Graduation Report

Modernising the Local Food Market:

Realising a Mobile Distribution Centre and Customer Pick-up Point for Food Retail

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Abstract

In the past few decades, supermarkets and online grocery alternatives have been chipping away at the revenue of small local stores. This trend has only accelerated during the corona pandemic of 2020. Right now, the online grocery sector is the fastest-growing e-commerce sector in the world.

At the same time, there is a trend in shorter food chains. The past few years have been particularly good for small alternatives of locally produced food. Companies like 'Boerschappen' and 'Support Your Locals' have been growing explosively in 2020. These companies try to sell products directly from the farmers to the customers.

Local Heroes (LH) is a start-up located in Amsterdam that intends to exploit this growing market of locally produced food to the advantage of local speciality stores. By providing small stores with an online platform to sell their products they want to make them more resistant to the growing online supermarkets. And by including initiatives of shorter food chains they try to keep the customers close to where the food comes from.

To achieve this goal, LH uses an app and a mobile distribution centre (DC). This DC is located on the outskirt of a local daily food market. Customer order food from various vendors located in the neighbourhood via the app. LH then collects all the products at the DC and distributes them to the customer. The DC also functions as a pick-up point for people in the neighbourhood.

LH wants to expand its business to other markets in Amsterdam, and possibly the Netherlands. For this to happen they need a DC which they can put anywhere to start operations. This graduation project describes the design process of this mobile DC. Firstly, the analysis of the current DC is described. From this research came several focus areas regarding product flow, customer contact and ergonomics.

By incorporating the wishes of the employees and by working at the DC myself improvements were made to the existing DC. Thanks to close relations with the production company (InnovaN) it was possible to build and test ideas in the real world. This ensured a well thought out design was possible for the final product.

The final product is the result of an evolutionary design approach. By learning about the pros and cons of certain ideas in real-world operations, designs were altered and improved. The final design improves product flow within the operations and increases efficiency by removing unnecessary steps in the process. The entire DC has also been decreased in size to increase the placement options for LH. These design choices ensure LH can continue to grow to other markets. Enabling them to help local speciality stores in their struggle against online competitors.

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Introduction

In the past few years, online grocery shopping in the Netherlands has been on the rise, putting pressure on the sales of physical stores (Meijsen, Online groei AH kannibaliseert op winkelomzet, 2021). A big factor for this growth is the current corona pandemic (Meijsen, Aandeel online knalt door naar 6,7 procent, 2020). The fast growth of the e-grocery sector is not only visible in the Netherlands. Worldwide, the sector has experienced a 41 per cent increase in sales in 2020 compared to 2019. This makes online grocery shopping the fastest growing e-commerce sector (Jansen, 2021). The fact that online shopping, combined with the corona pandemic, is putting extra pressure on physical grocery stores means more bad news for smaller local stores in cities. Already in 2015 did the Central Bureau of Statistics (CBS) identify that the shopping streets in the city were losing to the online stores (Dam, 2015). And this trend is only a continuation of the past couple of decades. Small speciality stores have been losing ground to the larger supermarkets for a long time already. between 1994 and 2004, the number of vegetable speciality stores has decreased by almost 50 per cent. The number of butchers shops decreased by 45 per cent in the same period (CBS, 2005).

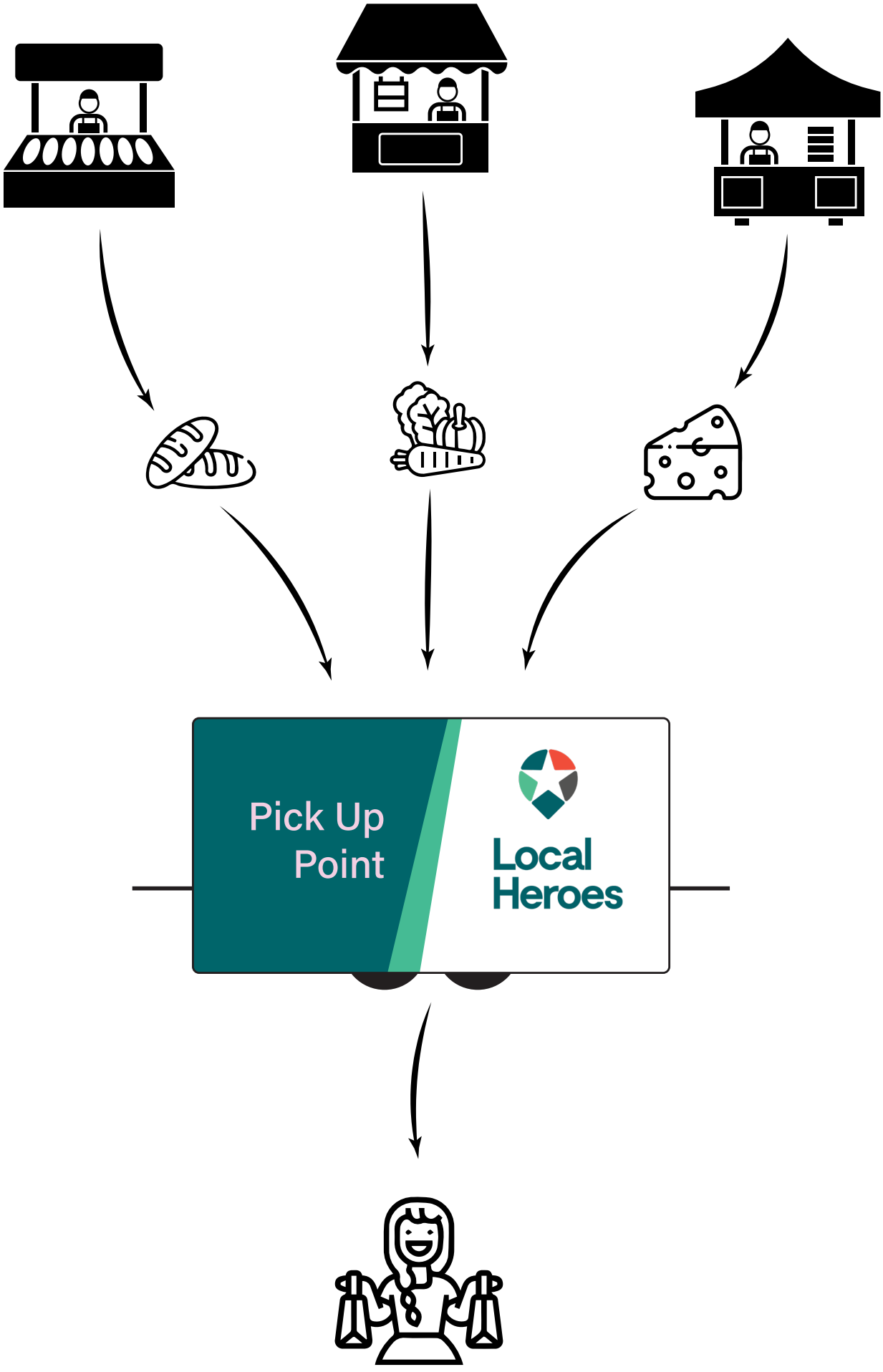
On the other hand, we see a trend in shorter food-chains. The past few years have been particularly good for small alternatives of locally produced food. Companies like 'Boerschappen' and 'Support Your Locals' have been growing explosively in 2020. These companies try to sell products directly from the farmers to the customers. and with success. In 2020 alone the revenue of Boerschappen increased by 335 per cent (Kamsma, 2021).

Local Heroes (LH) intends to exploit this growing market to the advantage of local stores. By providing small stores with an online platform to sell their products they want to make them more resistant to the growing online supermarkets. And by including initiatives of shorter food-chains like Landmarkt they try to keep the customers close to where the food comes from.

In the centre of this food distribution system stands a hub. This is best described as a small mobile distribution centre (DC). Here, located on one of the daily markets of Amsterdam, employees of LH receive products from local stores which have been ordered by customers in the accompanied App. Then the products are sorted by type and name of the order and distributed to customers. The DC also functions as a pick-up point for people in the neighbourhood.

Local Heroes intends to expand its business in the city of Amsterdam by working together with the city municipality and local shops. In order to succeed they need more and better mobile DCs. A second version has already been designed and build by InnovaN trailers in Ede. This new DC will be deployed for testing somewhere in February 2021.

The hub or DC is an interesting product. It must not only function as a pick-up point for customers but also function as a base from which deliverers of LH set out to deliver groceries to customers on a bike. All while being just 20m^2 in size. The DC also needs to be able to 'shrink' since it is based on a trailer which can be driven away with a van. This makes for a challenging logistical problem, products need to be sorted and stored. A loading bay is needed for delivery bikes, and a pick-up point should be integrated for customers. Considering these points, a new design for the DC is requested, with an extra wish of the company to make everything modular. In order for the design to be able to grow together with the company.


Pick Up
Point
Local
Heroes

Context

What is Local Heroes

Local Heroes (LH) is an e-commerce platform that enables local stores to sell their products on the internet. Customers can browse for products from stores in their neighbourhood. Local stores can see the orders customers place and bring the packed orders to Local Heroes. They have a mobile distribution centre (DC) where they collect all the orders of different vendors. Here they sort all the incoming orders after which the customers can come to pick up their groceries. Alternatively, LH delivers your groceries to your doorstep for a small delivery fee.

LH believes that local store owners live in a difficult time right now with online supermarkets popping up left right and centre. At the same time, there is a trend going on where there is a growing demand for locally produced food. (Kamsma, 2021) In general, local stores have been disappearing from the street. Losing the competition with larger supermarkets and online stores. (CBS, 2005) (Dam, 2015) With Covid, online supermarkets have seen their revenue skyrocket. (Meijsen, 2020)

Current product

Local Heroes started in 2020 with an adapted trailer (internally called the hub V1). By placing a standard IKEA cloth shelving system on some steel bars, they could easily sort incoming orders. This was not space-efficient, however. And this way of working is not easily scalable to multiple locations. That's why they asked an external party to build them a custom trailer. InnovaN designed and built the currently used trailer. The trailer is 5 meters long and 1.6 meters wide when closed. During operational hours they unfold the trailer into its 'open' state, at which the trailer is 8 meters long and 4.5 meters wide. A tv on the front and back of the trailer is used to convey advertisements and show the faces of several local vendors. Internally the trailer is referred to as 'the hub.'

TV with vendors

Working principle

The hub personnel work in two shifts. The morning shift (9:00-14:00) and the evening shift (15:00-19:00). Each shift is divided in two parts. During the first part (9:00-12:00) or (15:00-17:00) local vendors bring their products to the hub for sorting. Products are then immediately scanned using QR codes on the products. After the products are received and scanned, they are slotted in the hub. Because not all vendors drop off their products at the same time, the slots fill up slowly with the products for all the customers.

After all the products are received and slotted, the customers get a notification on their phone to let them know their order is ready for pickup. The pickup window is from 12:00-14:00 or 17:00-19:00. When customers arrive at the hub, they give their name or order number after which an employee will start to pick their order from the slots. Products are given directly to the customer, who has already paid for them in advance.

hub V1

hub V2 with the current bicycle used for delivery

Product journey

To better understand the operations of the company, a product journey was made. The image can also be read as a customer journey. It is important to note that during operations, three different apps are used. Customers use the regular app meant for buying products. Market vendors use a special 'vendor' app that shows them the orders that they have to deliver. They can also use this app to update their stock and make changes to product prices. The hub employees use a specialised logistics app that ties both previously mentioned apps together. The logistics app can see the individual orders of customers. And also show all the products a specific vendor has to deliver. The app also helps with the logistics of sorting and storing all items of an order; something which will be explained further in the following chapters.

Legend:

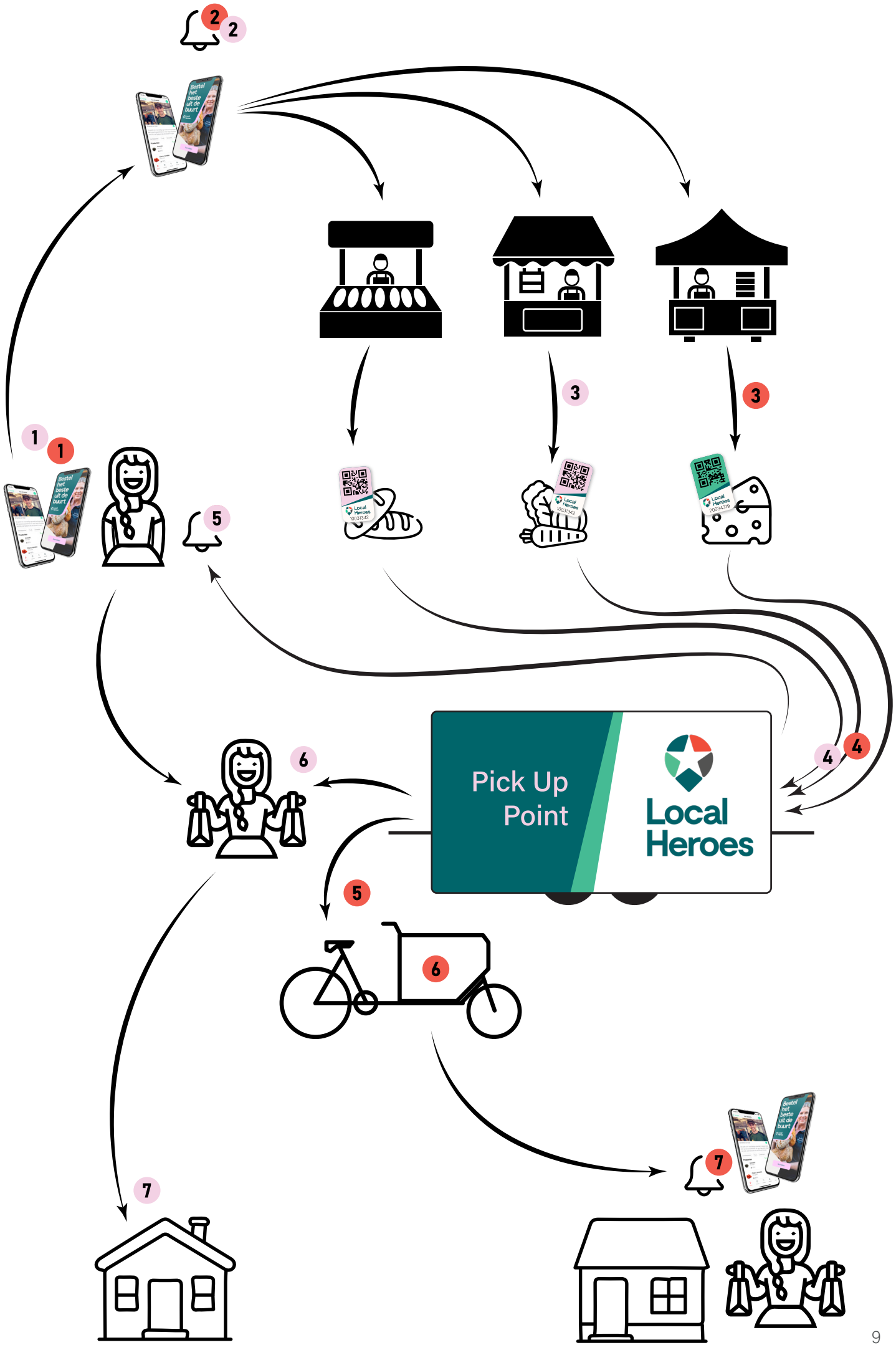
- Journey delivery orders
- Journey pickup orders

1. Customer makes order
2. Vendor receives order on app
3. Vendor picks items of order
4. Items are delivered and sorted at the hub
5. Items are transfered to bike

5. Customer receives notification of complete order
6. Delivery bike starts driving

6. Customer picks up order
7. Customer receives notification and order

7. Customer takes order home


Pick Up Point
Local Heroes

Stakeholders

To better understand how this project will need to be run, a stakeholder analysis has been performed. Appendix VIII shows the entire list of stakeholders. This chapter limits itself to the crucial ones. The initial stakeholders were determined using internal documents of Local Heroes.

Crucial Stakeholders

Local Heroes - Company

Who are they?

Maarten Coumans. Is the owner of the company. He makes final decisions and does acquisition management of potential investors.

What do they want?

Wants to make the company profitable by expanding the business to multiple locations city-wide. Potentially nation-wide. Wants to achieve this whilst staying true to the mission statement of the company: they want to support local entrepreneurs and strengthen the neighbourhood.

How will they get it?

By acquiring more funds he intends to deploy the concept of the company to more markets across Amsterdam. He wants the next hub to play a key role in this development.

Local Heroes - Staff

Who are they?

Employees who are working on the market. The hub is their workplace. These are mostly students. Both male and female employees are hired.

What do they want?

They want a space that facilitates their working needs. They need to easily find the orders they require, and they need the hub to accomodate their personal belongings.

How will they get it?

During company meetings, they vocalise their ideas and thoughts about the working methods in use. The two most experienced employees work together with the IT department to make the technical backside of the operations more fluent.

Customers of LH

Who are they?

People who live in the neighbourhood of the hub and do their groceries with the LH app.

What do they want?

They want a system with which they can shop for food whilst supporting local stores. They want it to be as easy as shopping at a grocery store (one-stop-shopping). And with Covid, they like to minimise the contact with people outside, so going to each individual store and stand in line is not desirable.

How will they get it?

There are plenty of alternatives to supermarkets these days. Picnic, Hello Fresh, AH online, Gorillaz, to name a few. The only platform which supports the small local stores, however, is Local Heroes. This is a reason for customers to keep using the app. But if an easier to use or better solution is available to them, customers will probably switch to the alternative. Keeping customers happy and listening to their feedback is important to keep customers loyal.

City municipality Amsterdam

Who are they?

This is the governing body of the city of Amsterdam. Consists of a mayor, several councillors, and other civil servants. They decide on new policies and they uphold the law. They decide what is allowed to be done within the city limits.

What do they want?

The municipality wants a lively city with little to no vacancy in the streets. They want to keep the city attractive to businesses whilst also keeping the residents happy. Currently, there is a trend of vacancy among speciality stores. The municipality is searching for ways to fill up these empty stores and, in the first place, to prevent the stores from leaving.

How will they get it?

The city government can decide on policies that make new and innovative solutions to their problems possible. They control what happens in markets and in shopping streets by means of market regulations. So if LH wants to expand their business to multiple markets across Amsterdam, they will have to work together with the municipality. The city government also has contacts that can help a company like LH to grow. They could be a powerful ally.

Shareholders and Investors

Who are they?

Local heroes is a startup, and dependant on external investors. These are people and companies who invested money into LH in return for a percentage of the company.

What do they want?

The end goal for investors is to make more money out of their investment. They saw potential in the business proposition of LH. They want to be assured that their money is invested in the right way, to maximise the possibility of a profit.

How will they get it?

Investors can have a large impact on the project. If they do not see the value of something, they won't put more funding into the company. Therefore, they require LH to meet milestones as a way to keep track of the development of the company. They can also bring contacts and networks to the table to help LH grow faster.

Suppliers Local Heroes

Who are they?

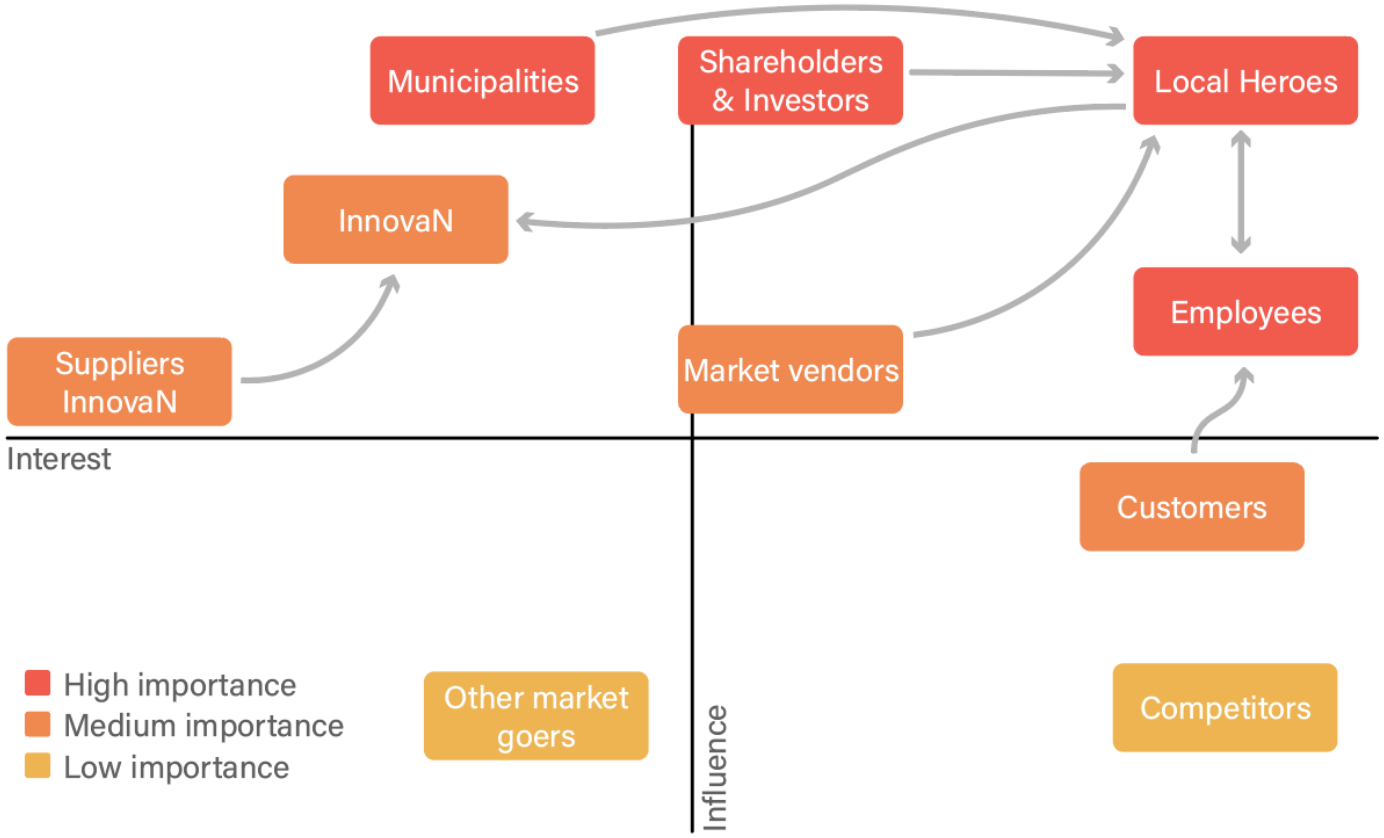
These are the local stores which LH helps to sell their items. They are the local butcher an deli stores.

What do they want?

The suppliers need a simple way to sell their products to more people. They often lack an online presence. They want the solution to be easy to use and it may not take too much time to work with, since they have a busy schedule.

How will they get it?

The suppliers can simply walk out of the project from LH if they don't like it. Since LH is a startup and needs all its vendors, they often try to make things work one way or another. This puts the suppliers in quite a powerful position at the moment. However, talks with the suppliers indicated that they don't mind what kind of storefront LH has.

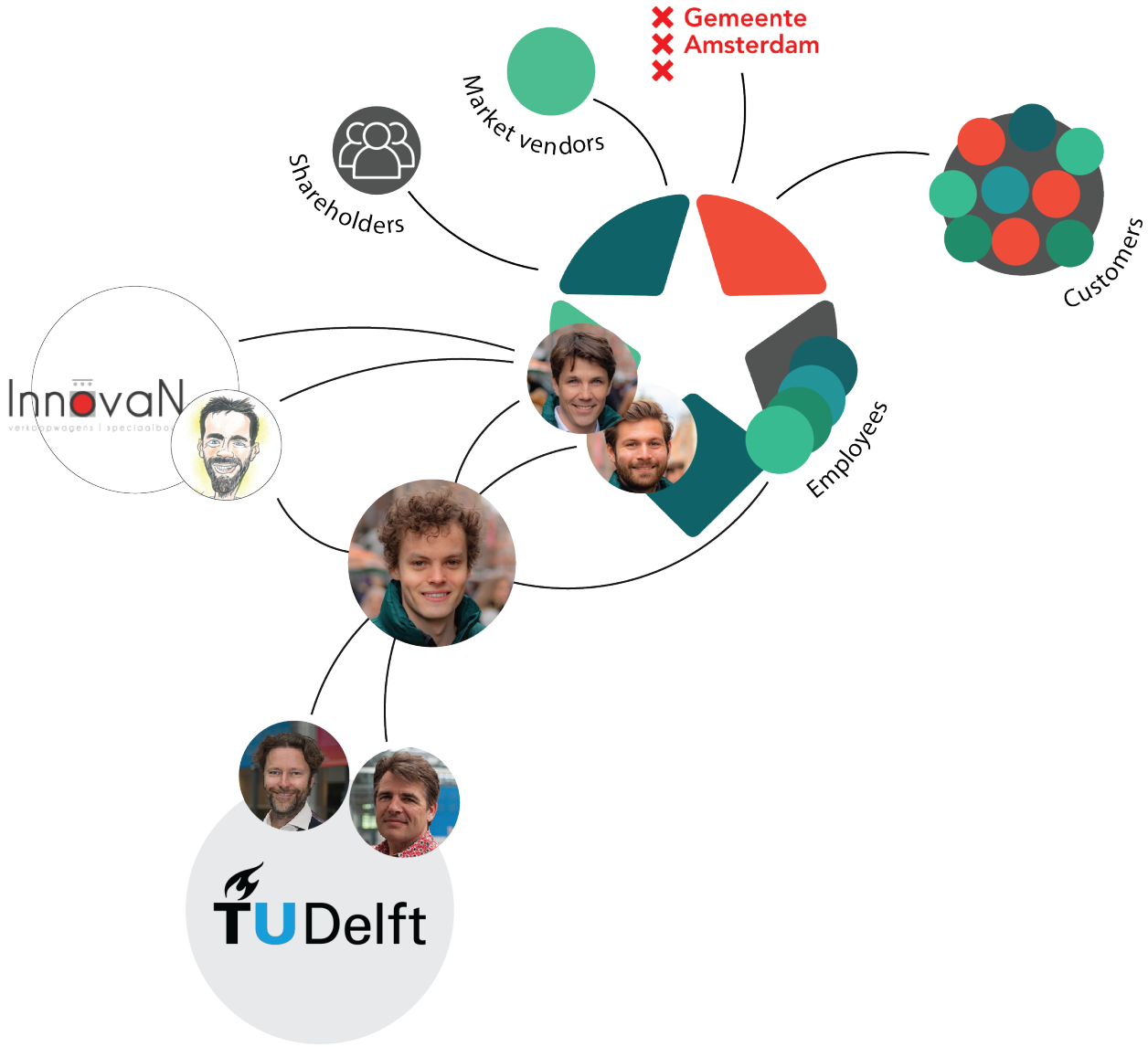


Stakeholder diagram

Above a diagram can be seen where the main stakeholders are plotted out according to their influence and the level of interest they have in the project. From left to right is the level of interest plotted. stakeholders which have a lot of emotional interest will be plotted on the right of the diagram. Bottom to top displays the amount of influence a certain stakeholder has. For instance, other market-goers do not have any significant influence on this project. Even though they might be potential future customers. Shareholders and municipalities however have a high level of influence. They can simply stop the entire project when they decide it is eighter too expensive, or too obstructive to place in a city for instance.

An important note to take from this diagram is that the most influential stakeholders are not the ones that will use the product. Keeping the municipalities and the shareholders happy, and notified is crucial for Local Heroes.

It is also noteworthy to mention that the owner of LH, needs an easy to deploy hub. One that he can plop down anywhere where there might be a market for LH. The employees, on the other hand, want more 'creature comforts. These are also the people who will use the product in the end. Even though Maarten will buy the product.



Direct stakeholders of this project

Direct stakeholders for this project

The stakeholders of this graduation project are similar to those of LH. There are, however, some differences. The manufacturer, InnovaN, for instance, is important for this project but is not a high priority for the operations of LH. Another stakeholder which has little to do with the company is the university, this project is still a graduation project after all.

For me as a designer the direct stakeholders are as follows:

- Maarten Coumans — Owner of Local Heroes and my client.
- Matthew van Gelder — Head of operations at Local Heroes and contact person for the employees.
- Employees — The people who work at the hub.
- Jakko Simonse — Planner and designer at InnovaN. My main contact at InnovaN and sparring partner for designs and ideas.
- Henk Crone — Coach of this graduation project. Sparring partner and someone who tells me I need to stop worrying and just start working.
- Erik Thomassen — Chair of this graduation project. Sparring partner and tells me that documentation is also a part of graduating.

First analysis

During the first phase of the design process, an analysis of the current hub was conducted. This was done by documenting personal experiences in the hub, and by talking to other operators of the product. The results of this initial analysis will be summarised in the following document.

To help with the documentation of errors of the hub, an excel sheet was used in which every little flaw could be reported. The table updated as of February second is shown in the following table:

As can be seen in table 1, most issues are damage related. Other issues are small and easily fixed by slightly altering the design.

It became clear this way of analysing the product would not give the most interesting points to focus on during the design process. It was therefore chosen to interview the operators of the hub directly.

By using a semi-structured interview method, more in-depth design points were discussed. Operators were also able to communicate specific wishes better this way. The questions used during this interview can be found in Appendix I. Afterwards, a questionnaire was conducted with multiple hub operators. The results of this study can be found in Appendix III.

