

# **DS4800 – Innovation and Prototyping**

Written home exam.

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Candidates: 23, 46, 31 and 59.

## 1. Summary

In this paper, we present our innovation journey addressing an issue within the Norwegian recycling system. We followed the “Five phases of prototyping” model by Vaishnavi and Kuechler (2007) through the innovation process. Our journey began by recognizing a significant problem: while 9 out of 10 bottles are recycled, the remaining bottle is not properly recycled which could harm the environment. Our solution is a mobile application aimed to guide people towards responsible bottle disposal on the go. This paper outlines our solution, from the idea to the implementation, including user testing and analysis. We conclude by identifying areas for future improvement based on the insights gathered during the testing phase.

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### 3. Introduction

In this document, we will demonstrate the process we have undergone during our innovation journey. To do this, we will follow the “Five phases of prototyping” model proposed by Vaishnavi and Kuechler (Vaishnavi & Kuechler, 2007), which includes problem awareness, solutions, development, evaluation, and conclusion phases. Our journey begins with problem awareness - 9 out of 10 bottles are recycled, but where does the rest end up? In the ocean, or in the nature of your favorite hike? If we recycled all these bottles, we could save as much energy as 5000 households use in a year, and take better care of nature (Infinitum, 2022). This is why there is a need for a solution.

To address this issue, we want to launch a mobile application designed to address the question of how to ensure that the bottles end up in the right place. We want to make it easier for the Norwegian people on the move to take responsibility. The purpose of this document is to introduce the chosen solution for addressing the issue of improper bottle disposal in Norway.

In the first part of the exam, we will go through previous solutions, our solution, and the idea process. In the second part of the exam, we move on to user testing our solution. We will go through the planning process of the user tests, then analyze the tests, and finally suggest future improvements based on the feedback we received during the user tests.

### 4. Presentation of previous solutions and comparison

The problem awareness phase includes uncovering a problem and analyzing the market and existing solutions (Vaishnavi & Kuechler, 2007). As mentioned in the introduction we have discovered that 1 in 10 bottles end up littering the environment, this is something we want to explore further by analyzing existing solutions on the market to identify their strengths, weaknesses, and areas for improvement.

We've explored the market and included some of the most known solutions in the field of recycling solutions for cans and bottles that exist. There are various solutions on the market, but we narrowed it down to the ones we found most relevant for this paper which are Infinitum, Oda, Bower, and “Pant”.

The Norwegian recycling system incorporates a recycling system, called “pant”, intended to

reduce the littering of plastic bottles and aluminum cans in nature. The concept is that the consumer pays a deposit of 2kr, or 3kr when purchasing a bottle or a can, for the consumer to collect the deposit they must properly recycle the bottle or the can.

The most known recycling system for bottles and cans in Norway is owned and operated by a company called Infinitum. Grocery stores, and other convenience stores, that sell plastic bottles or soda cans, are obligated to provide a recycling offer to the customers. The recycling offer consists of machines that recycle bottles and cans, while also providing the deposit back to customers. This deposit can be used to purchase items in the store or withdrawn as cash (Infinitum, n.d.). This solution works, 9 out of 10 bottles are returned. Infinitum is a convenient option when you're already planning to visit the store, as many people accumulate several bottles at home and can return them all at once. However, all bottles are still not recycled - it can be inconvenient to make a trip to the store just to return one bottle and can lead to the last bottle ending up in inappropriate places. Additionally, stores are often closed on Sundays and have limited opening hours, and there might not be a nearby store once the soda can have been consumed.

Oda is an online grocery store that offers a conventional solution for recycling bottles in collaboration with Infinitum. Customers can purchase a recycling bag from Oda, fill it with bottles and cans, and hand it over to the delivery driver when their groceries are delivered. Afterward, Oda then sends the bag to Infinitum, where the bottles are counted. Customers receive the deposit as a voucher on Oda, which they can later redeem for groceries. The cost of the bag is 14 NOK for a pack of 5 and it has the capacity of up to 50 liters (Oda, n.d.). This system simplifies the recycling process for customers, eliminating the need to plan a trip to the store for recycling bottles. Oda does this for you. One downside of this solution is that it incurs a cost; Oda charges for the service by requiring customers to purchase the recycling bags, resulting in a smaller voucher than they would have received if they had returned the bottles themselves. You don't receive immediate cash; it's a process that takes several business days. The money you receive is also linked to Oda, so you can't use it wherever you want.

Bower is an app made for recycling not only cans and bottles but all disposable packaging. Their vision is that all disposable packaging holds value and should not end up in nature. The user can register the barcode on the packaging and then the user can find their nearest recycling station. After the disposables are recycled the user will receive coupons or money

based on what they recycled (Bower, n.d.). Some users reported that they don't receive the same amount of money when recycling through Bower as they would if they recycled using a recycling machine in the store. Bower's solution focuses more on recycling other types of waste, such as paper, batteries, and electronics rather than on bottles and cans. The recycling machines are not as available on the map as the other types of waste bins. It has a broader approach and is a valuable alternative to users who want to contribute to environmental sustainability.

Other solutions focus on charity. In these solutions, those who have purchased the bottles do not receive the deposit back; instead, it goes to charity. This includes the app called "Pant". This solution focuses on donating bottles and cans and allows the users to choose an organization that collects their recycling deposit. The chosen organization collects the user's recycled bottles, and cans, and is responsible for the recycling process (Pant, n.d.). This solution makes it easy for people to recycle, as they don't have to do it themselves. At some schools and public places, for example, Høyskolen Kristiania, you will find bins made specifically for recycling bottles or cans. This measure makes it easy for the consumer to throw away their bottles or cans but in a more recycling-friendly way. In these solutions, the consumers can recycle and possibly give the deposit to a charitable purpose.

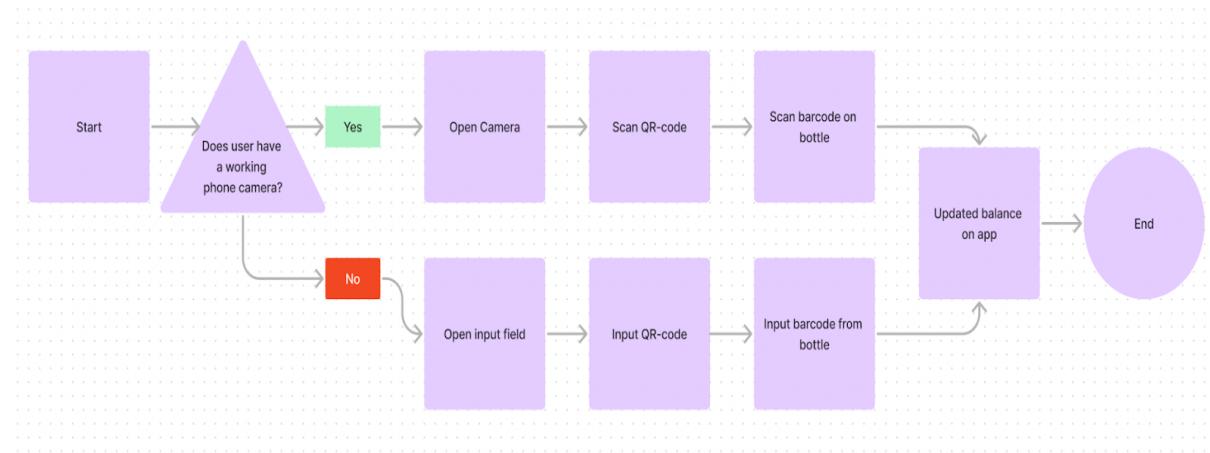
As seen, there are several solutions already available in the recycling market. Some focus on rewarding the user with coupons or money for recycling whilst others simply provide the users a way to recycle without collecting their deposit. We like to think that our solution is somehow similar to the already established recycling system, but more accessible. There is already a solution available for those who accumulate bottles at home and wish to return them all at once. Our solution addresses the issue of the remaining 1/10 of bottles that end up in nature or improperly sorted in garbage. We want the consumer to be able to recycle on the go, to "solve" that last bottle. We by no means want to out-compete today's market. We want to be an addition to the already established recycling system. By mapping existing solutions, we gain insight into what is lacking and will use this as inspiration going forward to improve upon the things we find working well. Our solution differs from others in that we are always available, unlike grocery stores with opening hours, and there's no need for planning, like with Oda, where you have to schedule the pickup of bottles. Our recycling bins should be accessible wherever people frequently walk, and as accessible as regular trash bins are today.

