Stage Four Report

Team N

Drone Fleet Management System

Members

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Tutorial 02

TA: Philmo Gu

Links:

Link to Portfolio: https://teamlepinee.wixsite.com/cpsc481teamn
Link to GitHub: https://github.com/stephanedorotich/TeamN.git

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1 Project Description

Our Project is a Drone Fleet Management System (also known as DFMS). This project is a desktop program that will allow a user to manage a fleet of drones. It will give them the ability to oversee drones as they pick up and deliver packages. If anything goes wrong, the operator can control, recall, or send maintenance to recover the drones. We believe this application would be used by companies that use drone delivery for packages or food. A simple example would be Amazon, but even companies like UberEATS and SkipTheDishes would be able to use it.

2 Task List

2.1 Vertical

List of Drones	Displays the list of drones, which can be filtered to see a specific selection of drones. Also allows the user to view the history of the drones or view the drone on the map.
Drone History	Displays information about a specific drone. Similar to the statistics page but focused on single drones. Also shows information such as when the next maintenance is.
Status of Drones	This is a pop up on the map. It allows the user to click on a specific drone on the map or use the list on the side to click on a drone. It displays the drone's information such as what part of the journey it is on, package weight, and where it is going.
Map	Map of all drones, map is movable, allows the user to click on drones to see more information, shows where the HQ is, and shows where the drones are headed.

2.2 Horizontal

Fleet Statistics	Page that contains statistics on a specific fleet of drones, such as total deliveries, failed deliveries, and total flight time. This would allow the operator/company to figure out which areas are the most active, dangerous, etc.
Issue Advisory	If there are any weather warnings or we are forced to recall or even send maintenance to pick up a drone, we need to issue an advisory to our customers in the area that might be expecting the package. This page would allow the operator to send such a message to the users explaining the delay or issue.
Register Drone	This page allows users to add drones to the system.
Login	Allows the trained operator to sign in to access the program.

Manual Control	If a drone senses it might have a hard time landing, the operator can manually control the drone and make the delivery.
Drone Recovery Request	When a drone crashes or gets damaged and can no longer fly, using the tracked location, we send maintenance personnel to drive out and recover the crashed drone.
Recall Drone	When a drone is thought to be at risk for whatever reason, the operator can recall the drone back to the HQ. This makes the drone head back toward the HQ rather than to its current destination.

3 Heuristic Evaluation

3.1 Process

Our heuristic evaluation process consisted of multiple steps:

1. We split ourselves into two groups. One group contained 3 evaluators (Andy, Kathryn, and Macks). This group went through the prototype (separately) looking for violations of the usability heuristics and then each evaluator filled out the provided evaluation template containing Jakob Nielsen's 10 usability heuristics with all our thoughts, ideas, and suggestions.
2. The next group consisted of 2 reviewers (Nicholas and Stéphane). These two separately went through all 3 evaluation reports and rated the severity of each problem. After that was done, they met to discuss their ratings and to create a list that rated each problem on its severity.
3. After the list was created, we discussed briefly which, if any, of the items on the list should be changed. The document containing the severity rating was reviewed by a member of our group (Andy), who then went through the prototype, fixing all issues that we decided to fix, starting with the most severe ones.

3.2 Findings

The most severe issues the three evaluators found (based off Jakob Nielsen's 10 usability heuristics) were related to Error prevention and Consistency.

For error prevention, we had no confirmations of actions that seriously affect the drones. Examples of such confirmations that were missing from the prototype are a popup asking the operator to confirm whether they truly wish to recall a drone, or take control of a drone, or even send maintenance out to recover a drone. The buttons to do all these actions could be pushed accidentally and no confirmation makes it more likely for an accidental action to occur.

For Consistency and standards, since each of us worked on separate parts of the system prototype, much of the wording was not matching, such as "pick up" instead of "pickup", "hr" instead of "hrs", etc. We want to make sure the operators understand everything in the system. Making sure there is no confusion in the wording and maintaining consistency for the user is key.

Some less severe issues were just small details we missed or decided not to include in our design. For example, a key one would be the recall drone task. We had decided not to prototype that this current iteration, but we created the button for it. After some discussion we decided to remove the button from the prototype. After going through the evaluation, we decided on adding the button to at least show where it would be in the system. We plan to add this functionality next stage.

