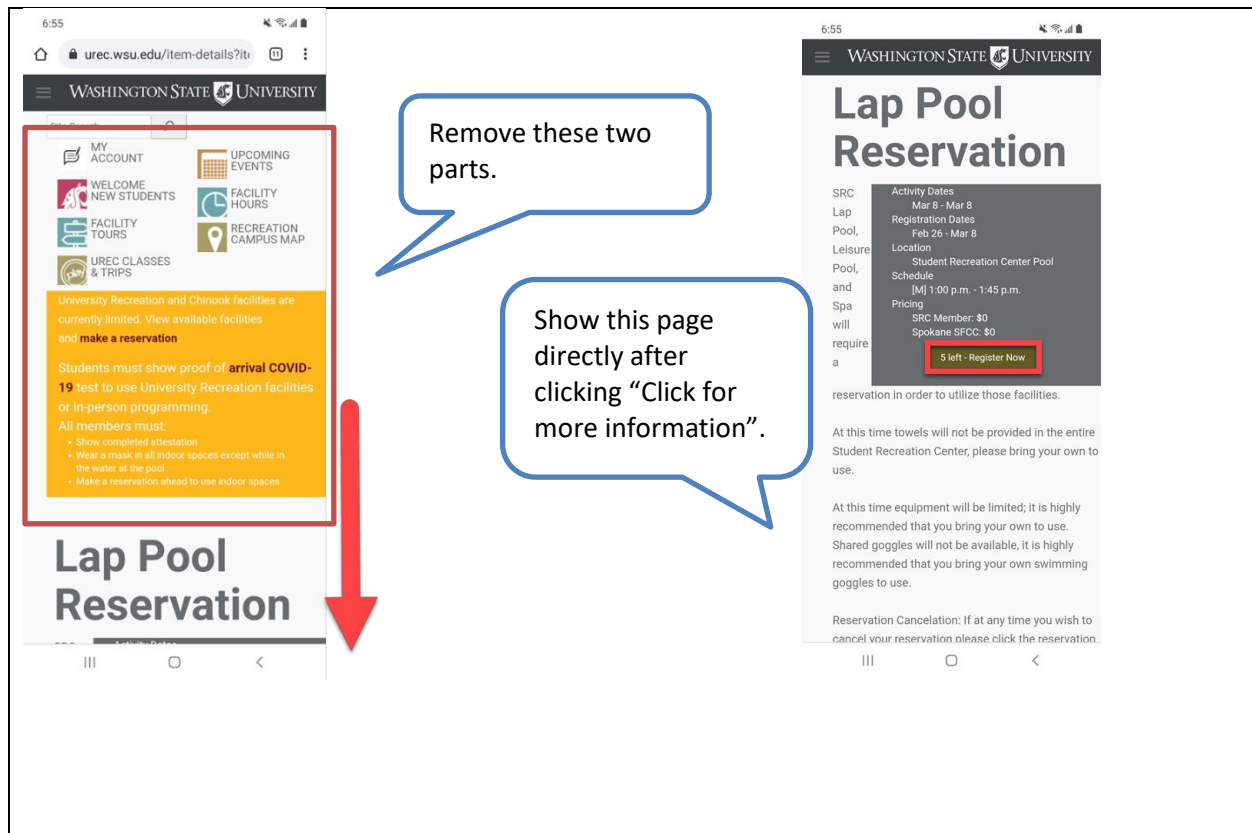




Change 2 Rationale

In walkthrough 1-4, the signifier is not clear enough since users' goal to click this button is not to look up more information about this timeslot, users aim to reserve that timeslot. The system just shows more information when users want to reserve the timeslot. Thus, since this is a user interface, it would be better to change "Click for more information" to "Click for making a reservation". In addition, the button is not fixed the screen size. We can make it smaller or move the button to a suitable place.

Change 3 Sketch



Change 3 Rationale

In the walkthrough 1-5, users might not know how to perform next step since the page shows on screen now is very similar to the home page. Instead of showing this page, "Lap Pool Reservation" page should be shown up directly after clicking "Click for more information".

1d. (15 pts) In the box below, write a short essay (up to two paragraphs) that applies **at least three** principles of human perception (5 pts each) discussed in the Johnson text (Chapter 1-6) to evaluate the goodness of the SRC's reservation mobile web interface.