Infinitum is the only existing solution giving customers their full deposit back. Others either take a fee or keep the whole amount as a donation. Our solution will return the full deposit, acknowledging that the user may prefer to have their money back rather than donating it simply because it's the only available option for bottle disposal. What's better with our solution is that we extract what's missing from existing solutions and what works well in them, combining these aspects can give a fulfilled solution. We prioritize availability, accessibility, and ensuring users receive their full deposit back.

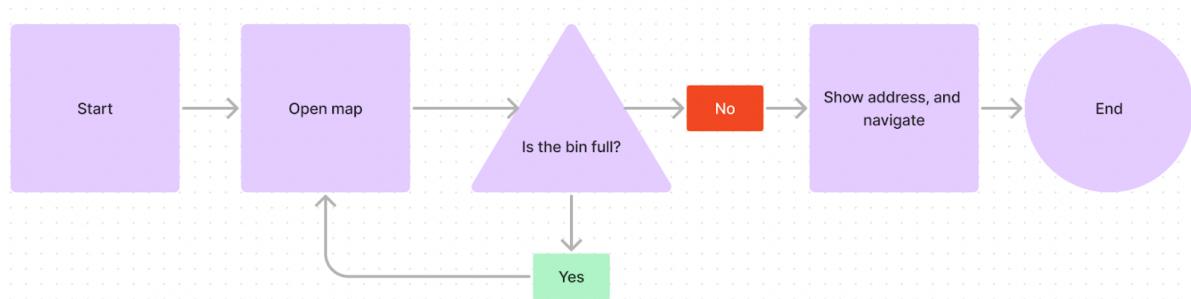
## 5. Presentation of our solution

Based on the information we have gathered through the “problem awareness phase” we can move on to the next phase, the solution phase. In this phase we want to solve the issue of improper disposal of cans and bottles in Norway, we want to solve this by making our solution accessible and giving the user their deposit back. Our solution involves a mobile application that is intended to work as a combination of garbage cans and an already existing recycling system.

Our recycling machines will be available wherever people move, as accessible as garbage cans. Each machine will be equipped with a QR code, which users will scan, followed by scanning the barcode on the bottle, or can. The total balance will be updated, and the money will be transferred to the user's account, then the bottles can be put in our recycling machines, for proper recycling. Before we developed the prototype, we implemented a flowchart, to map out how the application is intended to work from A to B. Using a flowchart as a tool helped us share and understand our ideas/visions within the group (Johnsen, 2024).



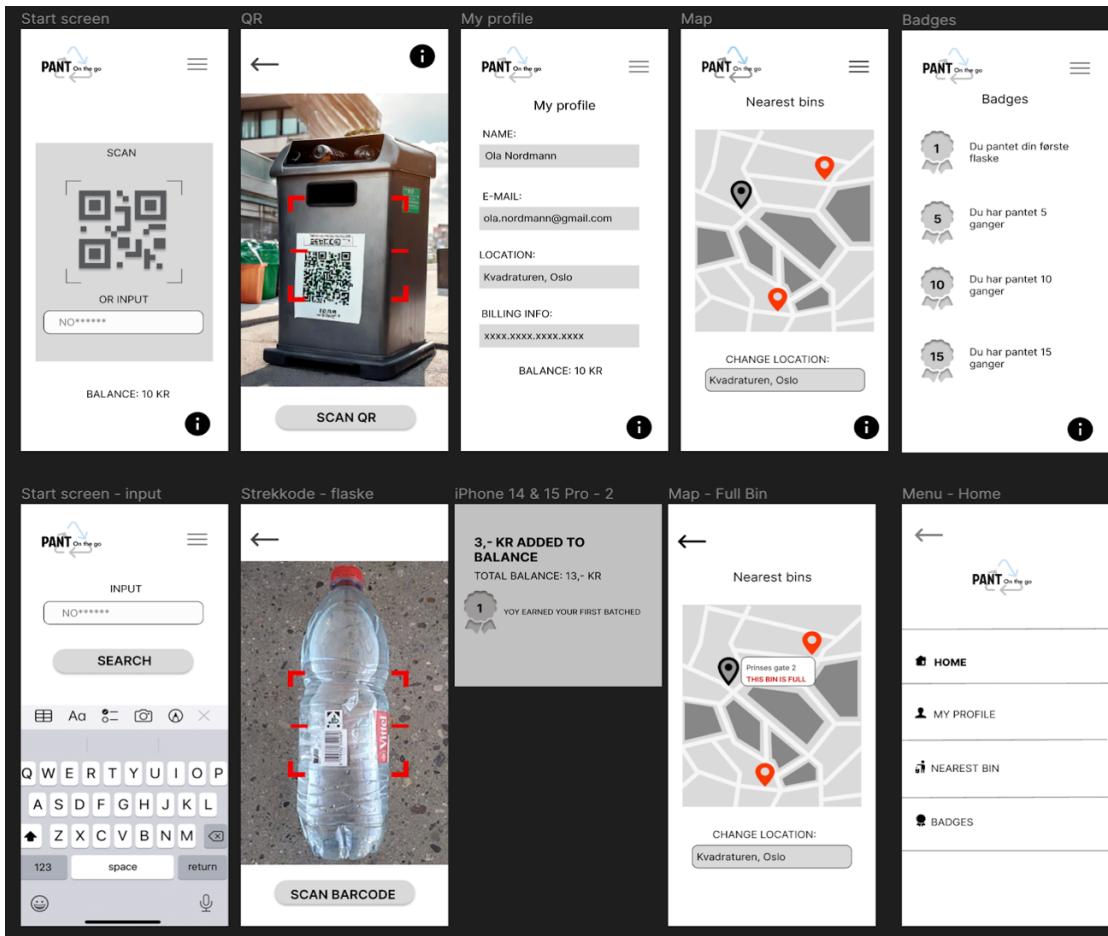
Additionally, to enhance accessibility and user convenience, we integrated a feature allowing users to locate the nearest recycling machine. This feature provides real-time information on machine capacity. In situations where a machine is full, users can effortlessly navigate to an alternative location, using the interactive map feature. Additionally, for users who already have a destination in mind, the feature allows pre-planned navigation and can show bottle machines near your pre-planned address.



In the development phase, we start to develop the prototype, in this phase, we extend our idea to a functioning prototype. Throughout this phase, we have made choices and implemented modifications to ensure that our solutions are maximally user-friendly so we can gather valuable feedback from the test users. The reason why we chose a mobile application is because we aimed to ensure accessibility for individuals on the move. A phone is something people often carry around wherever they go. Therefore, our prototype is designed with actual sizes of a phone.

In our prototype, we decided to keep things simple by using minimal colors, primarily black and white. By minimizing color, the idea is that test users can focus on what's important - how the application should interact, without being distracted by unnecessary elements.

Additionally, research has indicated that this approach can encourage more creative feedback, as test users are presented with an unfinished design and therefore can become more involved in the process (Johnsen, 2024). To further enhance user-friendliness and gather valuable feedback we've integrated a helpful feature called a tooltip. During user testing, participants can access these tooltips for assistance, thereby delivering this information orally due to limitations in the prototype (Johnsen, 2024). Demonstration of the prototype will be shown in the final part of the exam, the presentation.



## 6. The process leading to the final product

In this part of the exam, we will describe the innovative process of our idea using primarily two of the five characteristics of innovation. In the book “The Innovator's DNA” the author introduces five discovery skills, which are essential for culturing an innovative process.

