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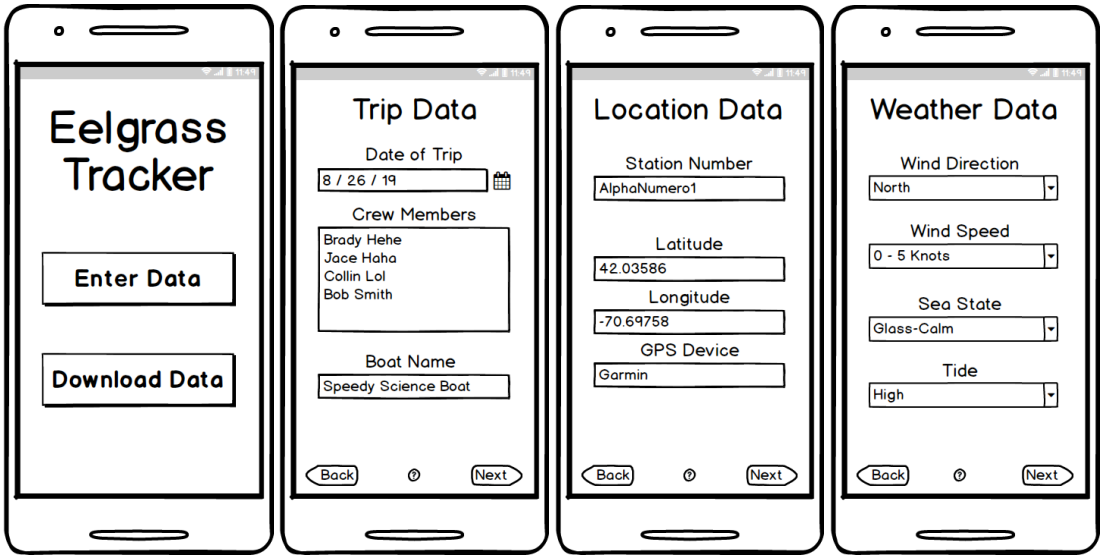
CS5760 - Evaluation 2: Heuristics

