Institutt for informatikk
Universitetet i Oslo

Group Report

IN1060 - Bruksorientert design

TeamUino

Siri Sollerud

Stela Ceaicovscaia

Zach Erjohn Kobe Gonsholt

Yan Jiang

Table of Contents

1.0 Starting point of the project

1.1 Topic, target audience, and motivation

Our group name is TeamUino, and it consists of four members; Zach Gonsholt, Siri Sollerud, Stella Ceaicovscaia, and Yan Jiang. Our group's main goal was initially to *help reduce food waste at Aker Brygge Coop Mega*. As the scope of our project seemed too broad, we eventually narrowed it down to *specifically at the fresh produce aisle* due to feedback from our first presentation stating that our topic was too broad. As time went on, we focused on solving this issue via *effectivating the "Too Good To Go" process*, because the users we interviewed all mentioned that they struggled with the process. To sum it up our topic is to *help reduce food waste at Aker Brygge Coop Mega fresh produce aisle, via effectivating the "Too Good To Go" process*.

Since our whole project centres around the fresh produce aisle at Aker Brygge Coop Mega, our target audience are the employees working there. One of our members actually works there, allowing easy access to the target audience, and posing as a mediator between us and them. This allowed us to aquire in-depth information about the whole "Too Good To Go" process, how the employees work on it, and how they feel about the current process.

Our main motivation for choosing this topic was because we wanted to work with welfare, and food waste was an issue we all wanted to fix. The specification on Aker Brygge Coop Mega was because of the ease of access due to it being one of our member's workplace, giving us inside access to participants and locale. Since that member works at the fresh produce aisle, it was natural for us to hone in on that specific part of the store due to practicality.

1.2 Group, members, and expertise

Our group name, TeamUino, has a pretty simple history. At the start, we struggled with figuring out what topic to work on. At that point, the only definitive thing we knew we were going to work on in the group was the Arduino, thus sparking the name TeamUino, a portmanteau of "team" and "Arduino".

Our group consists of different people with varying sets of skills that helped us through this project. Everyone in our group barely knew each other, as we all met each other in our first semester in our "Informatics: Design, Use, and Interaction" bachelor course. This is a profile showcasing each individual member's abilities, and how they were utilized in the various roles that they fulfilled:

Note: All members work on all aspects of the project, the roles displayed here are just the ones that they supervised the others on.

- Zach Gonsholt (Visual designer):

  Responsible for the visual aspects of the project (logo, presentations, prototype visuals)

  - Draws as a hobby (both traditional, and digital)
  - Experienced in picture and video editing

- Siri Sollerud (Organizer):

  Responsible for presentations/website, planning, and keeping the team's efficiency high

  - Used to run student clubs that organized regular meetings and events
  - Experienced with teaching and creating presentations

- Stella Ceaicovscaia (Field Expert):

  Responsible for obtaining interview subjects, and gathering data

  - Works at Aker Brygge Coop Mega
  - Experienced in video editing

- Yan Jiang (Lead programmer):

  Responsible for designing the technical aspects of the prototype

  - Experienced in 3D-modelling
  - Report writing & Technical writing

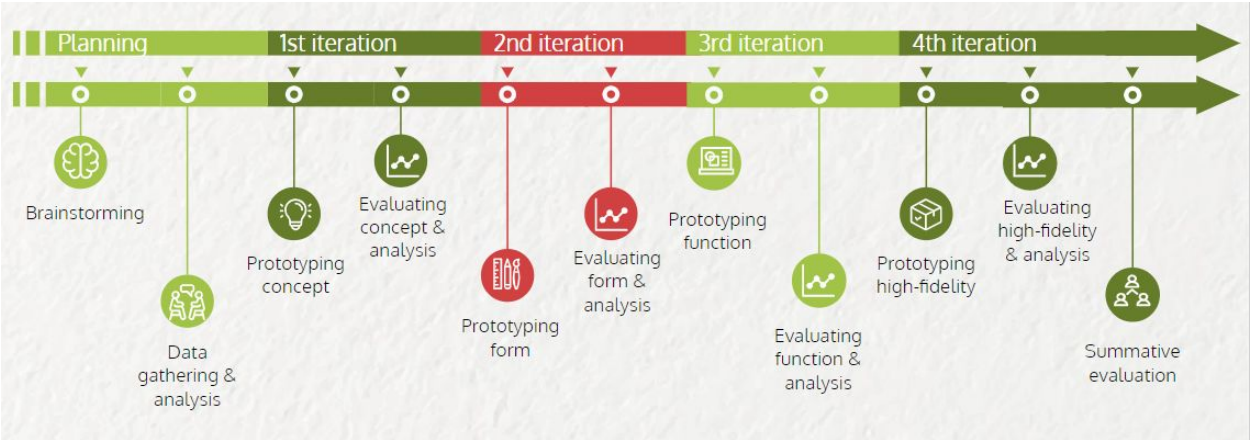
2.0 Plan for the Project

Throughout this project our plans have changed due to practical considerations, narrowing down our scope, introspection on not being too 'genius-design minded', the COVID-19 pandemic, and simple trial and error when it comes to working as a team. Our biggest takeaway from this project is that things rarely go exactly as planned and when you have closed the design space it quickly opens up again. As the author Henry Green once said "the more you leave out, the more you highlight what you leave in" (Green, n.d.).