Fostering a culture of innovation and driving meaningful change within organizations. By developing these key skills individuals, and teams, can unlock their creative potential. The skills that we are referring to collectively form what the authors refer to as the “five discovery skills” or “five points of innovation” (Dyer et al., 2019. p. 3). We will describe how we came up with our idea through observing and questioning, but we also choose to mention networking.

### 6.1 Observing

One of the discovery skills we decided was best suited for our project was the observation skill. This skill is about paying close attention to the world around you, actively seeking out

new experiences, and studying the behaviors, preferences, and needs of others. Usually, innovators draw inspiration from their observations and use them to generate new ideas, insights, and solutions. By immersing themselves in diverse environments and experiences, they can expand their perspective and fuel their creativity. Some ideas come from identifying patterns, trends, and unmet needs (Dyer et al., 2019. p. 91).

Our idea started when we observed one of the Infinitum commercials with Karsten Warholm (Infinitum NO, 2022). In this commercial Warholm's opening line is "We recycle 9 out of 10 bottles, but what happens with the last one?". This commercial raised the obvious question, what happened to that last bottle? The last bottles are the bottles or cans that are not recycled, the ones you see lying on the streets or in nature.

To find out more about this, we wanted to observe how people behaved in their natural being. In lectures, a lot of students bring either a bottle of water or cans containing soft drinks or energy drinks. We observed that in some cases there are no bins in the lecturing hall, or next to the lecturing hall, that are specifically for recycling bottles and cans, therefore the students use the regular trash cans. In most cases, people avoid holding on to the bottle or can until they find a recycling station. We observed the same behavior when we observed in one of Oslo's most busy streets Karl Johan. People would rather throw their bottles or cans in the trash can than hold on to them until they find a proper recycling station.

To observe a new environment we choose to visit the cinema, first at Ringen Kino and then Colosseum. A Lot of people buy themselves a beverage before entering the cinema hall, therefore cinemas seemed like an appropriate place to observe. We noticed that there were multiple trash cans for recycling bottles near the exits at the cinema halls. During our visit to Ringen Kino, we observed that people threw their bottles and cans in the trash cans for recycling bottles. Our second observation was interesting, here, many of the bottles were thrown into regular trash bins despite their being trash cans for recycling right next to it. But we noticed that the bins for recycling bottles were full.

Our theory is that the first persons set the standard for what those behind them do. In our last observation at Colosseum, the first person to leave the cinema hall threw their bottle in the regular trash can, maybe that encouraged the rest to do the same? Could it be that if the bin for recycling bottles were not full people would rather use that?

<b>Location:</b>	<b>Observation:</b>
Lecture hall	<ul style="list-style-type: none"> <li>• Students threw bottles and cans in regular trash cans.</li> <li>• No trash cans for recycling bottles nearby</li> </ul>
Karl Johan	<ul style="list-style-type: none"> <li>• People threw bottles and cans in regular trash cans.</li> <li>• No trash cans for recycling bottles nearby</li> </ul>
Ringen Kino	<ul style="list-style-type: none"> <li>• Trash cans for recycling bottles outside the cinema hall</li> <li>• People threw their bottles in the trash cans for recycling bottles</li> </ul>
Colosseum	<ul style="list-style-type: none"> <li>• Trash cans for recycling bottles outside the cinema hall.</li> <li>• People threw their bottles in regular trash cans.</li> </ul>

Observing helps us gain insight and ideas for new ways of doing things, (Dyer et al., 2019. p. 23-24). and we also see what doesn't work, we need to make deposits available where people move and are on the go. Drawing inspiration from our observations, we were able to come up with new ideas, insights, and solutions to our application. And by observing known environments and new ones we were able to expand our perspective and fuel our creativity.

But how could we make it even more accessible and efficient? We came up with some solutions that we believe would be able to contribute to this. To make recycling more accessible for the consumers we think it would be beneficial to have recycling machines for bottles and cans in the streets, the same places where you usually will find a trash can. It could also be argued that this measure also contributes to more efficient recycling as it would separate the ones who only wish to recycle a few bottles from those who recycle once a year. If recycling machines were accessible to the consumers at all hours each day it would possibly solve some of the littering happening at night or on the days grocery stores are closed. Also, the observations we mention above are highly related to this. What we observed in lectures and on the streets was people rather throwing away their bottles and cans in regular trash cans since there were no recycling stations nearby. Could it be that today's recycling system isn't accessible and efficient enough?

## 6.2 Questioning

In addition to observing we also wanted to include the concept of questioning. By combining these DNA skills, questioning as we observe, we hope to discover more than if we used just one skill. (Dyer et al., 2019. p. 85). Why are things done in a certain way? How could these things be done differently? These are typical questions innovators ask to gain new insights and to bring forward new perspectives (Dyer et al., 2019. p. 67).

As stated previously in our assignment the idea for our project started after watching the Infinitum commercial. This was the start of the questioning phase where we sat down asking what our application needed to catch people's attention, and why would people want to use it. In "The Innovator's DNA" you can read about the "Questioning skill", which involves a willingness to change assumptions, explore alternative perspectives, and ask thought-provoking questions. This made us think about an alternative option to today's recycling system since we knew that there was no chance to outcompete Infinitum in their market. And by asking thought-provoking questions, and questioning assumptions we were able to identify new alternative avenues. With this, we hope to make a meaningful change and come up with something innovative. Now we will go deeper into how we brought the questioning skill into the project, using one of the methods described in "The Innovator's DNA".

A method, or tool, described in Innovator's DNA is QuestionStorming. This method challenges the innovator to brainstorm questions about the problem, not the solution. The method encourages innovators to identify a problem or a challenge to solve, and then to ask fifty questions regarding the problem. The questions shouldn't be too long and should include interrogative words such as why, why not, what if, what is, and what caused (Dyer et al., 2019. p. 87-88).

To engage questions about a specific challenge we brainstormed 50 questions about the challenge, "1/10 of plastic bottles aren't being recycled properly, causing unnecessary pollution and wasting energy". Due to the scope of the exam, we chose not to include all 50 questions, we chose to rather include a smaller selection to show our thought process.

Why aren't all bottles recycled?	What is the motivational factor to recycle bottles?
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What happens to plastic bottles that aren't recycled properly?	What caused people to throw the bottle in nature?
What impact does improper recycling have on wildlife/ nature?	Why aren't all plastic bottles recycled?
What are the benefits of properly recycling bottles?	How can we make recycling more accessible?
Why do some people choose not to recycle?	How can we motivate people to take responsibility?
What if recycling was more accessible?	How can technology help to make it easier?
What if recycling was more efficient?	What are the consequences of not recycling properly?
Where are the most improperly sorted bottles found?	How can we shift our attitude?
What if recycling were as accessible as trash cans?	What causes limited options?
What if we increase the deposit?	What is the environmental impact?

### 6.3 Networking

Lastly, it feels wrong to not mention networking as a DNA skill when we have worked in a group. Despite sharing the same school and professions, our group consists of people of different ages, backgrounds, and perspectives. We've used these differences to learn from each other, share ideas, give feedback, and trigger new and creative thoughts through our conversations. Networking is about challenging each other's ideas and building on them (Dyer et al., 2019. p. 115).

For instance, one team member shared their experience from traveling abroad, where they observed specialized trash bins designated for empty bottles. However, they noted that bottles often ended up in the wrong bins, such as those intended for food waste, even though the bins were right next to each other. This is argued in our observation at cinemas, people tend to do what other people do.

This observation prompted discussions within our group, and we asked questions: how can we motivate people to use our solution? One member of our team shared their perspective that their motivation to run is largely due to the achievement badges they receive from their Apple watch after completing a run. This sparked thoughts about how we can draw inspiration from this. How can we give something back to the user? Firstly, people will get their deposit back, and secondly, we will implement achievement badges to inspire and motivate users.

## 7. Implementation of the user test

In the evaluation phase, the next step in “The five phases of prototyping”, we are going to test our prototype on external users and give them tasks and questions while observing their interaction with the prototype (Johnsen, 2024). Through this process, we aim to get useful insight into user experience and identify opportunities for future improvements.

