DIT046 / DAT356 Requirements and User Experience
Final Exam

January 10, 2024

Examiner/Contact Person

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Jennifer will come to the room to check for questions roughly every hour.
Alternatively Phone: 0733 050517 (call again if no answer, I am in another exam room)

Authorized Aids

Textbook: Designing Interfaces, 2nd or 3rd Edition, By Jenifer Tidwell (Charles Brewer & Aynne Valencia)

Grading Scale for Exams

% Grade	Final Grade
0-49	Fail (U)
50-64	3
65-79	4
80-100	5

PLEASE OBSERVE THE FOLLOWING:

- All answers must be in English. Answers must be legible and readable.

- Sort the questions in order before handing them in.

- Put the number of the question on every page.

- This exam has 7 pages.

Part 1: Multiple item and Short-Answer Questions

Question 1: Multiple Choice Questions (15 points)

On your paper, write the name of the question, then the letter(s) of your chosen answer(s), e.g., 1.1: c., 1.3: a, d, e. For each question, there may be more than one correct answer. For full marks, list all the correct answers. Each correct answer listed is +1 point, each incorrect answer is -1 point.

1. Which of these requirements captures design information or unnecessary constraints and is therefore not well-formed? Note: the examples are about lifts, also known as elevators. In this question there may be more than one correct answer, list them all.

    (a) A lift will only reverse direction when stopped at a floor
    (b) The system will cycle the lift doors every time that a lift stops at a floor
    (c) The lift buttons must use only red and green as identifying colors
    (d) The lift must communicate with a central server every 30 seconds
    (e) The lift must never be moved with the doors open
    (f) The lift class shall have a "date installed" attribute
    (g) Each lift should be used an approximately equal amount

    Answer: c, d, f

2. Which of the following definitions is correct? One or more may be correct.

    (a) Transformational creativity involves taking existing ideas and converging to an agreed upon set of new ideas
    (b) Exploratory creativity involves finding new ideas by examining the combination of existing ideas
    (c) Exploratory creativity involves finding new ideas within the same space
    (d) Convergent creativity involves taking existing ideas and converging to an agreed upon set of new ideas
    (e) Transformational creativity involves shifting the idea space (e.g., by questioning assumptions), leading to a new space of ideas
    (f) Convergent creativity involves finding new ideas within the same space

    Answer: c, d, e

3. Which descriptions of experimental terminology are correct? There may be more than one correct answer.

    (a) The dependent variable is the influencing factor you are changing in order to see if it has an effect on the independent variable.
    (b) The independent variable is the response/effect you are observing to see if it should be attributed to the independent variable.
    (c) The dependent variable is the response/effect you are observing to see if it should be attributed to the independent variable.
    (d) The independent variable is the influencing factor you are changing in order to see if it has an effect on the independent variable.
    (e) Confounding factors are other influencing factors that, if left uncontrolled, won't let you prove the connection between variables.

we look for c and e, ignore d or b,
and give +1 to all
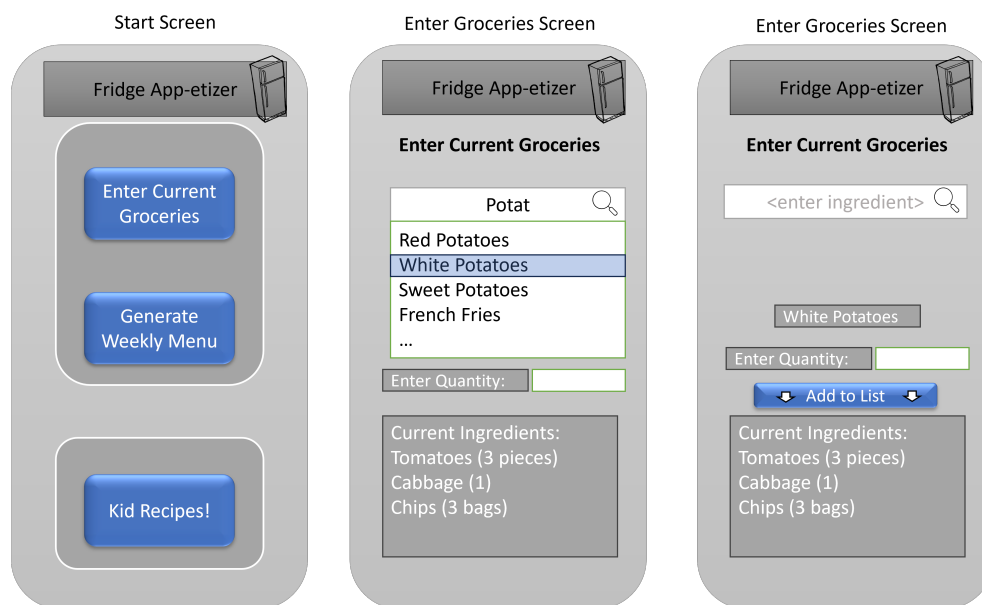
Answer: c, d, e