2.1 Mapping out the project - milestones

The first few weeks of our project were spent brainstorming to figure out the central theme of our project. This was a difficult process that took almost a whole month to conclude, as we were overwhelmed by the initial design chaos. There were numerous ideas written down onto sticky notes and assembled into affinity diagrams, and it led to a lot of confusion and conflicts in interest between the members of the team. Eventually we had a dot voting on our finalists, and we landed on a target group 'elderly in *sick homes*' with the topic of improving their social interactions with far away loved ones. To get a fresh perspective on our idea we decided to ask our group teacher for some 'design critique' (Bratteig, 2020, Kap 7) on our target group and topic. Our group teacher pointed out that our target group is too vague and she stressed the importance of having access to our target group. This was a welcomed wake up call: we had not thought about the practical issues with sourcing participants or how this could affect the project further down the line.

This led to another round of brainstorming with a more practical focus in mind in mind: what target group do we have access to? Thus we all came into agreement and decided to shift the topic to food waste in grocery stores, and narrowed it down to the Aker Brygge Coop Mega. Order was established and we set up a milestone plan that we'd follow throughout the lifespan of this project.



2.2 Teamwork and project planning during COVID-19

Before the global pandemic affected life as a student at UiO we used to meet once or twice a week in person to work on the project together. We reserved a group room, set expectations for each meeting, had discussions, drew on the white boards, played with arduino parts in person, and had a good time together. The only online tools we used at that point was Facebook Messenger group chat and Google Drive.

When the university closed due to the pandemic we had to adapt by conducting all of our project meetings and communication online. At first this really threw a wrench into our productivity and several of our group members struggled with mental health. To combat these issues we created a Discord group that made it easier for us to communicate both through text and voice chat. We got back to our old routine of meeting one or twice every week and we chatted in the group throughout the week to keep each other updated on our progress or to just to support each other.

Our teamwork structure formed organically where we delegated tasks democratically. We worked together, but also a lot individually with tasks we split up. Looking back we think we could have benefitted from a more agile teamwork structure to help us work more together and possibly work more efficiently.

3.0 From data collection to analysis

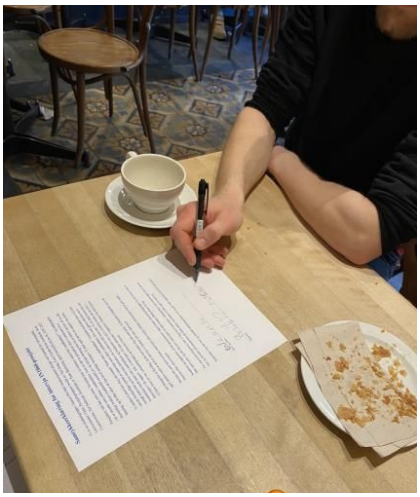
3.1 Interview guide and pilot interview

Our project required us to gain insights of the food waste situation in the grocery store, to understand the use context to be able to suggest viable design solutions. We were especially interested in the opinions of the employees as they experience this situation on a daily basis. As our research is exploratory and relies on unstructured and non-numerical data, we decided on utilizing **qualitative research** methods.

We had two meetings discussing how to carry on our data collection, where we considered focus groups, structured interviews, and even questionnaires and surveys. Each of the methods has their advantages, however, we chose to continue with semi-structured interviews as they allow for open-ended questions and are more adaptable and responsive. We had ideas of some questions we wanted to ask, but we wanted to encourage participants to take it in another direction if necessary.

We wrote our first interview guide and found it a little bit difficult to formulate good interview questions. We then decided to carry out a pilot interview to help us generate more probe questions for subjects, and learn new concepts in the field. We also consulted our group teachers about how we can ask better questions that can generate rich data. We learned to formulate good normative and evaluative questions as it helps to evaluate the good and bad side of the topic. We made some improvements, as we realised that we were speeding through the intro and outro of the interview, as well as changed the order of some questions. We also prepare questions beforehand to help guide the conversation and keep respondents on topic within our group.

In order to ensure the interviewees that their data will be anonymised and only accessible to us and our group leader, we carefully created a consent form and talked about where to store data. We asked our user to read the consent form thoroughly and explain to them the purpose of our projects, the procedure of the interview and their rights. Also, we read up on related topics and we conducted our interview in a relatively quiet cafe near the store the participants work. We think the familiar environment will help our participants to relax and talk more comfortably.



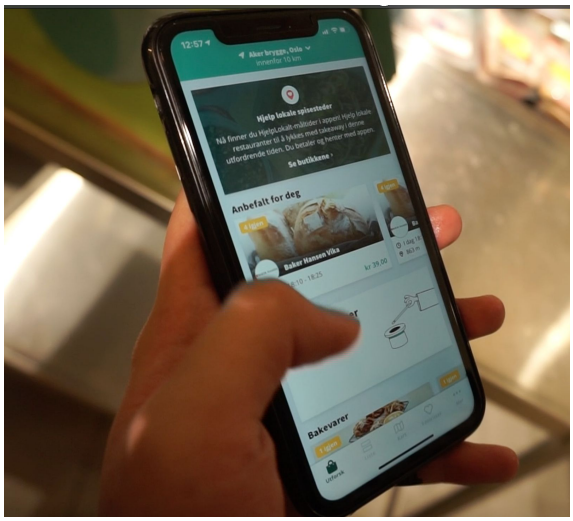
3.2 Semi-structured interview and observation

We had four semi-structured interviews before the Covid-19 shut-down situation. We recorded the interviews and later transcribed the interviews. And then we have to keep social distance and adopt interviews via Skype. We still asked all the questions on our interview guide and our participants answered most of them. Later when we reflected on the interviews we had on skype, we noticed that our 4 participants were relatively quiet during the interview via skype and participants seem to be more talkative when we had an interview face to face before Covid-19. Also one of our participants did not open the camera when we did the interview, it was a little hard as we can not see the facial expressions and reactions. We are mindful of the fact that how we conduct interviews and the environmental changes and the whole situation of Covid-19 definitely have an impact on our data.