#	What	Type	Date	Who
1	Support member of sails do not fit	Fitting issue	11-02	Matthew
2	Foot support broke off left	Damage	11-02	Matthew
3	Fridge door installed on the wrong side	Point of improvement	11-02	Matthew
4	Flap too heavy	Point of improvement	15-02	Gary
5	Screws of the table broke	Damage	15-02	Gary
6	Foot support broke off right	Damage	15-02	Gary
7	Leak	Damage	15-02	Gary
8	Metal fatigue	Damage	15-02	Lars
9	Scratches on body panels	Damage	18-02	Gary
10	Metal fatigue	Damage	18-02	Gary
11	Support table	Fitting issue	18-02	Gary
12	Water damage	Damage	22-02	Gary
13	Fitting sails	Damage	22-02	Gary
14	Flap does not latch	Damage	22-02	Gary

Table 1: hub V2 errors

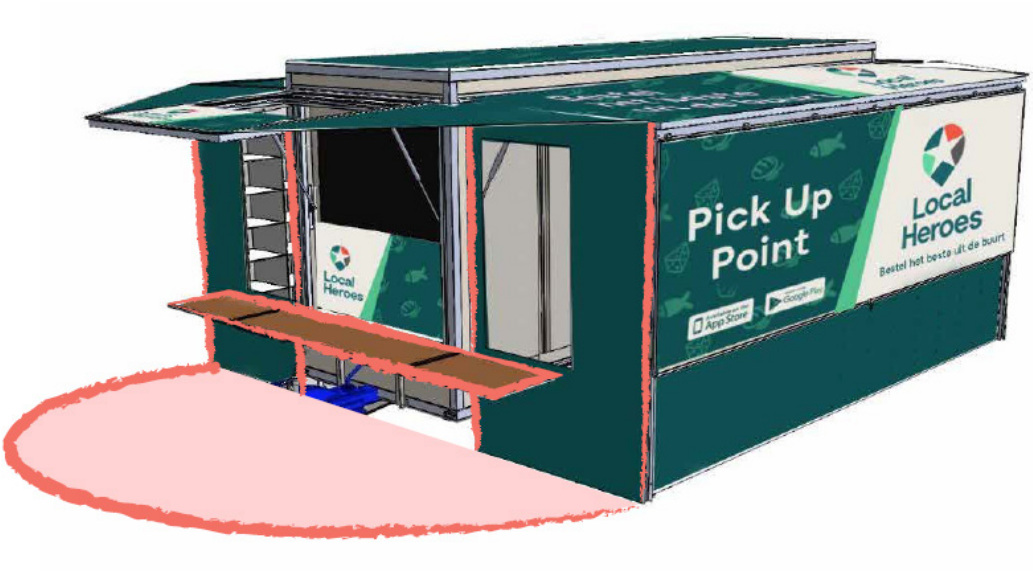
Some store owners were also interviewed, to find out if they thought the current infrastructure for taking in the products from the suppliers was adequate. It was found that the suppliers found the current product nice and professional in appearance, they did not have any points of improvement for the way LH currently takes in their produce. However, the owner of 'Het Warme Notengilde' stated that LH should take humidity seriously in the design of a new cart. The humidity of the car might not be an issue however, since the products will only be in the hub for a few hours.

Lastly, Customers were interviewed during their visit to the hub. The questions and their answers can be found in Appendix II.

A summarised version of the findings of this research is shown on Appendix V. In short, there were three areas to focus on in the next phase, these are shown on the right.

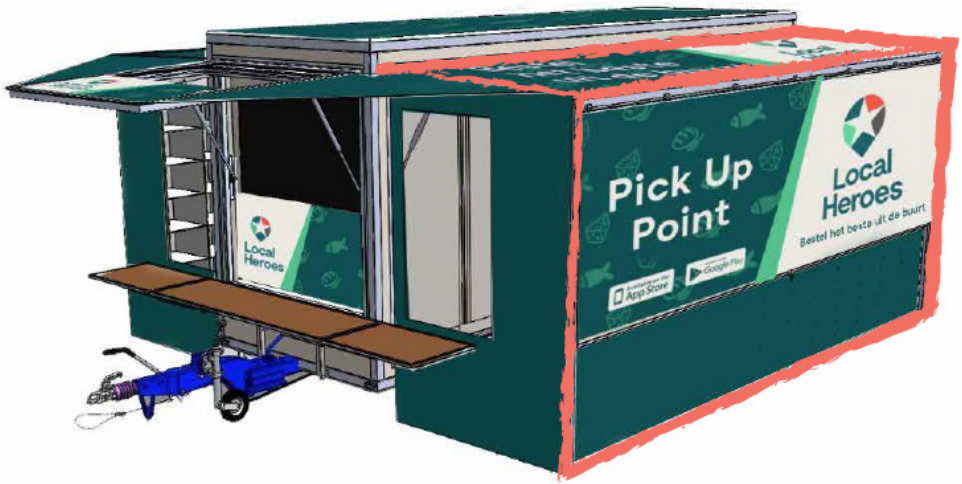
Receiving and shipping

The table; is used for receiving aswell as shipping.



Interior logistics

Side panels; Heavy and difficult to operate. The cloth slots are difficult to install and stow away, since the operators have to work without seeing what they are doing.



Modularity

Direct wish of the client. Wants the hub V3 to be 'scalable'

v2 testing and development

The V2 hub was delivered at the start of February before InnovaN could complete it. This meant that only half of the interior was installed. An agreement was made with Innovan to install the other half of the interior in May. This created the opportunity to evaluate the interior and develop a new design for the V3 that could be test fitted in the V2. The following pages describe the focus areas discussed in the previous chapter. The developments made in the V2 will function as research for the V3, which will be further discussed in the next chapter.

Hub with table in front

Receiving and Shipping

Current table

In the current product, a foldable table (as can be seen on the previous page) is used as both a receiving and shipping area. In the first half of a shift, vendors come by and drop their products off on the table. The hub operators then sort the products based on whether the products are meant for pickup or delivery. From that point, the products are stored in the hub. The table functions as a shop counter during the second half of a shift. Products are scanned by the hub operator and put on the table for customers to pack into their bags.

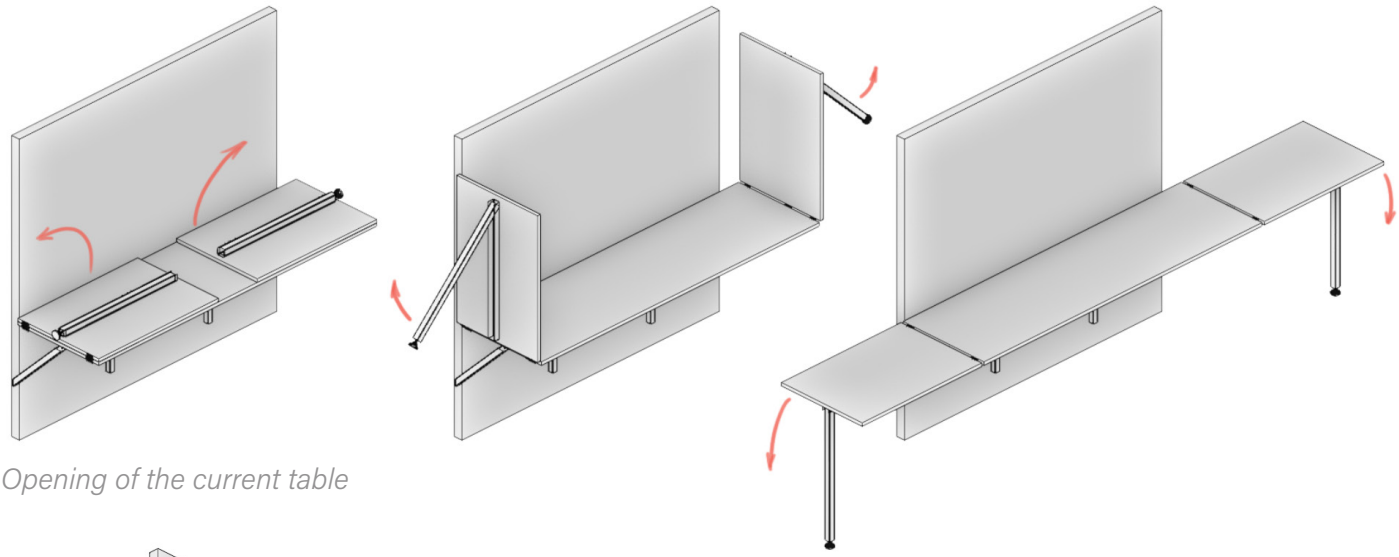
Vendor bringing products for sorting to the table

Products being presented for a customer to take home

Working principle

The table is approximately 320 cm long and 50 cm deep. It is supported by a metal frame, which is installed on the side of the hub, and two legs on the end of the table. The working area is 70 cm high.

After the table is installed, it is operated by folding out the sides of the table. The table is installed on the side of the hub by inserting steel L frames into slots on the end of the hub. The table lies on top of these L frames and is supported on the corners by two diagonal steel tubes. The entire table is then secured using four bolts that screw into the bottom of the wooden tabletop.



Opening of the current table

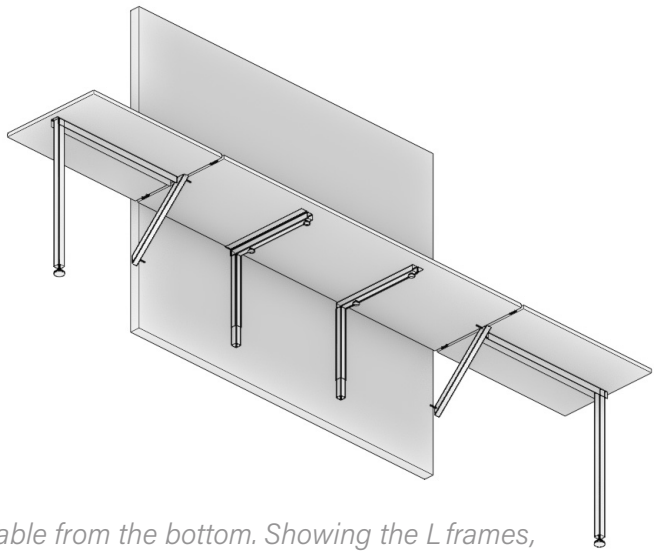
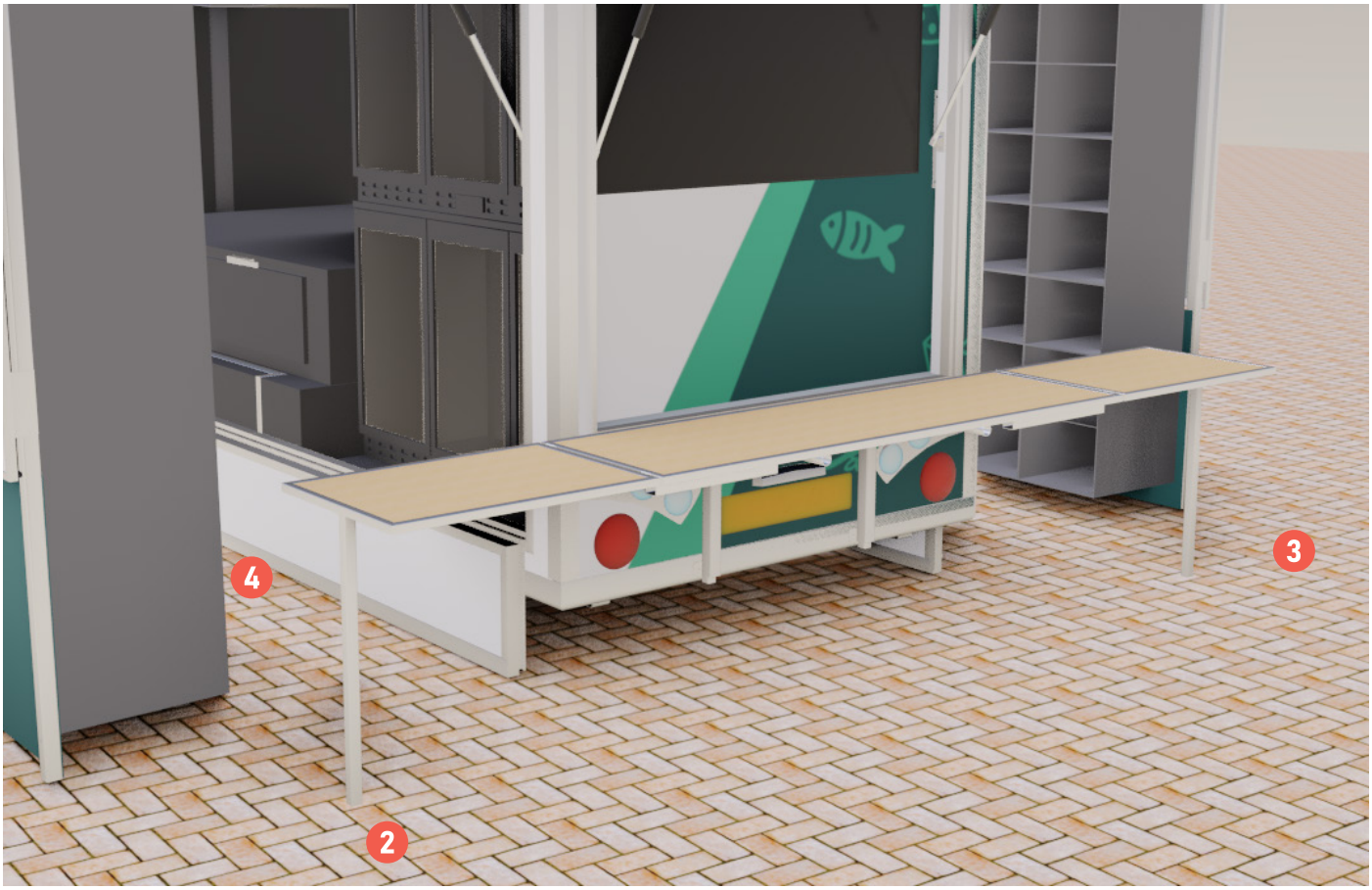


Table from the bottom. Showing the L frames, diagonal supports, and securing bolts.



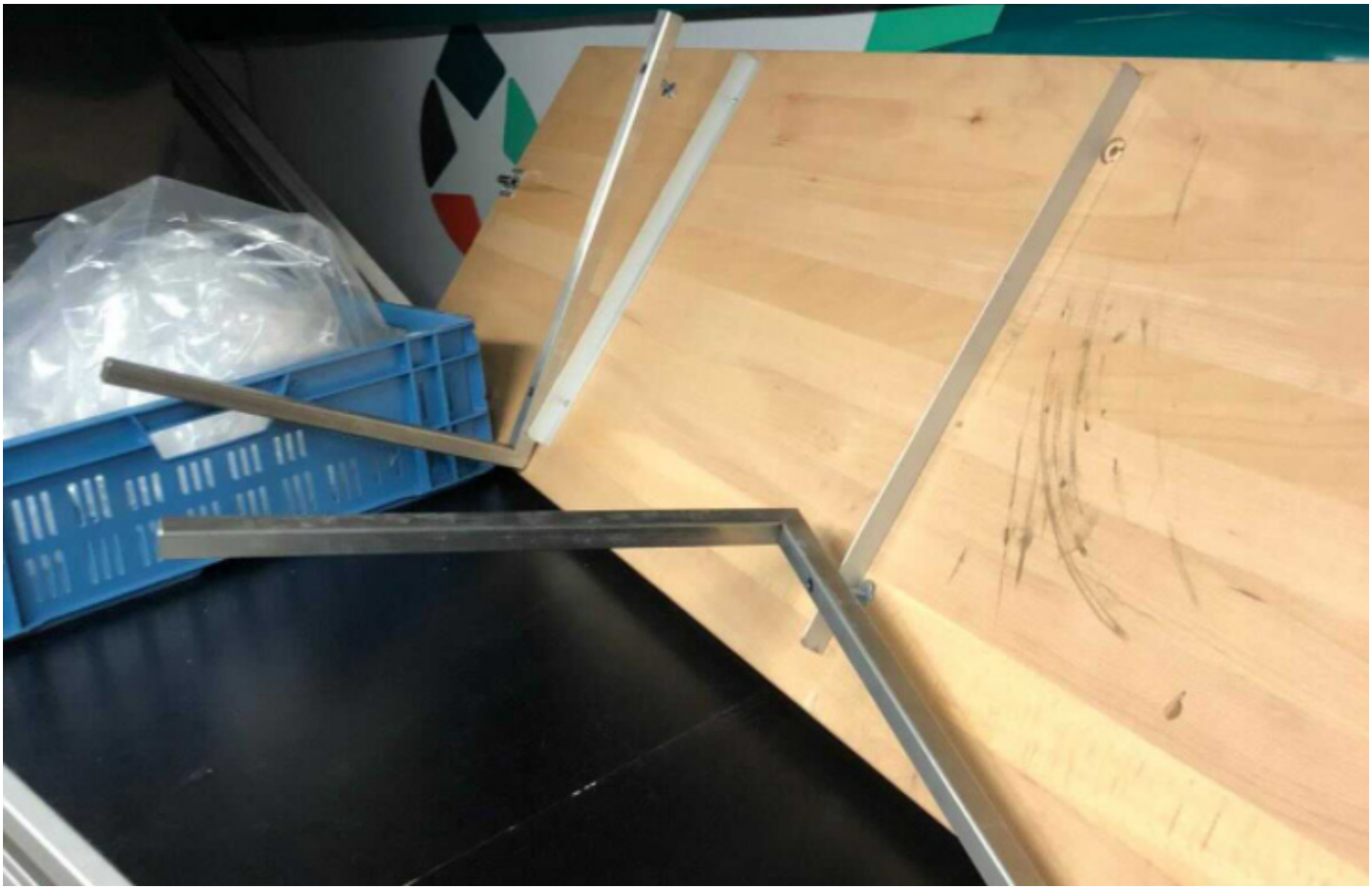
Current table with problem areas

Problems

During the first few weeks of operation with the table, multiple problems arose. These can be found in the following list. More information can be found in Appendix V.

1. The table was deemed too heavy; two people are needed to install and take apart the table.
2. The legs on the end of the table are annoying; when kicked they flip over and the table falls partly to the ground, causing products to roll over the street.
3. The working surface of the table is too low; 70cm is nice to sit behind, but for a surface behind which you stand 90cm is better.
4. The table is too close to the slots; It is difficult to walk in and out of the hub.
5. The table broke down after only a few weeks of operation.

InnovaN did not anticipate correctly how the hub employees would use the table. They intended for the table to be completely disassembled and assembled each day. They also instructed LH employees to use the table as such. However, after a few days, employees started cutting corners during the installation process of the table. not completely disassembling the table each time to save a few minutes every time the table was put on the hub. This resulted in ripped out screw-inserts that meant the table could no longer be secured to the steel supporting frame.



Broken table, screw inserts are torn out of the wood

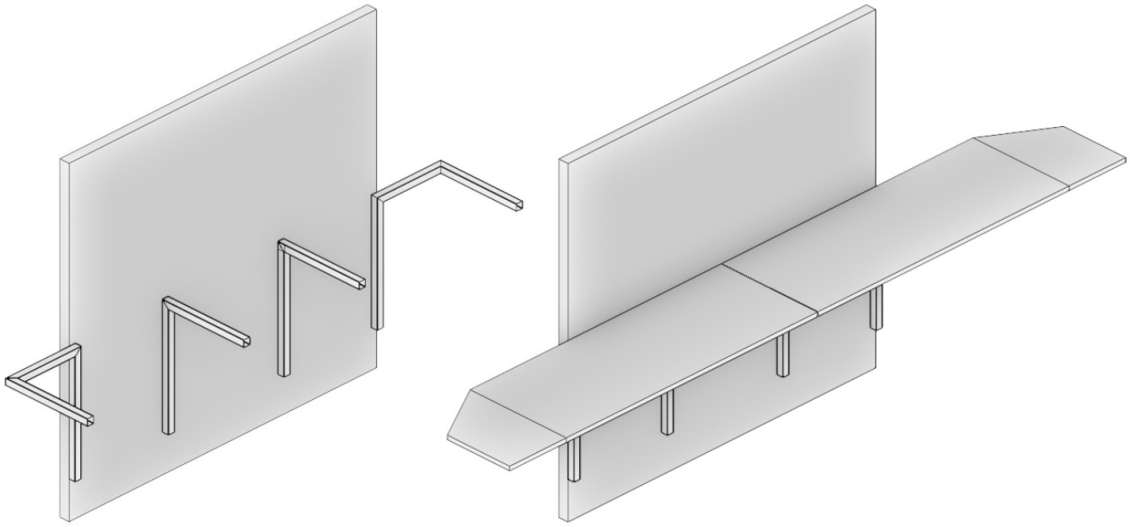
Criteria

To mitigate the previously mentioned problems, a list of requirements was made specifically for the table. This list is shown below (these can also be found in Appendix IV).

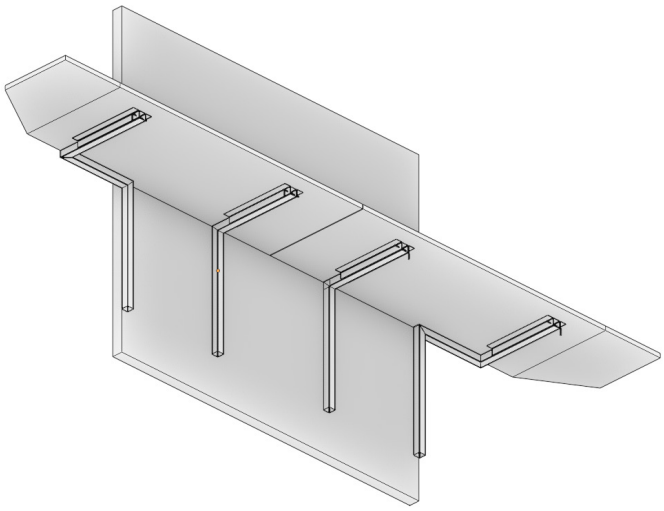
1. One person should be able to install the table.
2. The main measurements of the table should stay the same; 320 x 50 cm.
3. The table should use the existing attachment points on the hub during installation.
4. The table should be entirely supported on the hub. No parts should touch the ground.
5. The working surface of the table should be 90cm high measured from the ground.
6. The entrance to the hub, when the table is installed, should be as wide as possible without decreasing the width or depth of the table.
7. The installation of the table should be such that it is not possible to detach the table without disassembling it first.
8. The table should be made with the material of the old model.

New table design

After a first design session together with employees (Appendix VI), a new design was made for the table in collaboration with InnovaN. The new design uses four steel support members which are attached to the side of the hub. There are no legs to the street. The tabletop is 90cm from the ground. Pins on the underside of the table attach the tabletop to the support struts. But because they only attach to the front, the employees cannot detach the tabletop without first removing the pins. The corners of the tabletop are cut off to enable easier access to the hub for employees. Lastly, the tabletop is cut in half to make the object easier to carry for one person.



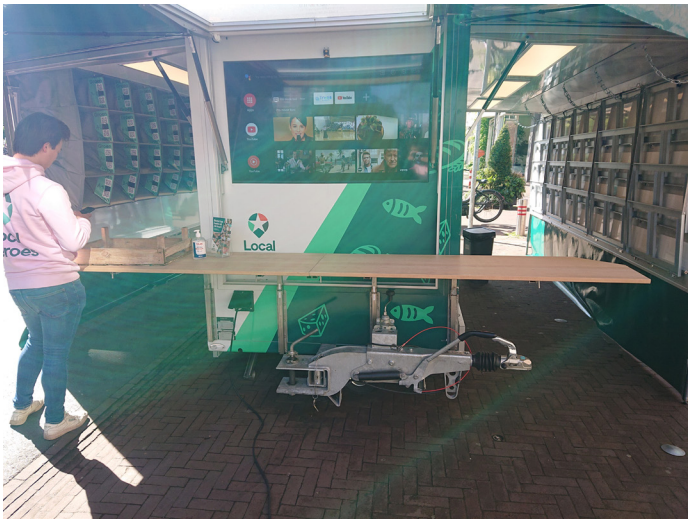
New table design

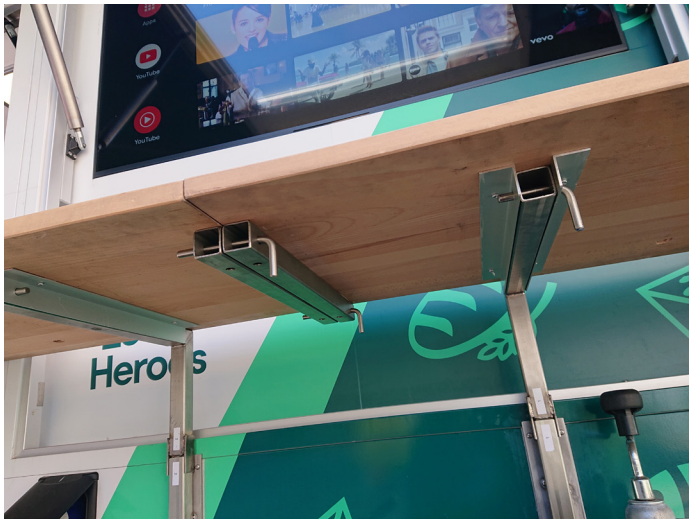


Underside of the table with fasteners

Table installation and validation

At the start of May, the table as shown on the previous pages was installed on the hub by InnovaN. After a full week of operation, the employees that work on the hub were asked how the table performed. They stated the table was easy to install and that they could do it with only one person. The employees also mentioned they liked the cut corner as it made moving in and out of the hub significantly easier. Lastly, the new table height was found to be more ergonomic to work with.





New table installed on the hub by InnovaN


Groen
A-1
Rood
A-2
Groen
F-2
Groen
Rood
B-2

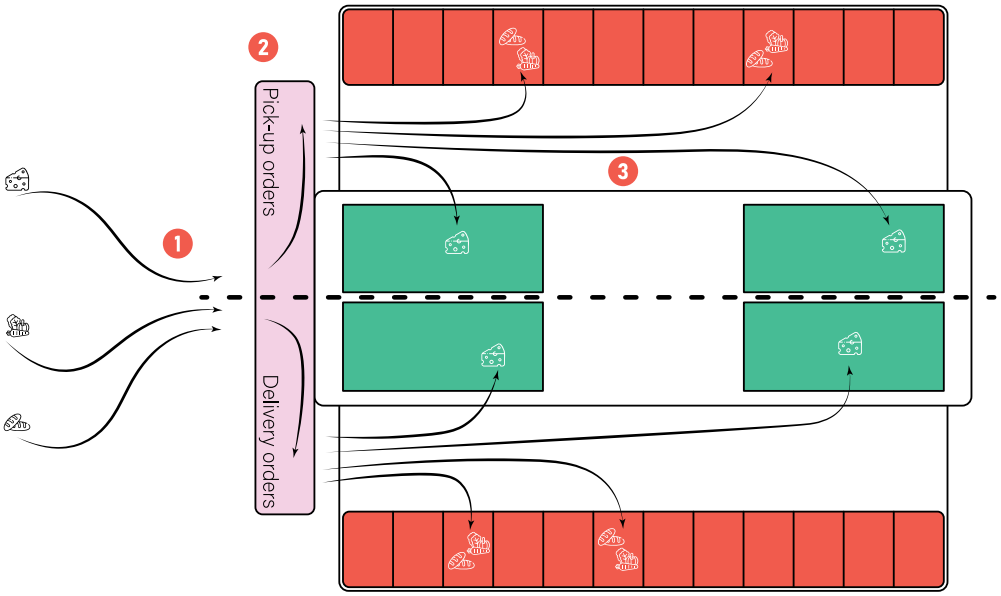

Groen
C-2
Groen
Groen
C-3
Groen
D-3

Interior logistics

Current interior

After products are delivered to the table, they are sorted into two groups: pickup and delivery. The two groups are then sorted based on customer order and slotted in a designated place in the hub. The processes of taking in products from suppliers up to the point products leave the hub to customers is shown in the diagrams below.

Supply shift



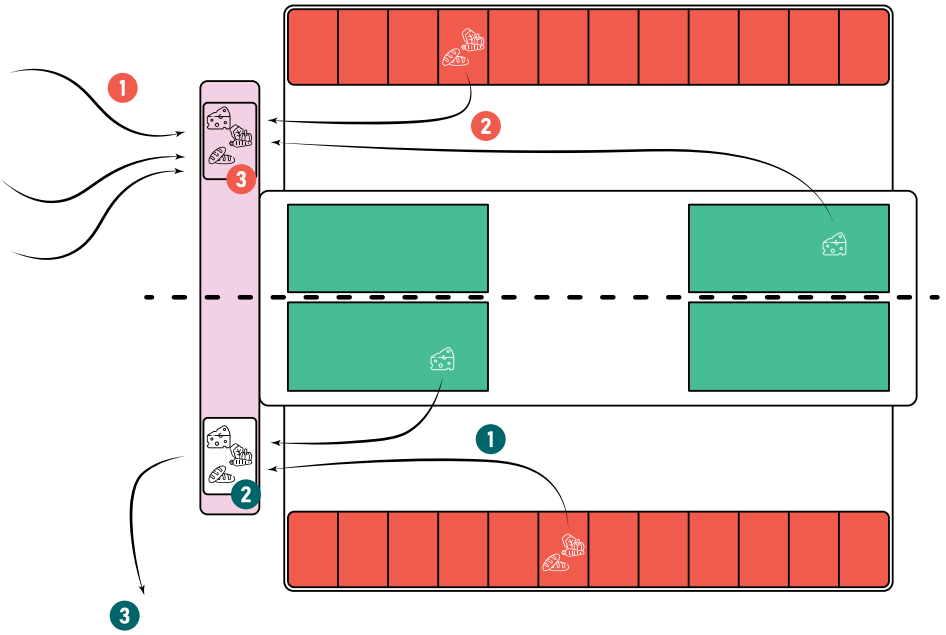
Supply

1. Items are delivered to the hub
2. Items are sorted on pickup/delivery
3. Items are slotted per order number

Legend

- Receiving and shipping
- Cooled slots
- Ambient slots

Delivery shift



Pickup

1. Customer arives and gives order number
2. Items are picked
3. Items are given to the customer

Delivery

1. Items of an order are picked
2. Items are slotted in crates per order
3. Crates are loaded onto a delivery bike

Legend

- Receiving and shipping
- Cooled slots
- Ambient slots

Movements of products through the hub

Working principle

The products are slotted in cloth pigeonholes. These are made of an IKEA shelving system; SKUBB. The entire wall consists of multiple slots measuring 45cm x 35cm x 25cm. A total of 24 of these SKUBB are attached to each other and onto the ceiling of the hub. This means there are a total of 96 slots on one side of the hub.

Inside the slots are multiple QR codes. These are used together with a logistical app to keep track of the orders. QR-codes are printed four times inside each slot. Two on the left, two on the right. This is done so that there will always be a code easily visible to scan. Currently, there are two colours for the 'ambient' slots. Red and green. Red is meant for delivery products, green is for pickup products.