The evaluations and findings can be found in the appendix.

4 REFLECTION

What worked well for us was having 3 independent evaluators. Since we didn't meet and work together to review it, we got a much wider variety of problems and views on our prototype. For example, Andy was able to find many consistency issues, whereas Kathryn and Macks both found other issues within the program and thought the consistency was correct. Having different perspectives worked well in finding many problems.

What went poorly for us was that the evaluators did not discuss the usability heuristics before evaluating the prototype. Due to this, our interpretations of the heuristics varied significantly and sometimes our responses unveiled no problems where some should have been detected. Additionally, after the reviewers summarized the problems and assessed their severity, our group only deliberated about a few core issues and how to implement fixes. We did not take the time to go through the entire list and instead left it mainly up to the editor to fix issues or leave them for implementation in the next stage. Consequently, we will have to meet again to decide what else from the list we would like to implement.

It is hard to come up with something we would do differently, because we believe the way we evaluated our prototype was good, because it produced so many different perspectives and issues. But maybe after we evaluated individually, we go over it one more time as a group (made up of the 3 evaluators) to see if we can discuss and find more issues with the prototype. Also, after the reviewers were done rating the severity together, we should have met and discussed every single problem and figured out which to implement changes on rather than only discussing a couple.

APPENDIX A: HEURISTIC EVALUATIONS

EVALUATION 1: ANDY MA

Rule of Thumb	Is this rule being applied? How so?	Is this rule violated? How so?	How can this rule further improve usability, utility and desirability?
1. Visibility of system status	Yes. The screen changes nearly instantly when a button is clicked.	No.	If drone information is only being updated periodically, then the time of the last update could be indicated.
2. Match between system and the real world	Yes. The system uses terminology that the operator should be familiar with. The map can be moved like a map and the list is organized vertically like a list.	No.	"Task" could be replaced with "Current Destination" with appropriate adjustments.
3. User control and freedom	Yes. There is a way to cancel every action that overrides the system.	No.	A "Cancel" button could be added to the Drone Control page. A "Back" button could be added to the Aggregate Fleet Statistics page. When vertically prototyped, Login, Issue Advisory, Register Drone, and Drone Recovery Request should have a way to undo an action if done accidentally.
4. Consistency and standards	Yes. The same colours are used to represent each status.	Yes. "Current Leg" (in status) and "Task" (in list) mean the same thing. The default ordering of drones is different in the map and list.	"Pick up" (in status) and "Pickup" (in list) mean the same thing. "hr" (in aggregate fleet statistics), "hrs" (in list and history), and "h" (in history) are all used to abbreviate "hour(s)". Disabled buttons look different in Register New Drone and status. The left column of the information boxes is right aligned in the weather summary and status, but left aligned in Aggregate Fleet Statistics and history. "Aggregate Fleet Statistics" (in aggregate fleet statistics) and "Fleet Statistics" (in menu) mean the same thing. "Register New Drone"/"Register" (in register new drone) and "Register Drone" (in menu) mean the same thing. "Recover Drone" (in status), "Drone Recovery Request"/"Submit Recovery Request" (in drone recovery request), and "Recovery Request" (in menu) mean the same thing. "Operate Drone" (in status), "Drone Control" (in drone control), and "Control" (in menu) mean the same thing. The symbol for headquarters is different in the map and the list. Numbers with at least four digits are formatted with spaces in Aggregate Fleet Statistics but formatted with commas in list and history.