We also chose to have **onsite observation**s that, in their turn, can determine the dynamics of a situation, which generally cannot be measured through other data collection techniques. We took onsite notes and later exchanged our notes for further analysis. We saw for ourselves that the employees are very busy and they have to do some clearing and preparation for closing. The customers are coming at different times within the 15 minutes time frame. Some customers also ordered more than one 'magic bag' from the store. Inside the bag, there are some fresh meat, vegetables, fruits, cooked food, dairy products and baked goods. Each bag has 4 or 5 different items and are packed by the store employee earlier. The store employees have to stop doing what they were doing and fetch the magic bags from the back room. The customers have to wait for some time.
Customers let the store employee swipe on their phones to close the 'too good to go' order.

During our final observation Stella also took pictures of the work station where the employees prepare the Too Good To Go bags. This gave us an insight into the Too Good To Go process and ideas for practical concerns when it later came to prototyping. Here are pictures of this workstation + the trolley used to store the bags and the Too Good To Go bags:

Our participant mentioned the app 'too good to go' during the interview, so later we tried the **body storming** technique, downloaded the app and tried to place an order on it and go and pick up the food (Body Storming in User Research, 2020). This helps us to "visit" the app users without taking their time, and it provides us deeper understanding of the scenario. We also studied the website of the 'too good to go'. In addition, we did a document study to have an insight into why and how food waste happens in grocery stores and what IT solutions are already in place to reduce such food waste.



After the data collection, we all felt that we have learned some new techniques about conducting interviews such as how to formulate **constructive questions**. Constructive questions helped us to open fresh aspects of our theme and served as a basis for sustained and constructive discussion. We also now feel more comfortable leading conversation during the interview.

3.3 Bias

First of all we were aware of the fact that since one of our group members works in a store and we were planning to interview people from the same fresh food aisle, it could lead to some relationship bias. However, to avoid the **Hawthorne-effect**, and not to influence users' behaviour, we kept our interviews formal and it turned out that the relationship between the user and the team members resulted in a more natural investigation situation for all parties (Torja & Halle, 2018).

Another possibility for bias was our genius design idea of a QR-code for expired products that we sometimes caught ourselves imposing to our interviewees at the end of the interview. Besides, the observation method is a subjective method for data gathering, as it requires the researcher, or observer, to add their judgment to the data. But in our circumstances, the risk of bias was minimal.

3.4 Analysis and choices

Figure 3-4

Our analysis started after late March/ early April. We gathered all our data together, including 1 pilot interview, 4 interviews with grocery store (Aker Brygge Coop Mega) employees, on-site observations. In order to find the user's needs, we have done several different procedures.

The first thing we did was to **transcribe our interviews**. We saved the transcribed interviews in our private folder. Each of the group members divided the interviews into different sections according to topics and read thoroughly and color coded the sentences they thought were important in the dialogue using different colors. There were many interesting views in the transcribed interviews. We had to select the ones that fit in our topic (food waste in grocery stores). The folder and files will later be deleted after finishing the project. We also created a tag cloud based on our data in the transcribed interview as shown in figure 3.4.

When we ask about what kind of measures the store has taken to reduce the food waste, the interviewees all mentioned a mobile App called ‘Too good to go’. This is an app that targets reducing food waste and they have cooperated with many shops, restaurants and cafes. We all browsed on the ‘Too good to go’ website and download the app to get familiar with the app. The customers order on their mobiles and pick up the so-called ‘magic bag’ in store. The ‘magic bag’ contains food or drinks that are about to expire but are still good to eat. By selling to ‘Too good to go’ customers, the companies can reduce food waste and make a little bit more profit. The customers can give good quality food with a much lower price and also contribute to reducing food waste.

Then we had one meeting regarding the analysis of data. The key points and potential problem area we analyzed from the interviews are:

- Employees spend a lot of time checking and selecting products that are about to expire.
- Employees were sometimes busy before the store closing time, and that is also the time the customers come and pick up too good to go ‘magic bag’, this leads to bad customer experience as customers have to wait for the employee to fetch the bag from the backroom and bring it to them. At the same time, when the employee has too many things at one hand, he or she also stresses out a little bit.
- wish ‘Too good to go’ can be known and used by more people

Then, we decided to use the technique or tools we learned from the lectures ---’**tell-make-enact**’ to move further with the analysis. We had a discussion, first we start with **telling** or discussing the problem so that everyone is on the same page and understands the problem. Then we **make** some collaboration and aim to concrete design ideas to learn about and explore possible solutions (Bratteteig,2020). At this stage, we came up with some **conceptual design ideas** on what the system should do and how to operate and verbally elaborated them. We then **enacted** and had some quick drawing (**‘mock-up’)** during our discussion(Bratteteig,2020).

After a quick evaluation, we decide to focus on the second problem which is to smooth or simplify the ‘magic bag’ pick up process and bring Arduino on to help them digitize this process, so the store employees do not need to physically go and bring the bags every time. We make such choices based on technical and practical considerations. The third point ‘make too good to go’ more well known is hard to realize using arduino. The first idea, creating a tool to select expired products is technically challenged

based on the tools and equipment we have (the arduino box) and also without access to school workstations and limited technical guidance due to the coronavirus condition. We use this '**see--move--see**' technique in our process from time to time(Bratteteig,2020). We each time discuss possible solutions and then make some choices and evaluate the new situation to make sure we are still on the right track.