SKUBB

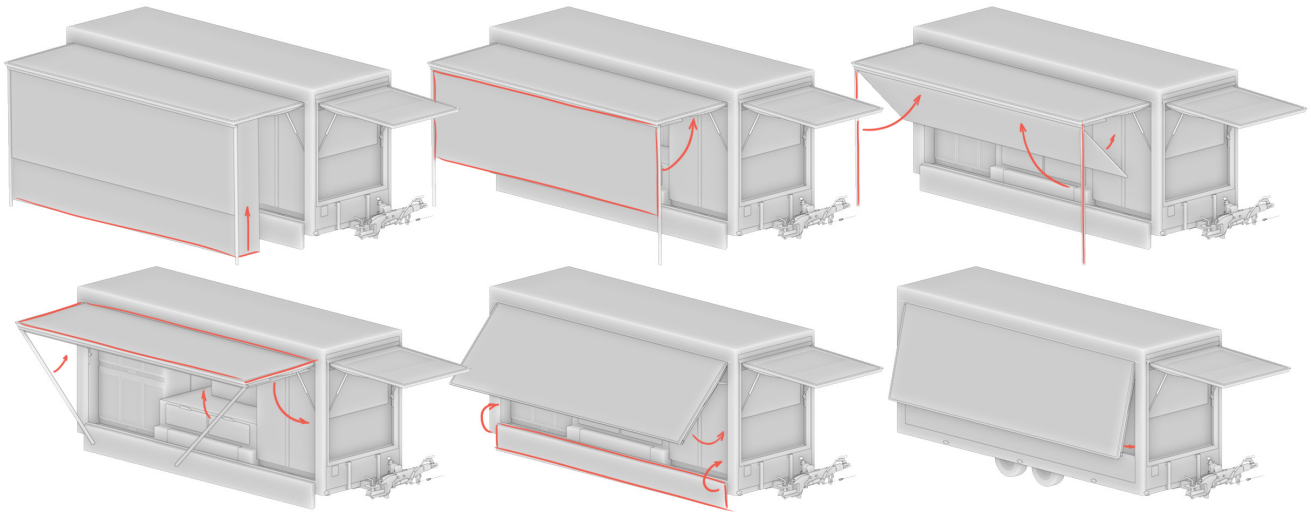
Slots in use in the hub

During the opening and closing of the hub, the slots are folded up to enable the sides of the hub to fold in on itself. The closing- and opening sequence is shown below together with the folding of the slots.

Problems

After working at the hub myself and talking to employees several problems were identified concerning the interior side panel of the hub. The most important one was linked to the weight of the side panels of the hub. Employees stated that they found the side panels too heavy. It was difficult to start the day since they sometimes had to ask for a stranger to help them open up the hub. To help open the side panels, gas springs are used. There are two installed on the side panels that have a strength of 2750N. These are strong enough to lift the side panel halfway, the last bit needs to be done by hand. This is the part where the employees struggle.

Collapsing the cloth slots



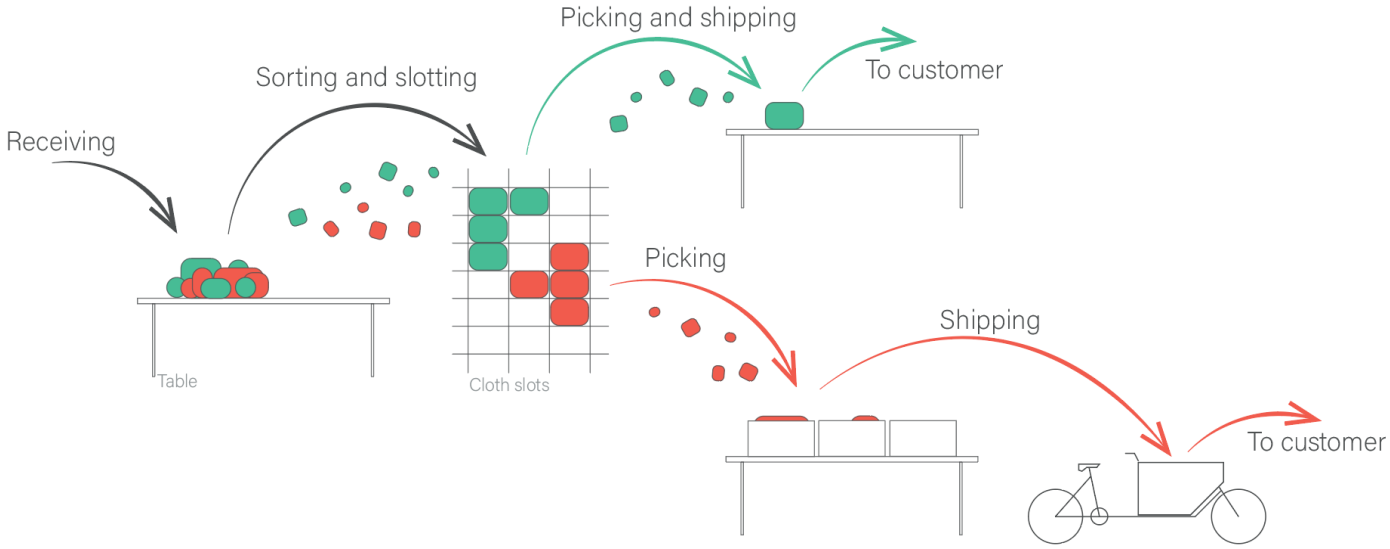
Closing of the hub (reverse for opening)

Other issues and remarks employees mentioned during interviews were:

1. Taking out products one by one for customers is slow.
2. Stowing the cloth bags away is difficult since you can't see what you are doing.
3. The wind pushes the side panel around sometimes. Making the side panels move toward you and making a lot of noise.
4. The lowest slots are almost never used. They are too low to the ground to be ergonomic.
5. Sometimes the QR codes won't scan.

The first mentioned issue here is interesting to further investigate. Right now, products are slotted one by one in a fixed slot. So, when customers arrive to collect their groceries, an employee has to give each product one by one. For the pickup orders, this is not necessarily an issue, since the customer has to pack the products in their bags. Slowing down the entire pickup process anyway.

For delivery orders, this is an entirely different story, however. Below, both the pickup (green) and delivery (orange) side of the operations inside the hub are shown in a diagram. As can be seen, the delivery orders are repacked from the cloth slots to crates before they are loaded onto the delivery bike. This was stated by employees as annoying and slower than it could be. Also because it is best to repack fresh produce as little as possible. More details on the conversations and interviews had with the employees can be found in Appendix I and II.



Journey of products form receiving to shipping

Criteria

In order to address the experienced problems mentioned above, the following requirements were made (these can also be found in Appendix IV):

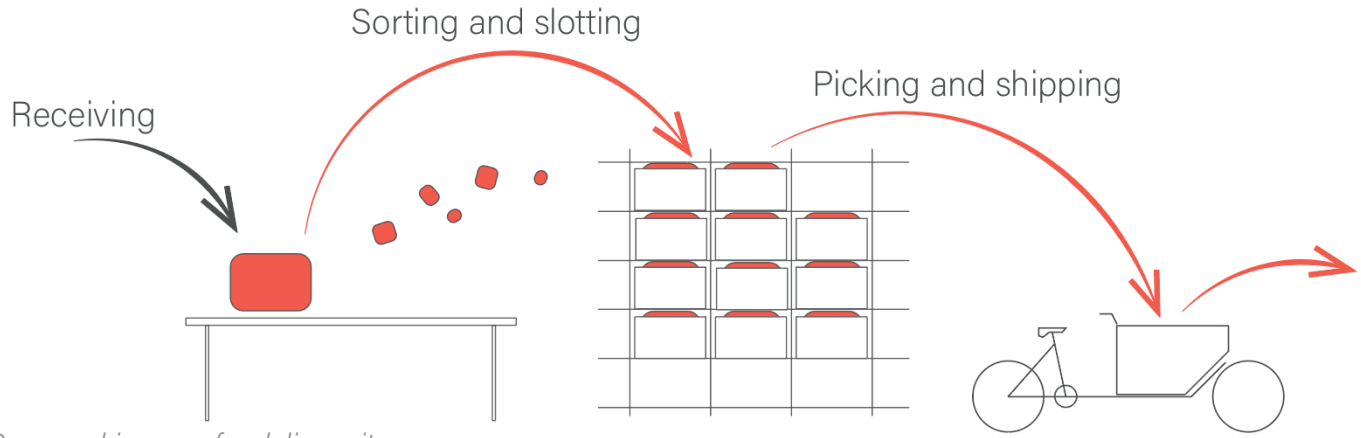
1. The shelving system should be faster to deploy and stow away than the current solution.
2. The shelving system should weigh less than the current solution.
3. Employees should be able to take multiple products at once out of a slot.
4. QR codes should face the employees.

Note that there is no requirement stating that one employee should be able to open and close the hub. This is due to the fact that this particular product will be installed in the current V2 hub. Meaning that the fortifications that were needed for the cloth slots are already installed and it is not possible to remove these, making it impossible to add something to this side without making it too heavy for one individual to open the hub.

New design

To conform to the earlier mentioned criteria, a shelving system was designed for large crates. If products could be slotted immediately into crates, this would effectively skip an entire step in the product journey as can be seen in the diagram below.

For this, several options were considered. Slotting in plastic bags or small crates, also constructing dedicated slots in the cargo bike was considered. These dedicated slots were not effective, however, since the employees would be unable to prepare the next bike delivery round before the bike would return. Eventually, large crates were chosen from a so-called 'pool system'. These are crates that are not owned by the users (in this case LH). Instead, the seller rents them to users and makes sure the crates are circulated, maintained, and cleaned. In this case, Euro Pool crates were chosen due to them being the standard in the fresh produce chain in Europe (Euro Pool System, n.d.). Market vendors mostly use the largest size of this system, a crate of 60x40x24cm large (Amsterdam Ten Katestraat market vendors, personal communication, 19-03-2021). Adopting these largest crates in the operations of LH means that LH can easily swap crates with vendors which speed up the receiving of products. More information on the Euro Pool system and its varying sizes can be found in Appendix XIII.



Proposed journey for delivery items

LH already uses these crates for their delivery bike. While looking for possibilities to increase efficiency LH wants to use crates for both delivery and pick-up orders. An order which is slotted in a crate can simply be handed over to a customer, who can then in their own time put the order in their bags. By testing the slotting in crates for the delivery side of the operation LH can test whether this way of working is more efficient.

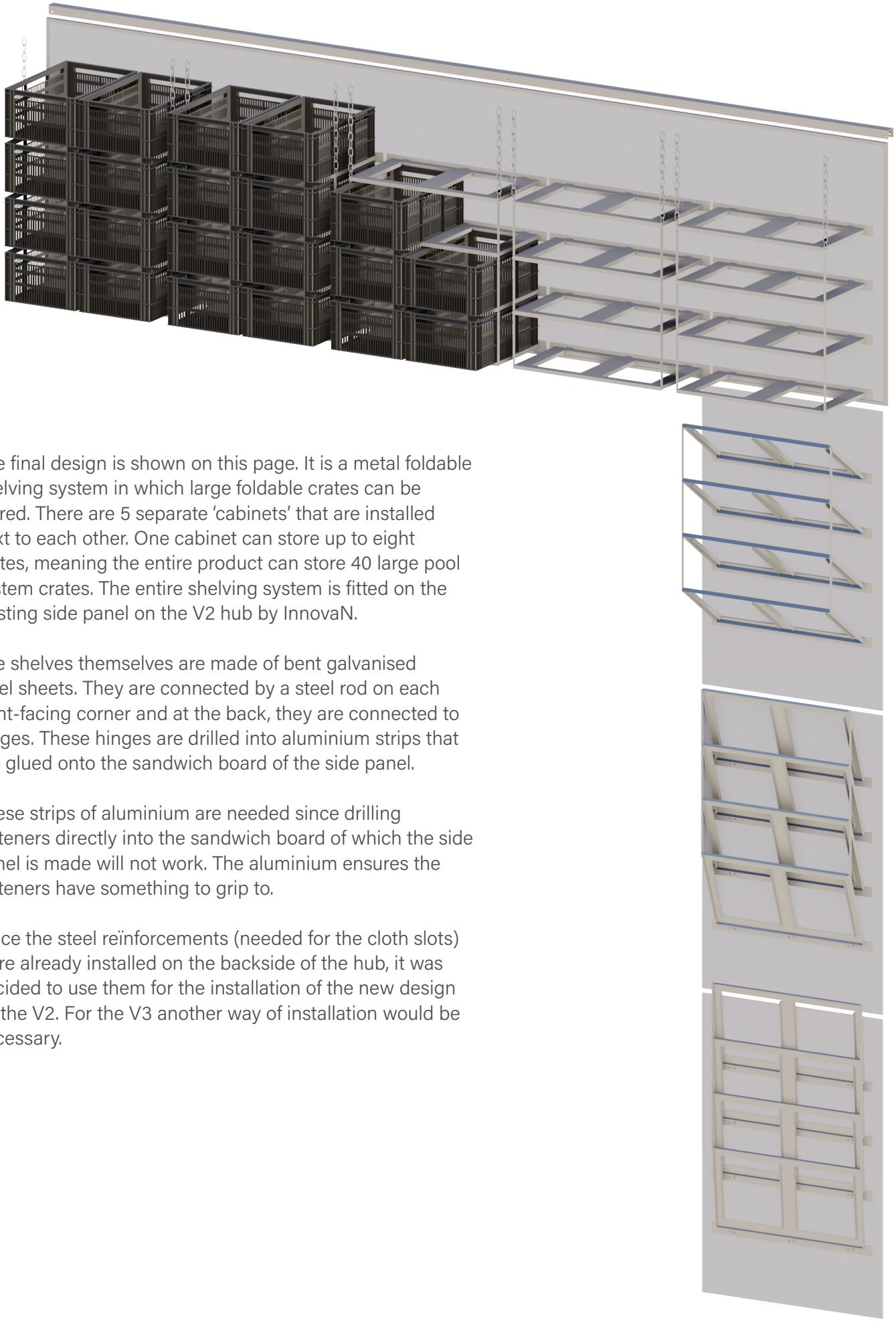
First test; slotting directly in crates

Second test; testing crates in shelving system

Third test, performed by InnovaN; Testing deformation with a mass of 30kg

Before an extensive and large design like the one shown on the next page could be installed, some tests needed to be performed. The first test was done to determine whether slotting directly in crates was faster than the method which was already in use. This seemed to be the case, with employees stating they were approximately 5 minutes faster when they had to fill an entire delivery bike (this is 6 orders fitted in 6 separate crates). The second test was conducted to test if crates could slide out of a shelving system like a drawer, enabling employees to fill crates more effectively. This was also deemed a success.

After the operational tests were successful, a prototype of the final design was built by InnovaN and was used to test the strength of individual shelves. InnovaN tested stainless- and galvanised steel. Galvanised was chosen for the final product since it is cheaper and performed similarly in the testing conditions. A more detailed report on the several designs, methods used, and considerations can be found in Appendix VII.



The final design is shown on this page. It is a metal foldable shelving system in which large foldable crates can be stored. There are 5 separate 'cabinets' that are installed next to each other. One cabinet can store up to eight crates, meaning the entire product can store 40 large pool system crates. The entire shelving system is fitted on the existing side panel on the V2 hub by InnovaN.

The shelves themselves are made of bent galvanised steel sheets. They are connected by a steel rod on each front-facing corner and at the back, they are connected to hinges. These hinges are drilled into aluminium strips that are glued onto the sandwich board of the side panel.

These strips of aluminium are needed since drilling fasteners directly into the sandwich board of which the side panel is made will not work. The aluminium ensures the fasteners have something to grip to.

Since the steel reïnforcements (needed for the cloth slots) were already installed on the backside of the hub, it was decided to use them for the installation of the new design on the V2. For the V3 another way of installation would be necessary.

New Shelves folding up

Shelving system installation and validation

InnovaN installed the shelving system as designed on the V2 hub at the same time as they installed the table in May. Employees stated they liked the new shelving system. It is easier to open and close each day than the cloth counterpart.

Since the shelves are 25cm apart, and the crates are 24cm high, the crates can be slid out of the shelves like a desk drawer. This helps employees to fill the crates. It also makes it nearly impossible to slam the crates on the shelves, mitigating the risk of deformation by sudden stresses on the steel sheets.

The side panel still has to be opened by two persons since the shelves are approximately the same weight as the cloth slots. However, when this system would be installed in a new hub (the V3) the shelves would not need to be attached to the ceiling. This would eliminate the weight of the reïnforcements currently in place. These reïnforcements are approximately 115kg (Jakko Simonse, InnovaN, personal communication, 28-04-2021).

Some parts can be improved. The finish of the shelves is quite rough, it is easy to cut yourself on the sharp edges of the steel sheets. The most annoying part of the system according to employees, however, is the elastic rubber band which is used to secure the shelves to the side panel. These are difficult to take off in the morning. And they do not feel like a finished product according to one employee.

Shelves being used in alternative ways than planned

Shelves as installed by InnovaN with crates in them


Up
nt
ONTDEK HET OP
Google Play
Local
Heroes

v3 development

After the development of the v2 was completed the focus could shift to the v3. The tests and prototypes built in the v2 were used as starting points for the v3. As discussed in the previous chapter there were three main focus areas in the v2:

1. Receiving and shipping
2. Interior logistics
3. Modularity

These areas are also important in the v3. The final design is shown on the these pages. How this design came to be will be explained on the following pages. Different than with the v2, the wishes of employees could be catered to while designing the v3.


v3 receiving area
Local
Heroes
ONTDEK HET OP
Google Play
v3 shipping area

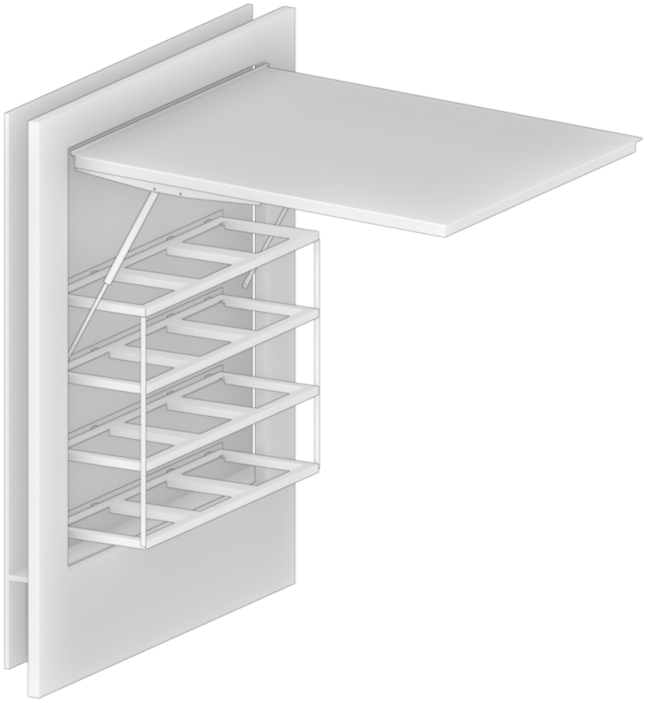
Receiving and shipping

In v2, the receiving and shipping of goods happened both on the table at the front of the hub. In the v3, these two actions get their own place on the hub, as this was one of the wishes of the employees (LH employees, personal communication, 19-02-2021). It also ensures that there is no crossing of logistical streams. Something that is the case for the v2 as can be seen in the image shown below

v2 with traffic flow shown

The receiving area of the v3 is on the front of the hub, where the table is located on the v2. Here, instead of a table, a shelving system is installed. This cabinet is used as a 'backlog.' Vendors can come and drop off their products in the cabinet as can be seen on the page to the left. The employees can then sort the items and slot them in their appropriate spot in the hub.

Customers no longer go to the front of the hub. Just like most other market vendors, the customer contact area (or shipping area) is on the side of the hub, parallel to the street. Another change is the replacement of the tv with a tablet. The tablet will be used to show which products the customer has ordered. It can also show which employee is currently helping the customer. The table is asymmetric to give customers a place to pack their stuff when it is busy.



Shelving system on front of the hub

Receiving

The shelving cabinet on the front of the hub is similar to the ones that were installed on the v2. The research and design that was done for the v2 version were therefore reused for this iteration. (Appendix VII) These are 40cm wider than those. Meaning a total of 3 large Euro Pool crates can fit on one shelf. During current operation, 5 crates of product influx at one moment is the highest influx that is currently observed (hub employee, personal communication, 23-04-2021). This system can handle 12 crates at a time. To make up for the larger mass that will sit on these shelves, the flanges have been widened to 3cm instead of 2.

With this shelf mounted at the front of the hub, market vendors can leave their products here without obstructing the customer area. LH employees can then, in their own time, sort and slot the items.

Because the receiving is in a different place than shipping LH can increase the number of shifts they have on a day. Now, first, all products of a shift need to be in before customers can come to pick them up. But now, once all products of a particular order are slotted, a customer can come to claim the order before all other products are slotted. This continuous in- and outflux of orders could increase the viability of LH's business.

The location of the receiving area does come with a drawback, however. When the receiving area is in use, the hub is longer than 4 meters. Which could pose a problem in some markets since they operate on a 4-meter wide policy. But after talking to several 'market officials' it appeared that this won't be a problem most of the time. The 4-meter rule is not heavily enforced. If LH is forced to abide by this rule, they can opt to keep this part of the hub closed. They then can choose to sacrifice a few order slots to use as a receiving area. Lowering the total orders they can handle, but maintaining the separation of shipping and receiving.

Shipping

The shipping area consists of 3 items: a table (1), an overhang (2) and a tablet(3).

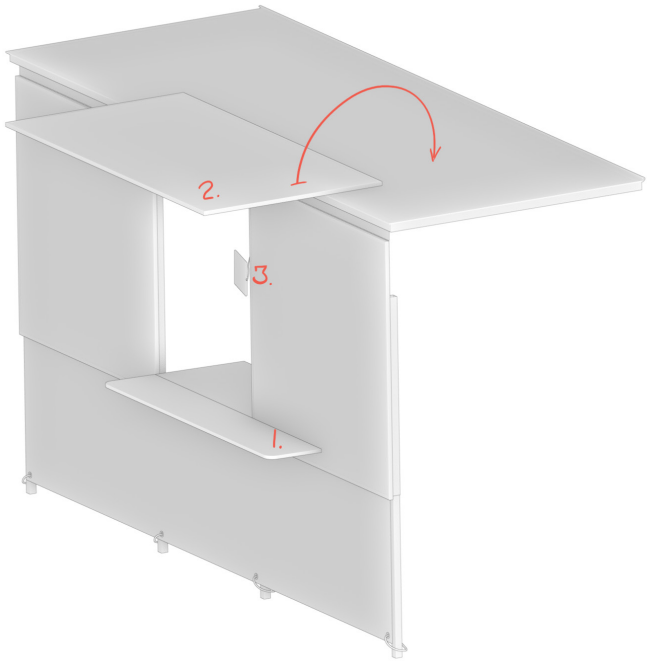
The overhang is a simple sandwich board of 1x2m that can rotate on a hinge attached to the side panel. It provides customers shelter from rain or heavy sun. It can be opened or closed when the side panels are half-opened, resting solely on the gas springs that help to push the side panels up.

A tablet on a swivelling mount is positioned near the pick-up window. It provides customers with information about their order or the current employee servicing them

The table consists of two pieces. One is 50cm deep, 94cm wide and located inside the hub. Attached to it is a 30cm deep, 175cm wide tabletop. This tabletop is located on the outside of the hub. providing easy access for customers.

The table is installed on the supporting legs of the side panels and can be completely disassembled. More information can be found in Appendix X.

The entire shipping area is located on the side panel. The side panel of the v2 had some issues with weight. One person can't open the side panels of the v2. In the v3 this is mitigated mainly due to some fortifications that are no longer necessary. This will be further explained in the next pages.



Shipping area

Interior logistics

The basic interior of the v3 is similar to that of the v2 after the new shelving system was installed. The same shelves can be found in the v3. There are, however, a few changes:

1. The shelves now store 3 crates in a row, measuring 120cm across.
2. In the centre of the hub is now a window with a table out to face customers; the new pickup point.
3. Under this table, dedicated bins can be found to store trash, plastic bags, and other items.
4. In the back, a storage rack provides the hub with ample space to keep operations organised.
5. Between the weels, a small lockable compartment gives employees the possibility to stow away valuables.
6. Lastly, the central table; can swivel out of the way so, during the off-hours, extra space is created for storing all the crates.

Table

The table functions as the contact area with customers. It also functions as a working and sorting area. During working hours, plastic bags are used to sort items. These bags are also used by vendors. To re-use the bags they need to be sorted and stored somewhere. In the v2 there was no designated place for this, resulting in balls of plastic bags popping up in random places. The space under the table can be utilised to put some bins that function as a sorting system. Giving the plastic bags a fixed place in the hub.


1
2
3
4
5
6

Closed sidepanel with crates

Closed sidepanel with legs visible

Side panel

When the table is not in use, for instance at the back of the hub, the middle section of the side panel can flip down to create a closed-off wall. This middle section has room for up to 16 more crates, stacked on top of each other.

To reduce weight, the legs of the side panel are attached to the most outer flaps. And there are two more in the middle of the side panel. This is a weight reduction of around 100kg. Although it is counterintuitive to add two legs to reduce weight it does help. The v2 needed heavy fortifications to prevent the side panel from bending too much in the middle. This stainless steel beam has a mass of 130kg and is no longer needed in the v3 due to the weight being supported in the middle by legs. These legs slide in a steel tube that is fastened to the side panel.

The overall panel is also 1-meter shorter, which reduces the weight further. This reduction in length also means there is less space for shelving systems that are also heavy. Each shelving unit in the v2 has a mass of approximately 15kg. Since one side panel has room for 5 shelving units, this amounts to a total of 75kg. The shelving unit for the v3 has an approximate mass of 20kg. But there is only room for two of these. This means another weight reduction of 30+kg these weight reductions combined should ensure that one individual can open the side panel

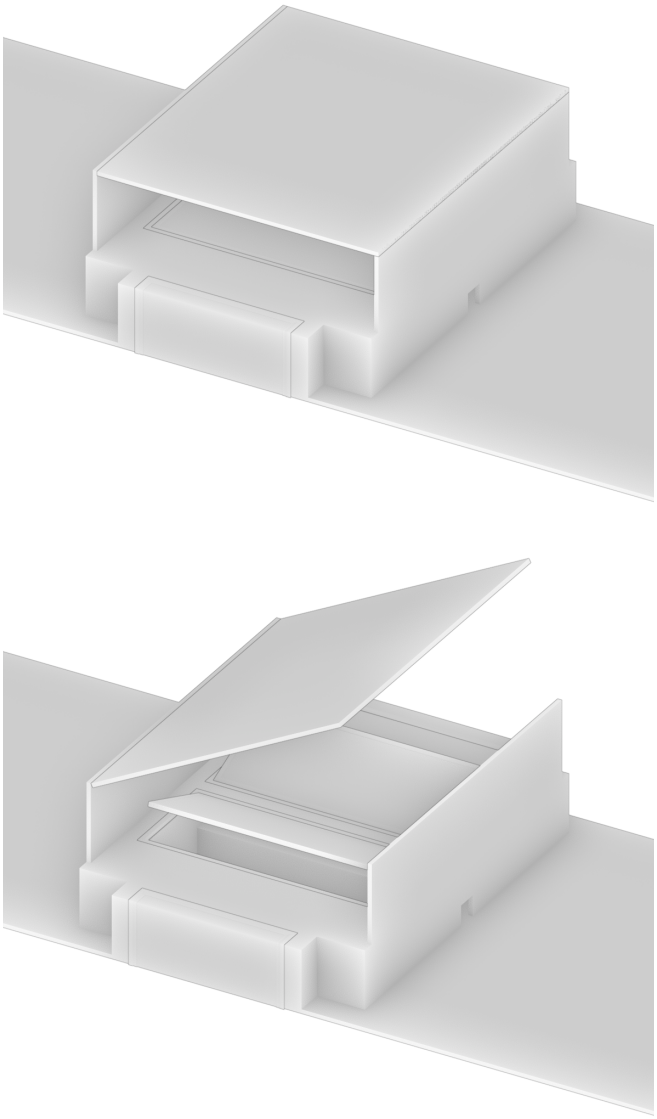
Central area

The central area of the hub is where the wheel axel is located. This creates a higher spot in the floor of the hub which can be utilised as a working area, or storage solution. In the v2, drawers are installed just above the wheel cases. This meant, however, that space directly between the wheels is not utilised. To exploit the room under the floor, two hatches are installed on the floor. These can be locked with a simple key, providing the hub with a safe space for valuables like laptops, phones, tablets and electric bike batteries.

The tabletop which can be found in the v2 has been altered so that it can swivel upwards against the fridges. This creates a larger volume which is needed to store all the loose items when the hub is not in use and is folded inwards. These items are the table and all the crates; up to 128 crates need to be stored during the night. More details on the interior floor can be found in Appendix XI.