Firstly, SRC's reservation mobile web interface **understands users' goals**. All users reach this web are going to make a reservation, and this goal can be easily achieved on this website. This web interface can provide all information for making reservations. Secondly, **colors are distinguishable, even for colorblind**. For example, "make a reservation" on the Screen1 is red and bold. Red is Cougar red which is familiar to all WSU students. Colorblind can also notice it since the text is bold. Thirdly, this mobile web interface **avoids unfamiliar words, difficult fonts, and poorly contrasting background**. Generally speaking, the website is easy to read and understandable, even for international students, I did not feel the website is hard to read. The overall background looks comfortable.

("L06-Perception-1, Slide 22; L06-Perception-2, Slides 17,40")

1e. (15 pts) In the box below, write a short essay (up to two paragraphs) that applies **at least five** principles of human memory (3 pts each) discussed in the Johnson text (Chapter 7-9) and the Norman text (Chapter 3) to evaluate the goodness of the SRC's reservation mobile web interface.

First of all, **short-term memory is easy to forget immediate goals**. Thus, this system does not require users to remember anything across pages. For example, the waivers are too long to show up in one screen. Developers still put one waiver in one page rather than separate it into two pages. Secondly, **when we focused on tasks, we do not notice other changes**. In this case, changes should be obvious. For instance, system responses are mostly showing new pages. These responses are obvious. Thirdly, **users quickly forget when we reach a goal**. In this case, system should allow user to keep track of progress. For example, after signing all waivers, users would be able to check the order information before final checkout. Fourthly, **user follow the information scent**, so it would be better to anticipate users' goals at each decision point. To match options to users' moment-to-moment goals, for example, when users are required to sign the waivers, the button is clearly labeled "Proceed to Sign Waivers". Fifthly, **recognition is easy**, so we can show options and dually encode with pictures. Although not all buttons in this web interface are shown as a more recognizable icon, there are still some buttons on the top of the home page achieved that goal, which is a good point. For example, "upcoming events" is labeled like a calendar.

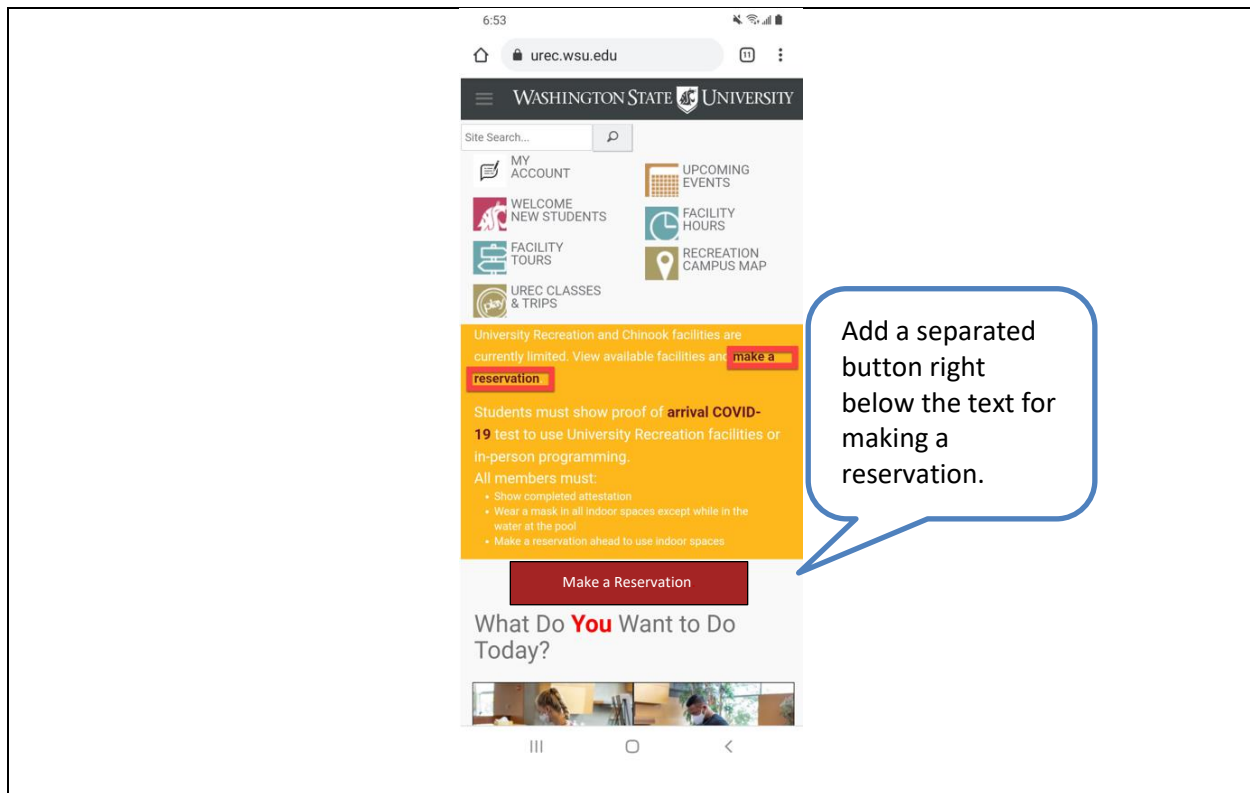
("L08-Memory, Slides 14,16,30,31,33,35,37,38,41,45")

