Human-Computer Interaction
Week 4-5: Implement High Fidelity Prototype + Chapter 6

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2 Prototype

2.a Prototype description

We've largely adhered to our Lo-Fi prototype due to the mostly positive feedback. However, we've made a significant adjustment by introducing a banner with the currently playing song's image, title, and artist name that pops up above the navigation bar when a user initiates song playback. This alteration aims to streamline simple user interactions with playing songs, especially if they're not currently in the "listening" screen with the full song menu. We've also added the "Search" section which was not present in the Lo-Fi prototype.

Additionally, we've revamped how users discern their location within the app by incorporating a title at the top, replacing our previous method of using different coloured buttons in the navigation bar. Furthermore, we removed the "go back" button as the navigation should now be only handled through the navigation bar and individual song buttons.

Lastly, the "song playing" section has undergone a makeover. We've opted for a more minimalist design, by significantly condensing the audio quality menu into a single dropdown and transforming the play/pause button into a dynamic one that switches its symbol and function according to if the state of the current song, whether playing or paused. The banner, song title, artist's name, and controls have been integrated into a single section for a more elegant and sleek look, as can be seen in the figure below.

In conclusion, our current Hi-Fi prototype still contains 4 different sections (Home, Library, Search, Friends) alongside the "song playing" section, which does not have a dedicated button in the navigational panel but can be brought up by clicking the "current song" banner. Their respective style either corresponds to the Lo-Fi prototype or is de-

scribed in the earlier paragraphs.

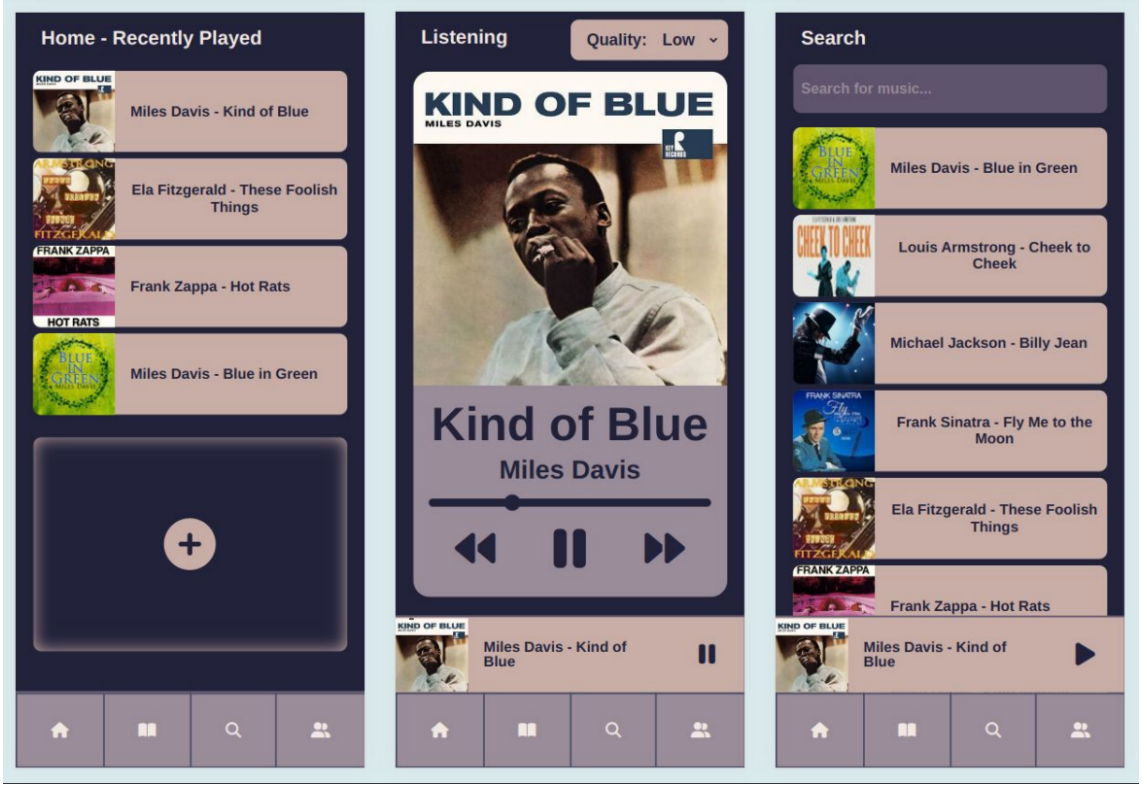

Figure 1: Screens from our high-fidelity prototype.

2.b Experimental description

Setup: The high-fidelity prototype will be launched using the VS Code Live Server extension in the Google Chrome browser. The URL in question will be similar to http://127.0.0.1:5500/src/index.h where 5500 is the port the live server is using. In Google Chrome, the researchers will open Developer Tools (Ctrl+Shift+I) and choose the iPhone 14 Pro Max, which the high-fidelity prototype was tailor-designed for.

Variables: The independent variable will be the primary input device. Half of the participants will use the touchscreen of Martin's laptop, and the rest will use a mouse. In case troubles arise with the touchscreen keyboard (for the "Search" task), participants will be allowed to use the laptop keyboard. The dependent variables include the participant's total clicks, their interaction errors and the time spent on each task. We will measure the time spent using a stopwatch app operated by Martin, and Dávid will count the clicks by observing the participant. Our main goal of this test is to see if the app's interface is clear and if users can get to their desired part of the app intuitively. We measure results separately for different tasks in order to better specifically identify potential pain points.