Fridges

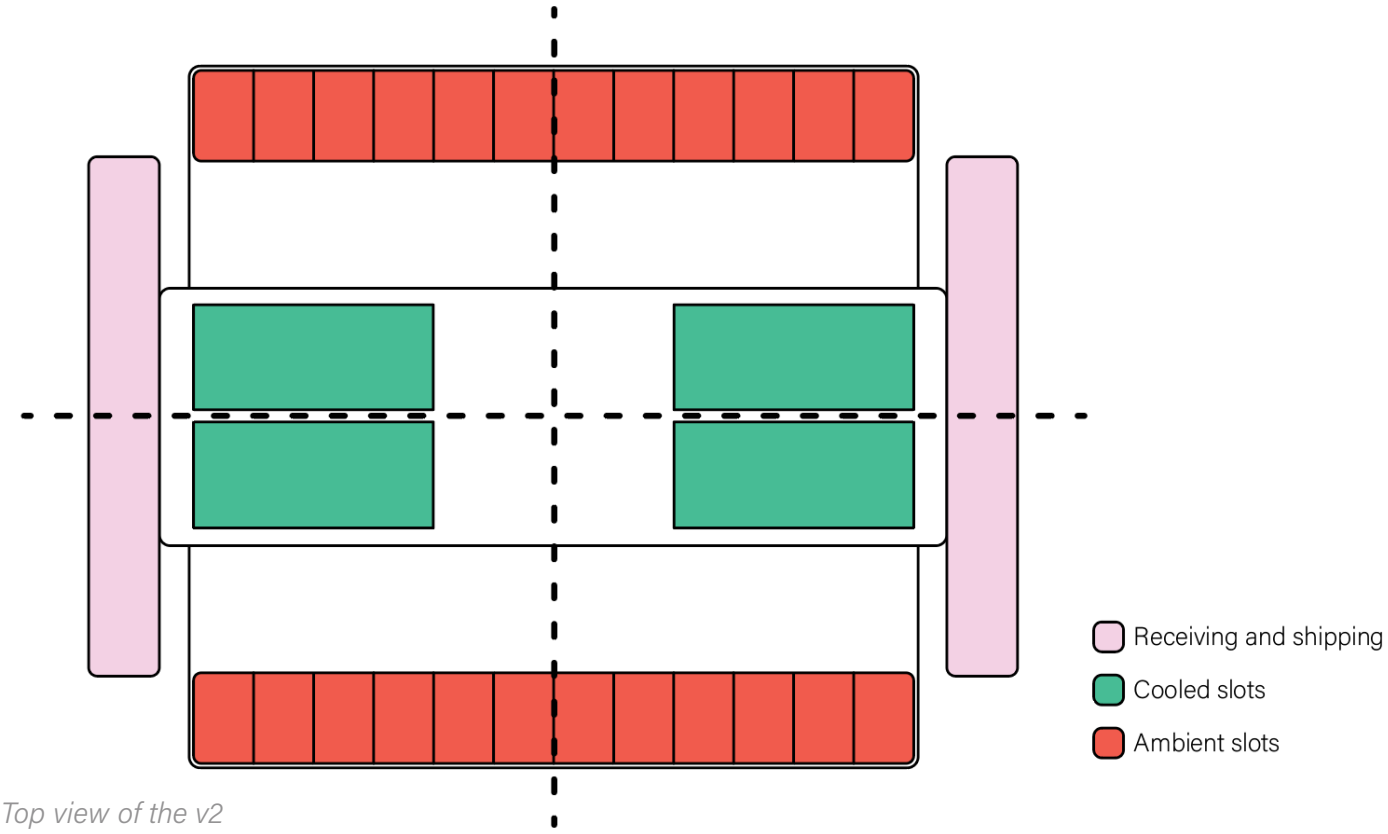
After calculating how many orders could fit in the v3 it was determined that a total of 6 fridges need to be installed on the v3. The calculation of this can be found in Appendix XIV



Middle section of the floorboard

Modularity

One of the main criteria of the client was the modularity of the next version of the hub. The company does not mean modularity in the regular definition (where modular means that a product is built up out of multiple separate units (Cambridge Dictionary, n.d.)). LH want their hub system to be scalable. They want their system to be the right size for each environment. It was therefore chosen to look at the original design of the current hub as a combined product consisting out of 4 modules.



Top view of the v2

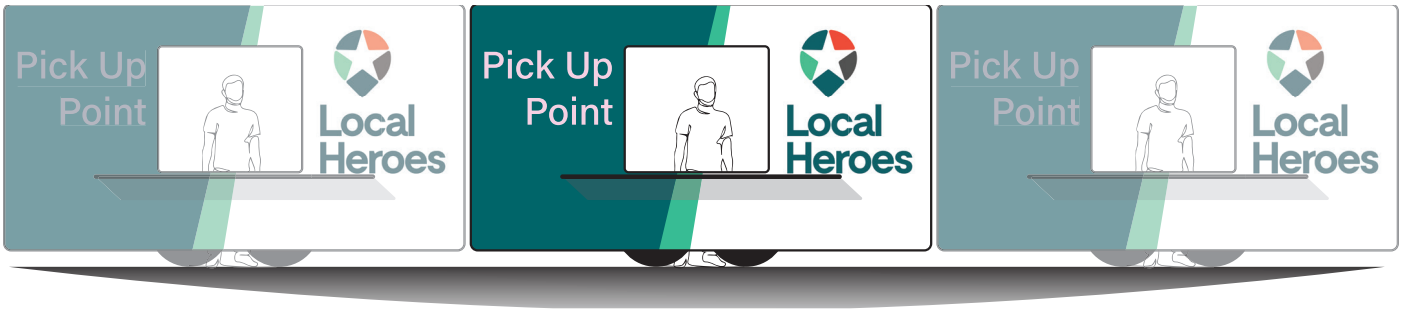
Using the configuration currently in use, 70% of the available slots in volume are ambient. The rest is cooled. According to in house research, the break-even point of this product is 80 orders per shift (two shifts per day). So one module should at the very least accommodate 80 orders, plus double that as profit margin.

These 80 orders are based on in-house reseach. one order was set as equal to one slot (35x45x25cm =39L).

Another criterion for one module is to be less than 4 meters wide. This criterion has developed out of standard market dimensions. In the Netherlands, a standard market place measures 4 meters in width. If your stall is wider than that, you have to hire an additional 4 meters of space. Since the current hub is 5 meters long, they have to take up two spaces. Not every market has room for such a stall. And the municipality of Amsterdam is not always helpful with these kinds of situations. (M. Coumans, personal communication, 12-04-2021) A quick rollout for LH would be easiest if their hub would fit standard market places. It would also help in the persuasion of the municipality of Amsterdam.

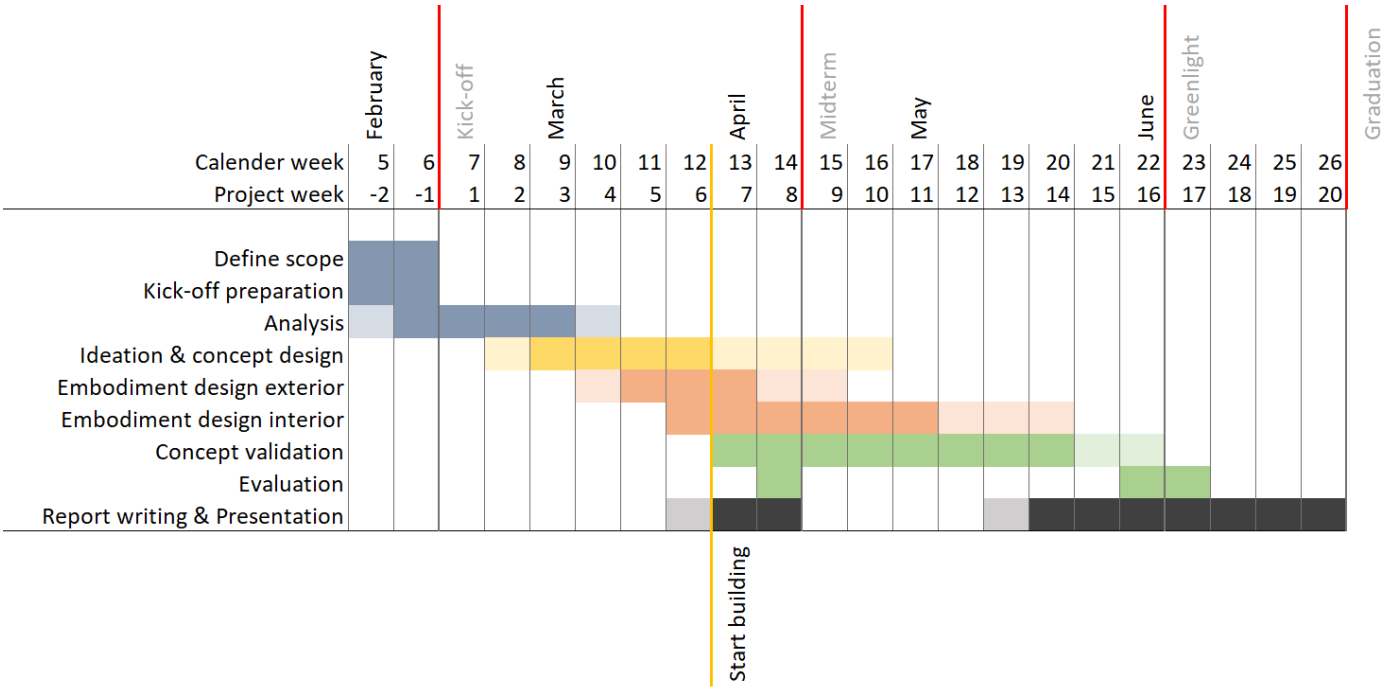
To fit the standard measurement of 4 meters wide, the pickup location has to move from the front of the hub to the side, since right next to the stall another market vendor will have its stall placed. Combining the criteria given above, and the demand of LH to have a 'scalable' solution. A minimum viable module will be designed as the V3. When this module no longer fits the need of the location, a second V3 hub can be installed along with the old one, doubling the capacity of the hub.

Noordermarkt, Amsterdam. All vendors use the same 4 meter wide stalls



Concept drawing of the 4 meter wide V3 hub

Planning and project management

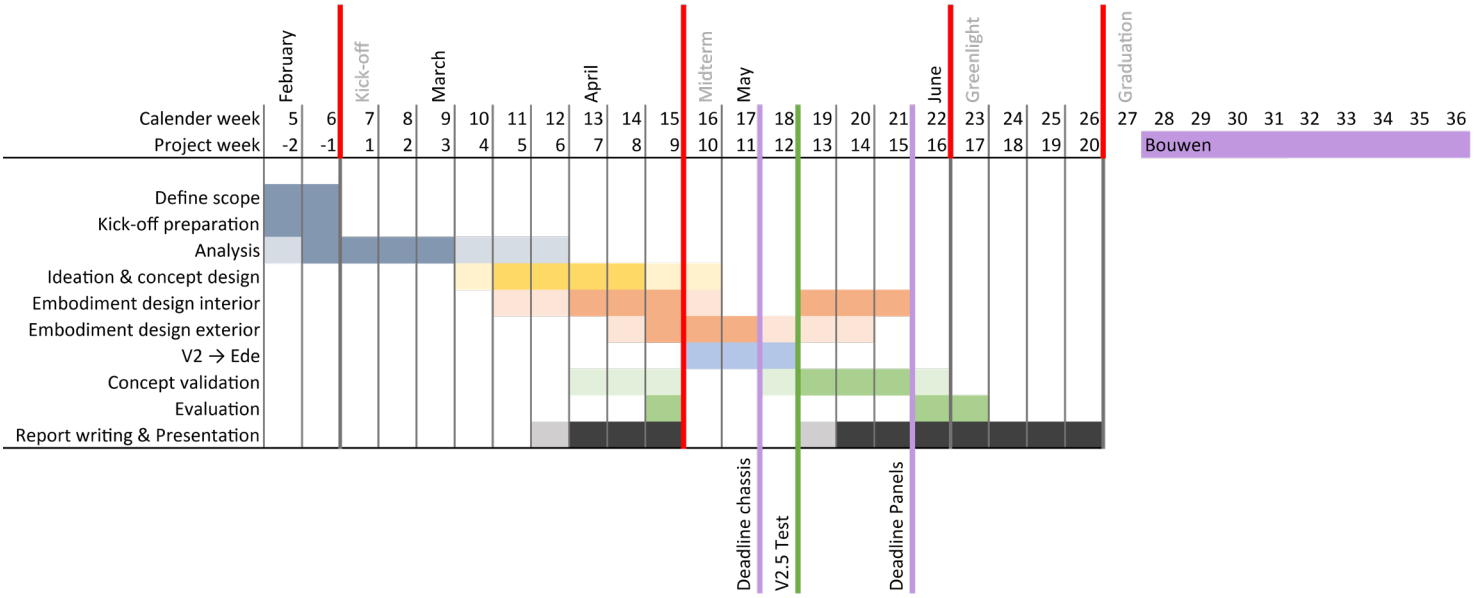


Planning at the start of the graduation project

General planning

Local Heroes is a startup. And they have ambitious planning. At the start of the project, LH stated they wanted to have the V3 ready and build before July. They wanted this to facilitate their rollout in Amsterdam. A first planning was made to accommodate this wish.

In this planning, the building of the V3 would start in April. This was due to the build time InnovaN needed for the V2. It was thought that they would need approximately 10 weeks to build the trailer from the moment the order was given. InnovaN, however, stated that their agenda was fully booked until calendar week 28. Or in other words, July, after my graduation would be finished according to my planning. They also said that they needed preliminary drawings of the chassis 10 weeks in advance. This was due to the lead times of their supplier of chassis. Another preliminary deadline before the actual building date was the deadline for the panels. The market stall trailers InnovaN makes are built from sandwich panels made from foam with a hard top layer. The supplier for these panels has a lead time of 6 weeks.



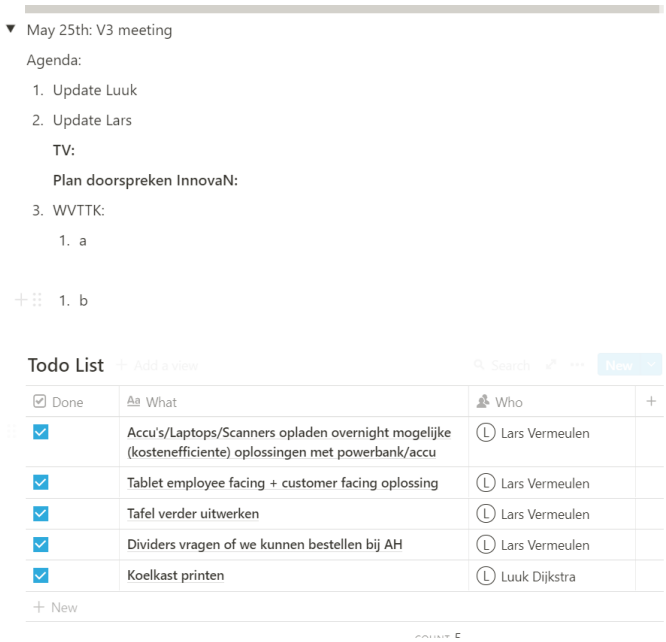
Planning at the midterm

This news meant a couple of things. Firstly, the trailer would not be finished before the end of my graduation project. So there would be no time to test and validate the final product. It also meant that Local Heroes had to shift the rollout of their service to later this year.

It did, however, also mean that there is more time for testing and validating smaller modules of the project. Since the V2 has to be finished by InnovaN at the start of May, some new designs could be implemented in a 'V2.5.' This version can then be tested and validated. Ensuring the possibility of iterating the design for use in the V3 which will be built in July. Due to the different deadlines for the chassis and the panels, the design phase of this will also be split into outside and inside.

Notion

To better keep track of these deadlines and what needs to be finished when several tools are used. For the work specific to the company, Notion is used for weekly meetings and keeping track of tasks that need immediate attention. This is a list of tasks that are developed and discussed each tuesday. The tasks primarily have to do with communication between InnovaN and design details that need to be fixed before talking to InnovaN.



▼ May 25th: V3 meeting

Agenda:

1. Update Luuk
2. Update Lars

   TV:

   Plan doorspreken InnovaN:
3. WVTTK:
   1. a
   1. b

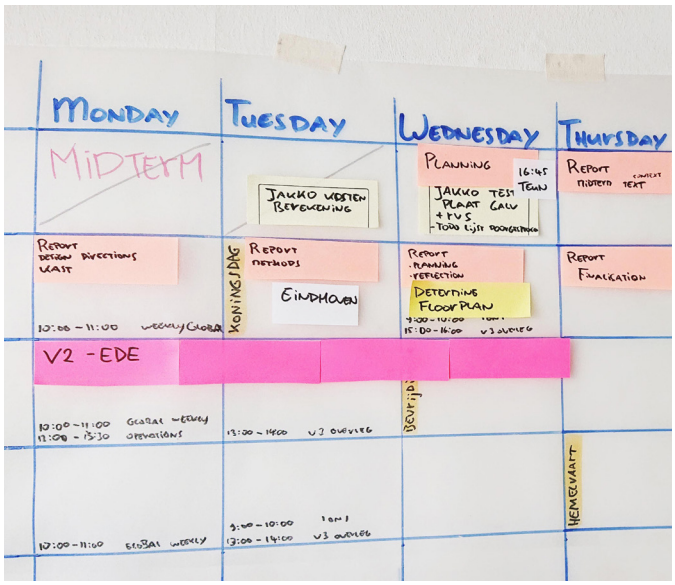
Todo List

Done	What	Who
☑	Accu's/Laptops/Scanners opladen overnight mogelijke (kostenefficiente) oplossingen met powerbank/accu	Lars Vermeulen
☑	Tablet employee facing + customer facing oplossing	Lars Vermeulen
☑	Tafel verder uitwerken	Lars Vermeulen
☑	Dividers vragen of we kunnen bestellen bij AH	Lars Vermeulen
☑	Koelkast printen	Luuk Dijkstra

+ New

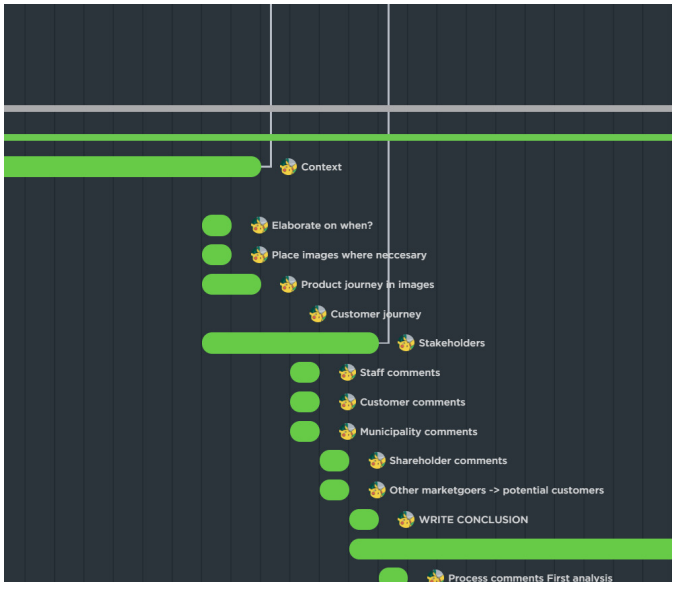
Wall planning

A day by day planning is taped to the wall in my room. This planning is used to keep track of meetings and large deadlines. In here, I also write down general tasks that I want to do on a specific day or events that happen outside of my project. Each morning I check the wall and make adjustments based on new developments. Then every time I don't know when something is supposed to be delivered, I can just look up to the wall.



Clickup

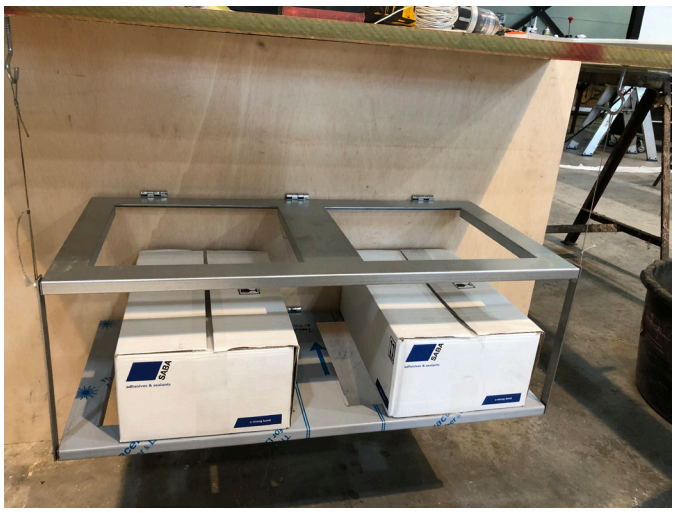
After Henk recommended it, I started using Clickup. I use Clickup to 'micromanage' my day. When many large tasks have to be completed, I devide the workload and plan each task to a specific timeslot on my day. I can easily track how long each task takes and what still needs to be done.



Innovan

During this project, I have the role of designer, but I also manage the contact at InnovaN. Since the client was busy during a lot of weeks of the project, I had to manage the V3 project and contact InnovaN largely on my own. In the beginning, the communication with InnovaN was difficult and only via mail. But later phone calls were the standard, accompanied with mails for later reference and talking points. These many 'meetings' really helped in keeping the project to the planning.

Due to Corona it is also not always possible to work on location. This is particulary difficult for making prototypes. The prototypes that are needed for this project are often quite big. Luckily I could use InnovaN to test out some things or iterate on design propositions I made. For instance, Jakko tested the deflection on the final shelf design to validate that the design would hold. I also go to Amsterdam each week to work in the hub. Here I can see how ideas might work in real life and I can test ideas relatively easy and quickly in a real world environment.



Tests performed by InnovaN

My goals

In the project brief, I stated that I wanted to develop my project management skills. I also wanted to learn what I want from a possible working environment. Since I was the only 'designer' within LH I had to work mainly on my own. The owner of the company was often occupied with the stakeholder management of LH, which meant that the communications between LH and InnovaN also mainly ran through me. These two facts enabled me to experience on my own what it is like to manage a larger design project.

The first thing that I had to learn early on in the project was expectation management. LH expressed the wish to have a new product ready before the end of my internship. I was sceptical of this from the getgo, but communicating this clearly and convincingly proved difficult. It was difficult to explain why the planning was so ambitious and that I probably needed more time to create a good design for LH. In the end, InnovaN made it clear that they would be unable to comply with the wishes of LH. In retrospect, the expectation management of the planning would have been much more effective if I had involved InnovaN sooner in the project's planning.

Another area in which I feel I developed myself is clear communication with a client. The Covid-lockdown meant that all meetings were online. While this is sufficient most of the time, it sometimes meant that it was difficult to convey an idea or to explain something technical. While in a conversation with someone I often grab a piece of paper and a pen to draw an idea. Or sketch something to explain something unclear to someone. Hand gestures and speech alone are not always enough. One such occasion was a discussion with regards to the number of orders the new product could hold. LH was talking about the number of slots there were in the design. I was talking about the volume of products in litres that the new design could hold. In the end, some prepared calculations and diagrams made everything clear. It helps greatly to be able to all look at something while talking about it. I learned that this is even more important when meetings are digital.

This project also showed me how companies work together. During my internship, InnovaN was a major stakeholder. I send them my designs, they gave their insights and I would change things accordingly. But when something had to be ordered, the owner of LH had to give a green light. On the other side, the owner of InnovaN also had to communicate with LH. This corporate hierarchy was both interesting and, at times, frustrating. I often found myself asking my contact person with InnovaN the same question: "Did your boss already do [x]"? By frequently calling and eventually making a face to face appointment I tried to speed the conversation along. A physical meeting was in the end the best solution.

I sometimes felt that I was re-inventing the wheel because I was the only designer in the company. I think that I do not have enough experience to always know what the best way forward is. Therefore I believe that it might be in my best interest to look for slightly larger companies to work for in the future. Here I can learn by looking at how other designers operate. Accelerating my development while taking away some of the responsibilities I felt I had during this project.

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Appendix I

Interview Operators

26/02/21 15:55

Q1 Zijn de grote QR-stickers duidelijk en prettig in gebruik?

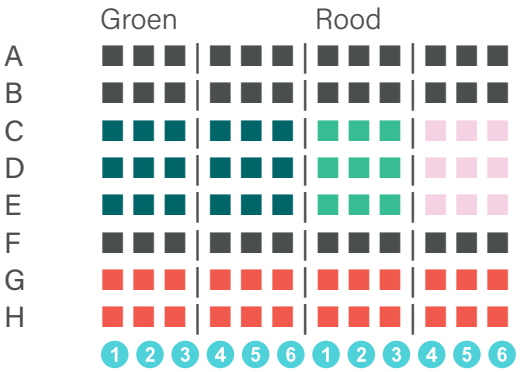
A Soms word de verkeerde code gescannd, dan word de code erachter gescand
Dus misschien moet de code groter? De dubbele qr code is in ieder geval niet echt nodig.
Net zoals de dubbele kleur naam, dat zorgt er wel een beetje voor dat het overweldigend is.

Q2 Zijn de IKEA zakken prettig in gebruik?

A Niet echt iets op aan te merken. De huidige zakken werken prima, als je iets kan bedenken wat beter is is dat natuurlijk ook top, Kan me alleen niet echt bedenken wat dat zou zijn.

De zakken worden nu op een willekeurige manier gevuld, wel met voorkeur op wat op ooghoogte en net iets daaronder ligt. Van links naar rechts. daarna erboven en eronder.

De onderste vakken worden het liefst niet gebruikt. Deze zijn onhandig in gebruik omdat je ver moet bukken en je de labels niet goed kunt lezen



vulvolgorde: donkergroen, lichtgroen, roze, grijs, rood.

Het opbergen is even wennen, maar het is al een stuk beter dan de vorige versie. Dat de vakken nu per 3 kolommen aan elkaar zitten is prima, als ze los zouden zijn lijkt het me meer moeite om het op te ruimen. maar als dat niet zo blijkt is dat ook goed natuurlijk. Erg jammer dat de vakken wel nu al kapot gaan.

Het formaat van de vakken is opzich prima. misshien zouden iets grotere vakken prettig zijn. De vorige kar had ook kleinere vakken, dat was fijn als je wist niet veel ruimte nodig te hebben. Een variabele vakindeling klinkt interessant, moet alleen wel net zo eenvoudig in gebruik zijn als het huidige systeem.

Q3 Welke koelkast heeft de voorkeur?

A Degene met grote deuren. De ander gebruiken we eigenlijk niet meer.
Wel graag grotere schappen in de koelkast zodat je de orders makkelijker uit elkaar kunt houden. Als dit kan met schotjes tussen de schappen zou dat ook goed zijn.

NB Grotere schappen in de koelkast is expliciet als wens gegeven.
Huidige situatie is de koelkastdeur opgedeeld in 3 vakken, 2 vakken is wenselijker.

Q4 Zou het handig zijn om de deliveries meteen in kratten te slotten?

A Interessant, zie wel wat problemen. Er kan veel misgaan tijdens het slotten. Als er niet veel orders zijn is het geen probleem. maar als je 10 orders hebt, en al die kratten naast elkaar hebt staan denk ik wel dat er problemen kunnen ontstaan. (na verder gesprek is er niet veel verschil met het systeem zoals we nu hebben)

als het goed wordt uitgevoerd zou het fijn zijn dat er een complete handeling niet meer hoeft.

Q5 Wat vind je van de uitgifte tafel?

A Het is wel mooier dat de huidige tafel geintegreerd is. Voor de functionaliteit maakt het niet veel uit of de tafel is ingebouwd of los staat.
Het zou fijn zijn als het blad iets hoger is. Moet hoe dan ook steviger, nu gaat het makkelijk stuk. Het ziet er ook niet sterk uit.

De tafel staat niet per se in de weg tijdens het werken, ik zie wel in dat het makkelijker zou kunnen zijn als de tafel tijdens het werk weg kan klappen eventueel.

Appendix II

Interview Customers

05/03/21 19:35

Q1 Wat vind je van onze nieuwe kar?

A
1 Ziet er mooi uit.
2 Mooi!
3 Ziet er erg professioneel uit.
4 Ik was er eerst voorbij gereden haha. Maar dat zal wel aan mij liggen want het logo staat er duidelijk op.
5 Ik vind het een mooie kar, ook een duidelijk concept

Q2 Wat vind je van Local Heroes en hun naam?

A
1 Ik vind het een goed concept
2 Fijn concept, goed ook nu met corona enzo
3 Ik maak er al lang gebruik van, dusja, dat zegt al veel.
4 Het is een uitkomst, zo met corona kan ik nog steeds winkelen.
5 Bij mij is er nog nooit iets fout gegaan, dus ik vind het fantastisch.

Q3 Vind je het uiterlijk van de kar belangrijk?

A
1 Ik vind hem er nu al goed uitzien.
2 Geen mening.
3 Ik vind het mooi.
4 Geen mening.
5 Mooie kar, ik vind die tv ook leuk, kun je zien waar je producten vandaan komen.

Q4 Vind je de huidige locatie van het uitgifte loket prettig?

5.1 Zou je het liever ergens anders willen?

A
1 Deze locatie is perfect. Optimaal voor de ruimte die je hebt en voor de klant is het ook prima aan deze kant.
2 Ik zou hem aan de andere kant doen. Niet aan de straatkant overigens. Aan de achterkant dus. Dan hoef je namelijk niet de markt op te lopen. Eigenlijk een drive-through dus, stop and go.
3 Ik vind het een logische plek.
4 Om eerlijk te zijn maakt het mij niet veel uit. Zolang het maar duidelijk is.
5 Dit is de beste plek. Zichtbaar vanuit de markt, maar je staat wel uit de loop voor de rest van het winkelverkeer. Ik zou hem dus niet verplaatsen.

5.2 Stoort het dat er soms veel verkeer langs dit punt gaat?

A
1 Nee, niet echt.
2 Het hoort er een beetje bij zo op de markt toch?
3 Ja het is wel onhandig, je zou eigenijk een achterdeur nodig hebben.
4 Ik ben het eens met wat hij zei (zien antwoord persoon 3)
5 Geen mening.

5.3 Vind je de tafel prettig in het gebruik?

A
1 Prima
2 Hij is best fijn in gebruik.
3 Ik zou hem dus aan de andere kant willen haha.
4 Geen mening.
5 Ik vind hem prima. Niet echt iets op aan te merken.

Q5 Wat vind je van alle stickers?

A
1 Ziet er professioneel uit hoor.
2 Professioneel hoor.
3 Ziet er duidelijk
4 Het ziet er uit alsof jullie weten wat jullie doen.
5 Professioneel.

Appendix III

Questionnaire Operators

08/03/21 14:16

Vragen hub V2 - vakken en stickers

Q1 Zijn de huidige stickers prettig in gebruik?

A	1	1 · · ✓ · · · · 7
	2	1 · · · · · ✓ · 7
	3	1 · · · ✓ · · · 7
	4	1 · · · · ✓ · · 7

Q2 Vind je het fijn dat er 2 qr-codes op elke sticker staat?

A	1	Ja dat is wel handig, want dan pakt je telefoon of vingerscanner 'm sneller
	2	Ja
	3	Beetje overbodig, het deel van welk vak het is meer naar voren brengen is belangrijker denk ik
	4	Ik weet niet zo goed of het meerwaarde heeft, maar in ieder geval is het niet storend!

Q3 Is het fijn dat de stickers aan beide kanten van het vakje zitten?