### 7.1 Planning the user test

When planning a user test, it's common to focus on when the test should take place, where the test should take place, and what should happen during the test (Toftøy-Andersen & Wold, 2021, p. 33). We used the twelve points for planning a user test which is stated in the book *Praktisk Brukertesting* written by Eli Toftøy-Andersen and Jon Gunnar Wold. Below we will outline our main choices regarding the test plan, while the entire test plan is available in the appendices in table 11.1.1.

#### Purpose and functionality

To properly conduct a user test it is crucial to explain the purpose of the user test (Toftøy-Andersen & Wold, 2021, p. 35). We want our solution to be as easy as possible so that as many people as possible want to use the final product. The purpose of our user test is to test functionality, usability, and how potential users experienced our prototype. Is the prototype too complex or too easy? Or are there any usability problems with the core feature or the navigation? (Mindsea. n.d.).

After we know the purpose of the user test it is easier to conduct a list of tasks that should test the prototype's functionality (Toftøy-Andersen & Wold, 2021, p. 35). Since we want our solution to be as easy as possible, we wanted to design tasks to test how easy the test persons

find the current functionality. The prototype primarily consists of four pages, the home screen, my profile, the nearest bin, and badges. We wanted to test how easy it was to navigate between these pages, and of course, to test the main function, scanning a bottle or can. We will develop our prototype in Figma, which means the test participants will be testing the functionality on a computer but designed to mimic an iPhone app experience.

### **Persons to be tested**

In Infinitum's annual report from 2022, they state that almost all people in Norway recycle their bottles and cans (Infinitum, 2022). Based on this we understood that our solution should be aimed against various target groups, but focused on those who own a smartphone. We found it difficult to find people in different age groups due to our limited network in our study city. Additionally, we wanted to avoid remote testing since it's difficult to capture body language with a web camera (Johnsen, 2024). Also, we found it difficult to recruit individuals we were not familiar with, usually test persons want some sort of reward for participating which we did not have the resources to offer them.

When finding out who to test it is usual to find which target group the solution is meant for. If there are multiple target groups you must prioritize, it is rare to have the opportunity to conduct tests with all these target groups (Toftøy-Andersen & Wold, 2021, p. 37). We therefore chose to rather focus on diversity in gender and technology knowledge.

We focused on recruiting two or three individuals with low technology knowledge and interest, along with two with either high technology knowledge and interest or low knowledge expertise in our specific area of focus.

We recruited five test persons through our network. We chose to limit ourselves to five test persons because it most likely wouldn't make a significant difference from testing one or three more (Johnsen, 2024). Conducting large usability tests that involve more than five participants can be both time consuming and expensive. Laura Faulkner mentioned in the book, Behaviour Research Method, that research shows that with five test persons it is likely that up to 80% accuracy rate for discovering user ability errors (Faulkner, 2003, p. 380-381).

### **Tasks and questions**

There is no correct answer for how many tasks a test should include, as long as the tasks cover the functionalities you want to test (Toftøy-Andersen & Wold, 2021, p. 40). We settled on 7

tasks, since adding additional tasks would be a bit pointless because of our prototype's simplicity. Our tasks consist of specific tasks, enabling us to get specific feedback to use for comparing, and partially open tasks, offering insight in how the user approaches tasks in a more flexible way (Johnson, 2024). To get well-structured notes, we made a table, 11.1.4, that consists of the tasks, the task's level of difficulty, and a column for observations.

Before the test started, we wanted to ask the test persons some demographic questions like age and gender. These questions help us get an insight into who we are testing, and we could make some correlations in our analysis. As we mentioned previously, we aimed to have test persons with different levels of technology knowledge and interest, therefore we also asked the test persons how they would range their knowledge and interest when it comes to technology. These questions can be seen in table 11.1.3.

After the test we gave the test persons a survey to get an insight into how they felt about the different tasks and the prototype, the survey can be seen in table 11.1.5. We also asked some questions to conduct a final interview. The final interview let the test persons explain in their own words how they felt about the prototype and if there were any changes they would like to see. The final interview questions can be seen in table 11.1.6.

## 7.2 Pilot test

Before conducting the user testing, we performed a pilot test. A pilot test is meant as a test before the actual user test starts. The user tests should be as similar to the pilot test as possible (Toftøy-Andersen & Wold, 2021, p. 62). We used the pilot test to prepare us for the user test, and since we won't use the data we collected during the pilot test in our analysis we decided to only perform one pilot test. This decision was made based on the fact that we didn't want to spend too much time on pilot tests before moving on to the user tests.

When we first planned the tests, we thought it would be a good idea for all team members to participate. We tried this in the pilot test but saw that the test person was distracted. The pilot test included questions, tasks, survey, and final interview. We had designed four tasks for the test person, but we noticed that the test person ran through the tasks very quickly which made us question if the tasks were complex enough.

After the test person was done solving the tasks we handed the test person a small survey to see what they felt about the prototype. The test person themselves said that he/she thought the

survey could include more questions.

Based on the pilot test, we choose to have one test manager and one or two observers during the actual user test and include more questions and tasks.

### 7.3 Analysis of user tests

To provide a well-structured analysis it's helpful to have structured notes, some statistics, screenshots, or access to the system that was tested and team members to discuss the results with (Toftøy-Andersen & Wold, 2021, p. 72). To help us to make well-structured notes during the user tests the observers took notes directly in the relevant tables. By doing this we always knew what tasks the observers were observing. We also made tables using Excel after the user tests that summarized the tests and we also included a column that summed the average result of each task and each question in the survey. All team members always had access to the prototype and relevant information about the tests as well.

#### 7.3.1 The tasks

To make the analysis process easier for ourselves we chose to make a table that contains the different tasks, what level of difficulty we assumed for the tasks, and how the test persons solved the tasks according to the observers. In this table, we choose to categorize how the test persons solved the task with the numbers 1, 2, and 3 which translates to easy, medium and hard. This again, will make the analysis process easier. In the first part of our analysis, we will systematically analyze the different tasks.

Level of difficulty: Low, Medium, High

How the test person solved the task according to the observer: 1 = Easy, 2 = Medium, 3 = Hard

Tasks	Level of difficulty	How the test person solved the task according to the observer:					Average
		User 1	User 2	User 3	User 4	User 5	
1	High	2	1	2	1	3	1,8
2	Medium	1	1	2	1	2	1,4
3	Low / Medium	1	1	1	1	1	1
4	Low	1	1	1	1	1	1
5	Medium	1	1	1	1	2	1,2
6	Low	1	1	1	1	1	1
7	Medium	1	1	2	1	2	1,4

Two of five test users completed the first task without any issues and with confidence. The rest encountered some challenges when trying to perform a scan. This was the most challenging task in the user test, but also one of the most important tasks since this is a functionality the user will frequently engage with in the intended final solution. We take into consideration that this is the first task that was assigned, it was their first encounter with the prototype. They had not familiarized themselves with the prototype yet, and expectations may have varied among the users, including differing assumptions about the completeness of the prototype.

All participants quickly understood in task two that they had to press the input field to manually scan a bottle. This was somewhat expected, given that users are familiar with using input fields in other solutions, so they understand that they need to tap to enter information. Only one had problems finding the input field. We did not expect this, we found our input field logically positioned within the interface right under QR scanning. Our final interview gave us a deeper understanding of why this participant struggled to find the input field. It turned out that the test person was distracted by the moving lines around QR, the same lines that another test person found helpful in task 1. Lost focus.

Everyone completed the third task without any problems. All test persons easily navigated to “My Profile” using the navigation menu. We believe it's because personal information such as payment, or billing information, is usually under “My profile” in other solutions as well, or in settings. We categorized this assignment with the difficulty level low/medium because we did expect this to be a simple task, but since we don't mention where the test persons can find this setting we did expect at least one or two to maybe use a longer time.

In the fourth task, the test person was supposed to find the page for “Badges” using the navigation menu. We thought this would be a simple task since they had to use the navigation menu in the last assignment as well. Every participant navigated easily and completed the task, doing it fast and with no hesitation. We believe the users have gained control of the navigation through the previous task, and that the navigation is easily found and predictable.