– Independent variable: The influencing factor you are tweaking in order to see if it has an effect to the dependent variable. – Dependent variable: The response/effect you are wondering if it should be attributed to the independent variable. – Confounding factors: Other influencing factors that, if left uncontrolled, they won't let you prove the connection.

4. Which mobile patterns are persistent?

   (a) Toggle menu
   (b) Tab menu
   (c) Cards
   (d) Side drawer
   (e) Dashboard

   Answer: b, c, e

5. In class we made the following simple UI for the App-etizer (Menu planner app). Three views of two screens are shown. Which UI design patterns are implemented in any of the following views/screens? There may be more than one.

   (a) Titled sections
   (b) Dashboard
   (c) Structured formatting
   (d) Dynamic search
   (e) Breadcrumbs
   (f) Clear entry points
   (g) List inlay

   Answer: a, d, f

Question 2: Short-Answer Questions (15 points)

1. The following are a list of requirements. Using the desired qualities of SRS requirements, list two quality issues with one or more of these requirements. For each issue list: which requirement(s) the quality issue applies to, and what specifically is the issue with the requirement. (4 points)

   Example Requirements:

   FR1 The system shall allow the user to scan receipts using their iPhone in order to enter ingredients into the system, and the system shall allow the user to enter ingredients in the fridge manually.

   QR1 The system shall provide a payment process which is seamless from the perspective of the user.

   Answer:

   QR1: vague, not measurable, can't measure seamless

   FR1: not implementation free, has design with iPhone

   FR1: singular, this should be split into two requirements, split on "and"

2. Explain the difference between a requirement, a constrain, and a domain assumption (same as a domain property). (3 points)

   Answer: Requirement:

   a desired function or quality of a system

   Domain Properties/Assumptions:

   Characteristics of the problem domain that are assumed to hold

   They are not requirements, because they don't have to be achieved by the system

   Constraints:

   "Constraints are global issues that shape the requirements" (Robertson2) "Constraints are simply another type of requirement" (Robertson2) They are a requirement that don't come from user needs

3. What are reasons to and to not create videos as part of requirements engineering. List two positive and two negatives. (4 marks)

   Answer:

4. Describe an anti-pattern and a dark design pattern as per the course lectures. Your definitions should make the difference between the two clear. Describe one example of each. The examples do not have to be from the lecture to be correct. (4 marks)

   Answer:

   Anti-pattern: a designer unintentionally uses a pattern incorrectly or in a way or combination that would confuse a user.

   Example: Using the cart metaphor wrongly, adding to cart something that shouldn't be purchasable.

   Example: Chart junk, including a lot of charts that have flashy graphics but little information.

   Example: Having both module tabs and bottom navigation with the same titles, e.g., "friends" in both. Where do you go? What is the difference?

   Dark pattern: a designer intentionally users a pattern that is meant to trick or deceive the users into doing something they normally wouldn't want to do.

   Example: The default when purchasing an item is a subscription for many items, easy to accidentally subscribe.

   Example: You can easily sign up for something, but to cancel or un-register, you have to phone someone or talk to a person or bot.

   Example: GDPR pop-ups which make it very difficult to say no to storing your data (have to scroll and uncheck many boxes).

Part 2: Domain Example and Long-Answer Questions

The remaining questions on the exam will relate to a problem in a domain, as described below. The scenario describes the situation today and the expectations for the new system. Focus your analysis and modeling on the envisioned (to be) system, but keep in mind the problems and requests with the as is situation, trying to avoid problems and satisfy user needs.