Method: For each participant, Dávid and Martin will approach them and request their consent to participate in a human-computer interaction study. At their assent, Martin will describe the nature of the music streaming app, comparing it to Spotify to establish an instant impression. He will go on to describe to the participant the nature of the

experiment: ”I will describe five tasks for you in succession and you will complete these tasks using only the touchscreen/mouse (alternating for participants). We will assess the interface by tracking how long it takes you to complete a task, how many times you click, and the number of extraneous clicks. After describing each task, I will count down from three before you start your attempt.”

After ensuring the participants' understanding, Dávid will prepare to note down in his Notepad application how many clicks the user would use and Martin will prepare to measure the time taken to complete each task using the stopwatch in the iOS clock app. Martin will then present the participant with their tasks one by one like so:

”Your first task is to start listening to music. Three, two, one, start.”

”Your second task is to change the audio quality to max. Three, two, one, start.”

”Your third task is to navigate to the friends tab. Three, two, one, start.”

”Your fourth task is to pause the music. Three, two, one, start.”

”Your fifth and last task is to use the search function to search the song 'Kind of Blue' by Miles Davis and start playing it.”

At the word ”start” for each task, Martin will start the timer. Dávid and Martin will remain completely silent during the participants' attempts to avoid influencing their performance. At the end of a task, Dávid will type the number of clicks (and extraneous clicks) into his Notepad document while Martin does the same with the time to a hundredth-second precision. In cases where the participant continued interacting with the app after the task had been completed, they will be guided to return to the page where the task had been completed so that all participants will embark on a task from the same page in the user interface.

After the participant finishes all tasks, Martin will ask them to fill out a short survey about the website, stressing its anonymous nature. After the questionnaire is finished, both Martin and Dávid will thank the participant for their time.

Adding different tasks, should, in addition to the new app design, give us enough information to properly evaluate our design choices.

3 ANOVA calculation

Participant	Texting speed (wpm)	
	Sitting	Walking
P1	13	10
P2	14	11
P3	12	9
P4	9	13
P5	15	14
P6	11	8
P7	18	9
P8	9	11
Mean	12.6	10.6
SD	3.07	2.07

Table 1: Experiment data, including mean and standard deviation, computed through Numbers.app.

Initially, the data was copied over into a text file, in the input format of ANOVA2: `num,num`. Before importing the data into the book's tool, we imported the data into Numbers.app to compute the mean and standard deviation (Table 1). This allows us to better understand the data but is not required to do an ANOVA.

To do the ANOVA, we must first download the tool mentioned in MacKenzie's book. Since the release of the first edition of the book, a new tool called "GoStats" was published on the book's website. This new tool functions similarly to the older ANOVA2 tool, but combines all of the statistics utilities into one, while also providing a GUI interface.

Using GoStats' Anova tool, we select the data file, type in the number of participants (8), as well as our F1 level, which in our case represents the 2 situations in which typing is done. After clicking "Analyse", an output (Table 2) is given to us, which contains the F and p values needed for a report.

Effect	df	SS	MS	F	p
Participant	7	42.750	6.107		
F1	1	16.000	16.000	2.113	0.1894
F1 x Par	7	53.000	7.571		

Table 2: The GoStat's Anova tool output/analysis for our input data

ANOVA report

The mean texting speed were 12.6 WPM when sitting and 10.6 WPM when walking. As there was substantial variation in the observations across participants, the difference was not statistically significant as revealed in an analysis of variances ($F_{1,7}$ = 2.113, $p > .05$, ns).

4 Chi-square calculation

Questionnaire results

System	Wallpaper Habit			Total
	None	Wallpaper Static	Wallpaper Dynamic	
Mac	13	8	25	46
PC	25	21	18	64
Total	38	29	43	110

Expected results

System	Wallpaper Habit			Total
	None	Wallpaper Static	Wallpaper Dynamic	
Mac	15,9	12,1	18	46,0
PC	22,1	16,9	25	64,0
Total	38,0	29,0	43,0	110,0

Chi-Squares

System	Wallpaper Habit			Total
	None	Wallpaper Static	Wallpaper Dynamic	
Mac	0,53	1,38	2,72	4,63
PC	0,38	0,99	1,96	3,33
Total	0,91	2,37	4,68	7,96

Findings

The final chi-square value is the total, therefore we get 7,96. To see whether the final chi-square value we get is statistically significant, we need the degrees of freedom and an alpha level. The degrees of freedom is calculated using $(r–1)(c–1)$, where r is the amount of rows and c is the amount of columns. $r = 2, c = 3$ so $df = (2–1)(3–1) = 2$. The alpha level we can choose ourselves, common values include: $.1, .05, .01$ and $.001$. We then read from the table of chi-square critical values, and compare our computed value.

$\alpha - level$	$df = 2$
.1	4,61
.05	5,99
.01	9,21
.001	13,82

With our computed value of 7,96 we see that for α-levels .1 and .05 it falls above the critical value, and for α-levels .01 and .001 it falls below. If we assume an α-level of .05, our

computed value of 7,96 is larger than the critical value of 5,99 and so is statistically significant. Therefore we can conclude that the operating system of a user does determine their wallpaper habits in some way.