A	1	Maakt niet uit
	2	Gebruik eigenlijk altijd linkerkant
	3	Opzich wel. Kan je vanaf beide kanten scannen. Het probleem is alleen wel dat ik af en toe heb gehad dat je per ongeluk een vak erachter scant, dat je er net langs scant.
	4	Ja! Als er iets voor ligt aan 1 kant, kun je de code aan de andere kant scannen.

Q4 Wat zou je veranderen als je zelf zou mogen bepalen hoe de qr-codes worden opgehangen in de vakken?

A	1	De plek is prima, wat belangrijker is, is de QR-code überhaupt blijft zitten. Een sticker blijft niet plakken op stof. Een vakje waar je een kaartje met de QR-code achter kan schuiven, zou denk ik beter werken.
	2	Dit werkt prima, beter dan de vorige qr codes die kleiner waren en los gingen
	3	Sowieso geen stickers als deze, want dat gaat nu al helemaal kapot zoals je weet. Meer naar voren brengen welk vak het is en toch excel aanhouden als volgorde (al kan je natuurlijk wel aan dit wennen maar het is gewoon logischer om excel aan te houden)
	4	Iets wat misschien onhandig kan zijn, maar mij nog niet is overkomen, is dat de qr codes redelijk groot zijn en je daardoor een code van vakjes achter het vakje dat je wilt scannen, scant.

Q5 Zijn de huidige stoffen zakken prettig in het gebruik?

A
1 1 · · · ✓ · · · 7
2 1 · · ✓ · · · · 7
3 1 · · · · ✓ · · 7
4 1 · · · ✓ · · · 7

Q6 Gebruik je alle vakken? (bovenste, onderste, uiterst rechts, etc..)

A
1 Ja als ze allemaal even groot zijn wel. Bij de vorige kar, waar je ook kleinere vakken had, gebruikte ik die kleinere niet. Bovenste rij gebruik ik overigens niet heel graag. Daar kan ik niet goed bij, heb wel eens per ongeluk wat laten liggen in zo'n hoog vak.
2 Bovenste en lage vakken niet (teveel bukken)
3 Nee want zo veel orders hebben we (nu) niet.
4 Ik gebruik vooral de vakken dichtbij de tafel en op armhoogte. De bovenste vakken kan ik niet zien wat er in ligt (en of je dus alles hebt gepakt) en de onderste moet je te erg voor bukken.

Q7 Hebben bepaalde vakken je voorkeur/heb je een bepaalde volgorde waarin je de vakken vult?

A
1 Ik vul eerste de vakken waar ik het makkelijkst bij kan. (Op knie/middel/ooghoogte)
2 Midden en een erboven en een eronder en dan van links naar rechts
3 Ik doe vaak de groene sectie meer omdat dat dichterbij de uitgeef tafel is.
4 Zie vraag hierboven

Q8 Hoe ervaar je het uitvouwen en opbergen van de zakken?

A
1 Niet erg handig. Zwaar om ze op te tillen en je krijgt ze niet makkelijk 'vastgeklikt' als je ze weer op moet ruimen.
2 Te zwaar
3 Gaat een beetje stroef maar is wel te doen.
4 Het is een beetje onhandig maar wel sneller. Hetgene waar ik nog een beetje moeite mee heb is de plaat in het gleufje plaatsen wanneer ze weer opgebergd worden. Misschien kan dit efficiënter, misschien met een sterke magneetstrip of iets dergelijks.

Q9 Vind je het prettig dat de zakken per 3 kolommen aan elkaar vast zitten?

A
1 Mwah, wel zwaar daardoor..
2 Nee, maakt het zwaar
3 Nu kan je wel meer tegelijk opbergen. Het is even zoeken hoe en wat, maar allemaal één voor één omhoog of omlaag doen, is ook niet echt lekker werken.
4 Ja, dat werkt snel!

Q10 Vind je dat de huidige zakken het juiste formaat hebben? Of zou je een ander formaat/meerder formaten willen?

A	1	Ze mogen nog wel wat groter. Moet toch vaak boodschappen van dezelfde bestelling in verschillende vakken leggen.
	2	Formaat is prima, je hoeft bijv de grote zakken van Lex niet echt te proppen
	3	Het is best een prima formaat. Niet te groot en niet te klein.
	4	Ik vind het prima.

Q11 Als je nog opmerkingen hebt over de zakken en stickers die je niet hebt kunnen noemen, dan kun je die hier plaatsen.

A	1	Miss een idee om ze niet in drieën te koppelen? Maar gewoon losse rijen en een minder zware onderkant
	2	-
	3	De zakken zijn toch misschien het beste dat je kan doen in onze situatie
	4	-

Q12 Zijn de huidige koelkasten prettig in gebruik?

A	1	1 · · · · ✓ · · 7
	2	1 · · · · · · ✓ 7
	3	1 · · · · ✓ · · 7
	4	1 · · · · · ✓ · 7

Q13 Welke koelkast heeft je voorkeur (de schuifdeuren of de klapdeuren) en waarom?

A	1	Geen voorkeur
	2	Klapdeuren, gaat sneller voor mijn gevoel
	3	Klapdeuren, dat is omdat het dichterbij de tafel is waar we de boodschappen uitgeven maar ik denk dat de klapdeuren ook wel lekkerder werken dan de schuif.
	4	Klapdeuren, deze blijven open staan wanneer je bezig bent met inladen.

Q14 Vind je de huidige schapgrootte goed? Of zou je liever meer/minder stickers per deur willen?

A	1	Minder per deur; boodschappen raken vaak door elkaar
	2	Nu het rustig is zou minder stickers fijner zijn maar als het drukker wordt is het prima zo
	3	Minder, want in de ijskast kan nog wel eens wat schuiven. Of wat jij zei, zet er een schuif tussen.
	4	Ik vind het prima zo

Q15 Denk je dat een vaste vakverdeling kan helpen met het georganiseerd houden van de orders?

A	1	-
	2	Ja
	3	Ja
	4	Ja

Q16 Heb je een voorstel voor een andere methode van de koelkast gebruiken?

A	1	-
	2	Nee
	3	Schuif tussen de verschillende vakjes of minder vakjes.
	4	Ik vind deze manier prima werken.

Q17 Als je nog opmerkingen hebt over de koelkasten die je niet hebt kunnen noemen, dan kun je die hier plaatsen.

A	1	-
	2	-
	3	De deuren van de ijskast allebei naar buiten. Maar die weet jij ook al volgens mij
	4	-

Q18 vind je de huidige tafel prettig in gebruik?

A	1	1 ✓ · · · · · · 7
	2	1 · · ✓ · · · · 7
	3	1 ✓ · · · · · · 7
	4	1 · · ✓ · · · · 7

Q19 Wat vind je ervan dat de huidige tafel is geïntegreerd in de kar? Is het beter dan wat de vorige kar had?

A	1	Het idee is prima, maar het is een ontzettend onhandige tafel. Hij is heel erg zwaar en viel al na een paar dagen uit elkaar. Een ander, praktischer systeem zou aantrekkelijker zijn.
	2	Niet perse, kost evenveel moeite en even zwaar
	3	Ben nu al vergeten wat we bij de vorige kar deden hahah
	4	Ik vind het veel beter ogen, maar het werkt nog nieet helemaal soepel. Hij is erg klein op de plek waar je de spullen uitgeeft, en een beetje te zwaar.

Q20 Is het splitsen op de tafel handig of heb je liever een andere indeling?

A	1	Dat is wel handig
	2	Splitsen op tafel handig
	3	Andere indeling want splitsen op de tafel werkt niet, want de achterkant gebruiken we niet. Dus het splitsen van de delivery en pick up gaat nu niet echt. Tenzij je de achterkant echt gaat gebruiken maar met de hoeveelheid bestellingen die we nu hebben is dat niet realistisch. Je moet kunnen splitsen, dat de ander ook meteen duidelijk ziet wat delivery is en wat pick up. Nu is er geen scheiding van wat waar ligt (omdat we de achterkant niet gebruiken). Als je echt de achterkant gebruikt, dan kan het wel.
	4	Nu is dit niet helemaal praktisch meer, omdat de app hier niet op is ingesteld en de we ook niet een aparte plek gebruiken voor de deliveries. Wanneer het drukker wordt en dit weer gedaan wordt, is het handig misschien de achterkant weer te gebruiken voor deliveries.

Q21 Vind je dat de tafel in de huidige vorm in de weg staat tijdens het werk/in en uit lopen van de kar?

A	1	Ja je kan niet echt makkelijk de kar meer uit, we kruipen vaak onder de tafel door haha. Althans, je kan natuurlijk aan de achterkant eruit, maar als het zeil daar hangt ivm kou moet je dus toch onder de tafel door.
	2	Nee je glipt er wel makkelijk langs
	3	Ja, die poot is echt vreselijk. Die trap je elke keer omver.
	4	Veel minder dan in de vorige kar! Een beetje, maar ik ben er al aan gewend.

Q22 Als je nog opmerkingen hebt over de tafel die je niet hebt kunnen noemen, dan kun je die hier plaatsen.

A	1	Hij is weer best wel zwaar en misschien onnodig lang
	2	-
	3	Te zwaar. Totaal onhandig ding. Weg ermee
	4	-

Q23 de openklapbare zijkant (klep) van de hub is prettig in gebruik.

A	1	1 ✓ · · · · · · 7
	2	1 · · ✓ · · · · 7
	3	1 ✓ · · · · · · 7
	4	1 · ✓ · · · · · 7

Q24 Zeg in één zin wat het onhandigste is aan dit onderdeel van de kar:

A
1 Te hoog en te zwaar.
2 Het gewicht, de steunberen werken niet goed en de poten voegen weinig toe
3 Ik heb meer dan één zin nodig hoor ;). De klep is te zwaar.
4 Het is giga zwaar. Ik voel me heel klein haha

Q25 Zijn er afgezien van het hierboven genoemde nog dingen die je kwijt wilt over de klep?

A
1 Dat systeem met die zwarte 'veren' werkt ook niet goed en is daardoor gevaarlijk.
2 -
3 De klep is te lomp, de poten hebben geen krik systeem waardoor ze vastzetten onhandig is en die flappen aan de onderkant zijn erg nutteloos. Met wind wappert dat als een gek en dan ziet het er armoedig uit. Ik denk toch dat het binnen staan in de kar beter is dan zo half buiten.
4 -

Q26 Wat mist er volgens jou nog aan functionaliteit in de hub? (bijv. Extra opslagruimte voor bepaalde dingen, een bureau voor administratieve zaken, of iets heel anders)

A
1 Stoeltjes om op te kunnen zitten en heaters (en dan niet van die blaasdingen, want dat helpt niet en is zonde van de stroom)!
2 Ja een bureau zou fijn zijn, of iig een open ruimte die niet wordt gebruikt om ook dingen neer te leggen zoals de zeilen enzo
3 verwarming voor koude dagen, opslag voor de plastic zakken. Een echt opslag deel en een deel waar gewerkt wordt.
Nu is de originele werkplek (de achterkant) omgetoverd tot opslag. Het ziet er rommelig uit en werkt niet echt want je zet de achterkant nooit open omdat daar allemaal troep ligt. Duidelijke scheiding voor werkmateriaal (stickers, tasjes, schroevendraaiers etc) en voor belangrijke dingen zoals contracten, administratief spul etc.
4 Ik denk dat in de koude wintermaanden het echt handig is om iets meer vaste verwarming te hebben, neem als voorbeeld de twee verwarmingblokken die de buren aan het dak hebben hangen. Het kleine kacheltje werkt voor nu super, maar verwarmt toch echt maar 1 persoon heel plaatselijk.

Appendix IV

List of Requirements

overall requirements

1 Performance

1.1 The product should be able to facilitate enough power throughput for:
- At least 8 small coolers or 4 larger ones and a freezer.
- Charger for an electric bicycle
- Chargers for 3 phones and a tablet

1.2 The product should be able to contain at least 80 orders
- One order is equal to a crate with dimensions of 40*60*24cm

1.3 One person (currently only female P3, male P46) should be able to start up operations with the hub.

1.4 Food should never have to be put on the ground.

1.5 A bin should be integrated in the design.

1.6 The pick-up table should be able to hold at least 3 crates (40*60*24).

1.7 The product should facilitate an easy-to-use work-flow. (it should be faster than the current hub)

1.8 The product should facilitate a place for employees to store their valuables (like a locker).

2 Environment

2.1 The product should function in a temperature range of -5 to +30 degrees C.

2.2 The inside of the trailer should be dry when it is raining.

2.3 The storage compartments of non-cooled products should stay above freezing temperatures.

2.4 Enough ventilation should be built in to prevent condensation in areas where corrosion is probable or where food is stored.

3 Life in service

3.1 The product will be in use 6 days a week for 10 hours a day.

3.2 The product should last for at least 15 years.

4 Maintenance

4.1 Wheels should be accessible for maintenance.

4.2 The surfaces inside the hub should be easy to clean.

4.3 Parts that come into contact with food should be easily cleaned and replaced.

5 Production facilities

5.1 The product will be built by InnovaN.
5.2 InnovaN should be able to build the product.
5.3 Mass production may be done elsewhere.

6 Size and weight

6.1 The length of the hub should be 4 meters when closed
6.2 The height of product should be less than 250cm when closed.

7 Aesthetic, appearance, and finish

7.1 Local Heroes must be recognisable as a brand.
7.2 Colour scheme must be conforming the logo of LH.

green	RGB [93,215,160]	CMYK [68,0,55,0]	
blue	RGB [2,95,103]	CMYK [95,34,48,29]	
grey	RGB [83,83,83]	CMYK [60,50,49,44]	
red	RGB [255,92,64]	CMYK [0,80,71,0]	
pink	RGB [255,199,245]	CMYK [2,21,0,0]	

7.3 The hub should look inviting to the public.

8 Materials

8.1 Flammable materials should not be used.
8.2 Materials used on the exterior should be corrosion resistant to Dutch weather conditions.
8.3 Parts that come into contact with food should be made of food-safe materials.

9 Standards, rules, and regulations

9.1 The product shoud conform to the "marktverordering Amsterdam"

10 Ergonomics

10.1 It should be easy to get in and out of the product without ducking or other non-natural motions.
10.2 There should be no possibility to stumble or trip over something in the product.
10.3 All text and signage in the product should be visible without the need to duck.

11 Reliability

11.1 The mayor parts of the hub should be able to withstand regular use for at least 2 years.
11.2 The critical parts (cooler, crates for storage) may not fail first.

v2 table requirements

1. One person should be able to install the table.
2. The main measurements of the table should stay the same; 320 x 50 cm.
3. The table should use the existing attachment points on the hub during installation.
4. The table should be entirely supported on the hub. No parts should touch the ground.
5. The working surface of the table should be 90cm high measured from the ground.
6. The entrance to the hub, when the table is installed, should be as wide as possible without decreasing the width or depth of the table.
7. The installation of the table should be such that it is not possible to detach the table without disassembling it first.
8. The table should be made with the material of the old model.

v2 interior requirements

1. The shelving system should be faster to deploy and stow away than the current solution.
2. The shelving system should weigh less than the current solution.
3. Employees should be able to take multiple products at once out of a slot.
4. QR codes should face the employees.

Appendix V

Points of improvement V2

Flap

- Too heavy
- Does not fall into latch
- Support bar doesn't function properly
- Little to no daylight

Ceiling/side panels

- Water damage
- Non scratch resistant

Appearance

- Closed/non inviting
- Appearance may be less important than initially thought

Inner side/slots

- Used materials erode faster than thought
- Stowing of slots is cumbersome
- Current QR-system facilitates a information overflow
- No extra thought was given to extra functionalities of the product

Table

- Too heavy
- Quite low
- Breaks easily
- Sometimes in the way of day to day operations

Points of value V2

Flap

- Integrated lighting
- Everything is mounted to one part, ensuring little actions are needed to start operations
- Simple to close during lunch-break

Ceiling/side panels

- Customers sheltered from rain
- Fun information for customers on tv screens

Inner side/slots

- Way better than previous product
- More flexibility in slotting due to sheer number of slots

Table

- Radiates professionlism
- Quite wide, facilitates multiple actions due to this

Appearance

- Professional
- No longer says ‘startup’

Appendix VI

V2 table design

Current design pictures

Table overview shot

Table details

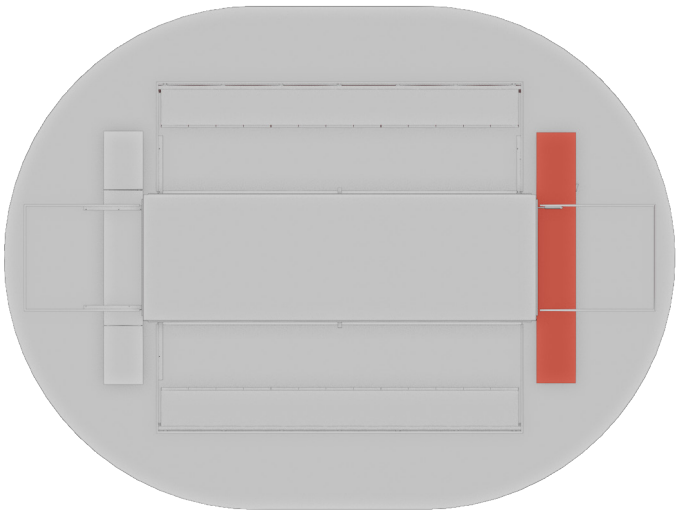
Faulty points

- Table is too low (now 70cm has to be 90cm)
- Table is heavy, maximum carry weight should approximately be halved
- Hinging porting is susceptible to damage
- Legs on the end of the table are kicked aside at times
- Difficult to exit and enter the hub with the table in place

Initial Ideas

One of the main ergonomic concerns of the current table is the difficulty to move in and out of the hub. The space between the table and the wall is too narrow. This can be seen in the image to the right.

After talks with employees at the hub, several table designs were considered. These can be seen below. In the very first hub, a beer table was used. Since LH still has this table it could be a viable option to improve the v2. Another option could be a picnic table. Alternatively, an entirely new design might be the best solution by maximising the table area whilst maintaining the sturdiness of a fixed table.



Hub top view with original table

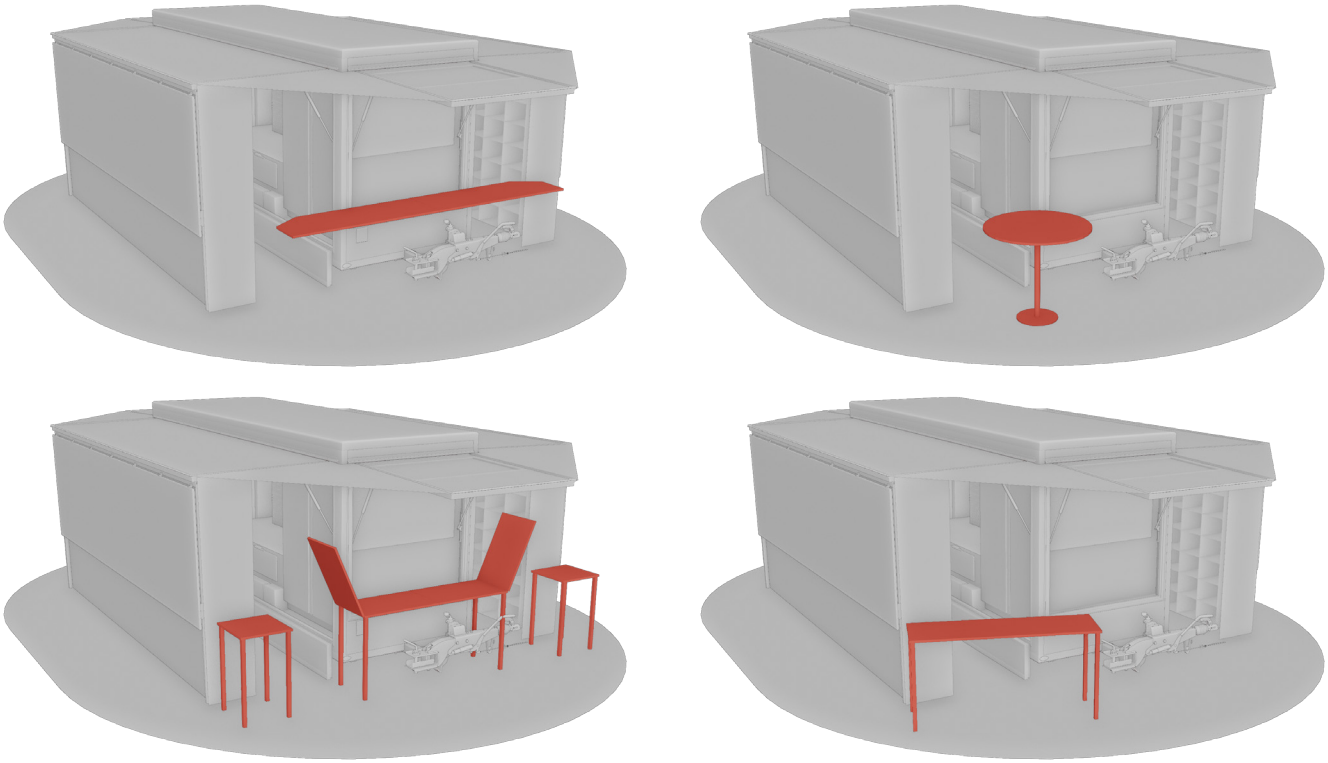


Table ideas

In the end, LH opted for a new design. The curent product already has infrastructure in place to install a fixed table. And the wood of the original table can be reused for the new one. Whereas if LH was to use a beer table or a similar solution, the old table would become useless. Another reason for

Proposition

- Table 90cm height
- Tabletop made from two independent pieces, not physically attached to each other
- No hinges in the design
- No legs that go down to the ground
- Sliced off corner of the tabletop for easier access

Design

After the first meeting with InnovaN, the following design was established. It met all the requirements. The tabletop would be made from the wood of the original table. The support structure would be made of welded steel tubes and sheet. In order to assemble the table, the employee would need to put in the central support structure and the corner supports onto the trailer first. Then the wood tabletop could be put on top of the support structure. The tabletop could slide into a u-profile beam on top of the central support structure. A pin on the side supports would go into a hole in the table. By using this assembly method we would prevent damage due to improper handling of the table, which is what happened with the current table.

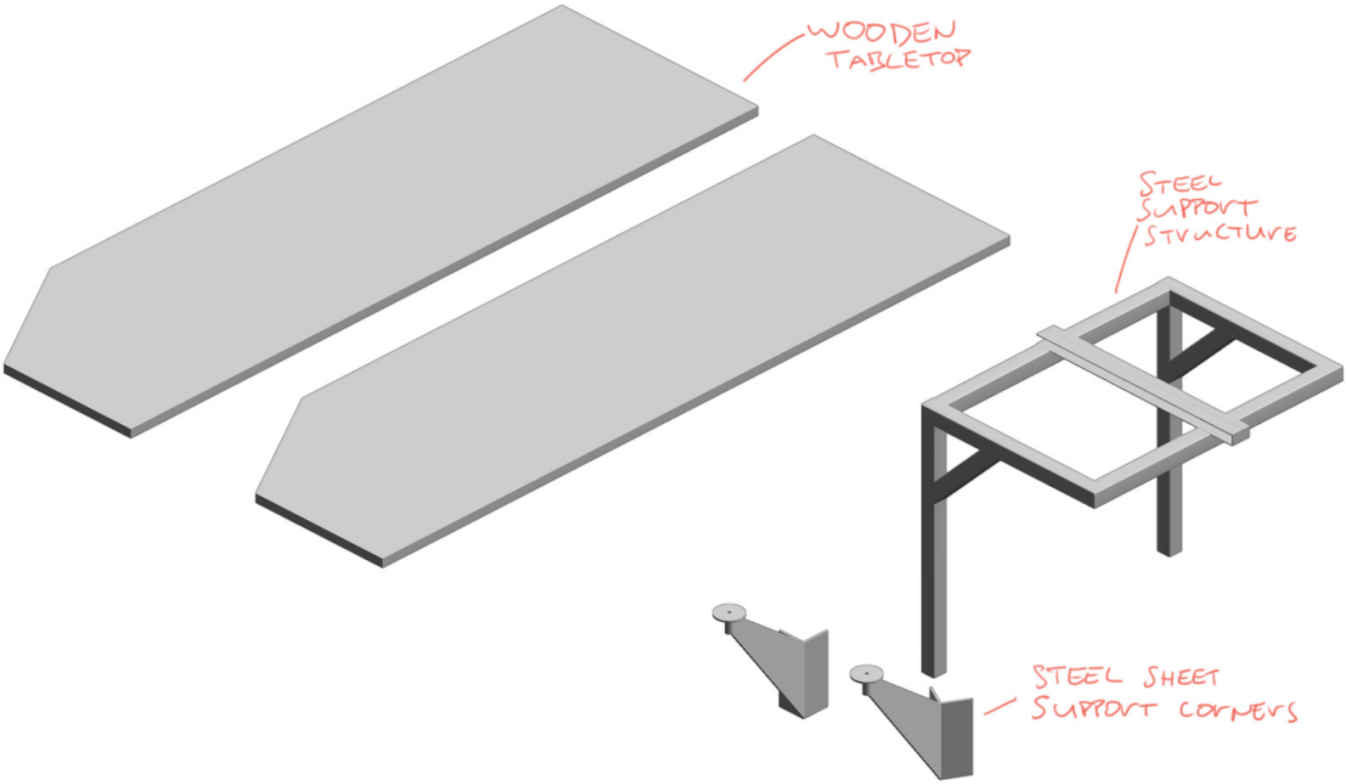

WOODEN
TABLETOP
STEEL
SUPPORT
STRUCTURE
STEEL SHEET
SUPPORT CORNERS

Table parts

Table detail: U-profile with tabletop

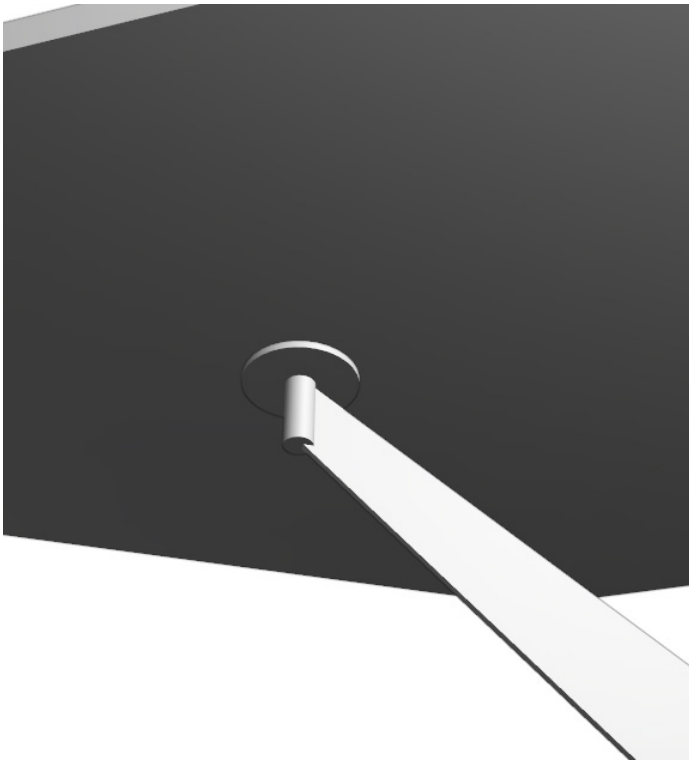


Table detail: side support under table

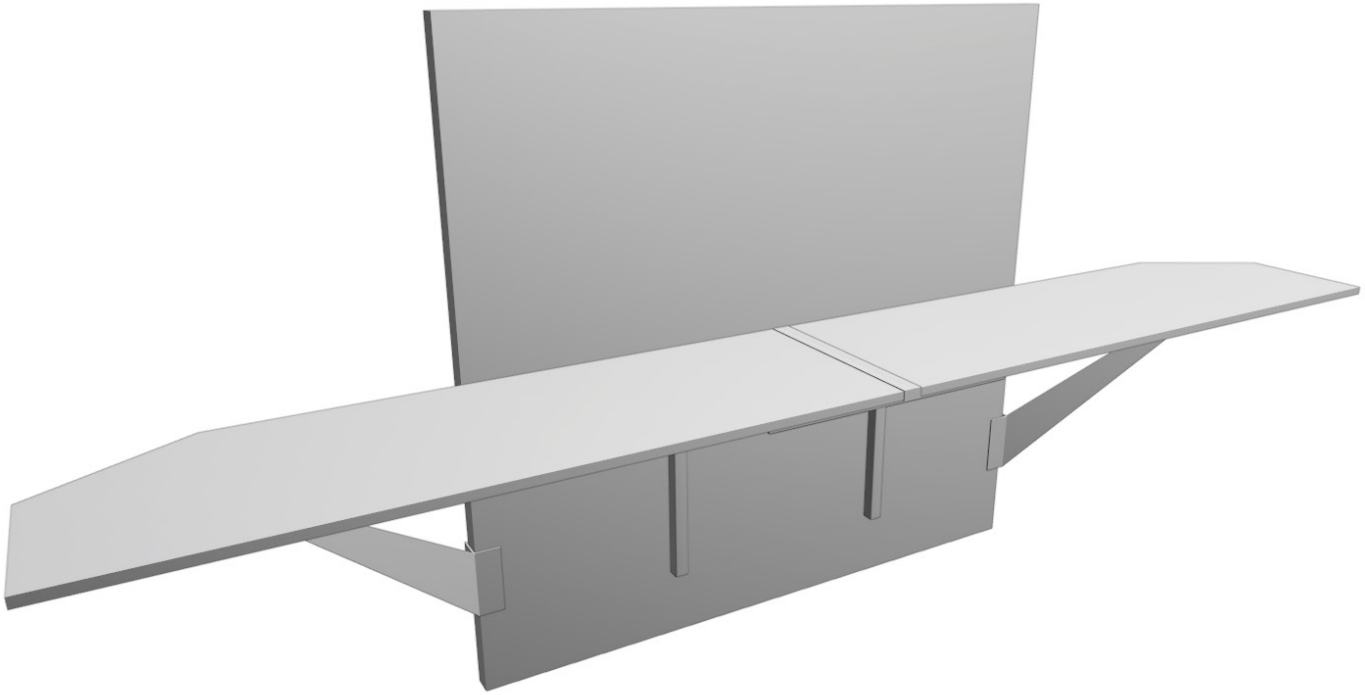


Table design overview

Changes based on manufacturing limitations

Unlike what Innovan had said during initial conversations, they were unable to produce the proposed design. InnovaN works extensively with square steel tubing. So they wanted the design to be made from this stock material. Concern was also made for the lack of vertical locking that the design had. The newly proposed design has locking keys that hold the table down on the supports. But they do not make it possible to remove the tabletop together with the support structure.