As is Situation

The emergency management department for a local city has been using drones (flying vehicles not carrying pilots) to deliver emergency material and services to hard-to-reach locations. For example, a drone could drop an inflatable life raft for someone in water, a drone could drop a defibrillator to someone having a heart attack, or a drone could drop supplies to someone stuck in snow. The department has a number of drones for these purposes, of different sizes, different carrying capabilities, and with different maintenance needs (e.g., good working condition, needs maintenance, or broken in some specific way). Drones can be available, on a mission, or broken.

Right now, the department has a spreadsheet of drones and their attributes and status, but different users need to know at different times what drones are available and their status, and this can be slow and error-prone via a shared spreadsheet. Users include drone operators, who either program the drones for automatic missions or fly the drones to the right location via remote control. When the mission is over, either they or the manager needs to record the new status of the drone. Sometimes this is done slowly or incorrectly. There are also drone mechanics to maintain and repair drones. The department manager assesses the adequacy of the drone fleet, determining which drones should be purchased or retired. Right now this manager has to manually send messages to mechanics to fix drones, and then either the mechanics or the managers update the drone's status in the spreadsheet.

Desired to be Situation

With a new app or website, the emergency management department and associated users should be able to check, update, and easily manage the status of all drones. Everyone should be able to see which drones are available, including the status and attributes of the drones. It should be easy for each user to update the right status quickly (e.g., the operator updates to say the drone is on a mission, and what the condition after the mission is, the mechanic updates drones which are now fixed, only the manager adds and removes drones from the system).

Users would like to be able to sort and search through the list of drones by available attributes and statuses. Managers would like to be able generate reports and statistics about the drones and their frequency of use. These are given to the city for budgeting purposes.
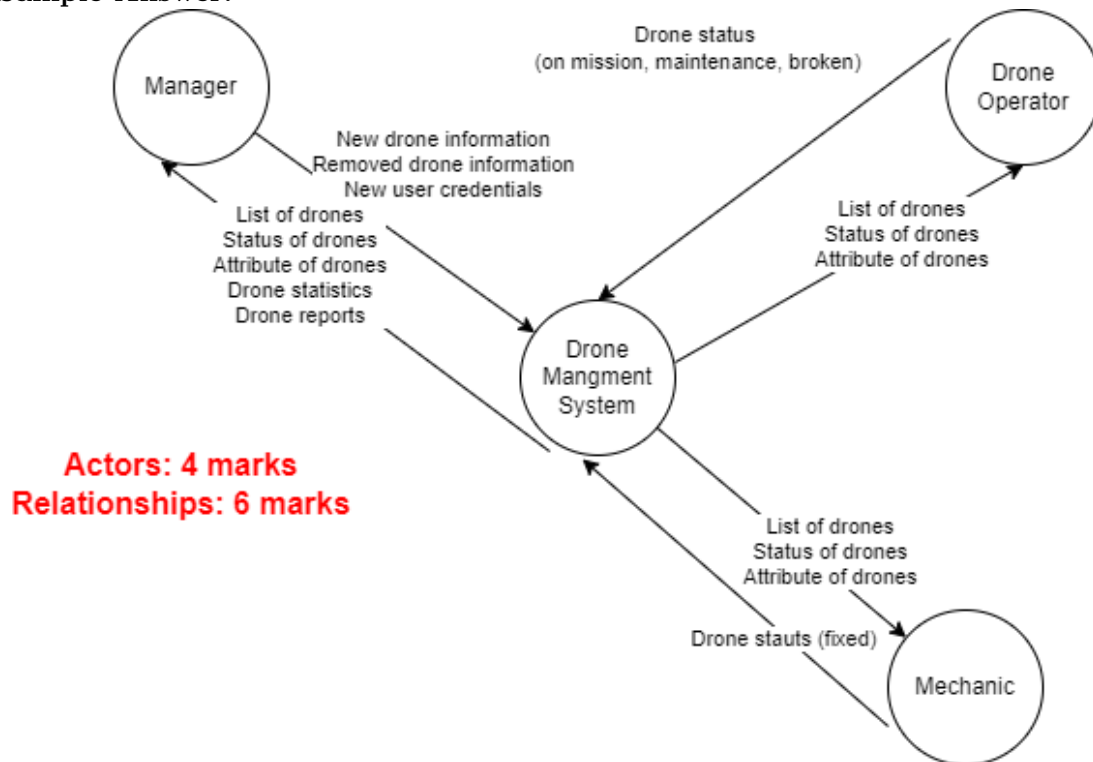
Because drone information is private, users must be registered with their appropriate role to use the app or website. In this case, the manager provides initial credentials, as they need to control who accesses the system.