5. Error prevention	Yes. Buttons that do actions that are not applicable are disabled.	Yes. The operator cannot tell if there is a critical drone unless the operator is in the list with the critical filter on or in the map with both the list open and the critical filter on.	When vertically prototyped, Drone Recovery Request, Issue Advisory, and Register Drone should have confirmation messages.
6. Recognition rather than recall	Yes. Drone Recovery Request, history, and status all show the relevant drone's ID and status.	Yes. Drone Control does not show the relevant drone's ID, status, and location.	Issue Advisory could include an option to view the weather summary.
7. Flexibility and efficiency of use	Yes. The drone list allows an experienced operator to find a drone efficiently. The status and history of a drone can be accessed from both the map and list.	Yes. There should be keyboard shortcuts for common tasks.	There could be an option to scroll through the drone list instead of browsing pages. There could be a way to go directly from history to status. There could be a way to go directly from the history of one drone to the history of another drone.
8. Aesthetic and minimalist design	Yes. The list only includes the most important pieces of information. The model information is hidden by default in the Register New Drone page.	No.	The "Map" and "Drone List" tabs could be made more visible than the other tabs. Pieces of information that are not applicable to a dormant drone could be hidden instead of displayed with a "~".
9. Help users recognize, diagnose and recover from errors	Yes. Critical drones have extra information with more details on the problem.	No.	When vertically prototyped, Login, Issue Advisory, Register New Drone, Drone Control, and Drone Recovery Request should have descriptive error messages.
10. Help and documentation	Yes. Dropdown menus and text fields are labeled. Instructions for Drone Control are provided. The text field for serial number in Register New Drone has a placeholder indicating the length and format of the serial number. The status and task headers of the list can be hovered to see what the icons mean.	Yes. The map does not have a legend. It is not obvious that the status and task headers of the list can be hovered.	Forms in Issue Advisory, Register Drone, and Drone Recovery Request could indicate which fields are required and which are optional.

EVALUATION 2: KATHRYN LEPINE

Rule of Thumb	Is this rule being applied? How so?	Is this rule violated? How so?	How can this rule further improve usability, utility and desirability?
1. Visibility of system status	Yes, this rule is being applied because the system is based upon real time events and you can see the drone move on the map.	I think so, other than visually seeing the drone moving on the map do not know if the system updating with real-time data. This may also be the case for drone history would want to know when the information was last updated.	Can give the operator more specific grounds to when data was received and processed Section on the map saying 'last updated 2 seconds ago', or however long so the operator knows the system is in real-time. Similar, display for drone history but may say 'last updated 2 weeks ago'.
2. Match between system and the real world	Yes, this rule is relevant to the system because even someone who does not know a lot about drones could understand the basics of the system.	Yes, most standard maps have zoom functions either on the map with + and – or with pinching the screen.	Creating a zoom function on the map would help increase the usability of the map and the operator's ability to see drones clearly.
3. User control and freedom	No, there is no way to go back or unclick something without switching tabs and reopening the tab.	Yes, when a user moves to corner of map, there is no way to get back other than drag back the way they came or pick a drone from the drone list.	This rule can improve desirability by having a re-centre button to bring operator to a centred main map.
4. Consistency and standards	Yes, there are buttons on different pages that all do the same thing.	No	
5. Error prevention	No, because we do not have any error messages.	Operator may accidently be taken to the operate drone page and begin manual operation by a simple mis-click.	This rule can help the desirability, of having pop-up confirmations for switching to major tasks.
6. Recognition rather than recall	Yes, every page is easily accessible through the system in a few clicks once have select a drone. Do not have to memorize pathways to get places it is intuitive.	Confusing that the icons beside the top words are filtering methods this may not be intuitive. Additionally, not intuitive to hover over the column name to get a description.	To have better usability may give indication to where to find more information about the filtering on the main page.
7. Flexibility and efficiency of use	Yes, this rule is relevant to the tabs available in the top menu make it easy to navigate from one place to another.	Would not say the rule is violated, but there should be faster methods to get places.	To improve usability could have hot keys that allow operator to navigate system. Example: if have a selected drone on map and press control-h go to the history page. Additionally, if selected drone on map and press arrow key go to next drone on map.

8. Aesthetic and minimalist design	Yes, this rule is relevant to the map weather display, this information is not at utmost importance and thus hidden until the operator wants to look at it.	Rule may be violated due to the fact the package weight does not seem like essential information and increases clutter.	To improve visibility and utility consider removing package weight.
9. Help users recognize, diagnose and recover from errors	No, as stated before we do not have any error messages.	The rule is being violated because the user clicks and nothing happens, they do not know if something went wrong or everything is good.	To improve the desirability can implement error message so the user knows there are no more drones in the list with that filter when clicking the arrows.
10. Help and documentation	Yes, this rule is relevant for the registers new drone bar, has an example of what the serial number should look like.	In drone list search there is no example of a drone ID to follow when searching.	Adding example drone ID would allow the operator to easily recall what the typing format should look like without having to look it up.