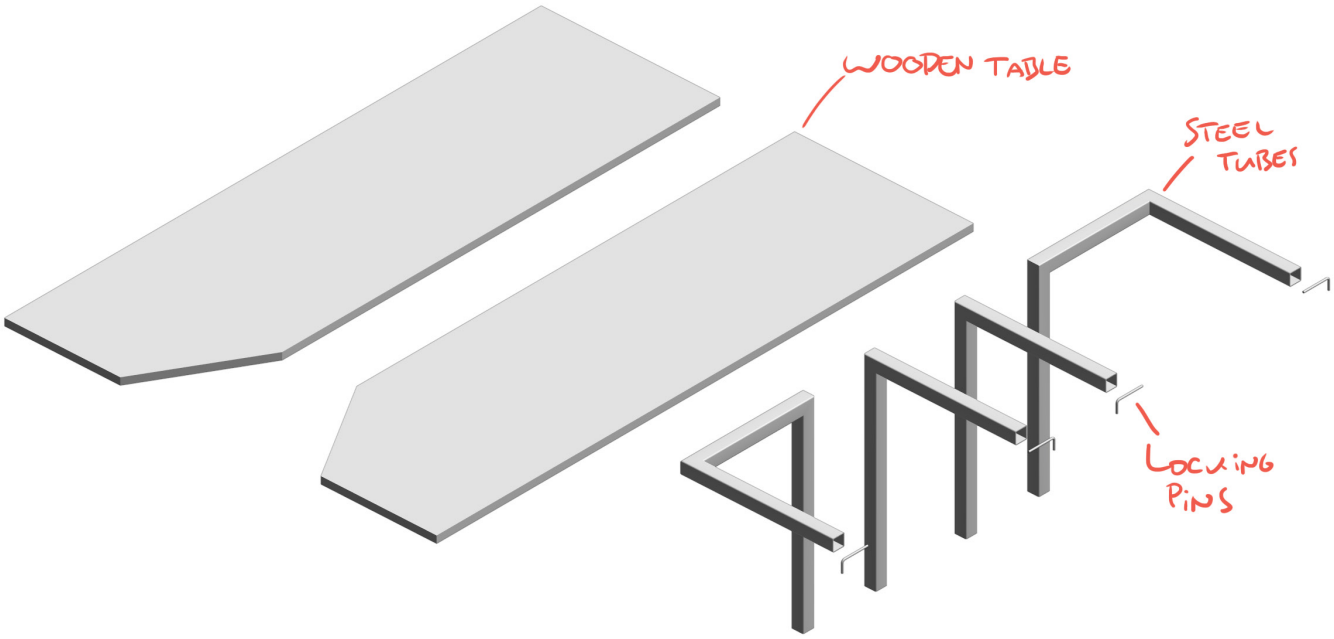
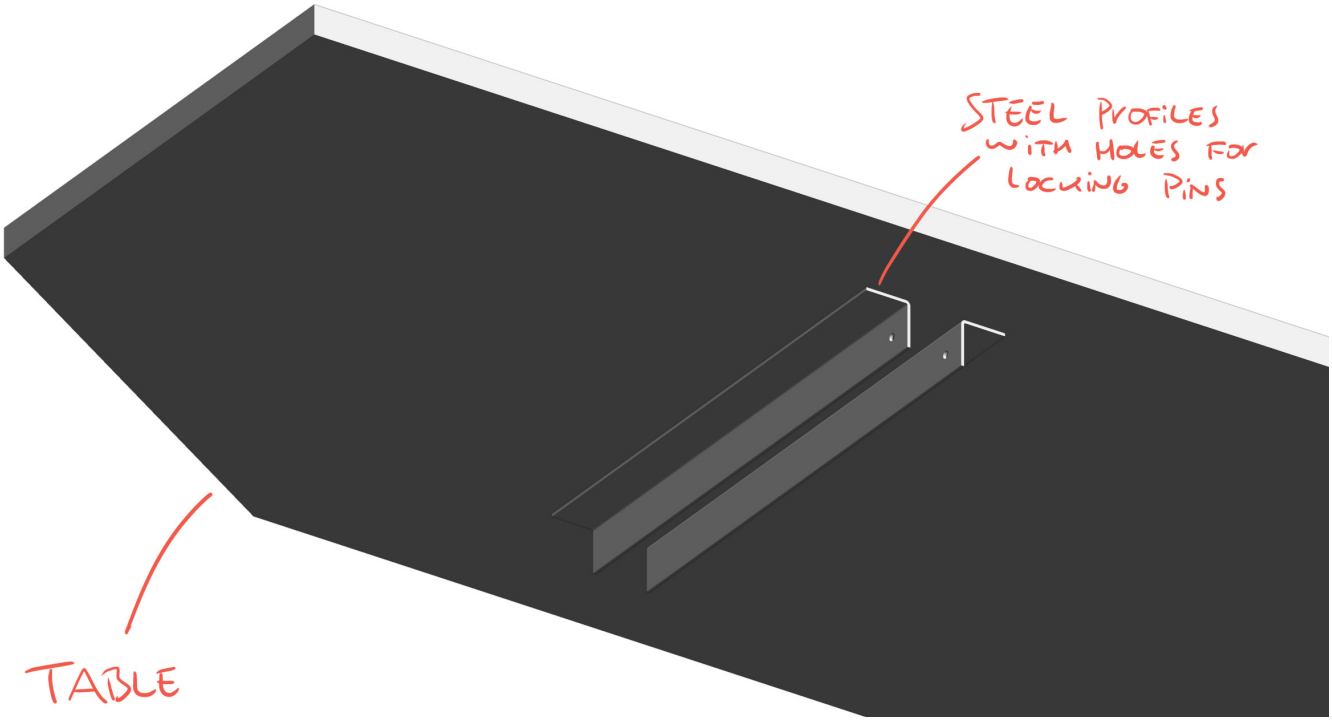


Table parts



Underside of table with steel profiles screwed onto it

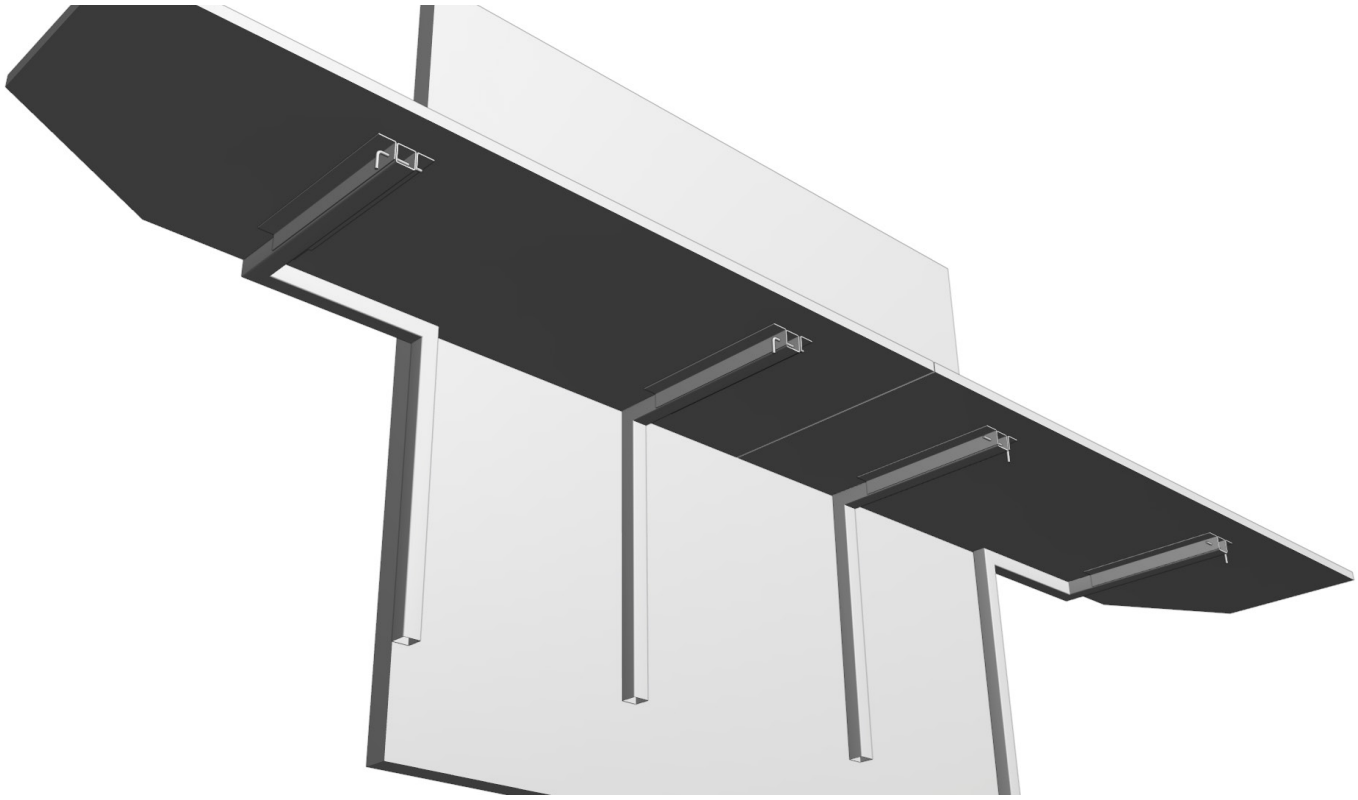


Table design overview underside

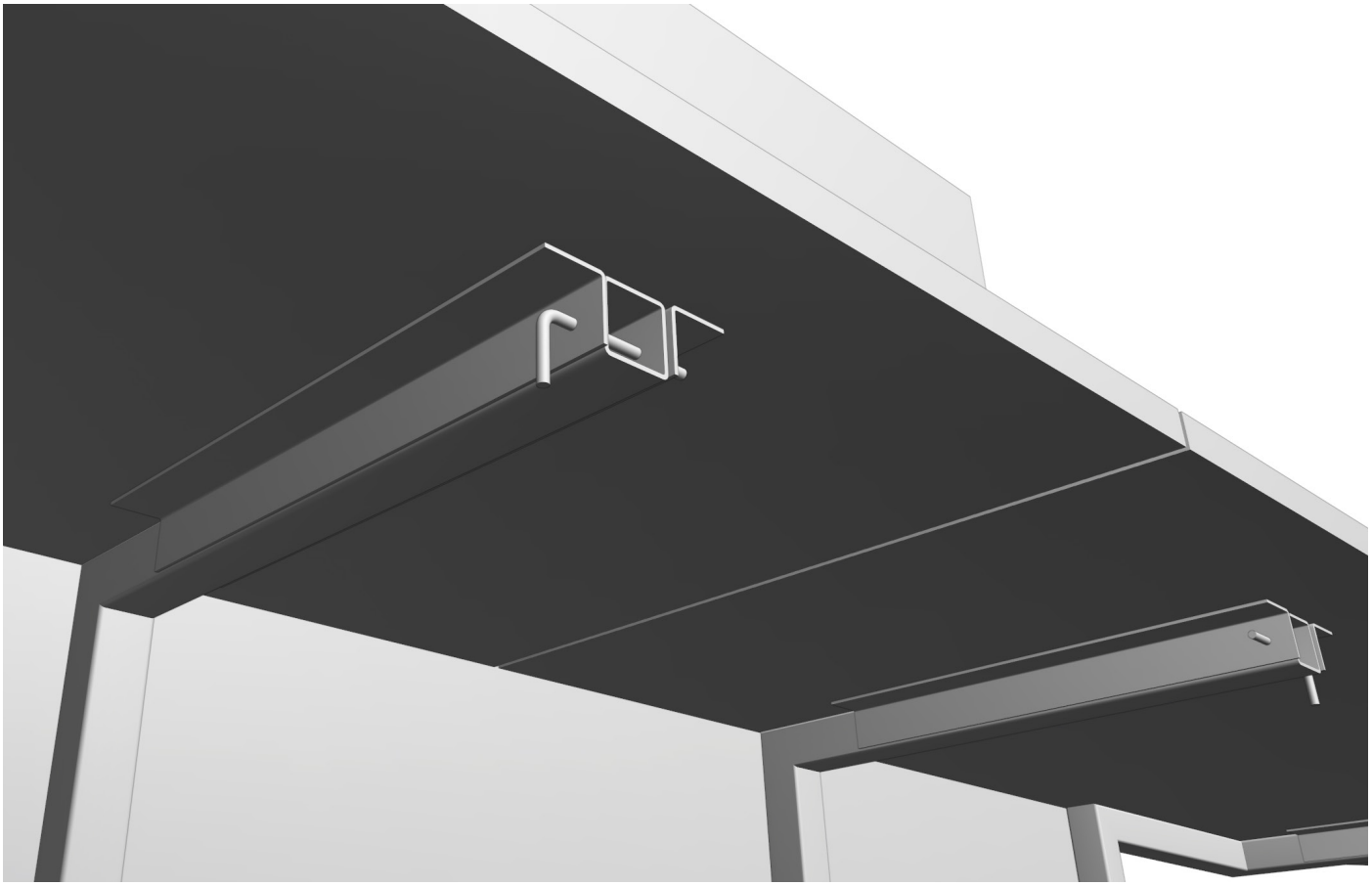


Table design detail underside

The support of the new design consists of four steel welded tubes, that can be attached to the trailer by inserting them into slightly bigger tubes that are glued to the trailer. On the end of the tubes are holes, through which a locking pin can be inserted. Under the tabletop, L-profiles are installed as guides for the support members. The supports slide into the gap between the profiles and then a locking pin can lock the table in place.

Table installed on the hub


Apps
Pro mode tool
YouTube
YouTube
vevo
Local
Heroes

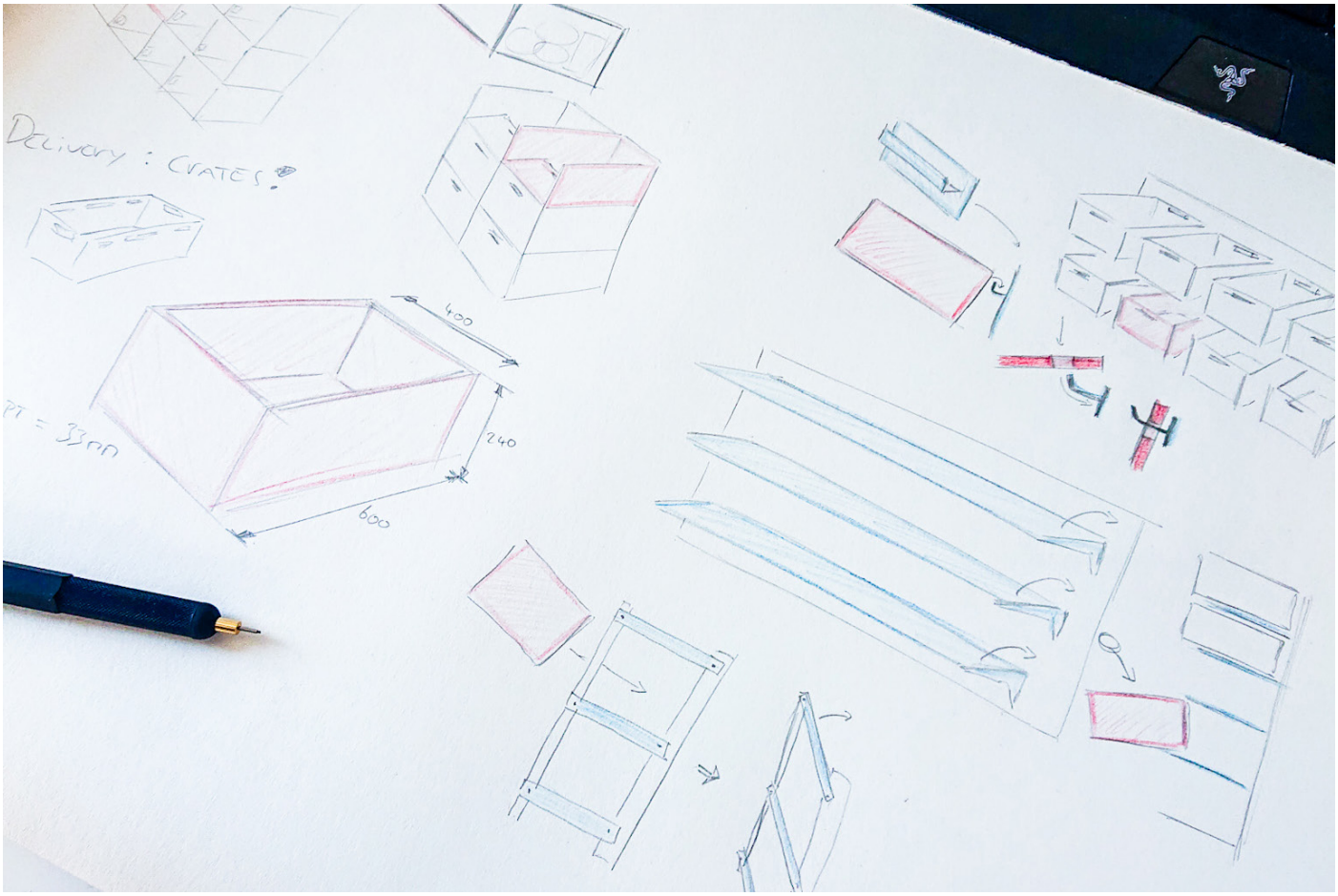

Apps
Pro mode tool
YouTube
YouTube
vevo
Local


YouTube
YouTube
vevo
Local


Apps
YouTube
YouTube
vevo

Appendix VII

V2 Interior shelf design



After it was decided to use crates directly as slotting positions for delivery several possibilities were considered. One option was to have long planks slot into struts that would be installed into the side panel. Another was to have hooks in the side panel on which you could hang a crate. Employees did not like this idea, however, since they wanted to be able to slide the crates back and forth. The design would also require more vertical space to get a crate out of the wall. This is not ideal since as many crates as possible should be installed on the wall for maximising profitability.

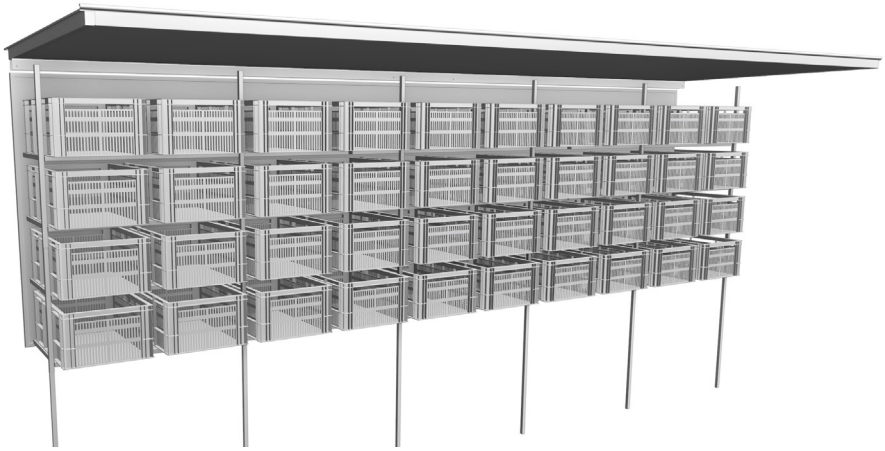
A tower of crated with one side flipped open was also a possibility, but after a brief test on the hub, it was found that this would become unstable once there were more than 3 crates stacked on each other. The big shelves with struts underneath was also deemed impractical. The struts required meant that the entire system would be difficult to fold up. A small prototype was built using foam board and can be seen on the next page. Another candidate was a parallelogram structure. A prototype of this was also created and can be seen next to the previously mentioned prototype. This was seen as most promising by the company and employees. Therefore it was chosen to be developed further.


Shelf with struts prototype


Parallelogram prototype

As can be seen above, both systems worked. But for the left version, you have to put each shelf up individually. Whereas the right version, everything folds up in one go. Next, a design was made in CAD. This was done to validate how many crates could be fitted onto the side panel. At the same time, a real-life test was done by installing an IKEA shelving system into the hub to test the crates in a vertical position.

The real-life test was a success, with employees stating they preferred this method of working over the old by a large margin. After trying out several combinations of crates per shelf, it was found that a system where there are 5 shelving systems with room for 2 crates in width was most efficient. Theoretically, a system could be made for a total of 11 crates horizontally, but it was later found out that the room measured in the CAD model was slightly longer than the actual space we had to work with.



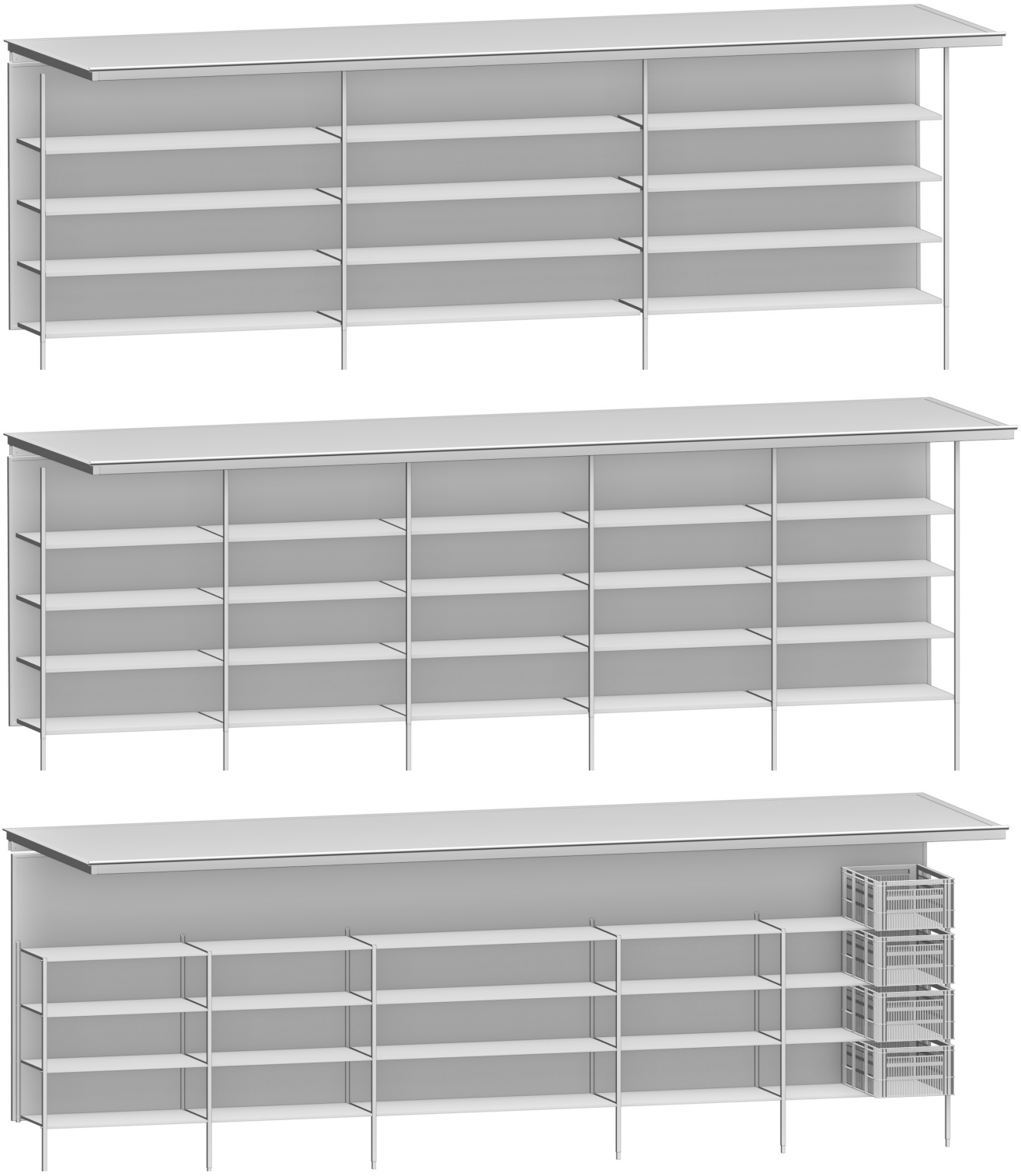
Representation of shelving system

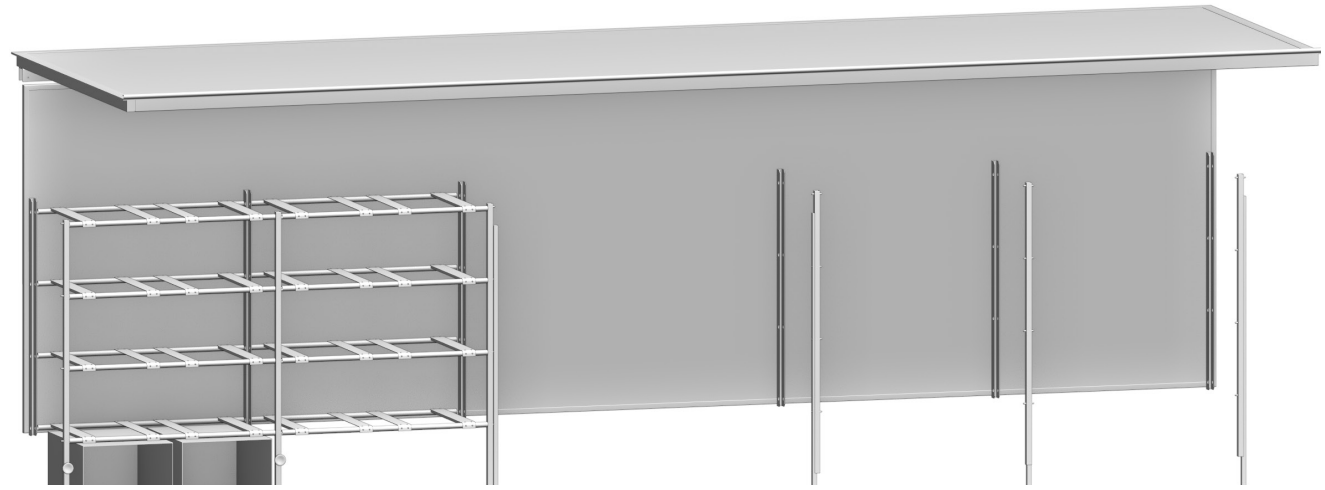
IKEA shelving test

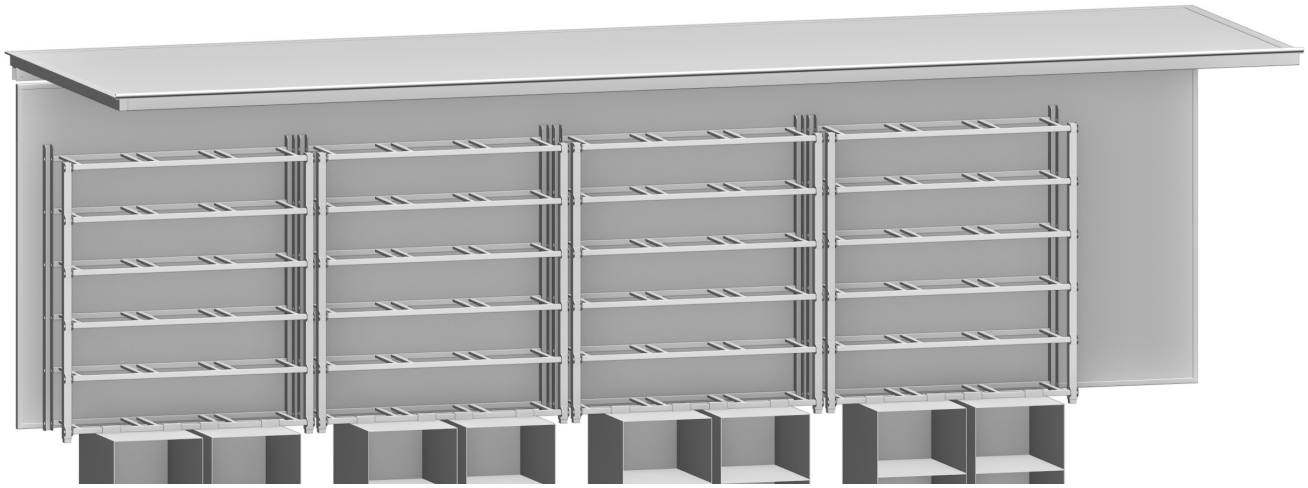
A total of 4 crates could be stacked on top of each other. This means that there is room for a total of 40 crates. With each crate being slightly larger than two cloth slots combined, this translates into a volume of more than 80 slots. Not all orders require this much room, however. More research on the efficiency is therefore still required and will be done by a fellow graduation student who graduates in the field of logistics.