After defining the needs of the user (simplify the bag picking-up process), we structured it in one **scenario** and created two **personas(see figure 3-5)**, one for an employee and one for the 'too good to go' customer, both are our primary users in this case.

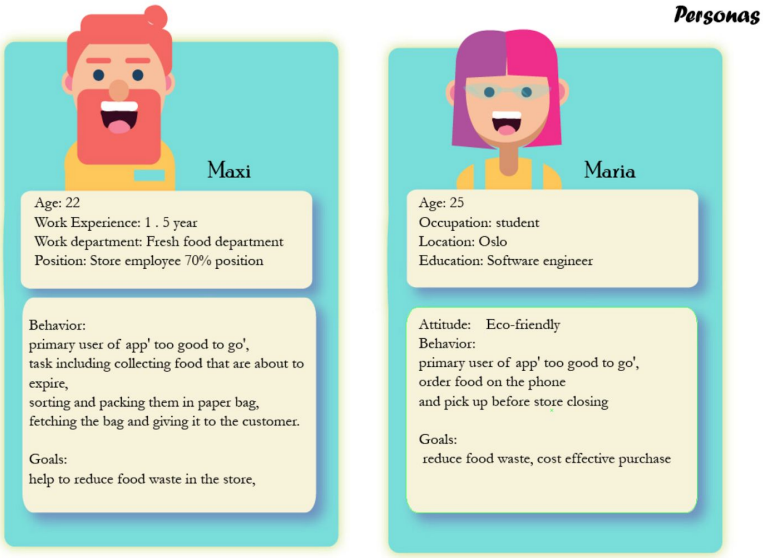


Figure 3-5

We also created some user stories because we hope this can help us clarity on what to build, for whom, why, and when in our project.

- As a store employee, I want a self-service machine so that I can do my job more effectively-
- As a customer, I want the magic bag placed in a place that I can reach so that I can get it and do not have to wait.
- As a customer, I want the magic bag stored in a safe place so that the bag I ordered wouldn't be touched or mistakenly taken by others.

By doing so, we have captured some characteristics and we can start our design work to realize these features in our product.

4.0 Design

4.1 Concept and goal image

The design concept is to create a product that can provide service to both grocery store employees and 'too good to go' app users (customers). We got inspiration from self service Parcel Boxes that are used in the post office.

'Pakkeboks (Parcel Box) is a new type of self-service parcel automat to be deployed in neighborhoods all over Norway. It can stand outdoors and easily communicate with your phone through an app, making it easy and flexible to retrieve your packages.'

Figure D-0 (picture and text extracts from posten.no)

We were inspired to create a self-service box system that can help to release the store employee from fetching the 'magic bag' and reduce customers' waiting time. This can help to reduce at least one task for store employees in their hectic working days and provide customers a better user experience as well. With decorations on the box, we can also advertise for the app so that more people join in this movement to fight food waste. Our vision is to design and build a self-service box that can be used in the grocery store environment and supports intuitive use. Our goal image (målbilde) is to make a functional self-service box product (relatively high-fidelity prototype) using Arduino and other components before June 1st. If it were not due to the corona virus situation, we would of course like to solder all circuits on the breadboard and take advantage of the 3D printing technology to print such a box.

4.2 From user needs to requirements

With these ideas in our minds, we then try to formulate **functional and non-functional requirements** (FR & NFR). We choose to do this because functional requirements can help us define our system and its components and give us ideas about the functions the system must perform. And non-functional

requirements define the quality attribute, constraints and restrictions of our product, and are essential to ensure the usability and effectiveness of the entire system (Joshi, 2019). They are as followed:

FR:

- Store employee should be able to open and put the magic bag in it
- The box should be able to stay locked if no one performs anything on it
- Customer should get instructions from the system/product
- Customer should be able to enter password
- When customer enter the correct password, the box should open
- If the customer enter the wrong password, the customer should get another chance

NFR:

- The system should greet the customer with “welcome to Too good to go self-service box”
- The system should show how many password the customer have entered on a screen

This process helps us to better identify the ‘role’ our prototype plays in the scenario and provide information for ‘implementation’ in the later stage.

4.3 Prototypes and choices

Based on our functional and nonfunctional requirements, we created a **sketch** and **storyboard**. See figure D-1 and D-2. This storyboard shows the process of the service and our **tangible user interface(TUIs)**, employees put the magic bag in the box, customers use code to open the box and bring home the food. We want this box to be used both by the employees and by the customers.

Figure D-1 storyboard

We made several design choices in our design process. In Figure D-2, the left and right boxes open differently, the left one can open from the top and the right one can open from the front. Both designs are easy and intuitive to use. We chose to move further with the left one, considering that in the right box, when the door opens, all the wires and arduino components will be exposed and could be difficult to cover up. We think we should use Arduino along the way as we explore our design options especially practically problems and limitations.

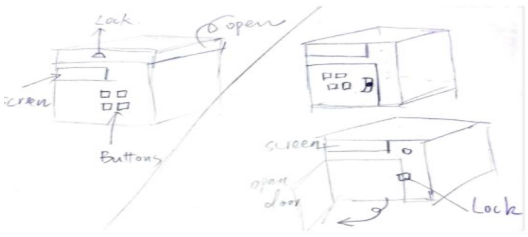


Figure D-2 sketch

Figure D-2 Sketches in Iteration 1

We also tried to bring **'reflection in action'** in our design process. 'Reflection in action' describes interaction with our 'live' problem as it unfolds (Bratteteig,2020). This leads us in the right direction, towards the vision or goal image we have. At the same time consider if it was right to do what we did, the way we did it, if it could have been done in one other way. Such reviews are essential to improve and avoid repeating mistakes or bad solutions. When we make the choices of the appearances of our box, We chose to use a light green color. It is a bright color and can be easily associated with vegetables. When we reflect on this choice, we also realize that we can also use brown color which is aligned with the iconic 'Too good to go' paper bag (see Figure D-3). However, we decide that the green color is more appealing and can help to

advertise the ‘too good to go’ app better in our setting. This is just one example of the choice we made regarding the ‘look and feel’ dimension in prototype.