In the fifth task, the test persons also had to explore the navigation menu by first accessing the page “My Profile” before navigating back to the “Home Screen”. We set the difficulty level for this task to medium because even though the test person already was familiar with the

navigation menu it could be confusing to navigate to multiple pages. Almost every test person did this task without any problems except for one who used some time to figure out where to navigate. Something we noticed during tasks 3, 4, and 5 was that some of the test persons tried to navigate back to the “Home Screen” by tapping the logo in the left corner. We see how this would make sense since some other apps have this feature. Most of the test persons understood that this wasn't possible after attempting to tap the logo once, but two of the test persons tried multiple times to press the logo. Something we hadn't expected was that one user, when trying to navigate back, test user tried to swipe the mouse from right to left over the screen. This is a feature that the iPhone has to navigate back from something.

The sixth task involves navigating to the page where you can find the nearest bottle machine. Our solutions should be easy to use, so we don't have many features apart from the essentials - bottle recycling, withdrawing money, and finding the nearest bin. All test users completed this task easily.

In the final, and seventh task, participants demonstrated a variation level of understanding. Three out of five managed to complete the task effortlessly, including one person who took some time to get an overview. The two remaining spent some time with the input field, attempting to change their current location. We had to intervene and explain that the prototype does not have that function, but that there is a set location they can use for navigation. When we asked about what they expected when they clicked on the pin, they wanted to see if the bin was available, get directions to the bottle machines, or show the distance to the nearest bin. We did not expect that none of the participants would notice the gray pin, which indicated a full and unavailable bin. When we asked why, they either did not notice it or they thought the gray pin was their location.

### 7.3.2 The survey

After the user test, we ran a questionnaire to get a better understanding of how the test persons felt about the different tasks which can be seen in the table below. The test persons were asked to answer how they felt about different tasks, and functions, on a scale from 1-5.

Almost everyone found the navigation in the app easy and just two test persons found the system to be somewhat complex. Nobody felt that they would need some form of technical

support to use the app. Everyone thought that the navigation menu was easy to find and that most people would learn the system quickly, the average score was 5, this was good to know since we wanted to focus on a simple and user-friendly app. Not everyone felt super confident using the app, but we expected this since this was their first meeting with our prototype.

Surprisingly, none of the participants used the tooltip, even though there were moments when they got stuck and could benefit from it. Maybe it's because they wanted to figure things out by themselves, or they wanted to be supportive since we know them, and not make it seem like our solutions weren't user-friendly. This idea is supported by that in task 1, three of five struggled to complete the task, however, according to the survey, everyone except one thought the scan function was easy to use.

	User 1	User 2	User 3	User 4	User 5	Average
<b>STATISTICS</b>						
<b>Personal Info</b>						
Age	26	27	26	25	27	26,2
Gender	male	female	female	male	female	female
It knowledge	4	3	2	5	3	3,4
Position	Working	Working	Studying	Both	Both	working/both
1 - strongly disagree, 5 - strongly agree						
<b>SURVEY</b>						
Scan function was easy to use	3	5	5	5	5	4,6
Navigation menu was easy to find	5	5	5	5	5	5
Navigation in our app was easy	5	5	4	5	5	4,8
Felt confident using the app	4	4	5	4	5	4,4
Most people will learn this system quickly	5	5	5	5	5	5
The system was unnecessarily complex	2	1	1	2	1	1,4
Require technical support to use the app	1	1	1	1	1	1
I found the tooltip helpful						
Finding nearest bin was hard to use	3	1	1	2	1	1,6

### 7.3.3 The final interview

We also had a final interview at the very end of the user test to gather more information on how the test persons felt about the prototype, the questions can be seen in the table below. The final interview lets the test person answer in their own words which gives us an even deeper understanding than just the questionnaire.

We first asked the test persons about what they felt about the app, by asking this question we hoped to get a better insight into how the test persons experienced the prototype. All the test persons mentioned that they thought the app was overall simple or easy to use, even though

some tasks were challenging. This confirms our findings from both observation and our survey.

We also asked what was hardest and easiest in our app. We asked this question to get more direct feedback and to see if it aligned with the observation we made. It turned out the test persons had different views on what was difficult and what was easy. Three of the test persons found the scan function to be the most difficult to use, while one found the same function the easiest to use. This may be because we selected testers with varying levels of knowledge in technology. The rest found the map the hardest to use. This corresponds with our observation, and we'll focus on developing these two functions further in future improvements. Several of the test persons mentioned the navigation was easiest to use, this is something we also figured out in the observation and the survey.

We also asked the test persons about any future improvements they would like to see, we will look at these answers further down in the paper under point 9 about future improvements.

## **8. Conclusion of the user tests**

We have now reached the final phase, the conclusion phase. Based on the user test we can highlight different core findings.

In our analysis of the user test, we noticed some differences between our observations and what the users expressed in the survey: we observed users struggling to complete a task, while in the survey, they wrote it was easy. This emphasizes that observations are crucial to tracking the user's behavior rather than basing the analysis strictly on the user's feedback. It's not possible to monitor users' honesty when providing feedback, and we acknowledge that users might misunderstand questions or may not always provide truthful feedback.

We also found many similarities between the observation, survey, and final interview, which support our findings. The test users scored highly on the navigation tasks and several of the test persons mentioned in the final interview that the navigation was easy, or simple. This indicates that the navigation part of our app is easy to understand and user-friendly. We observed that some users tried to navigate back to the home screen by clicking on the logo. Introducing features that are similar to those found in other solutions, such as navigating back

to the home screen by clicking on the logo, could be beneficial since it's likely that the user has encountered this feature before.

Some users found the scan function challenging and thought the scan process was a bit confusing. As we mentioned previously, the order of tasks may have influenced the outcome of the user test and user confidence level. Perhaps the success rate would be higher if we had reordered the task, saving the hardest one for later, this could potentially give a higher success rate as users become more familiar with the solution over time.

Furthermore, our prototype was designed as if it was an iPhone, but developed in Figma meaning that the user tests were performed using a computer. Their interaction can have differed from what it would have been on an actual mobile device since our prototype lacked normal functionality such as swiping and hoovering.

The users easily navigated to the “Nearest bin” page, but some users were confused during the next task where they were supposed to locate an available bin. The confusion was about how the full bin and available bin worked. The reason for this may have been due to our choice of colors, should have been clearer to differentiate between which bin is full and which bin is available. The map in our prototype was fictive and may have caused more confusion since it differs from what people are usually using, which we observed under the test itself where one of the users was surprised that the map was clickable.

## 9. Future improvements

As we progress into the conclusion phase, the next step is essentially to improve the existing prototype and conduct a new round of testing (Johnsen, 2024). In the context of the exam paper, we've been instructed by the lecturer to conduct only one round of user testing due to time constraints. However, in a professional setting, we would proceed to implement all proposed changes and conduct another round of user testing. This second round of testing would enable us to assess the impact of the implemented changes from the initial testing phase. Subsequently, we would analyze the results again before proceeding with the application launch.

Through our analysis of the user test, we found that the scanning function and map were the most challenging for users to use. Based on this, we should aim to improve these functions so that they meet our main goal for the prototype better, which is that it should be simple to use.

To make the scan function more user-friendly we would implement a “tutorial” for new users, to demonstrate how the scanning works, this was suggested by one of the users in the final interview. Going forward we want to implement the possibility to scan multiple bottles/cans before you are taken back to the home page. This improvement is because one user requested this feature in the final interview, and that the scan should happen automatically and not with a button each time. During the user test, we found that the moving lines around the QR code distracted and got one participant to lose focus but helped another. To solve this, we will explore more about universal design principles, so that it's accessible to people despite functional ability including the ability to focus (Nordbø, 2022, s.75).