The system must be ready by July 2025. The software can work on a computer or a phone, using versions of Apple, Windows or Android within the last 5 years.

Question 3: Context Diagram (10 points)

For the given case, draw a context diagram. Add the system actor, identify the relevant stakeholder/actor entities, and the relationships between the system and these entities, labelled with high-level inputs and outputs. Try to capture four actors (the system actor counts), and appropriate relationships. Supplement the diagram with text to explain any ambiguous or unclear parts of the model.
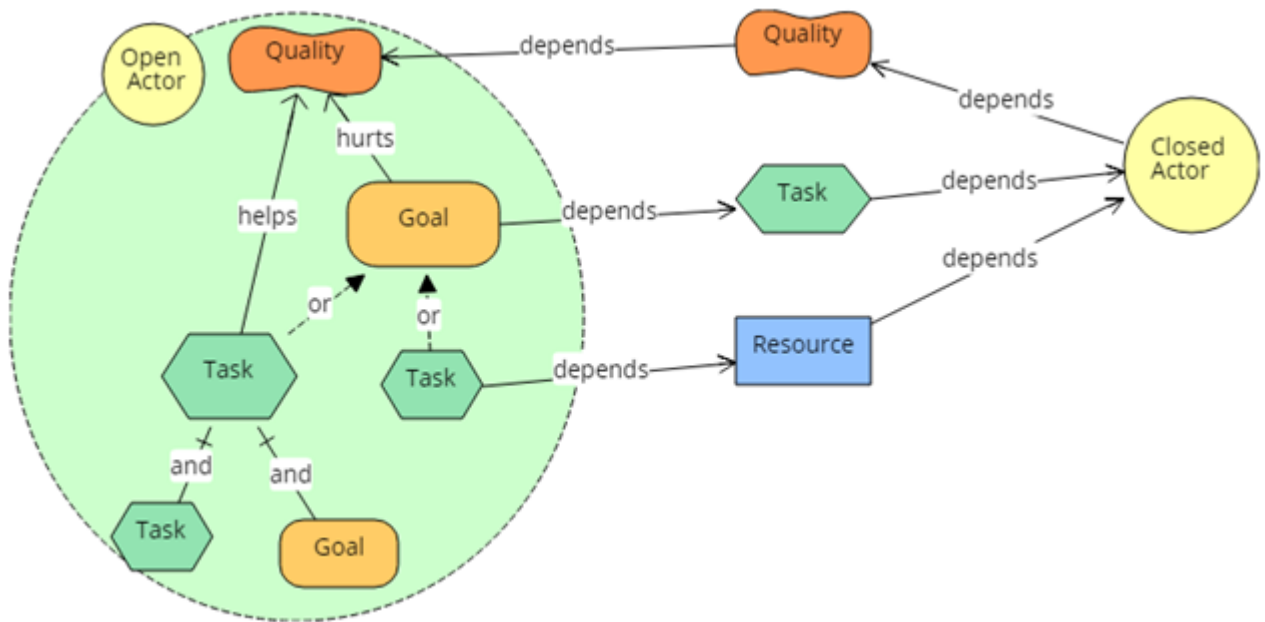
Sample Answer:

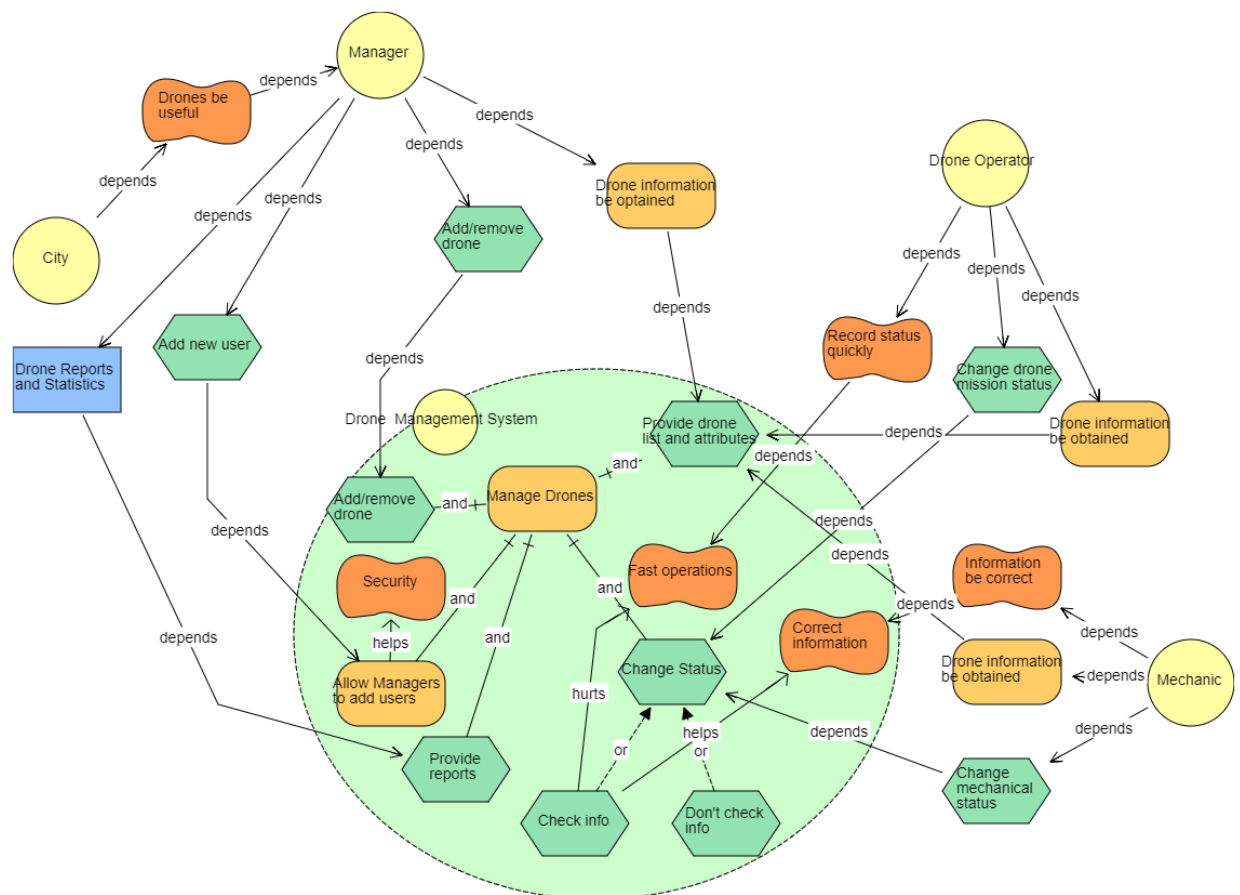## Question 4: Goal Model (10 points)

For the given case, draw a goal model. Identify the relevant actors, including the system actor. Try to capture at least four actors, and important dependencies between actors. Show the internal goals/tasks/resources/qualities for at least one actor, the others can be "closed" showing only dependencies to and from the actors. See the legend below for open and closed actors. For the open actor, capture the desired goals, tasks, resources, and qualities. Add some internal relationships between these elements.

There are many elements that can be included in the model. Aim for: four actors including one open actor with an actor boundary, at least one goal, quality, resource, task, four dependency links, two contribution links and two AND/OR links. In other words, the model does not have to be complete as per the domain description. It's helpful to use the information already captured in the other diagrams; however, we won't mark you on consistency between diagrams. Supplement the diagram with text to explain any ambiguous or unclear parts of the model.