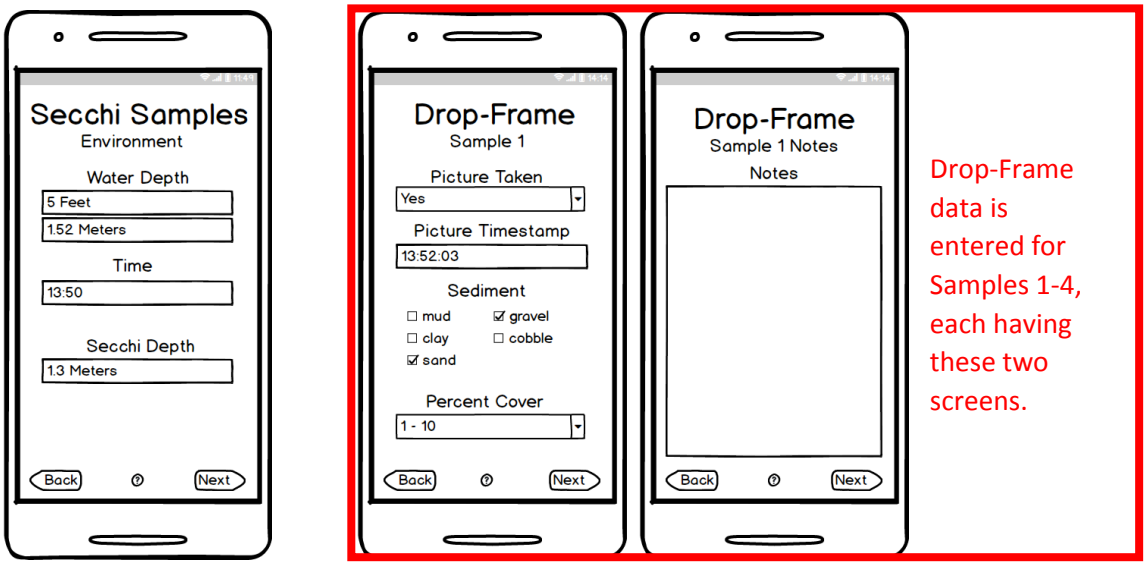
2/18/2019

Team #3: Eelgrass Monitoring App, Quadrilateral Cowboys

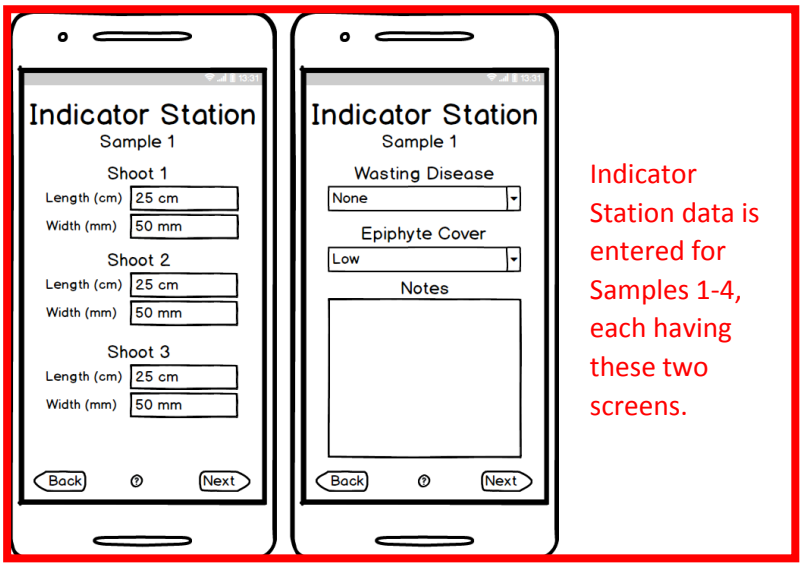
2. App: The team has created an app that experts and citizen scientists will use to enter eelgrass data; this data is used to monitor eelgrass extent. They will perform measurements and enter the resulting data into the app, along with weather data, station identification data, date, crew and boat names, and GPS data.

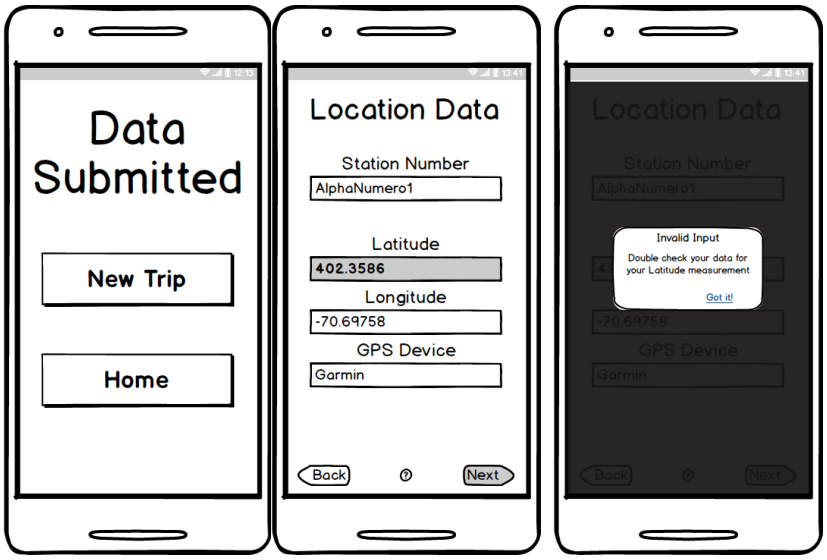
The data collected will help the scientists to understand and track changes to the eelgrass in the Duxbury-Kingston-Plymouth embayment (DKP). The current "as is" state of the project is using paper and pencil as their data collecting tool. They are currently entering Phase II of the project, replacing the paper/pencil with an app.