Improvement of the map is necessary for both the functionality and user experience. We aim to address concerns about the map and the location of the nearest bins. Based on feedback, one user expressed the desire for a feature indicating the distance to the nearest bin and an icon representing their real-time location. Consequently, we plan to implement a functionality wherein users can click on an available bin to view its distance from their real-time location and an estimated time of arrival. Furthermore, users found it challenging to differentiate between available and full bins. To alleviate this issue, we propose implementing color-coded indicators. When a bin reaches full capacity, it will change to a bright red color, a universally recognized signal akin to a stop sign, indicating its unavailability (Babich, 2019). Conversely, available bins will be highlighted in bright green to ensure visibility and accessibility. Additionally, if a bin is currently unavailable, it will be displayed on the map but remain non-clickable, allowing users to still locate it for future reference.

By introducing design elements that are typically consistent across different solutions, our solution will become easier for new users to learn (Nordbø, 2022, p. 46). Our app's navigation was found to be relatively easy for all test users when switching between pages. However, during the testing phase, observers noted that two of the testers attempted to use the logo as a “home button”, but no action occurred. Upon inquiry, these users explained that they had encountered similar navigation patterns in other applications. This observation may reflect their IT knowledge or could be attributed to habitual behavior, or preferences, from other

applications. Going forward we will implement the logo as a home button, together with retaining the original home button on the navigation bar to ensure clarity and ease of navigation for users with limited IT knowledge. We need to acknowledge that people have different preferences, what works for one person might not work for another. By acknowledging this and taking the feedback from the final interviews into consideration, we can improve the solution to meet universal user needs.

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## 11. Appendices

### 11.1 Planning the user tests.

#### 11.1.1 Test plan

Following the twelve points for planning a user test which is stated in the book *Praktisk Brukertesting* written by Eli Toftøy-Andersen and Jon Gunnar Wold.

The purpose of the user test	Test functionality, usability, and how users experience the app
Which functionality should be tested?	Navigation and main function: Scanning a bottle/can
Which system should be tested?	Developed our app in Figma. All team members were familiar with this program. Easy to use as a group, updates in real-time.
Persons to be tested	Diversity in gender, and technology knowledge and interest
Where will the test take place	In our school, Høyskolen Kristiania. Booking a meeting room.
What equipment is needed to perform the tests?	Information letter and consent form. A computer for test users, and a computer for the observers to make notes.
What tasks should be in the user tests?	7 tasks, about navigation and main functionality in the app, such as scanning and navigating in the map.
What time schedule should you follow?	The schedule can be seen in 11.1.2 and consists of a schedule of when the different parts of the test should take place and how much time is estimated for each part.
What questions should be asked before and after the test?	Before: Demographic questions and technology level. After: Survey and final interview
Who is on the test team?	One test manager and one or two observers

#### 11.1.2 Schedule

Time:	What should be done:
5 min	Welcome the test user and introduce how the test will work. Signing consent form.
5 min	The test user fills in the first form (age etc.).

10 - 15 min	User test with tasks.
5 min	Test user fills in the survey (how was the prototype etc).
5 min	Perform final interview.

### 11.1.3 Questions before the test

Question:	Answer:
What is your age?	
Verifying names	
What is your gender?	
Are you currently working or studying?	
How do you assess your IT knowledge on a scale from 1 to 5? 1 meaning you have no IT knowledge and interest and 5 meaning that you have both high IT knowledge and interest.	

### 11.1.4 Tasks

Task	Degree of difficulty	Observations
Try to perform a scan in order to recycle a bottle	High	
Your phone has a broken camera, how do you register your bottle?	Medium	
You have gotten a new bank card, where do you update the information?	Low/medium	
Navigate to “Badges”	Low	
Navigate to “My Profile”, from “My Profile” navigate back to the Home Screen.	Medium	

Navigate to “Nearest Bin”	Low	
Locate nearest bin and find a an available bin	Medium	

### 11.1.5 Survey

Gathered inspiration from a system usability scale found on GitHub (Blattgerste, 2023).

1	2	3	4	5	Question:
					On a scale from 1 to 5, how easy did you find the scan function? 1 meaning that it was very difficult to perform a scan, and 5 meaning that it was very simple.
					On a scale from 1 to 5, how easy was it to find the navigation menu/ hamburger menu? 1 meaning that it was very difficult to find, and 5 meaning that it was very simple to find.
					It was easy to navigate in our app. 1 strongly disagree, 5 strongly agree.
					I felt confident using the app. 1 strongly disagree, 5 strongly agree.
					I would imagine that most people would learn this system very quickly. 1 strongly disagrees, 5 strongly agrees.
					I found the system unnecessarily complex. 1 strongly disagree, 5 strongly agree.
					I think that I would need the support of a technical person to be able to use this system. 1 strongly disagree, 5 strongly agree.
					I found the tooltip helpful. If not used, don't answer this question. 1 strongly disagrees, 5 strongly agrees.
					I think the navigation to find the nearest bin was hard to use. 1 strongly disagrees, 5 strongly agree.

### 11.1.6 Final interview

Gathered inspiration for the lecture “Conduct a user test and write the report” by Alexander Dreyer Johnsen (Johnsen, 2024).

What do you think of the app?	
What was hardest and easiest?	

Do you have any suggestions for improvements or other feedback?	
Is there anything else you would like to say?	

## 11.2 User tests

### 11.2.1 User 1

Question:	Answer:
What is your age?	26
Verifying names	Henrik
What is your gender?	Male
Are you currently working or studying?	Working
How do you assess your IT knowledge? 1 meaning you have no IT knowledge and interest and 5 meaning that you have both high IT knowledge and interest.	4, high interest

Task:	Degree of difficulty:	Observation:
Try to perform a scan in order to recycle a bottle	High	Doesn't understand that one has to press the QR-code on the screen. But it helped with the lines that go in and out. Trying to press where it says "scan" and not on the QR itself, expressing some frustration on the facial expression. On the next page, he sees the button clearly and presses "scan qr".
Your phone has a broken camera, how do you register your bottle?	Medium	Confidently presses the input field, doing so quickly. This task was performed fast and easily.

You have gotten a new bank card, where do you update the information?	Low/medium	Navigate to the menu, straight to my profile and find the bank card registered. Confidently.
Navigate to “Badges”	Low	Manage this one confidently as well.
Navigate to “My Profile”, from “My Profile” navigate back to the Home Screen.	Medium	This also went smoothly. Got good practice in navigation from the previous tasks that have been carried out. When navigating back to the home screen he tried to take the mouse from right to left over the screen.
Navigate to “Nearest Bin”	Low	Went well.
Locate nearest bin and find a an available bin	Medium	Presses “change location”, trying to change location since he is not located in Kvadraturen. Pressing the two red pins, when the test manager asks why he didn't click on the gray pin, he says he thought the gray pin was his location. He suggests that we should have this feature in our solution. When he pressed the pins, he expected them to indicate whether they were available or not, and direction to pop up or show the distance to the nearest one.

1	2	3	4	5	Question:
		x			On a scale from 1 to 5, how easy did you find the scan function? 1 meaning that it was very difficult to perform a scan, and 5 meaning that it was very simple.
			x		On a scale from 1 to 5, how easy was it to find the navigation menu/hamburger menu? 1 meaning that it was very difficult to find, and 5 meaning that it was very simple to find.
			x		It was easy to navigate in our app. 1 strongly disagree, 5 strongly agree.
		x			I felt confident using the app. 1 strongly disagree, 5 strongly agree.

			x	I would imagine that most people would learn this system very quickly. 1 strongly disagrees, 5 strongly agrees.
	x			I found the system unnecessarily complex. 1 strongly disagree, 5 strongly agree.
x				I think that I would need the support of a technical person to be able to use this system. 1 strongly disagree, 5 strongly agree.
				I found the tooltip helpful. If not used, don't answer this question. 1 strongly disagrees, 5 strongly agrees.
		x		I think the navigation to find the nearest bin was hard to use. 1 strongly disagrees, 5 strongly agree.