Goal Model Legend (note, can use alternative shapes and labels as long as the mapping to the original concepts is clear)

Sample Answer:

Actors: 2 marks
Goals: 1 mark
Qualities: 1 mark
Tasks: 1 mark
Resources: 1 mark
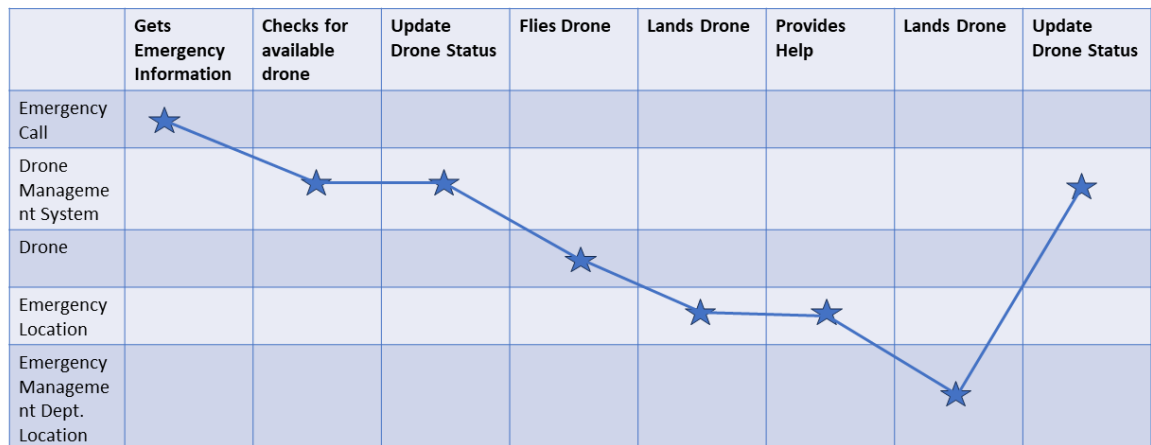Dependencies: 2 marks
Contributions: 1 mark
AND/OR: 1 mark

Question 5:   Customer Journey Map (10 points)

Draw a customer journey map for the given case. Indicate the persona that the journey applies to. Think about the channels and touchpoints that the persona would have to go through when using the system. Try to include three channels and at least five touchpoints.

Sample Answer:

Persona: J. Smith (drone operator)

	Gets Emergency Information	Checks for available drone	Update Drone Status	Flies Drone	Lands Drone	Provides Help	Lands Drone	Update Drone Status
Emergency Call	★							
Drone Management System		★	★					★
Drone				★				
Emergency Location					★	★		
Emergency Management Dept. Location							★	

Persona: 1 mark
Channels: 3 marks
Touchpoints: 5 marks
Timeline: 1 mark

Question 6: Textual Requirements (15 points)

Write requirements for the case provided. List four functional requirements in SRS form, two non-functional requirements in SRS form, two domain assumptions, and two constraints. In addition, list five user stories. The user stories should be unique, i.e. not a repeat of one of the SRS requirements. Remember the desired characteristics of user stories and SRS requirements when writing your requirements.

Sample Answer:

Sample functional requirements:

FR1. The system shall allow managers to add a new drone to the system, including the following drone attributes: size and carrying capabilities.

FR1.1. When adding new drones to the systems, managers should be able to add uniquely identifying drone names for each drone.

FR1.2 When entering a uniquely identifiable drone name, if the manager enters a name already in use, they will get a warning from the system.

FR2. The system shall allow managers to remove drones from the system.

FR3. The system shall allow users to view a list of drones in the system.

FR3.1. The system shall allow users to filter drones by status (good, mission, maintenance, broken), or by attributes (size, carrying capability).

FR4. The system shall allow operators to indicate that they have taken a drone out for a mission.

Non-functional requirements

NFR1. The system should allow quick updates of the status of a drone, 90% of users should be able update a status within 30 seconds.

NFR2. Information in the system should be accurate, all drone information should reflect reality within one minute of a change in status.

NFR3. The system should be secure, no non-authorized personnel should access drone information.

Domain assumptions:

DA1: We assume that operators have a way to get information about an emergency situation.

DA2: We assume that it is legal to fly drones in the city.

DA3: We assume that drones have their own power source or charging.