EVALUATION 3: MACKS TAM

Rule of Thumb	Is this rule being applied? How so?	Is this rule violated? How so?	How can this rule further improve usability, utility and desirability?
1. Visibility of system status	I believe so, the color of the drones to indicate status of the drones. There is even an option to show only critical drones. The map itself shows the drones routes so the operator can watch. Clicking on the drone displays more information that is easily accessible.	I do not believe so	Making the system easily understandable and accessible is extremely important. Displaying correct and informative data is also extremely important especially for our system which the operator depends on the data to make sound decisions. No changes
2. Match between system and the real world	I believe the terms we used were understandable even for those with limited knowledge about drones. Most important terms being critical, active, and dormant (the statuses of the drone). Other words such as pick up and delivery also used often in the real world.	N/A	Making sure the users understand the information they are receiving is extremely important. Operators need to be able to understand the information they are receiving from the system thus with simple terms it becomes easier to understand. Making the system usability much easier. No changes
3. User control and freedom	There are exit buttons that allow you to return to your previous screen. There are buttons in place that allow you to navigate to different tabs without clicking	If the user makes some sort of mistake on recall drone or recover drone there is no currently implemented way to	Allowing for ease of access and undoing of mistakes is key. With this system any commands made by the operator to the drones is important as it affects the delivery of the packages and the happiness and desirability for the customer.

	the tab. I believe there is an extensive amount of freedom for the user	cancel this order which may be important!	Some sort of pop up or way to rescind the order of recalling/ recovering drone.
4. Consistency and standards	Made sure all icons, and terminology is matching, no current issues here.	N/A	This rule affects usability and utility. If a user is unsure of what a button does, they may be less motivated to test or use it. With all buttons and terminology matching the user can understand what each part of the system does. No changes
5. Error prevention		When the operator clicks recall/ recover/ operate drone, there is no suggested way to make sure this is what the user wants. Say the user accidentally clicks operate drone, it automatically brings the user to the operate drone page rather than say a pop up confirming this is what the user wants.	Stops the user from making errors and makes them more comfortable with committing to actions as they know there is error prevention in place to make sure they don't mess up. Some sort of pop up to confirm that is what the user wants to do (whether its for recalling, or recovering drone)
6. Recognition rather than recall	Each button is correctly labeled and is informative of what they do. There are simple tabs that allow the user to navigate the system.		A system that does not require the user to remember how everything works is more desirable. If a user is able to understand what everything does just from small labels or symbols it becomes easier to use thus also improving usability. No change
7. Flexibility and efficiency of use		We do not have any key binds in the system. Maybe esc to exit status. Maybe tab to toggle critical drones or such.	Allows experienced users to navigate or use the system more efficiently but not harming the experience of the new users who might not be as skilled in key binds. Thus, increasing usability and desirability. Since those inexperienced users won't feel discouraged to use the system due to complex key binds. Esc to exit map status Tab to toggle critical drones or status H for that drone's history Essentially some simple key binds to navigate through the system might be useful
8. Aesthetic and minimalist design	We 100% I believe did this as it was one of our goals when creating this system. The information is toggled and easily understood. We allow for filtering of select information that way the user isn't overwhelmed. The map is uncluttered and displays exactly what is necessary.		Whenever a system is extremely complex and displays a ton of information, many users get deterred from using it because they feel overwhelmed with information. To be able to display information without overwhelming the user is extremely important in usability (because it makes the system easier to use), and desirability (it does not scare or overwhelm the user) No change

9. Help users recognize, diagnose, and recover from errors		We do not have any error messages or such for any actions BUT our system is assumed to be used by trained operators, so I am not sure if this is necessary	Normally for untrained users having an error message when actions are made is useful to inform the user of their mistake allowing the user to learn from their mistakes and making usability easier. This one is difficult because as stated our system is supposed to be used by trained operators. Thus, I do believe they should know what to do in case of errors. To prevent these as stated before maybe pop ups to confirm the action the user is doing.
10. Help and documentation	We have some popups to notify what certain things that may seem unclear do. Once again, our system should be used by trained operators, so I am not sure we need a help button or anything of the sort.		For regular untrained users, a help button is extremely useful and desired for when something is unclear. Implementing this would allow said user to ask for help to learn and understand how to use the system better! As before we have the assumption of trained operators thus, I personally see no need for a Help or documentation button or such. On top of that the system personally believe is very simplistic and easy to understand.