What do you think of the app?	I found it easy to use and learn, when you have done it once you have learned it and remember it for next time. User friendly and simple design.
What was hardest and easiest?	Hardest was to understand the map, that was the only thing I did not understand about our app. Easiest was to navigate around the app.
Do you have any suggestions for improvements or other feedback?	One should have the ability to scan multiple bottles at the same time, without it returning to the home screen after scanning the first bottle. On the navigation site, it would be beneficial to see how long it is to the nearest bin and to get a navigation. Wanted a pin/symbol to see his location.
Is there anything else you would like to say?	No

### 11.2.2 User 2

Question:	Answer:
What is your age?	27
Verifying names	Kaia
What is your gender?	Women
Are you currently working or studying?	Working

How do you assess your IT knowledge on a scale from 1 to 5? 1 meaning you have no IT knowledge and interest and 5 meaning that you have both high IT knowledge and interest.	3
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Task:	Degree of difficulty:	Observation:
Try to perform a scan in order to recycle a bottle	High	The test person pressed the QR code immediately, and pressed “Scan QR” for scanning the bottle.
Your phone has a broken camera, how do you register your bottle?	Medium	Immediately pressed on the input field for manually scanning a bottle.
You have gotten a new bank card, where do you update the information?	Low/medium	Used the menu to find “My Profile” and tried to press the field for “Billing info”
Navigate to “Badges”	Low	Navigated to badges using the menu
Navigate to “My Profile”, from “My Profile” navigate back to the Home Screen.	Medium	Navigated back to “My Profile” and then to “Home Page” without any problem
Navigate to “Nearest Bin”	Low	Easily navigated to “Nearest Bin”
Locate nearest bin and find an available bin	Medium	Looked at the screen for a minute before pressing one of the red pins and found an available bin

1	2	3	4	5	Question:
			x		On a scale from 1 to 5, how easy did you find the scan function? 1 meaning that it was very difficult to perform a scan, and 5 meaning that it was very simple.
			x		On a scale from 1 to 5, how easy was it to find the navigation menu/hamburger menu? 1 meaning that it was very difficult to find, and 5 meaning that it was very simple to find.
			x		It was easy to navigate in our app. 1 strongly disagrees, 5 strongly agree.
			x		I felt confident using the app. 1 strongly disagree, 5 strongly agree.
			x		I would imagine that most people would learn this system very quickly. 1 strongly disagrees, 5 strongly agrees.
x					I found the system unnecessarily complex. 1 strongly disagrees, 5 strongly agree.
x					I think that I would need the support of a technical person to be able to use this system. 1 strongly disagree, 5 strongly agree.
					I found the tooltip helpful. If not used, don't answer this question. 1 strongly disagrees, 5 strongly agrees.
x					I think the navigation to find the nearest bin was hard to use. 1 strongly disagrees, 5 strongly agree.

What do you think of the app?	I think the app was quite simple and straightforward.
What was hardest and easiest?	I didn't find anything about the app very difficult but I used the longest time on the first task. The task about navigating to different pages was very easy.
Do you have any suggestions for improvements or other feedback?	I think it would be helpful for some user to get some kind of tour, or guide, on how to perform a scan the first time they use the app. Or even the 2-3 first times.

Is there anything else you would like to say?	I liked that the design was simple.
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### 11.2.3 User 3

Question:	Answer:
What is your age?	26
Verifying names	Christine
What is your gender?	Women
Are you currently working or studying?	Working
How do you assess your IT knowledge on a scale from 1 to 5? 1 meaning you have no IT knowledge and interest and 5 meaning that you have both high IT knowledge and interest.	2

Task:	Degree of difficulty:	Observation:
Try to perform a scan in order to recycle a bottle	High	The test person pressed the QR code immediately, but pressed the QR code on the bin on the next screen instead of the button “Scan QR”
Your phone has a broken camera, how do you register your bottle?	Medium	Tried to find a new page for this using the menu, but eventually found the input field on the home screen.

You have gotten a new bank card, where do you update the information?	Low/medium	Used the menu to find “My Profile” and tried to press the field for “Billing info”
Navigate to “Badges”	Low	Easily navigated to badges using the menu
Navigate to “My Profile”, from “My Profile” navigate back to the Home Screen.	Medium	Navigated back to the Home screen before My Profile then back to the Home screen again
Navigate to “Nearest Bin”	Low	Easily navigated to “Nearest Bin”
Locate nearest bin and find a an available bin	Medium	Pressed one of the red pins and found an available bin right away

1	2	3	4	5	Question:
			x		On a scale from 1 to 5, how easy did you find the scan function? 1 meaning that it was very difficult to perform a scan, and 5 meaning that it was very simple.
			x		On a scale from 1 to 5, how easy was it to find the navigation menu/hamburger menu? 1 meaning that it was very difficult to find, and 5 meaning that it was very simple to find.
			x		It was easy to navigate in our app. 1 strongly disagree, 5 strongly agree.
			x		I felt confident using the app. 1 strongly disagree, 5 strongly agree.
			x		I would imagine that most people would learn this system very quickly. 1 strongly disagrees, 5 strongly agrees.

x				I found the system unnecessarily complex. 1 strongly disagree, 5 strongly agree.
x				I think that I would need the support of a technical person to be able to use this system. 1 strongly disagree, 5 strongly agree.
				I found the tooltip helpful. If not used, don't answer this question. 1 strongly disagrees, 5 strongly agrees.
x				I think the navigation to find the nearest bin was hard to use. 1 strongly disagrees, 5 strongly agree.

What do you think of the app?	The app was simple and looked nice.
What was hardest and easiest?	The first task was a bit difficult, i got a bit distracted by the qr code on the trash can and also the button for scanning the qr below. I thought the tasks about the nearest bin were very easy.
Do you have any suggestions for improvements or other feedback?	Maybe the scan could be easier? But I think it will be easier once people have done it a few times.
Is there anything else you would like to say?	I liked the app and would actually see myself using it.

#### 11.2.4 User 4

Question:	Answer:
What is your age?	25
Verifying names	Jonathan
What is your gender?	Male
Are you currently working or studying?	Yes
How do you assess your IT knowledge on a scale from 1 to 5? 1 meaning you have no IT knowledge and interest and 5 meaning that you have both high IT knowledge and interest.	5

Task:	Degree of difficulty	Observation:
Try to perform a scan in order to recycle a bottle	High	Presses the QR code to perform a scan, then presses “SCAN QR” followed by “SCAN BARCODE”. The test person seemed confident in this task.
Your phone has a broken camera, how do you register your bottle?	Medium	Presses the input field on the home screen and “SEARCH” to perform a manual scan.
You have gotten a new bank card, where do you update the information?	Low/medium	Navigates to my profile and presses billing information. Tries to navigate back to the home screen by pressing the logo. We asked why; he had encountered similar navigation patterns in other applications.
Navigate to “Badges”	Low	Navigates easily to “Badges” by using the menu.
Navigate to “My Profile”, from “My Profile” navigate back to the Home Screen.	Medium	Navigates easily to “My Profile” by using the menu, and uses the menu again to navigate back to “Home Screen”.
Navigate to “Nearest Bin”	Low	Navigates to “Nearest Bin” using the menu. And continues then to explore the page by pressing a red pin.
Locate nearest bin and find a an available bin	Medium	Completed this task in the previous task when he explored the page.

1	2	3	4	5	Question:
			x		On a scale from 1 to 5, how easy did you find the scan function? 1 meaning that it was very difficult to perform a scan, and 5 meaning that it was very simple.
			x		On a scale from 1 to 5, how easy was it to find the navigation menu/hamburger menu?

				1 meaning that it was very difficult to find, and 5 meaning that it was very simple to find.
			x	It was easy to navigate in our app. 1 strongly disagree, 5 strongly agree.
		x		I felt confident using the app. 1 strongly disagree, 5 strongly agree.
		x		I would imagine that most people would learn this system very quickly. 1 strongly disagrees, 5 strongly agrees.
	x			I found the system unnecessarily complex. 1 strongly disagree, 5 strongly agree.
x				I think that I would need the support of a technical person to be able to use this system. 1 strongly disagree, 5 strongly agree.
				I found the tooltip helpful. If not used, don't answer this question. 1 strongly disagrees, 5 strongly agrees.
	x			I think the navigation to find the nearest bin was hard to use. 1 strongly disagrees, 5 strongly agree.