Drop-Frame data is entered for Samples 1-4, each having these two screens.





3. UI Domain:

The domain of this app is data entry via a form. This data will be uploaded to a .csv file, which will be copied to an Excel file.

Experts and citizen scientists will collect data as per the document entitled Massachusetts Division of Marine Fisheries Standard Operating Procedure Citizen Scientist Eelgrass Monitoring, and enter the data into forms. The data is entered in an established order. Some of the stations assigned to collectors are "indicator" stations, where additional screens containing additional data fields will need to be input.

The collectors will be using the Internet to connect to the app, and they'll be on boats as they perform their collections and enter data into the app.

Representatives at Massachusetts Division of Marine Fisheries (MA DMF) will upload the data, and place it into an existing Excel file for analysis.

4. List of heuristic usability principles for the design's UI domain

Heuristic	Description	Source
Visibility of system status	The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.	Nielson (https://www.nngroup.com/articles/ten-usability-heuristics/) Lecture Notes
Match between system and the real world	The language used by the GUI should be simple, with words phrases and concepts familiar to the user. It should follow real-world conventions, making information appear in a natural and logical order.	Nielson Lecture Notes
User control and freedom	If a user chooses system functions by mistake, there should be a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. The system should support undo and redo.	Nielson Lecture Notes
Consistency and standards	User should not have to wonder whether different words, situations, or actions mean the same thing.	Nielson Lecture Notes
Error prevention	System should have careful design which prevents a problem from occurring in the first place. If not, system should be checked for problems/errors and present users with a confirmation option before they commit to the action.	Nielson Lecture Notes
Recognition rather than recall	Objects, actions and options should always be visible.	Nielson Lecture Notes
Flexibility and efficiency of use	If the system will be used by both experienced and inexperienced users, can experienced users tailor frequent actions? Can inexperienced users find a fully explainable system? Are there shortcuts?	Nielson Lecture Notes
Aesthetic and minimalist design	Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.	Nielson Lecture Notes
Help users recognize, diagnose, and recover from errors	Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.	Nielson Lecture Notes
Help and documentation	It's better if a system can be used without documentation, but it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.	Nielson Lecture Notes
Sufficient information design	The display should be designed to convey "just enough" information. Too much information cramps the display, and too little makes the display less useful.	Mankoff (2003)

Heuristic	Description	Source
Accommodation	The system will fit the way each user group works and thinks	Weinschenk (2000)
Predictability	The system will behave in a manner such that users can accurately predict what will happen next.	Weinschenk (2000)
Interpretation	The system will make reasonable guesses about what the user is trying to do.	Weinschenk (2000)
Fulfillment	The system will provide a satisfying user experience.	Weinschenk (2000)
Precision	The interface will allow the users to perform a task exactly.	Weinschenk (2000)
Responsiveness	The interface will inform users about the results of their actions.	Weinschenk (2000)
Automate unwanted workload	Eliminate unnecessary thinking to free cognitive resources for high-level tasks.	Gerhardt-Powals (1996)
Limit data-driven tasks	Reduce the time spent assimilating raw data.	Gerhardt-Powals (1996)