After presenting our prototypes to our teachers and fellow students, we received feedback to think about where we want to place our lockbox, we had some discussion and we want to implement it on a trolley right in front of the fresh food department. We think it is intuitive in this way as it is where the service happened before and we want to make sure it is not blocking the way in the store (Bratteteig & Verne s. 5, 2018).

Figure D-3

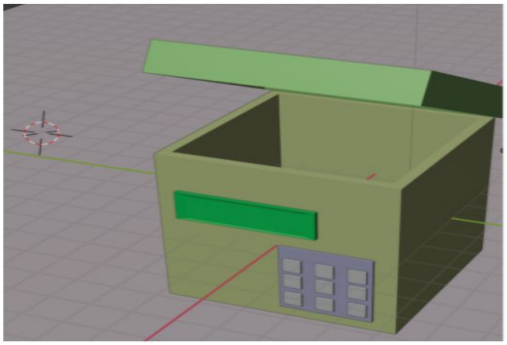


Figure D-3.1 a 3D modeling prototype in Iteration 2

4.4 Prototypes with Arduino

The prototype of arduino represents the development of functional prototypes that are thought to improve the way in which 'Too good to go' service is performed in the Coop Mega grocery store. Our early prototype ideas will also be expanded, annotated, and adjusted accordingly.

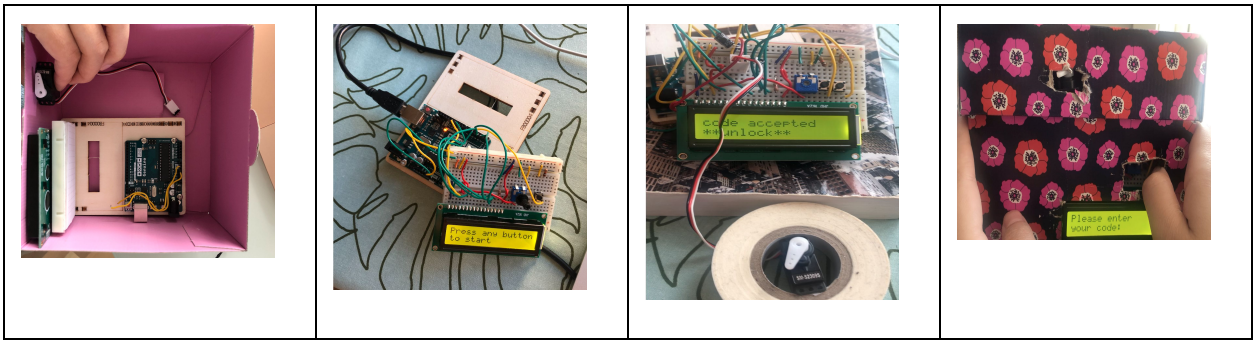


Figure D-4 Arduino prototype from Iterations 2 & 3

Based on our earlier phases of prototyping, the physical configuration is further developed. Our starting point of the arduino design process was the scenarios and what we have in the arduino starter kit, advancing iteratively through the design process phases. An LCD screen and switch buttons (later stage numpad) are the main components in our user interface, we also use the servo motor as a lock (rotate 90 degrees to lock or unlock). The employee/customer enters codes by pressing the buttons, and receives feedback on the screen. When the code is verified and then the motor rotates to lock/unlock.

4.5 Workflow and 4 Iterations

Design is an iterative process and we also have several interactions of prototypes in our journey. In each iteration, as shown in the Figure D-5, we concluded our workflow into 4 phases in a stacked area chart. It can show how we shift our focus and where we spend our time in the process. We usually begin each iteration by reading articles in syllabus provided by Tone, user evaluation feedbacks or other articles, then we have meetings online (using Discord) where everyone is brainstorming and trying to concrete and formulate our ideas. Then we all moved on to drawing or modeling the prototype, the final phase in each interaction is to realize our prototypes with Arduino and other materials.