Problem 2 (25 pts)

This problem focuses on analyzing the efficiency of locating and tapping on buttons and links in the SRC mobile web site described in the previous problem.

Scenario 1. Suppose that, based on user research, it is learned that the most common task from the home page of the SRC mobile web site (see **Screen 1**) is to make a reservation.

2a (5 pts). In the box below, sketch out a new design for Screen 1 that promotes the *lowest average time* to access the "Make a Reservation" functionality.



2b. (5 pts) In the box below, justify your redesign of **Screen 1** based on the laws, principles and/or concepts you have learned in this course that are most relevant to this problem.

Firstly, **users' goals** should be understood clearly. The most common task from the home page is to make a reservation. Adding a separated button makes the **affordance** stronger, users will easily know to tap this button for making a reservation. A clear button will short the average time to access the "make a reservation" functionality.

("L02-Norman-Concepts, Slide 6; L06-Perception-1, Slide 38")

Scenario 2. The WSU SRC reservation screen requires users to sign three waivers (see **Screen 8**). Each waiver is long: On a phone, the user must touch-scroll through multiple screens to reach the "I have read and agree to the above" button that must be tapped to advance to the next screen.

2c (5 pts) Using concepts and terminology learned in this class, *describe the sequence of movements* necessary for the user to reach and tap the "I have read and agree to the above" button.

Goal: read and sign all waivers.

Plan: skim through each waiver and click the "I have read and agree to the above" button.

Specify: skim through the waiver and touch-scroll down the screen till the bottom. Click "I have read and agree to the above" button. Move to the next waiver, repeat the steps until users signed all three waivers.

Execute: physically perform touch-scroll through multiple screens and click "I have read and agree to the above" buttons.

Perceive: the current waiver page disappears, and the next waiver page shows up.

Interpret state: reach the next checkout page.

Compare: goal met.

("L04-Seven-Stages, Slide 6")

2d (5 pts) Analyze the efficiency with which the user can tap the "I have read and agree to the above" button when presented with Screen 8. Base your analysis on relevant material from this class.

Based on the Fitts's Law, "the larger the target, and the closer the pointer is to it, the faster a person can move the pointer to the target." Since the button is far away from the users' pointer, and user have to touch-scroll down till the bottom of the screen. it is not efficient.

(L11-MotorControl-Responsiveness, Slide 7)

2e (5 pts) Based on material learned in this class, how can Screen 8 be redesigned to promote better task efficiency? Justify your redesign.

Based on the Fitts's Law, we should make the button closer to users' finger. The goal of this step is to let users read and sign waivers. We can minimize three waivers and show each waiver as a button or icon on the screen. Two buttons for users to tap right below the three waiver buttons or icons. Users can extract each button or icon for detailed information. So far, it achieves the users' goals and save the time of touch-scrolling screens. This redesign would be more efficient.

(L11-MotorControl-Responsiveness, Slide 7)

Problem 3 (5 pts)

Consider the following login screen design:



The above screenshot shows the state of the login screen after a user has attempted to log in unsuccessfully. In the box below, critique this design in a few sentences, citing relevant facts and principles related to human perception.