Reviewers' Findings:

Severity Rating	Description
0	Does not seem to be a usability problem
1	Cosmetic problem
2	Minor usability problem
3	Major usability problem
4	Usability Catastrophe

'Fix?' Tags	Description
Yes	Needs to be fixed
No	Does not need to be fixed
Optional	Can be fixed - time allowing
Stage 5	Should be fixed in Stage 5
Stage 5?	Should be discussed as a possible change in Stage 5

Problem Description	Area of Prototype	Rating	Fix?	Solution / Comments
Default ordering of drones	Drone List	4	Yes	Red -> Green -> Dormant (+ ordered numerically)
Feedback: when recovering a drone	Drone Recovery	4	Yes	Confirmation dialogue (pop-up) on "Submit Recovery Request" button click
User is not alerted of critical drones	Everywhere	4	Yes	Use the bottom bar to display a notification that a drone is in a critical state. Allow for click to bring user to map view of drone (or map view of "view critical drones only")
Feedback: when issuing an advisory	Issue Advisory	4	Yes	Confirmation dialogue (pop-up) on "Issue Advisory" button click. Could possibly return to map?
Manual Control is missing information.	Manual Control	4	Yes	Include Drone ID, its Status, and a small map showing its location (maybe shrink Sensors & put map beside?). USE DUMMY VALUES. This is Horizontal, so there should only need to be 1 frame. They can all go to the same one.
Default ordering of drones	Map	4	Yes	Red -> Green (+ ordered numerically)
Dormant drones on map	Map	4	Yes	Remove dormant drone from map
Recall Drone button missing	Status	4	Yes	Recalling a drone is integral enough that it merits existence, even if it isn't elaborately implemented.
Feedback: when recalling a drone	Status	4	Yes	Confirmation dialogue (pop-up) on "Recall Drone" button click
Consistency: "Pickup" vs. "Pick up"	Drone List	3	Yes	"Pick up"
Consistency: "hr" vs. "hrs"	Drone List	3	Yes	"hr"
Filter by Status: colour inversion is backwards	Drone List	3	Yes	Unselected options should be 'greyed' (Layer -> pass-through set to 30%) and selected option should be full colour. This is currently backwards
Hovering "Status" & "Task" for more details is not intuitive	Drone List	3	Yes	Remove hover pop-ups (they have too little information to be useful). Replace 3 symbols beside "Task" with their respective words (Pick up, Delivery, Return)
Should be able to scroll through drone list	Drone List	3	Yes	Delete left & right arrows.
Consistency: "Aggregate Fleet Statistics" vs. "Fleet Statistics"	Fleet Statistics	3	Yes	"Fleet Statistics" (rename title)