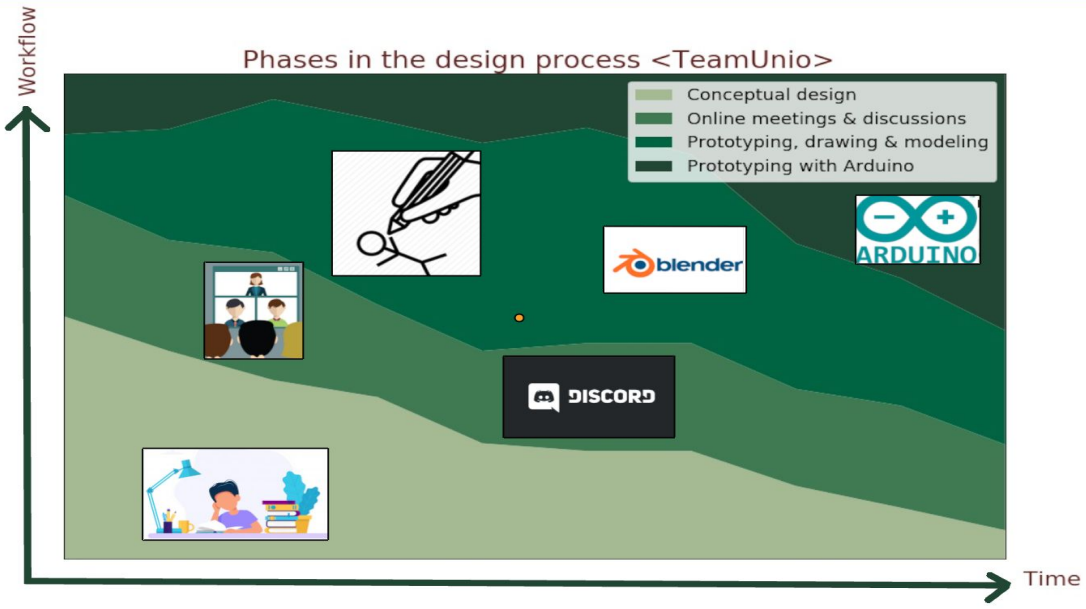


Figure D-5

In the first two iterations, we make our conceptual ideas into a prototype and make some functions possible with Arduino parts, as shown in D-4. Then we sent our prototypes to users to get some evaluations. Based on the user feedback, we improve the interface, using a numpad instead of buttons, trying to make compartments inside the box, trying to make a bigger size box so it can fit two or three 'magic bags'. In Figure D-6, it shows the working progress of our prototype in Iteration 3. And in Figure D-7, our team members try to decorate a bigger box and implement the arduino in the box.

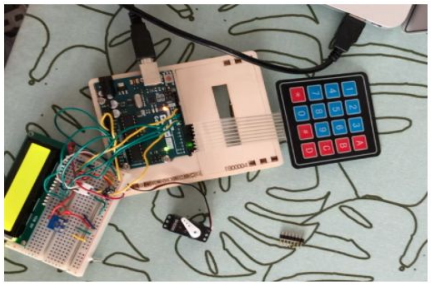


Figure D-6 Iteration 3

Figure D-7 Iteration 4

4.6 Final version

In our fourth iteration, we tried to make changes according to the feedback we received from our users and also try to integrate ‘look and feel’, ‘role’, and ‘implementation’ together.

We made the final prototype as shown in the Figure D-8. It is working and powered by a power bank. We made holes on cardboard to place the numpad and the LCD screen. The lock is inside the lid. We decorate the box with green wrapping paper, ‘too good to go’ logos. And the product is functional when the wires are connected and we placed it on the trolley in front of the fresh food department in the store.

Figure D-8

5.0 Technical solution (difficulty)

One of the difficulties that we encountered at the beginning is the connection issue. Wires constantly jump out and result in open circuits. We did online research and tried to glue it to the breadboard but that did not help much. We would like to solder the wires to the pins and breadboard but we did not have access to the tools due to the COVID-19 situation. We used tape and rubber bands to fix them in the end.

Another difficulty we faced after we ordered the numpad was that we needed more digital pins. Arduino Uno only has digital pins from 0 to 13 and most commonly we use from pin 2 to pin 13. The 4*4 numpad have 8 pins and LCD screen also have 6 pins to be connected, and one for the servo motor as well. We ran out of digital pins. We had to do research to find solutions. We brainstormed and thought that we may need to connect several arduino together or maybe we can use some of the analog pins.

We actively searched for answers online and figured out that digital pin 0 and 1 can also be used if we only use them as inputs and/or outputs but we will lose the ability of serial communication. And we can not use 'Serial printer' in our code if we use pin 0 and 1 as ordinary digital pins. We also used two analog pins as digital pins as analog pins can be used identically to the digital pins, using the aliases A0 (for analog input 0), A1, etc. For example, the code would look like this to set analog pin 0 to an output, and to set it HIGH.

6.0 Evaluation

6.1 Concept evaluation

After several interviews, brainstorming and data analyzing, we created several prototypes and gave the opportunity to our users to choose which of them they considered was the most needed. It was important for us to get feedback from the users at every step of our design process (Schön & Wiggins, 1992). We presented several paper low-fidelity prototypes (the cart for abandoned products, the barcode for expiring items and the self-service too good to go box) and performed an A/B testing. First of all, we explained the concept of the prototypes and since they were low-fidelity prototypes, we used the Wizard of Oz method. We interviewed our participants both individually and in a group. The participants mentioned both advantages and disadvantages of each prototype. As a result of the prototypes contest, the self-service too good to go box won as it showed to be more of current interest. However, the users mentioned that such a box would be expensive to implement in real life.

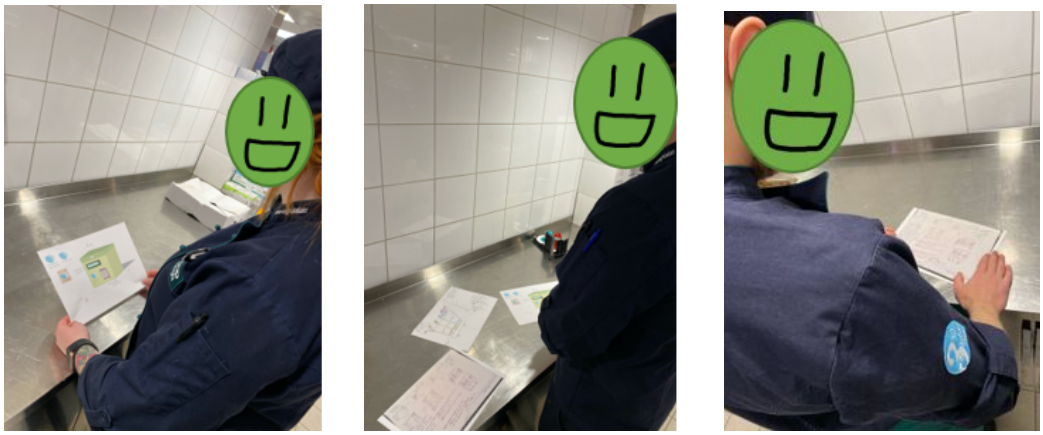


Figure D-9 First evaluation

6.2 Form evaluation

On our second evaluation, after presenting the low-fidelity prototype of the self service too good to go box made in cardboard, we wanted to hear feedback about the box considering its form and functionality. Regarding the form, we made the box rectangular with a bigger length and shorter width. After the first evaluation with the employees, this form proved not to be very