According to Norman's principles, system feedback is not obvious. "log on unsuccessful" is too small and placed by the corner of the screen. The previously entered username and password are still in the input box. Users might not notice they logged in unsuccessfully.
Affordance is clear since this window is obviously used for log in a system.
Signifiers like "username", "password", and "log in" is clear. Users can easily follow the signifiers to perform right actions.

("L02-Norman-Concepts, slides 12,13,25")

Problem 4 (12 pts)

This problem relates to design requirements and representations. *Pay particular attention to the format of your responses. For full credit, they must match the formats presented in class.*

4a (2 pts) In the box below, write down a possible **functional requirement** for the software you are developing in the team project.

Users must be able to log in through unique username and password.

("L14-Early-Data-Gathering, Slide 7")

4b (2 pts) In the box below, write down a possible **usability requirement** for the software you are developing in the team project.

Users must be able to log in through unique username and password in 30 seconds.

("L14-Early-Data-Gathering, Slide 8")

4c (2 pts) In the box below, write down a possible **user experience requirement** for the software you are developing in the team project.

On a scale of 1 to 10, users must rate the system a 8 in terms of ease of use.

("L14-Early-Data-Gathering, Slide 9")

4d (6 pts) In the box below, present a **use case** related to the functional requirement you identified above.

Employee Mr. Jonas has his own username and password. Once he wants to get in their company's working system, he can type in his username and password then click log in button. If his username and password are correct and matched up, he will successfully log in the working platform in 30s.

Problem 5 (15 pts)

As discussed in class, a series of aviation accidents in the 1980s and 1990s (e.g., [Northwest Flight 255](#) and [Delta Flight 1141](#)) were caused by pilots failing to extend the wing flaps prior to takeoff. Since the wing flaps were not extended, the planes failed to obtain sufficient lift at takeoff and crashed quickly after they became airborne.

Based on what you have learned in class about human errors, write short responses to the following questions.

5a. (3 pts) Based on the root cause analysis technique discussed in class (see [Slide 8 in Lecture 12](#)), were these accidents solely the fault of the pilots? Why or why not?

Not only the fault of the pilots. According to the root cause analysis, we need to keep asking "why" even though the accidents were caused by pilots failing to extend the wing prior to takeoff. For example, after searching on Internet, I know the cause of Northwest Flight 255 accident is "contributing to the accident was the absence of electrical power to the airplane takeoff warning system which thus did not warn the flight crew that the airplane was not configured properly for takeoff".

("L12-Errors, Slide 8")

Reference URL: https://en.wikipedia.org/wiki/Northwest_Airlines_Flight_255

5b. (12 pts—6 pts per box) In the boxes below, describe **two user interface improvements** to the cockpit that might have prevented these accidents. Justify your improvement by citing relevant principles related to human memory (Johnson 7-9, Norman 3), human learning (Johnson 10-11), human decision making (Johnson 12), and/or human errors (Norman 5).

First improvement:

Add a function which can save all necessary parts which should be checked before takeoff. Before takeoff, pilots and crews must check all parts follow this function shows.

According to human memory principles, long-term memory is faulty, and recall is hard. Some accidents are happened because people's bad memory. Now this function can free pilots and crews from some long-term memory, they only need to follow the system to check all necessary parts. It might prevent some accidents.

("L08-Memory, Slide 22")

Second improvement:

Add an alarm system. Once the system detects security risks, it will give an alarm, and all other uncritical actions will be banned until security risks have been removed.

According to the Norman's principles, users might not interpret system feedbacks correctly since the imperfect feedbacks. In this case, as long as alarm system finds security risks, it will close all other functions to ensure the plane cannot takeoff, and also, ensure pilots and crews notice security risks.

Honor Pledge

You are required to include and sign the following honor pledge in your submitted solutions document. *A failure to include and sign this pledge will result in an automatic 0 on the exam.* A violation of any of the policies in this honor pledge will result in an automatic “F” in the course.

I hereby verify and attest, under penalty of receiving an “F” in this course, that

- I have **not** discussed the problems on this exam with anyone else;
- in preparing my solutions to these problems, I have **not** collaborated or consulted with anyone else;
- any outside materials I have consulted (e.g., course materials, websites, books, articles, blogs) are **properly cited** in my solutions; and
- the solutions I have submitted are **completely my own**.

Name

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Signature

Jinyang Ruan

Date

3/19/2021