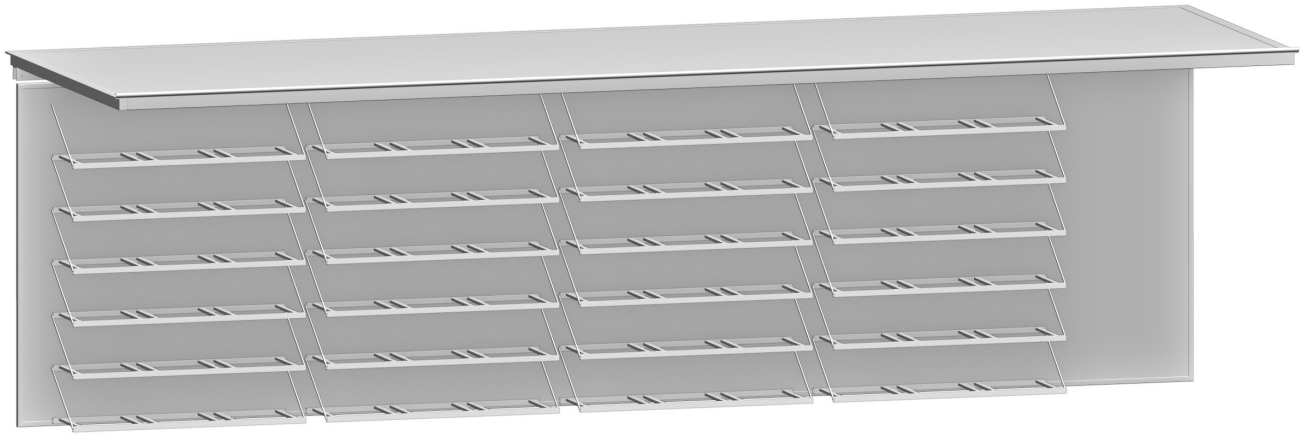
Iterations and InnovaN

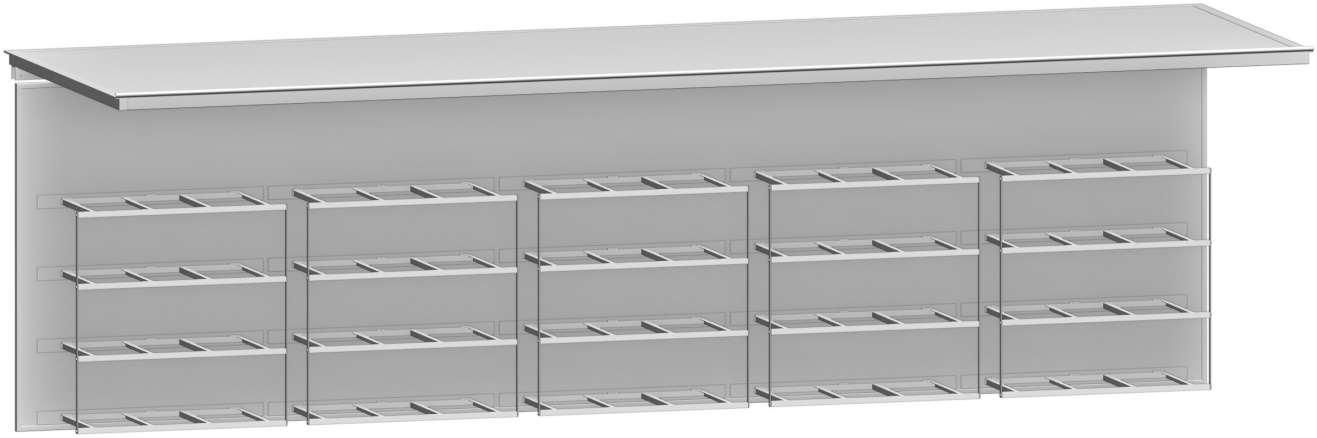
Next steps were iterations made by me together with input from Jakko at InnovaN. He would suggest changes based on what InnovaN could make and what would be cheapest. The biggest part of the influence on InnovaN's part was the shelves themselves. They went from fully closed sheet metal plates to welded aluminium pipes with strips on them, to welded steel tubing, and eventually bent sheet metal. At all times the dimensions of the existing product dictated what was possible to build.

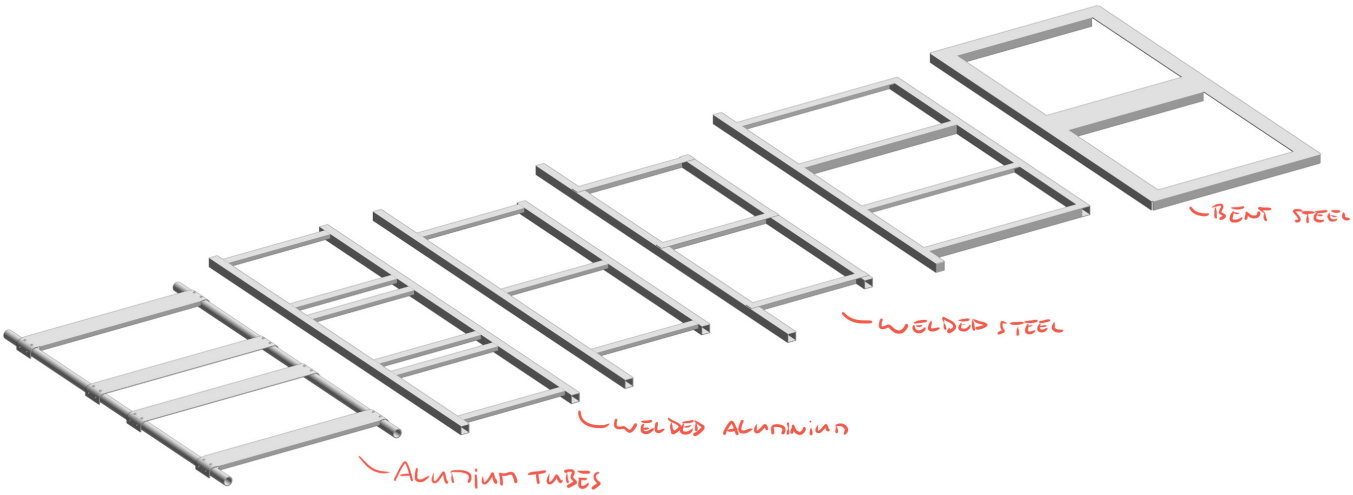






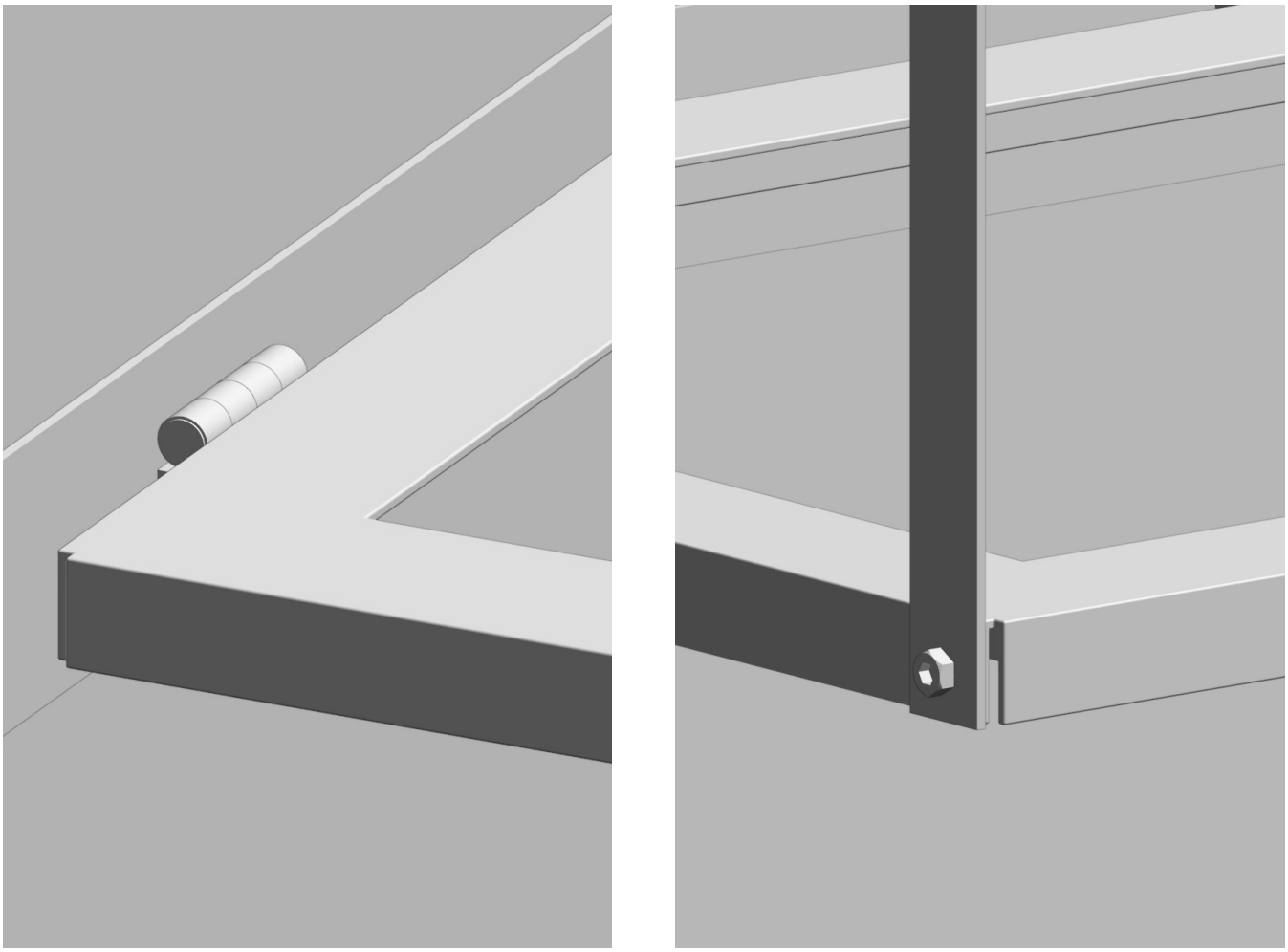




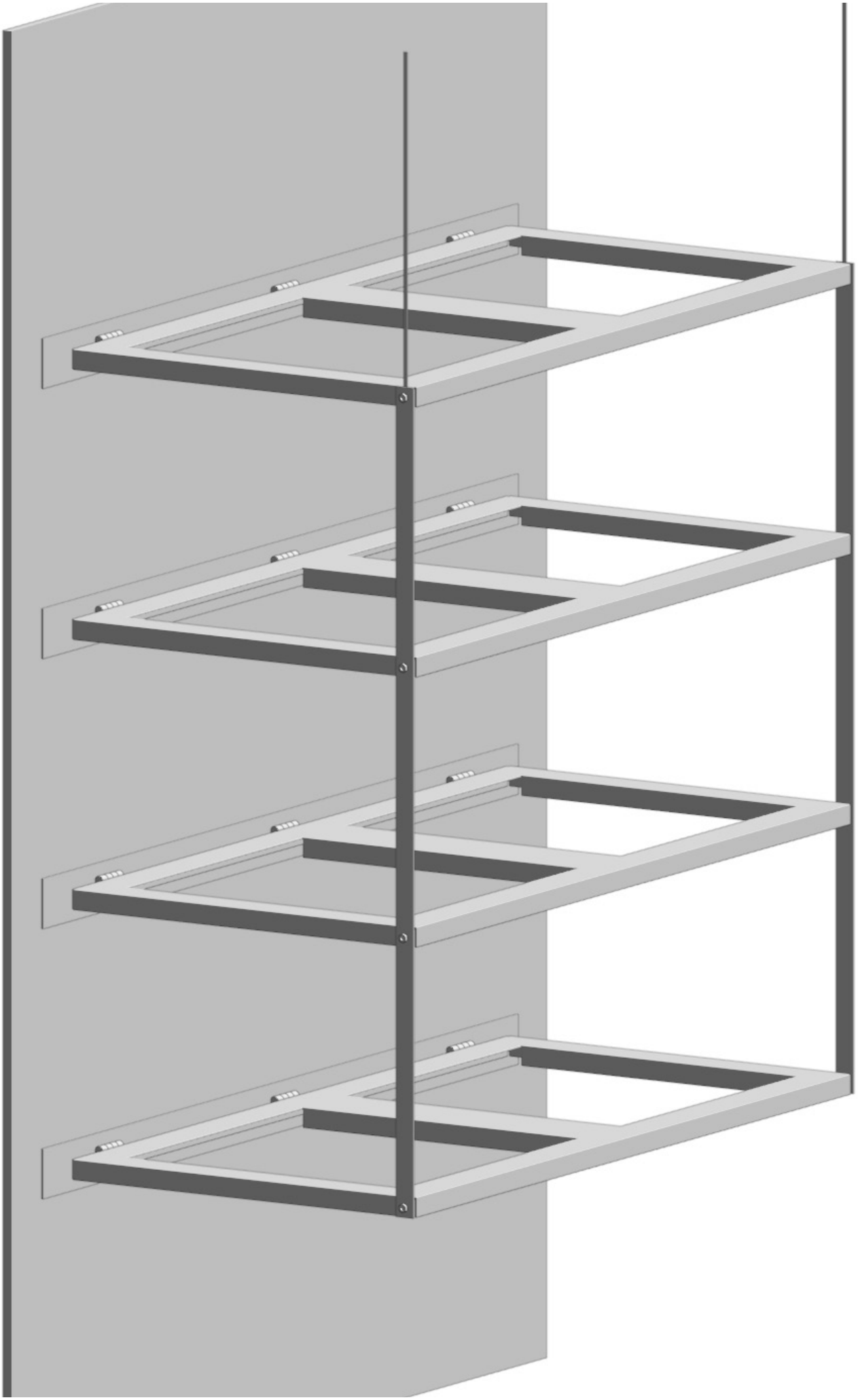


Iterations of shelves

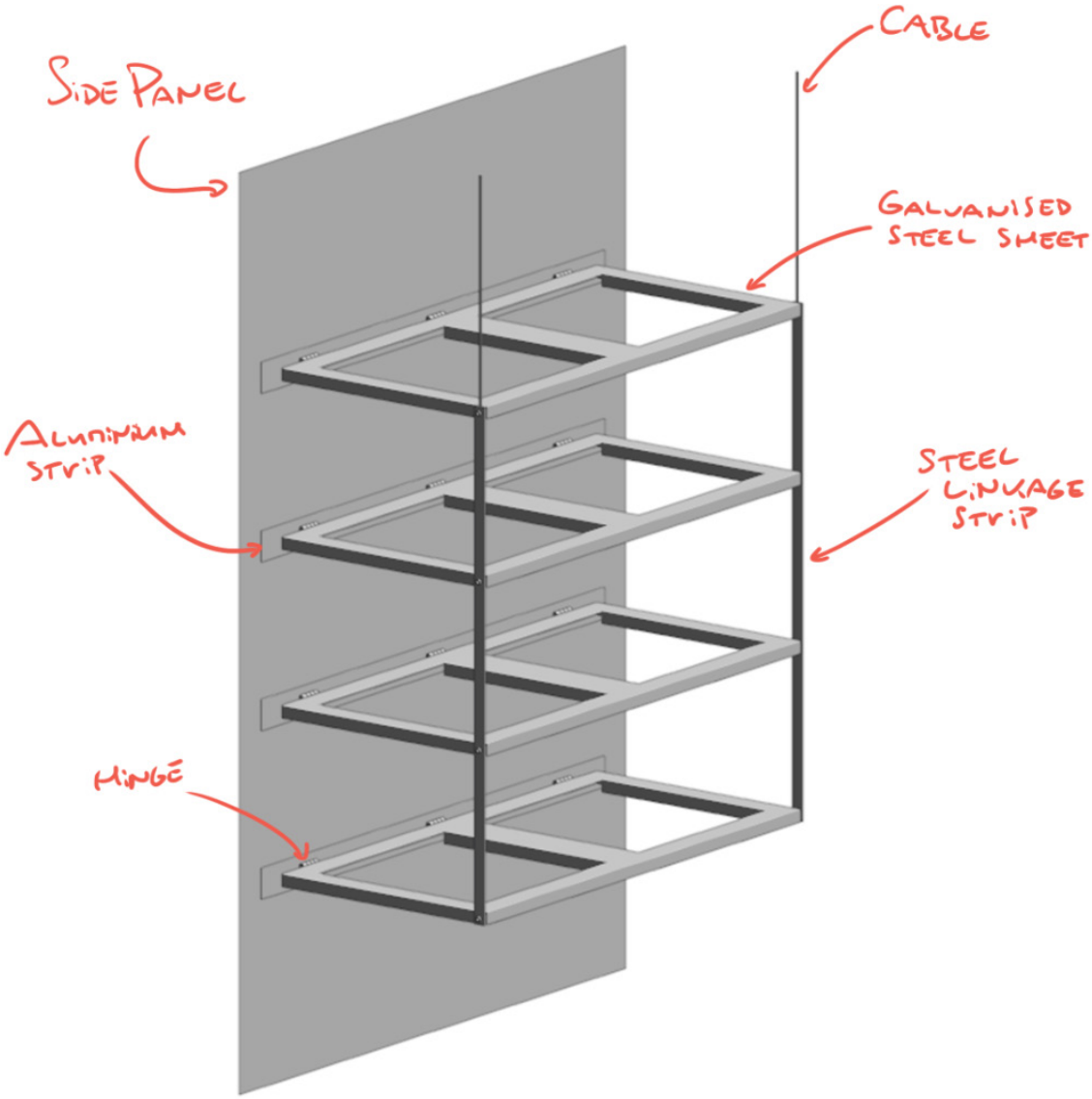
InnovaN likes to work with aluminium and stainless steel since these metals do not rust. The aluminium is light and the stainless is weldable. Jakko wanted to make the shelves out of stainless because this would be stronger than the aluminium with the dimensions that could be achieved in the existing product. The entire shelving system would then cost 1700 euros, however. By using bent galvanised steel, which is also rust resistant, the cost could be reduced to 500 euros.



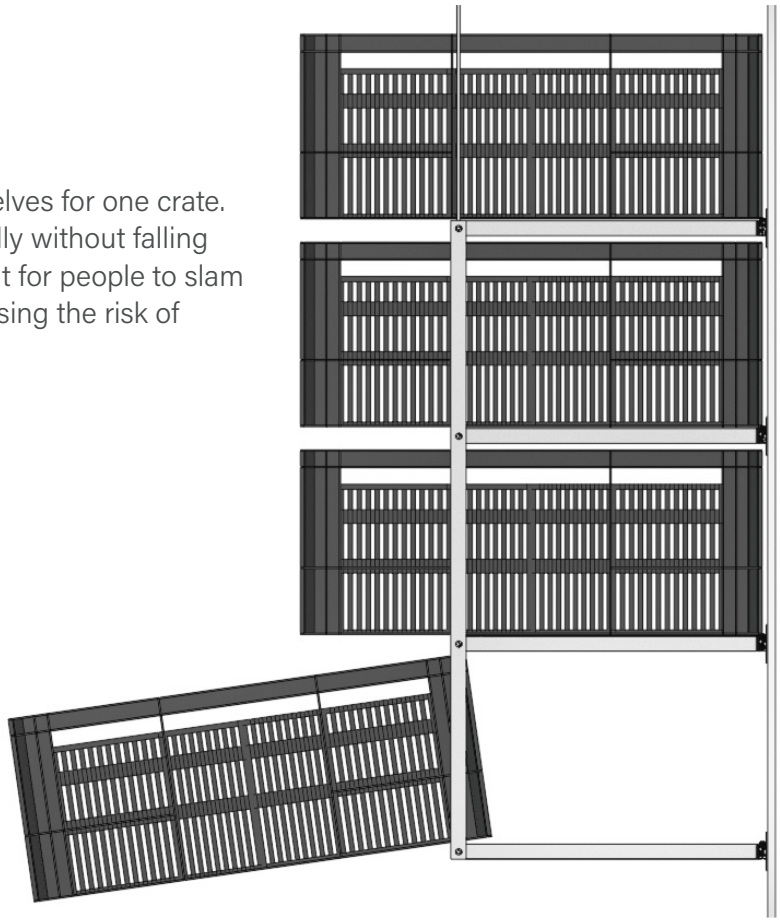
Details of the shelving system

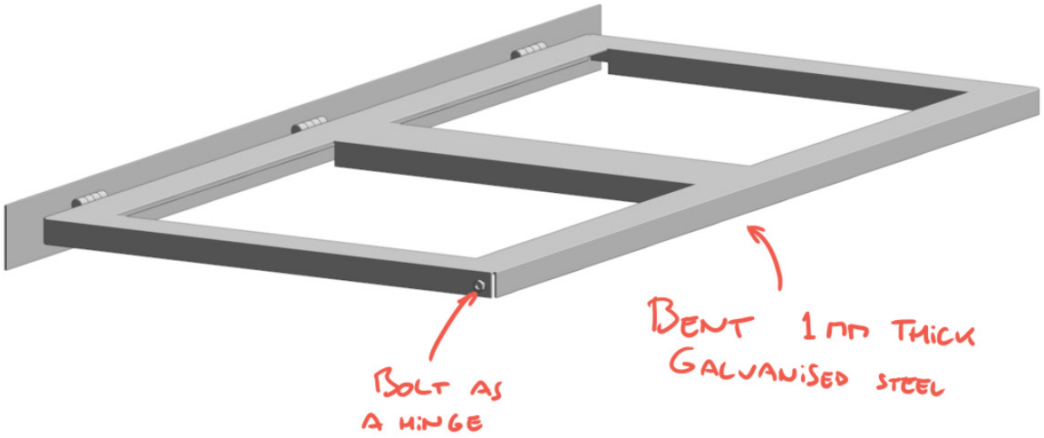


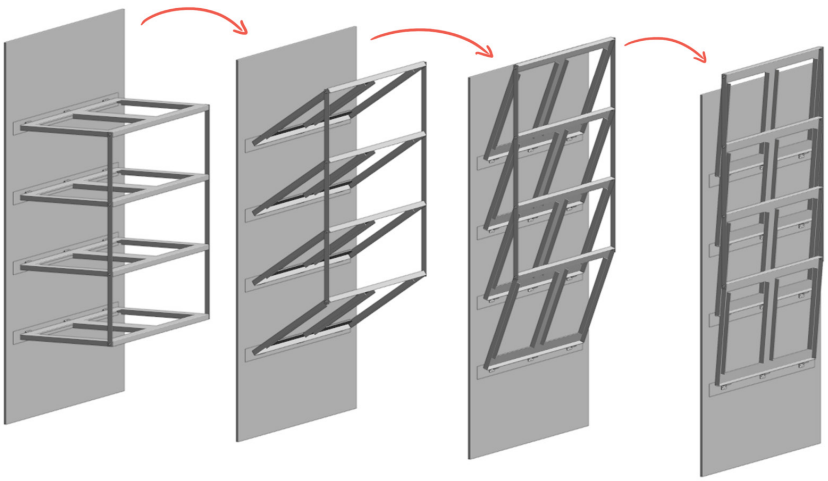
The design shown here was built in the first week of May 2021. Aluminium strips were glued to the side panel. These strips are a standard method of InnovaN to attach things to their sandwich panels. Since these strips will be supported by the sandwich panel on which they are glued, they will be strong enought to support the shelves. Then, galvanised steel sheets were mounted on these strips using metal hinges. The steel sheets are linked together with a steel strip. This linkage is bolted onto the sheets, but the links will be free to rotate. The entire shelving system can then fold upwards onto itself. To support the shelves in the open position, cables were installed from the ceiling down, onto the top shelf. A total of five of these shelving systems were installed. This means the entire system has room for 40 delivery crates. Below the system is room for an additional 30 crates if you stack them on top of each other.



There is exactly enough room between the shelves for one crate. This ensures that a crate can be slid out partially without falling out of the shelves. It also makes it more difficult for people to slam a crate onto the shelf with a high force, minimising the risk of deformation due to high stresses.

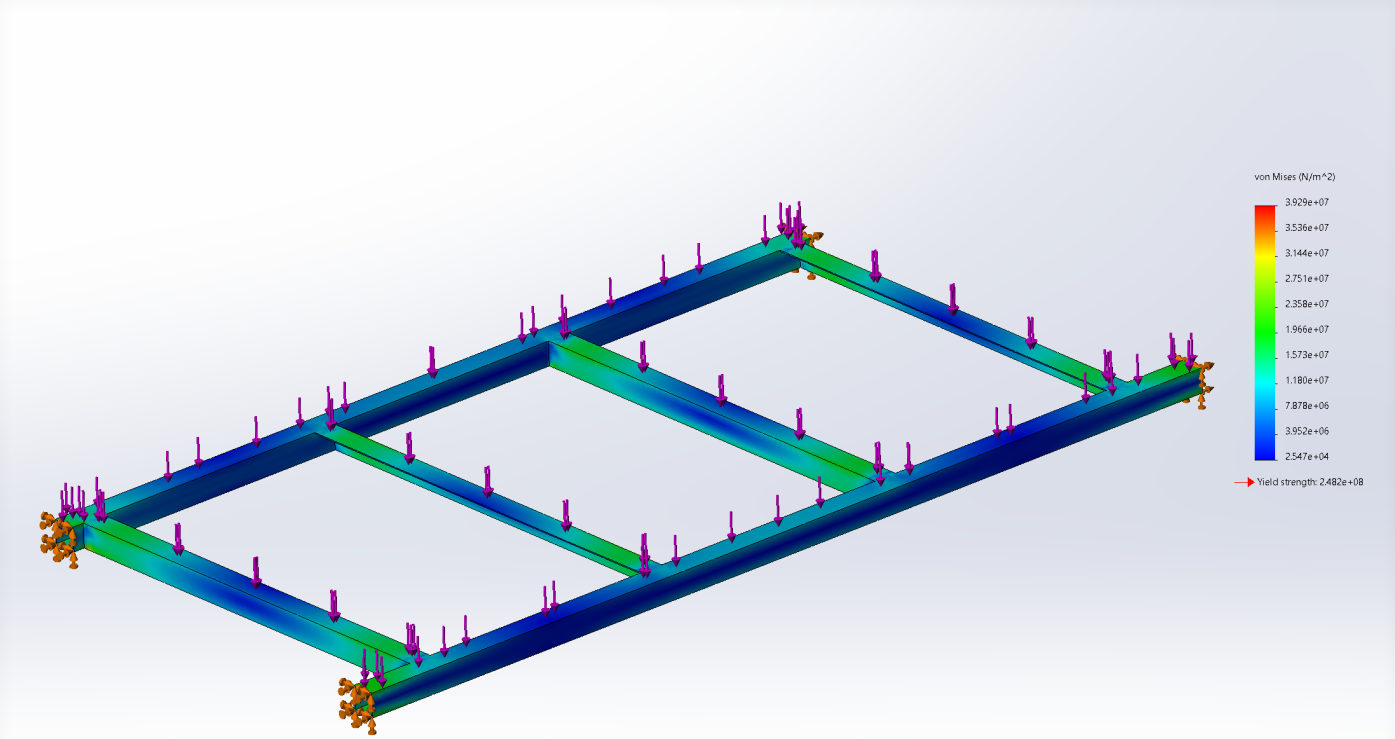






Strength test and validation

Simple stress tests were run in Solidworks to check whether the initial designs could hold the stresses involved in regular use. For these tests, it was assumed that each crate would hold 15kg of items and that there would be two crates on one shelf. The result of one of these tests is shown below. After these tests, InnovaN created a test setup in their factory to check the results from Solidworks. Here they took the same approach as the computer model and let the situation sit for a few hours after which they checked for deformation. Nothing was found and thus the design was deemed adequate.

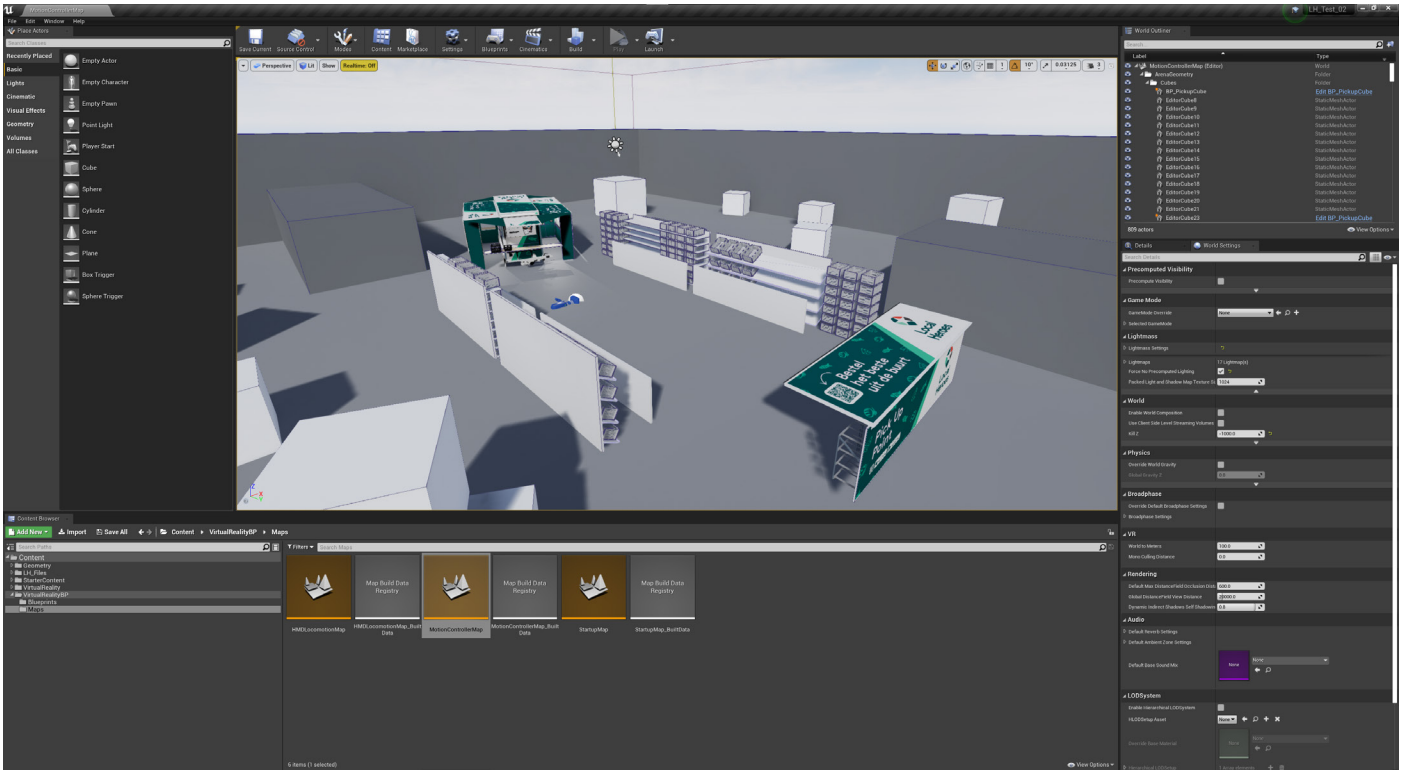


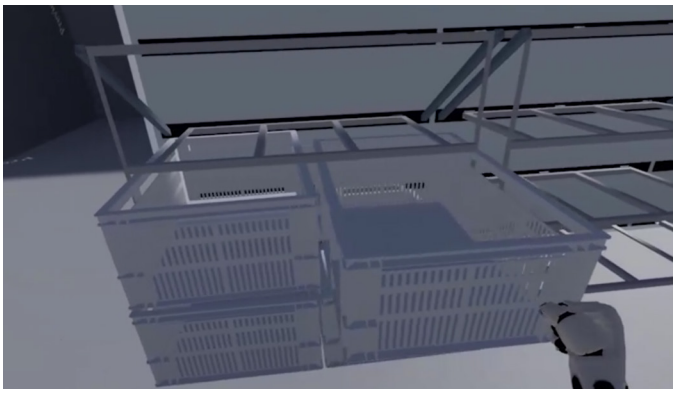
Solidworks simulation

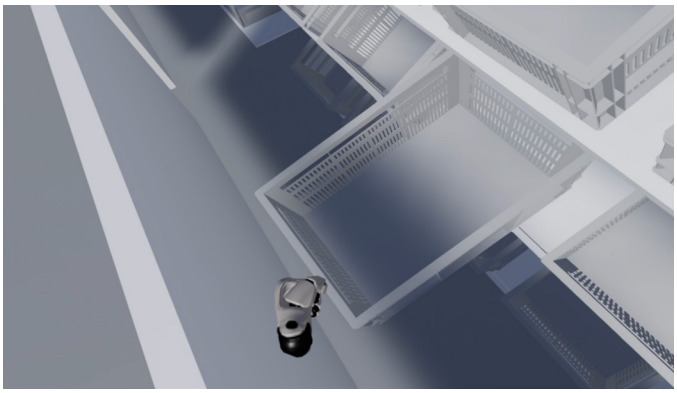
Test done by InnovaN

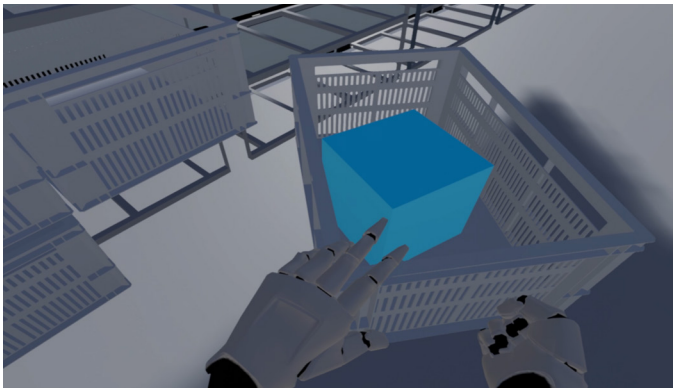
Other methods used

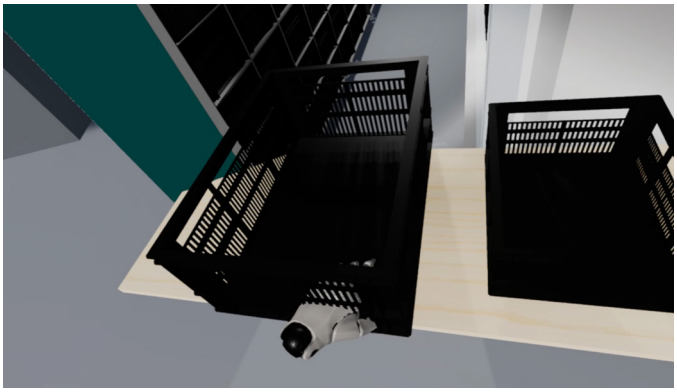
To get a better feel for the scale for the shelving system and methods of using the crates without actually being able to build a real-size test setup, I made a VR ‘playground’. By importing the hub together with some crates and some simplified shelving solutions I could try out what ways of storing the crates could work and what did not function.