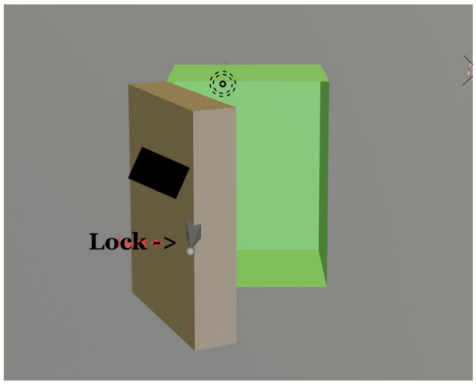


Figure D-10 First prototype of the Too Good To Go Box with the lid opening in front

comfortable since the bags have a longer width than length. The placement of the lock wasn't convenient, so we decided to make the lid open upwards.

The box we made seemed to be too small as it had space for only one Too Good to Go bag, and since we wanted to check its functionality on a higher level, we made a bigger box with a place for 2-3 bags for our next iteration. We interviewed the same users as for our first data gathering sessions, as they seemed to be included in the design process and showed a big interest in what the results will be.

Figure D-11 Second prototype of the box with the lid opening upwards

6.3 Function evaluation

For the next iteration, based on the evaluation findings we got from previous iterations, we changed the size of the box and made its width longer than the length. At this stage we put into practice the Arduino parts.

The goal of this iteration was to make sure that our design is steered in the right path by discovering usability issues and utterly fixing them in the next iterations. When we had an actual functioning prototype, we proceeded to interview our users about the interface of the box as well as test the implementation and the great total of the prototype.

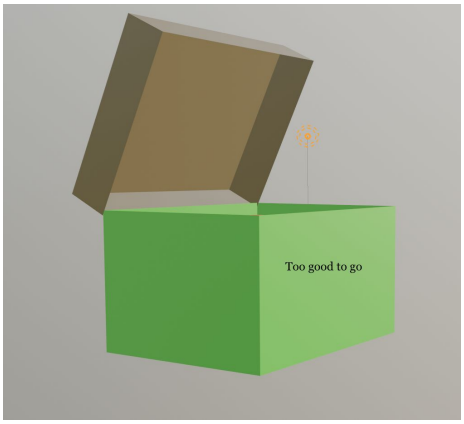


Figure D-12 Third prototype

Figure D-13 Implementing Arduino

As we needed a way to unlock the box, we were choosing between 2 alternatives; both of them are related to implementation of a new functionality to the Too Good to Go app :

1. When customers buy a Too Good to Go bag, they are sent an one time code that would unlock the box when entered.
2. The customers are sent a QR-code that they would scan on the box.

Together with our interviewee we came to the conclusion that a sent code would be more practical. Next moment was reflecting over where to place the Box in the store so that it is easy to find and doesn't block the way for both customers to shop and employees to work and have an overview of the shelves. On account of the fact that a conventional way to pick up the bags is to go to the fresh food isle where employees hand in the bags, we came to decision that the box should be placed in that part of the store with the intent that users don't have to look for the bag in the store but follow the habitual path. (Bratteteig & Verne s. 5, 2018)

6.4 High-fidelity evaluation

On our next phase of the development of the prototype we wanted to test out the design choices we made so far. Considering that we made a functioning prototype and our box looked more realistic, the employees had a big impact on our final version of the prototype. After conducting the assessment testing and gathering information about how users see the self-service Too Good to Go Box can be improved, we can emphasize several moments:

- make compartments for each bag that opens for one specific customer with a specific code so that people don't take more boxes than they paid for
- make the functionality in english because it's universal and there are many international customers that not always know Norwegian
- when the box gets unlocked after entering the code, the open compartment must have a LED that signifies which compartment is open for that specific customer.

Taking into consideration all the ideas above, we divided the box into 2 compartments with lids, as well as changed the greeting and the fail messages into English, and should have implemented new parts in our arduino codes that included the LED signals (green for the open compartment and red for the closed ones). At this point we focused on all the technical solutions of prototypes from previous iterations and were ready for the summative evaluation of our high-fidelity prototype.

6.5 Summative evaluation:

After the final fourth iteration, we conducted the summative evaluation that involved getting the big picture of the usability of the system and assessing the overall success of our product. At this point we wanted to see how our box prototype stands in comparison to the previous versions of the box.

We conducted the evaluation in natural settings to achieve the ecological validity, in the Coop Mega store with "expert" participants. We decided to ask some of the employees to check the prototype as the employees know the system domain. The users were asked to perform the thinking aloud method and answer a semi-structured interview to generate qualitative data and tell what they like and dislike about the product. Also, we wanted to see how affordable our prototype is, and what is the overall success rate of its functionality.