DA4: We assume that operators know how to operate all drones.

Constraints:

C1: The system should be available by July 2025.

C2: The system should follow all rules and regulations set by GDPR.

Sample user stories:

US1: As an operator, I want to be able to tell the system that the drone is back where it started, so the system knows it is potentially available for a new mission.

US2: As a mechanic, I want to know which drones I need to fix, so I can plan my day.

US3: As a mechanic, I want to be able to tell the system that I've fixed a drone, so it can be used again.

US4: As a manager, I want to know how many drones we have that can carry more than 10 kg, so I can plan if we need new drones.

US5: As a manager, I want a report on the number of times each drone has flown a mission in a month, so I know which drone are used the most or not at all and can plan for future needs.

US6: As a manager, I want a report on the number of times a drone has broken, so I can figure out which suppliers produce reliable or unreliable drones.

Question 7: UI Design & Patterns (20 points)

Draw two UI screens for the given case implementation. Screens can include pop-up windows, just be clear how and why they appear. Each screen should use at least two different patterns from either Tidwell book, four different patterns in total. Each screen should implement at

least two functional requirements (SRS or user stories). The requirements do not have to be the requirements from question 6, just make it clear what requirements the screens implement. For each screen, write: the two requirements implemented (and how, if not obvious), the two patterns implemented, and why the patterns are a good choice for the screen and its functions.

Answer:

We give 4 points for the requirements, 4 points for the patterns, and 2 points for the screen. A few of these answers use slightly different schemes.

Screen 1

Patterns & Why

Input Prompt: The black text on the left, indicates what should be entered in each field.

Input Hint: The grey text in the boxes, gives a further hint on what should be entered.

Prominent Done Button: The green save button, makes it obvious what to do when done.

Cancelability: The orange cancel button, can cancel the operation without consequence, takes the user back to the previous screen.

Requirements Satisfied

FR1. The system shall allow managers to add a new drone to the system, including the following drone attributes: size and carrying capabilities.

FR1.1. When adding new drones to the systems, managers should be able to add uniquely identifying drone names for each drone.

Screen 2

Drone Management System

Update Status: Operator View

Drone Name	Capacity	Status
Life Raft 1	15 kg	Available
Defib 3	10 kg	Needs Maintenance

Life Raft 2   8 kg   Available

Use	Return Good Status	Return Maintenance	Return Broken

Cold Rescue	20 kg	Broken
Water Rescue	15 kg	In use

Show more drones (7 more drones available)

Back

Note: greyed out buttons are those not available given the status.

Patterns & Why

List Inlay: when the operator clicks on a drone, the drone information opens up to reveal available buttons to change the status.

Infinite list: the user can show more drones by clicking on the blue text on the bottom, avoids trying to show all the drones at once.

Visual framework: the two screens looks the same to be obviously part of the same app, add familiarity.

Escape hatch is also possible, if it is clearly explained that the top title and icon lead the user to the home page.

Requirements Satisfied

FR4. The system shall allow operators to indicate that they have taken a drone out for a mission.

FR3. The system shall allow users to view a list of drones in the system.

Question 8: User Testing Tasks (5 points)

Come up with a list of five test tasks for the users to perform during usability tests for the two designed screens. Each screen should be tested by at least one task, for at least two tasks, indicate which of your two screens they test. The tasks should cover some of the main use cases or requirements of your system. Tasks should conform to the desirable qualities of user test tasks as discussed in the lecture.

Answer:

Sample answers, there are many:

1. (Screen 1) You are a manager and have just received your three new drones! You are excited to make these new drones available in the system, can you enter all of the relevant information for the drones into the system? What will you call your new drones?

2. (Screen 2) You are an operator and are about to send the Defib 3 drone out on a new mission. Can you update the status of this drone in the system to indicate it is in use?

3. (Screen 2) You are an operator and want to find a drone with a carrying capacity of 18 kg or more, as you have a delivery that is 19 kg. Can you find such information in the system?

4. You are a mechanic and have fixed drone Cold Rescue, can you update the status of the drone in the system to make sure others know it is fixed and available.

5. You are a manager and want to know how often the low-carrying capacity (less than 10 kg) drones are used in a month. Can you generate a report with this information?