What do you think of the app?	The app was neat and good. Everything made sense.
What was hardest and easiest?	Perhaps the most difficult thing was to understand how the "full bin" system worked, but it wasn't really that difficult. The easiest was the scan function. Very straightforward.
Do you have any suggestions for improvements or other feedback?	Don't really have anything to offer when it comes to feedback. If I have to take something, it would be to make it even more clear how a "bin" is full or not.
Is there anything else you would like to say?	Nothing more to add.

### 11.2.5 User 5

Question:	Answer:
What is your age?	27
Verifying names	Trine
What is your gender?	Women
Are you currently working or studying?	Both

How do you assess your IT knowledge on a scale from 1 to 5? 1 meaning you have no IT knowledge and interest and 5 meaning that you have both high IT knowledge and interest.	3
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Task:	Degree of difficulty	Observation
Try to perform a scan in order to recycle a bottle	High	Clicks directly on the qr-code. Then stops on the next step and thinks it does scan by itself. Skipped the next steps because of this.
Your phone has a broken camera, how do you register your bottle?	Medium	She clicked on input field but didn't click search to collect deposit.
You have gotten a new bank card, where do you update the information?	Low/medium	Took a while to navigate to "My Profile". But proceeded to use the navigation bar to navigate to profile, then down to Billing information.
Navigate to "Badges"	Low	Clicked the navbar, then proceeded to badges.
Navigate to "My Profile", from "My Profile" navigate back to the Home Screen.	Medium	Clicked on the navbar, and then proceeded to My Profile page. Then she tried to use the logo of the app to get back to the home screen. Got a little stressed when this didn't work. Clicked to the billing information, but then proceeded to click back to the homepage.
Navigate to "Nearest Bin"	Low	Navigated easily to the Nearest Bin
Locate nearest bin and find a an available bin	Medium	Clicked on the bar under the map, but with some help she understood that the map was clickable. Clicked on the nearest bin but

					didn't pay attention that red was full and black was available.
--	--	--	--	--	---

1	2	3	4	5	Question:
			x		On a scale from 1 to 5, how easy did you find the scan function? 1 meaning that it was very difficult to perform a scan, and 5 meaning that it was very simple.
			x		On a scale from 1 to 5, how easy was it to find the navigation menu/hamburger menu? 1 meaning that it was very difficult to find, and 5 meaning that it was very simple to find.
			x		It was easy to navigate in our app. 1 strongly disagree, 5 strongly agree.
			x		I felt confident using the app. 1 strongly disagree, 5 strongly agree.
			x		I would imagine that most people would learn this system very quickly. 1 strongly disagrees, 5 strongly agrees.
x					I found the system unnecessarily complex. 1 strongly disagree, 5 strongly agree.
x					I think that I would need the support of a technical person to be able to use this system. 1 strongly disagree, 5 strongly agree.
					I found the tooltip helpful. If not used, don't answer this question. 1 strongly disagrees, 5 strongly agrees.
x					I think the navigation to find the nearest bin was hard to use. 1 strongly disagrees, 5 strongly agree.

What do you think of the app?	The app was easy to use. Fun concept. It was light and nice, not too many features which provides good overview
What was hardest and easiest?	Easiest was the navigation. Easy and intuitive. The menu was simple and clear. Most difficult was knowing if the scanning was completed or not.

Group number 17

Do you have any suggestions for improvements or other feedback?	Missed being able to click on the logo to go to the homepage. The scanner should scan automatically, not via a button.
Is there anything else you would like to say?	Not really.

### 11.3 Consent form and information letter

#### 11.3.1 Consent forms



#### CONSENT FORM

Participants are to fill out the form on their own.

Please check the relevant box

YES                    NO

Have you read the information letter about the study?

Have you had the opportunity to ask questions and discuss the study?

Have you received satisfactory answers to your questions?

Who have you spoken with?

EMMA KRAG BRUN

Have you understood that your name will not be given or referred to in the study report?

**Do you understand that you are free to withdraw from the study?**

At any time

Without having to give any reason for withdrawing

Do you agree to participate in this study?

Signature of study participant Henrik A. Ottosen

Date 10.04.2024

Name in block letters HENRIK ANDREAS OTTOSEN



## CONSENT FORM

Participants are to fill out the form on their own.

Please check the relevant box

YES

NO

Have you read the information letter about the study?

Have you had the opportunity to ask questions and discuss the study?

Have you received satisfactory answers to your questions?

Who have you spoken with?

Maren

Have you understood that your name will not be given or referred to in the study report?

**Do you understand that you are free to withdraw from the study?**

At any time

Without having to give any reason for withdrawing

Do you agree to participate in this study?

Signature of study participant.....

*Kaia H. Tuitt*

Date 01.04.24.....

Name in block letters KAIA HELENE TUITT.....



## CONSENT FORM

Participants are to fill out the form on their own.

Please check the relevant box

YES                    NO

Have you read the information letter about the study?

Have you had the opportunity to ask questions and discuss the study?

Have you received satisfactory answers to your questions?

Who have you spoken with?

Maren .....

Have you understood that your name will not be given or referred to in the study report?

**Do you understand that you are free to withdraw from the study?**

At any time

Without having to give any reason for withdrawing

Do you agree to participate in this study?

Signature of study participant.....

Date 01.04.24.....

Name in block letters.....CHRISTINE ELSETH.....



### CONSENT FORM

Participants are to fill out the form on their own.

Please check the relevant box

YES                    NO

Have you read the information letter about the study?

Have you had the opportunity to ask questions and discuss the study?

Have you received satisfactory answers to your questions?

Who have you spoken with?

*Jøset*

Have you understood that your name will not be given or referred to in the study report?

**Do you understand that you are free to withdraw from the study?**

At any time

Without having to give any reason for withdrawing

Do you agree to participate in this study?

Signature of study participant.....  
*[Handwritten signature]*

Date..... *4.4.24*

Name in block letters..... *JONATHAN LAFJELL EB*



## CONSENT FORM

Participants are to fill out the form on their own.

Please check the relevant box

YES                    NO

Have you read the information letter about the study?

Have you had the opportunity to ask questions and discuss the study?

Have you received satisfactory answers to your questions?

Who have you spoken with?

.....

Have you understood that your name will not be given or referred to in the study report?

**Do you understand that you are free to withdraw from the study?**

At any time

Without having to give any reason for withdrawing

Do you agree to participate in this study?

Signature of study participant.....

Date.....44.2024.....

Name in block letters.....TRINE OLSEN TUYNES.....

### 11.3.2 Information letter

## Information letter

Hello,

We are a group that currently are taking the course “Innovation and Prototyping”. The course aims to expand our understanding of information systems and how they relate to businesses, individuals, strategies, and the development of new applications and platforms.

Our project is called “Pant – On the go” and our goal is to make an app that contributes to a more efficient recycling system. We need you as a participant to participate in a user test.

As a participant in the project, you will test the user interface and provide feedback. The test will be conducted in a controlled environment, and feedback will be given through a questionnaire and a final interview.

It is not mandatory to participate in this study, and if you choose to participate, you can withdraw at any time without consequences. All personal details will be kept anonymous. If you have any concerns or complaints regarding this project’s ethical elements, please contact [alexander.johnsen@kristiania.no](mailto:alexander.johnsen@kristiania.no) or Alexander Dreyer Johnsen by phone at +47 977 65 888.

If you have any questions regarding the test, please contact:

- Josef Phan: +47 452 45 389 or [joph003@student.kristiania.no](mailto:joph003@student.kristiania.no)
- Eirik Gulbrandsen: +47 406 27 776 or [eigu006@student.kristiania.no](mailto:eigu006@student.kristiania.no)

## 11.4 The prototype

Link to our prototype in Figma:

<https://www.figma.com/proto/6r58hTt1vKkGJAY7Ds1iqA/Pant?node-id=1-2&starting-point-node-id=1%3A2&mode=design&t=MklNZszC4Qjo55Ae-1>