Figure D-14 Final Evaluation

Since it is not a full size Too Good to Go Box but only a mini size concept, it is anyway a good representation of how its implementation would work in a store. The users mentioned that they could compare the metrics obtained with the previous versions of the box and that our final high-fidelity prototype is improved according to all their needs and advice. However, during the summative evaluation we also experienced some learning points that we should have taken into consideration if we had to further develop our prototype. The quote from a semi-structured interview:

"In case if the customers interact with the Too Good To Go system for the first time, maybe it would be useful to show the feedback on the screen, after the code is entered, on how many bags are reserved for them, so that it will avoid confusion."

Overall, the feedback was positive over the self concept of the prototype. Ideally our prototype would incorporate green and red LED lights to show what compartments can be taken when a customer opens the box. We have decided to go with the trust-function on this prototype. But in the future it may be a need to install separate compartments in the box to keep people from taking more than their bag.

7.0 Conclusion

Now as we are at the end of this project it is strange looking back at where we started. Initially we set out to reduce food waste in grocery stores as we wanted to work on a project that was associated with the UN Sustainable Development Goal 12.3 that aims to "halve per capita global food waste at the retail and consumer levels" by 2030. From those idealistic beginnings we ended up redefining our goal to help the workers at the fresh produce aisle at Aker Brygge Coop Mega by automating the Too Good To Go service check out feature with a self-check out box. We learned the importance of letting go of a genius design mindset, realizing that although a group dynamic is going well does not mean it is perfect, and coming to terms with the things we wish we would have done differently.

7.1 Overcoming a genius design mentality

Initially, in our excitement on deciding on a target group and topic we started discussing potential IT solutions before we actually talked to the users. We came up with the idea to imbed the expiration date information into the bar-code of a product in order to reduce food waste by making the manual rotation of products based on expiration date easier for the workers. It could also have the additional benefit of applying an automatic discount on products that neared their expiration date to create an incentive for customers to buy the product rather than let it go to waste. We were so married to this idea that we got disgruntled when the users we interviewed talked about completely different things.

What helped us break out of our genius design mentality was conducting a thematic analysis of our interviews. From this analysis we discovered that with the topic of food waste in mind workers talked mainly about three subcategories: 'lost items that customers forget to put back in their rightful place, often resulting in spoiled products', 'mistakes in buying too much product', and 'the Too Good To Go service'. Although we are still proud of our barcode idea, we had to move our pride aside and remember that we are supposed to design *with* and *for* the user, not for ourselves. This led us to investigate how we could improve the Too Good to Go experience for workers while still being effective for the customers to use as well.

7.2 What group work has taught us

In the group oblig 2 concerning the teamwork throughout the project we all mentioned that we enjoyed working as a group and we think it had all worked out very well working together. Upon further reflection we have realized that although something is running without issues does not mean there isn't room for

improvement. For example, although we always got the job done on time we could have implemented methods that would have helped us be even more effective. And even though we all felt we communicated well and allocated tasks fairly, perhaps we worked too much individually rather than together.

What we have learned from all of this is that there is value in following a project structure like Scrum, which we really did not do. We honestly thought that if we get the job done, communicate and meet regularly, then what is the point? The point is that we lost some valuable experience working with agile methods such as Scrum that we are likely to meet in the future. In our last meeting we discussed how Scrum could have really helped us throughout this project and that we feel foolish for having not prioritized it. For example, we think we could have benefitted from implementing Scrum sprints that involved planning, daily or bi-daily scrums, sprint reviews, and sprint retrospectives. With this increased structure and transparency we think it would have been easier to keep track of what everyone is working on, which could have enabled us to refine our work and be more organized. A product backlog would give us even more structure and it would have helped us a clearer view on how the priorities of what needed to be done in the project evolved over time (Schwaber & Sutherland, 2018). Furthermore, we believe Scrum would have helped us work more together as we may have worked too much individually.

8.0 References

Aksen Torja & Nils Herman Halle (2018), “Hawthorneeffekten”. Retrieved May 29 from https://snl.no/Hawthorneeffekten.

Body Storming in User Research. Retrieved May 27, 2020, form https://think.design/user-design-research/bodystorming/

Bratteteig & Verne (2016), “Old Habits as a Resource for Design: On Learning and Un-learning Bodily Knowledge”. University of Oslo.

Bratteteig, T. (2020). Notat om bruk og undersøkelse av bruk. 9

Bratteteig, T. (2020). Notat om design. ss. 1-11.

Bratteteig, T. (2020). Notat om kvalitativ analyse. s. 6.

Bratteteig, T. (2020). KAPITTEL 7. DESIGNIDEER, SKISSER OG PROTOTYPER. In Utkast til manus (pp.3-4). Oslo. Retrieved May 20, 2020, from https://www.uio.no/studier/emner/matnat/ifi/IN1060/v20/7-ideer-prototyper-23mars.pdf

Green, H. (n.d.). A quote by Henry Green. Retrieved May 20, 2020, from https://www.goodreads.com/quotes/268401-the-more-you-leave-out-the-more-you-highlight-what

Joshi, S. G. (2019, August 27). IN1050 - Krav og behov. Lecture, Oslo. Retrieved June 4, 2020, from https://www.uio.no/studier/emner/matnat/ifi/IN1050/h19/forelesning_190903.pdf

Schön, Donald A. & Wiggins, Glenn (1992). *Kinds of Seeing in Designing.* Creativity and Innovation Management, Vol. 1, Issue 2, June 1992. Pp. 68-74.

Schwaber, K., & Sutherland, J. (2018). The Scrum Guide™. Retrieved June 1, 2020, from https://scrumguides.org/scrum-guide.html