5. List of usability problems generated from the heuristic evaluation

Heuristic	Issue	Weight (1=Minor Concern, 5=Critical Concern)
Visibility of system status	In the 2nd screen, the "Crew Members" field is not clear on how to input data. The large text field could accept columns of data (as displayed), names separated with commas, or names separated with space. The concern is how the .csv (and the Excel) file will interpret this. In the paper Field Datasheet that they're currently using, the field is labeled "Crew Names"; however, in the sample Excel sheet (into which the app's data will be imported), the heading says "Crew (Initials)".	5
Visibility of system status & Predictability	It's not clear how the users tell the system if they need to fill in the Indicator data. When they finish entering the data into screen 6, do they just tab through the Indicator fields if they're not at an Indicator Station?	5
Recognition rather than recall	On the Secchi Samples screen, how will the user know to enter feet in the first text box and meters in the 2nd? On the same screen, the Secchi Depth has two fields (#1 and #2, on the current Field Datasheet), are the users supposed to place a comma between the two depths?	3
Recognition rather than recall	The time fields on the sample Excel sheet are all in 24-hour formats. How will the user know to do that?	5
Recognition rather than recall	Are the checkboxes (vs radio dials) enough to let the user know that they can select as many as apply?	3
Responsiveness	Other than the final message "Data Submitted", will the users get notification that each screen's data has saved?	4
Limit data-driven tasks	It's unclear how some of the data will export to .csv and subsequently to Excel. (Sediment, Water Depth, Secchi Depth) A further issue that the Field Datasheet does not match the current Excel spreadsheet field for field. For example, there are 5 note fields on the Field Datasheet, but just one on the spreadsheet. Does the user need to consider this when making a note in the app?	5
User control and freedom/Error prevention	Once the data collector enters data in a screen, they proceed to the next. They are able to go back to modify data previously entered. However, it might be nice to have a table summarizing all the data they've entered, and they can either update it as necessary, or click on "Submit".	3
Error prevention	The scientist has stated that there is no need to worry about an Internet connection. However, should there be a contingency plan just in case? If the citizen scientists will be using their cellphones, some people may have cellphone plan carriers that get a good signal there, but some may not. I was unable to find anything providing for offline data entry.	5

6. Identification of critical usability concerns

Screen colors - the data will be collected and entered into the app while afloat in the bay. Is the color scheme amenable to glare from the sun and water? It's critical that the users know which field they're in.

Data format clarification - the end-goal of collecting this data is analysis. It's important that the data export effectively and cleanly into their Excel spreadsheet. Therefore, it would be good to spell out any specific requirements. For example: Time (24-hour HH:MM)

There's a disconnect between the Field Datasheet and their current Excel sheet. It appears that someone is manually typing in the data now, so this disconnect hasn't been an issue up until now. However, we should probably ask the scientist how she'd like to handle this. (Crew Names, Note fields, etc.)

User's need to be able to communicate to the system if they'll need to enter the Indicator Station data. Suggest a prompt: "Is this an Indicator Station" Yes/No at the beginning of the data entry. If it's not, the final screen comes after the 4th drop frame screen.

If the collectors do not have an Internet connection, there should be a back-up - either the current paper Field Datasheets, or an offline accessible app.

7. Illustrate the critical usability concerns with a short story

Alexa Denniston is very detail oriented. It's better to give "more than enough" data than "not enough". It's for that reason that she spells everything out - February 18, 2019 instead of 2/18/19, 2:35 p.m. CST instead of 14:35. This should be a good thing, but sometimes it's not.

Kirsten, in the DMF office uploads the data from the app and puts it into Excel, where she has macros that contain formulas to summarize the data for management. Every time Alexa gathers data, Kirsten needs to standardize Alexa's input. Some people don't put enough information, but Alexa really overdoes it, and it really skews the final summaries if Kirsten doesn't catch it up-front.

Then there's the high school students that Xavier Xylophone brought in to collect data. They finished entering the 4th Drop Frame, and the screen went to the Indicator Station fields. Even though they weren't at an Indicator Station, they weren't paying attention and just made the data fit the fields in that screen. It really skewed the data. Their data's incomplete anyway, as the cell signal was spotty. Add to that, in the sunlight, and with the drops of water on the screen, it was hard to tell what they were supposed to type into the boxes, but it's all good. They did their good deed and spent time helping the eelgrass problem.

8. References

Mankoff, J., Dey, A. K., Hsieh, G., Kientz, J., Lederer, S., & Ames, M. (2003, April). Heuristic evaluation of ambient displays. In *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 169-176). ACM.

Weinschenk S. and Barker D.T., 2000. Designing effective speech interfaces. John Wiley & Sons, Inc., New York.

Gerhardt-Powals, J. (1996). Cognitive engineering principles for enhancing human-computer performance. *International Journal of Human-Computer Interaction*, *8*(2), 189-211.