Consistency: "hr" vs. "hrs"	History	3	Yes	"hr"
No weather information in Issue Advisory	Issue Advisory	3	Yes	Use "weather / open summary" button, or use "weather / summary"
Consistency: "Drone Control" vs. "Control"	Manual Control	3	Yes	"Manual Control" (rename menu name & title)
Manual Control shouldn't force the user to start manual control instantly.	Manual Control	3	Yes	Make a button "Assume Manual Control" that allows the user to assume control of the automated drone after they have assessed the situation (i.e. looked through cameras and at sensors/map)
Manual Control doesn't allow user to stop	Manual Control	3	Yes	Make a button to "Return to Autopilot" (perhaps this swaps with the "Assume Manual Control" button)
Consistency: "Register New Drone" vs. "Register Drone" vs. "Register"	Register Drone	3	Yes	"Register Drone" (rename title & button)
Consistency: Disabled button colour	Register Drone	3	Yes	Make button grey (match disabled buttons in status page) [consider updating the button component]
Consistency: "Current Leg" vs. "Task"	Status	3	Yes	"Task"
Consistency: "Operate Drone" vs. "Control"	Status	3	Yes	"Manual Control" (rename button)
Consistency: commas in numbers	Fleet Statistics	1	Yes	No preference. Both standards seem fine. Simplest fix is to change Fleet Statistics. Pages were consistent within themselves and both styles are acceptable.
Title alignment	Everywhere	1	Yes	Issue Advisory and Register Drone should have their titles aligned. Possibly aligned with Fleet Statistics, but perhaps not fleet stats because the page format is different. Top & Center hopefully looks fine for each of them
No zoom functionality on map	Map	3	Stage 5?	Impractical to implement with Figma.
Can't navigate between drone histories	Drone History	2	Stage 5?	The only case we found where tabbing drones would be useful is if you are scanning the histories of ALL (or at least most) the drones. With filters applied, the ordering could be somewhat unpredictable, and we couldn't think of a case where that would be useful. IF we add something like a "Submit Maintenance Request" button, maybe it can be justified. But without further use cases, it's probably not needed.
No keyboard shortcuts	Everywhere	2	Stage 5?	Definitely possible, but too many considerations for right now.
Map is missing a legend	Map	2	Stage 5?	
"Task" to describe the part of the delivery the drone is undescriptive	Everywhere	1	Stage 5?	Upon further thought, "Current Destination" seems like a viable alternative to "Task" as it would give us Vendor, Customer, HQ as our destinations (which are clear). During discussion, "Current Destination" seemed no more descriptive than "Task", which is also longer, and would require substantial edits to our prototype.
Recall / Recover buttons can be confused due to proximity	Status	1	Stage 5?	
No universal back button	Everywhere	0	Stage 5?	This wasn't actually raised by anyone, but perhaps could be useful?

Should be able to scroll through drone list	Drone List	3	Stage 5	Implement scroll. Very easy to do in Figma. Because it requires additional row entries, not recommended until Stage 5.
Indicate required fields in Issue Advisory	Issue Advisory	2	Stage 5	Horizontal. No fix recommended.
Indicate required fields in Recovery Request	Recovery Request	2	Stage 5	Horizontal. No fix recommended.
Indicate required fields in Register Drone	Register Drone	0	Stage 5	Horizontal. No fix recommended. Button is disabled by default, presumably until field is filled in.
Can't recenter map	Map	3	Optional	Most map services allow you to recenter to your location. A button along the bottom should be sufficient.
Search field has no example of drone ID	Drone List	2	No	Examples are already visible on the page. No fix recommended.
Drone filter methods don't feel intuitive	Drone List	2	No	
Consistency: field name column alignment. Right aligned in Weather Summary & Status. Left aligned in Fleet Statistics & History	Everywhere	1	No	This didn't seem like a problem. The right aligned ones are both info boxes and alignment looks good that way. The left aligned ones are both full pages and the alignment looks good that way. If a fix is desired, making everything left aligned is the simplest fix.
Consistency: "Drone Recovery Request" vs. "Recovery Request"	Recovery Request	1	No	We didn't mind this, it didn't feel inconsistent.
Consistency: "Recover Drone" vs. "Recovery Request"	Status	1	No	"Recover Drone" makes sense for a button (since that's the action you're taking) but not for the page. Maybe "Issue Recovery Request" could work, but that may be too long for a button.
Can't navigate from drone history to status	Drone History	0	No	Viewing the drone on the map from its history is already (and always) either 1 or 2 clicks away.
Can't cancel actions	Everywhere	0	No	Aligning with other management systems, cancelling/undoing is seldom an option. However, confirmation dialogues are very important. A user should be deliberate about their actions, and conf dialogues should be enough.
Lack of error messages	Everywhere	0	No	Evaluations did not mention where these error messages ought to be. We could think of only a few and given the other recommendations for reducing errors, this didn't seem important.
"Map" and "Drone" tab not prominent enough	Everywhere	0	No	
Don't know when drone info was last updated	Everywhere	0	No	Given that the real system would be updating in real-time (drones moving on map, their statuses changing as they fly, their histories updating when you open them…) the user certainly has real-time feedback about updating. Adding something like "Last updated: a few seconds ago" would be redundant in such a system
Fleet Statistics doesn't have a back button	Fleet Statistics	0	No	As a tab, it shouldn't have a back button. This does, however, raise the question of the merits of having a universal back button.
Package weight information is superfluous	Status	0	No	