Using ‘Unreal Enginge’ as a testing ground

Appendix VIII

Stakeholders

Local Heroes - Company

Who are they?

Maarten Coumans. Is the owner of the company. He makes final decisions and does acquisition management of potential investors.

What do they want?

Wants to make the company profitable by expanding the business to multiple locations city-wide. Potentially nation-wide. Wants to achieve this whilst staying true to the mission statement of the company: they want to support local entrepreneurs and strengthen the neighbourhood.

How will they get it?

By acquiring more funds he intends to deploy the concept of the company to more markets across Amsterdam. He wants the next hub to play a key role in this development.

Local Heroes - Staff

Who are they?

Employees who are working on the market. The hub is their workplace.

What do they want?

They want a space that facilitates their working needs. Everything has to happen inside the hub, so they need it to function effectively and without difficulty.

How will they get it?

During company meetings, they vocalise their ideas and thoughts about the working methods in use. Some of the employees work together with the IT department to make the technical backside of the operations more fluent.

Customers of LH

Who are they?

People who live in the neighbourhood of the hub and do their groceries with the LH app.

What do they want?

They want a system with which they can shop for food whilst supporting local stores. They want it to be as easy as shopping at a grocery store. And with Covid, they like to minimise the contact with people outside, so going to each individual store and stand in line is not desirable.

How will they get it?

There are plenty of alternatives to supermarkets these days. Picnic, Hello Fresh, AH online, Gorillaz, to name a few. The only platform which supports the small local stores, however, is Local Heroes. This is a reason for customers to keep using the app. But if an easier to use or better solution is available to them, customers will probably switch to the alternative. Keeping customers happy and listening to their feedback is important to keep customers loyal

City municipality Amsterdam

Who are they?

This is the governing body of the city of Amsterdam. Consists of a mayor, several councillors, and other civil servants. They decide on new policies and they uphold the law. They decide what is allowed to be done within the city limits.

What do they want?

The municipality wants a lively city with little to no vacancy in the streets. They want to keep the city attractive to businesses whilst also keeping the residents happy. Currently, there is a trend of vacancy among speciality stores. The municipality is searching for ways to fill up these empty stores and, in the first place, to prevent the stores from leaving.

How will they get it?

The city government can decide on policies that make new and innovative solutions to their problems possible. They control what happens in markets and in shopping streets. So if LH wants to expand their business to multiple markets across Amsterdam, they will have to work together with the municipality. The city government also has contacts that can help a company like LH to grow. They could be a powerful ally.

Shareholders and Investors

Who are they?

Local heroes is a startup, and dependant on external investors. These are people and companies who invested money into LH in return for a percentage of the company.

What do they want?

The end goal for investors is to make more money out of their investment. They saw potential in the business proposition of LH. They want to be assured that their money is invested in the right way, to maximise the possibility of a profit.

How will they get it?

Investors can have a large impact on the project. If they do not see the value of something, they won't put more funding into the company. Therefore, they require LH to meet milestones as a way to keep track of the development of the company. They can also bring contacts and networks to the table to help LH grow faster.

InnovaN

Who are they?

InnovaN is the current manufacturer of LH. They built the V2 and will also build the V3.

What do they want?

They want a profitable project that they can put in their portfolio. InnovaN likes to make one-offs where they have to come up with new and fun ways to make something work. The products from InnovaN are rarely exactly the same.

How will they get it?

InnovaN has years of experience in the building of market stalls. They have experience in working with clients and have the technical know-how to facilitate the wishes of their clients. They have good relations with most of their clients and also with their suppliers. This means they are flexible with their work, but it could also limit them in certain areas. Since they might shy away from trying something completely new because it can't be done by them or one of their suppliers.

Suppliers Local Heroes

Who are they?

These are the local stores which LH helps to sell their items. They are the local butcher an deli stores.

What do they want?

The suppliers need a simple way to sell their products to more people. They often lack an online presence. They want the solution to be easy to use and it may not take too much time to work with, since they have a busy schedule.

How will they get it?

The suppliers can simply walk out of the project from LH if they don't like it. Since LH is a startup and needs all its vendors, they often try to make things work one way or another. This puts the suppliers in quite a powerful position at the moment. However, talks with the suppliers indicated that they don't mind what kind of storefront LH has.

Residents and other market goers

Who are they?

The people who live in the vicinity of a LH hub or who are frequently visiting a market without making use of the service LH provides.

What do they want?

These people generally don't mind markets or even like them. They often do not understand what LH is and what the company does. They like to be informed and are thus potential new clients of LH.

How will they get it?

By offering discounts on the first order people make LH tries to bind new people to its service. LH also advertises in the neighbourhood to educate people of its existence and mission.

Appendix IX

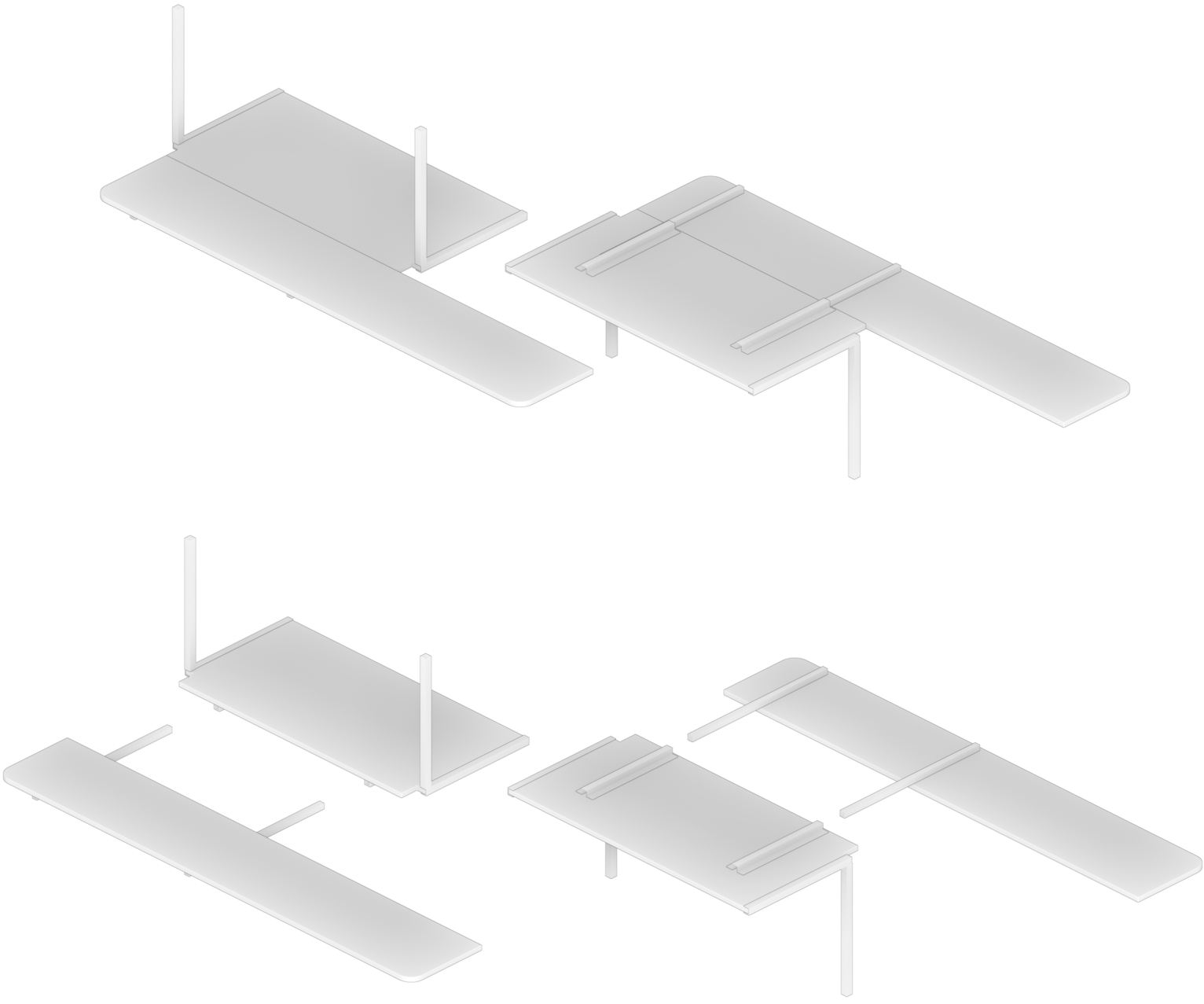
Competitors

Name	URL	Tags	Way of working	MOA
Local Heroes	https://www.localheroesonline.com/	iOS app, Android app, delivery, pickup, same-day, local vendors, pickup hub	https://www.localheroesonline.com/faq.html	€ 0 + € 2,50 delivery
De Lokalist	https://lokalist.nl/	webshop, delivery, local vendors	https://lokalist.nl/werkwijze	€ 35 + € 3,95 delivery
peddler.	https://www.peddler.com/	webshop, delivery, same-day, pickup	https://www.content.peddler.com/faq	€ 5
Picnic	https://picnic.app/nl	iOS app, Android app, delivery	https://picnic.app/nl/hoe-werkt-het	€ 25 + free delivery
Hurby	https://www.hurby.app/	courier	https://www.soellaart.nl/nl/pages/hurby-de-lokale-bezorgservice/	
Zupr	https://www.zupr.io/nl	platform non food, courier	https://warenhuis.groningen.nl/	
Bringly	https://www.bringly.nl/	courier, delivery, same-day	https://www.bringly.nl/oplossingen	
Albert Heijn bezorgen	https://www.ah.nl/over-ah/gemak/boodschappen-bezorgen	webshop, iOS app, Android app, same-day, delivery		Op di, woe en do bezorging vanaf €50 Bezorgingskosten tussen de €3.95 en €12.95 AH Bezorgbundel € 8 / maand alsnog minimaal € 50 / bestelling
Lokale Markten	lokalemarkten.nl	webshop, delivery	https://den-haag.lokalemarkten.nl/pages/hoe-werkt-het	€ 15 + € 4,95 delivery
Dorspleinen	https://www.stichtingdigitaledorpspleinen.nl/	webshop, delivery, pickup	https://www.stichtingdigitaledorpspleinen.nl/daarom/	€ 15 + € 3,50 delivery > € 25 free delivery
Albert Heijn pickup point	https://www.ah.nl/over-ah/gemak/pick-up-points	webshop, iOS app, Android app, pickup		Vanaf € 2
Local Heroes UK	https://localheroes.fadne.org/#	product bundles, delivery, webshop, pickup, local vendors	https://localheroes.fadne.org/how-it-works/	£ 25 + free delivery
Hoody	http://hoody.nl/	failliet	https://indebuurt.nl/haarlem/nieuws/nieuw-in/nice-je-kunt-nu-online-bestellen-bij-lokale-winkels-en-laten-bezorgen-in-haarlem~66748/	
Gorillas	https://gorillas.io/			
Order Daily 1	https://orderdaily.nl/			
Lokalist	https://lokalist.nl/			
Food Market Amsterdam	https://foodmarketamsterdam.nl/		Leveranciers van de food market (jan van Galen) die samen hun waren aanbieden alla Local Heroes. Tring Tring zit achter het initiatief.	
Mijn Winkel	https://www.mijnwinkel.nl/			
Shopsin	www.shopsin.nl			
Packaly	https://packaly.com/nl			
Lokaal ideaal	https://crowdaboutnow.nl/campagnes/lokaalideaal https://lokaalideaal.nl/stores			

Appendix X

V3 table design

The table for the V3 consists of two parts. The large tabletop has metal I profiles attached to it. These slide into slots on the support structure of the side panels of the hub. Once this part is installed, the second tabletop can slide into rails on the bottom of the tabletop. This can then be fastened with simple ‘keys’ that lock the smaller tubes into the larger ones on the bottom of the table. the extended section of the table slides into a u-profile which is located on one of the side panels.

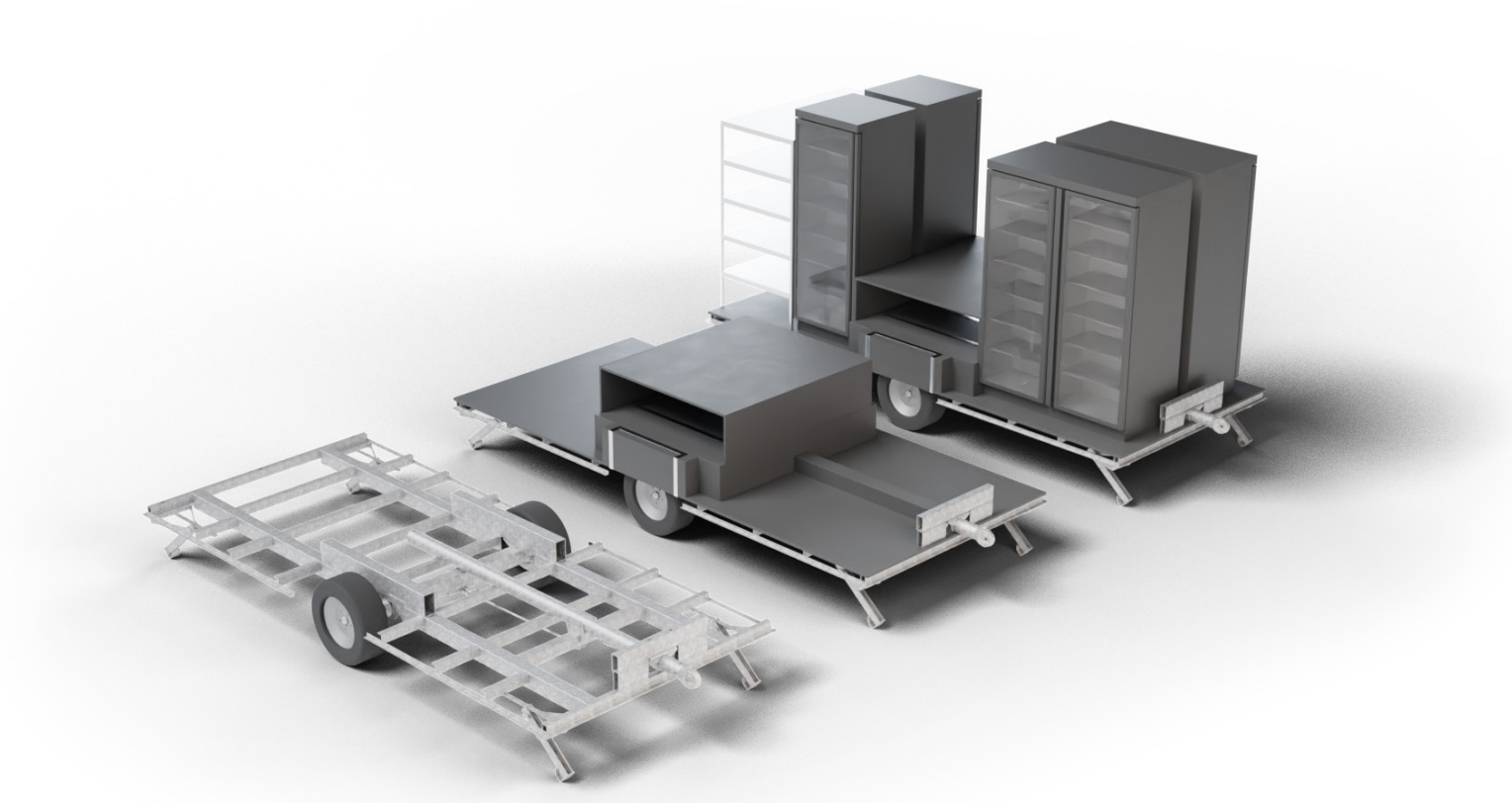



Up
ONTDEK HET OP
Google Play
Loca
Hero

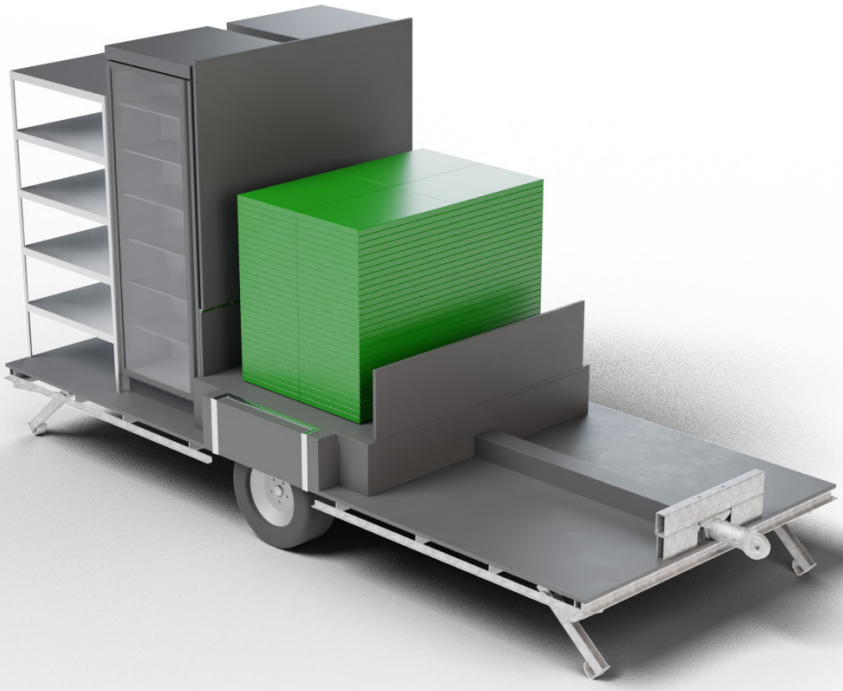
Appendix XI

V3 floorbed design

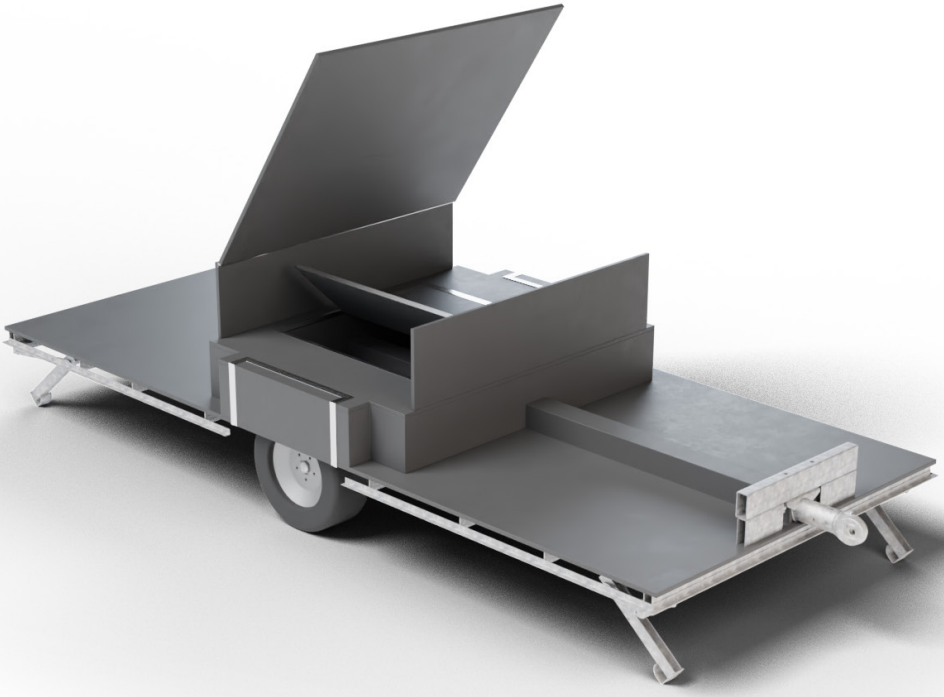
The floorbed is the part that is installed on top of the chassis. The fridges and a cabinet are placed on top of the floorbed. In between the fridges, a tabletop is placed. Underneath the tabletop is storage space and a lockable compartment which is positioned between the wheels. Employees can use this space during operations to safely stow away their valuables. To create enough space for all the crates, bins, customer table, and more the tabletop can swivel up. This creates the space needed to store all items inside the hub while not in operation. The floorbed of the V3 is made of 18mm thick multiplex.



Chassis - floorbed - Fridges and cabinet



120 collapsed crates in the centre of the floorbed for night storage



Lockable compartment between the wheels

Appendix XII

V3 sidepanel design

The side panel has been altered heavily when looking at the v2. The outer panel is cut into three separate pieces, making an optional opening in the middle for customer pick-up. The legs are no longer only situated on the outside but are also installed in the centre. They slide in tubes that are fixed on the two outer panels and they can be fixed with a pin, much like the tabletop from the v2. By fixing the legs to the outer panels the wind can no longer push the outer panels from one side to another, ensuring stability to the shelving system. The 'wind tarp' which is located on the bottom of the side panel is almost the same as the one in the v2. This time, however, there are rings that go around the legs of the side panel. This is done to fix the tarp and mitigate the tarp from fluttering in the wind. Something that is regarded as extremely annoying by hub employees.

Ring to fix the tarp around sidepanel legs

Fixed tube in which the legs slide

Side panel with all shelves collapsed, and the middle section opened

Appendix XIII

Euro Pool Crate choice

A shift from cloth slots to crates was made from the v2 to the v3. Euro Pool System is an organisation which produces reusable plastic trays for the food market in Europe. These trays are circulated within all logistic chains. This means that the trays are collected by Euro Pool and cleaned before they are returned into the food logistics. (Euro Pool System, n.d.)

There are several sizes of trays that are available within the Euro Pool System. All of these sizes are listed on the page to the right. Note that in the past, Euro Pool had blue trays. These are being replaced by the new green ones. The new trays can fold up to a max height of 30 mm. Most market vendors work with the largest crates (Amsterdam Ten Katestraat market vendors, personal communication, 19-03-2021). This is also the size which is used by Landmarkt, a supermarket specialised in local products, to deliver products to LH.

The tray that is mostly used has serial number 24603. It has the following dimensions:
- external (mm) 600 x 400 x 238
- internal (mm) 566 x 367 x 229
- volume (L) 48
- folded height (mm) 30

This will also be the tray that is used for the V3.

Foldable crates

Green Packaging

Reusable folding trays

trays	246	24603	216	206	186	156	136	106	154	104
dimensions										
external (mm)	600 x 400 x 238	600 x 400 x 238	600 x 400 x 211	600 x 400 x 201	600 x 400 x 176	600 x 400 x 153	600 x 400 x 123	600 x 400 x 101	400 x 300 x 153	400 x 300 x 101
internal (mm)	567 x 367 x 226	566 x 367 x 229	567 x 367 x 202	566 x 364 x 199	567 x 367 x 167	567 x 367 x 144	567 x 367 x 114	567 x 367 x 92	367 x 268 x 143	367 x 268 x 91
maximum internal (mm)	**577 x 380**	**581 x 383**	**577 x 380**	**583 x 382**	**577 x 380**	**590 x 381**	**577 x 380**	**577 x 378**	**389 x 284**	**377 x 284**
internal usable height (mm)	213	220	193	199	158	135	105	83	135	83
Max. inner height (mm)	223	227	200	199	165	142	112	90	142	90
volume (L)	47	48	43	42	35	30	23	19	14	9
max. capacity per tray (kg)	20	20	20	20	18	12	10	8	7	4
nominal capacity (kg)	400	400	400	400	400	400	400	400	200	200
tare weight (g)	2070	2000	1820	1980	1540	1350	1340	1190	690	550
weight tolerance (g)	± 10	± 10	± 10	± 10	± 10	± 10	± 10	± 10	± 10	± 10
folded height (mm)	60	30	30	30	30	30	30	30	30	30
features										
Linear barcode GS1	87 14548 24600 5 + unique no	87 14548 35800 5 + Unique no	87 14548 21600 8 + unique no	87 14548 20600 9 + unique no	87 14548 18600 4 + unique no	87 14548 15600 7 + unique no	87 14548 13600 9 + unique no	87 14548 10600 2 + unique no	87 14548 15400 3 + unique no	87 14548 10400 8 + unique no
2D barcode GS1	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes

Pallet & truck

Open trays
Euro pallet 80 x 120 cm

quantities										
max at 2,5 meter	4 x 10 layers =	4 x 10 layers	4 x 11 layers =	4 x 11 layers =	4 x 14 layers =	4 x 16 layers =	4 x 20 layers =	4 x 25 layers =	8 x 16 layers	8 x 25 layers
Total per pallet	40 trays	40 trays	44 trays	44 trays	56 trays	64 trays	80 trays	100 trays	128 trays	200 trays

Closed trays
Euro pallet 80 x 120 cm

max at 2,5 meter	4 x 38 layers =	4 x 76 layers	4 x 76 layers =	4 x 76 layers =	4 x 76 layers =	4 x 76 layers =	4 x 76 layers =	4 x 76 layers =	8 x 76 layers	8 x 76 layers
Total per pallet	152 trays	304 trays	304 trays	304 trays	304 trays	304 trays	304 trays	304 trays	608 trays	608 trays
Total weight (excl. pallet)	315 kg	608 kg	553 kg	602 kg	469 kg	411 kg	407 kg	362 kg	419 kg	334 kg
Per 45ft trailer	33 pallets = 5016 items	33 pallets = 10032 trays	33 pallets = 10032 items	33 pallets = 10032 items	33 pallets = 10032 items	33 pallets = 10032 items	33 pallets = 10032 items	33 pallets = 10032 items	33 pallets = 20064 items	33 pallets 20064 items

Open trays
Pool pallet 100 x 120 cm

quantities										
max at 2,5 meter	5 x 10 layers =	5 x 10 layers	5 x 11 layers =	5 x 11 layers =	5 x 14 layers =	5 x 16 layers =	5 x 20 layers =	5 x 25 layers =	10 x 16 layers	10 x 25 layers
Total per pallet	50 trays	50 trays	55 trays	55 trays	70 trays	80 trays	100 trays	125 trays	160 trays	250 trays

Closed trays
Pool pallet 100 x 120 cm

max at 2,5 meter	5 x 38 layers =	5 x 76 layers	5 x 76 layers =	5 x 76 layers =	5 x 76 layers =	5 x 76 layers =	5 x 76 layers =	5 x 76 layers =	10 x 76 layers	10 x 76 layers
Total per pallet	190 trays	380 trays	380 trays	380 trays	380 trays	380 trays	380 trays	380 trays	760 trays	760 trays
Total weight (excl. pallet)	393 kg	760 kg	692 kg	752 kg	586 kg	513 kg	509 kg	452 kg	524 kg	418 kg
Per 45ft trailer	26 pallets = 4940 items	26 pallets = 9880 trays	26 pallets = 9880 items	26 pallets = 9880 items	26 pallets = 9880 items	26 pallets = 9880 items	26 pallets = 9880 items	26 pallets = 9880 items	26 pallets = 19760 items	26 pallets = 19760 items

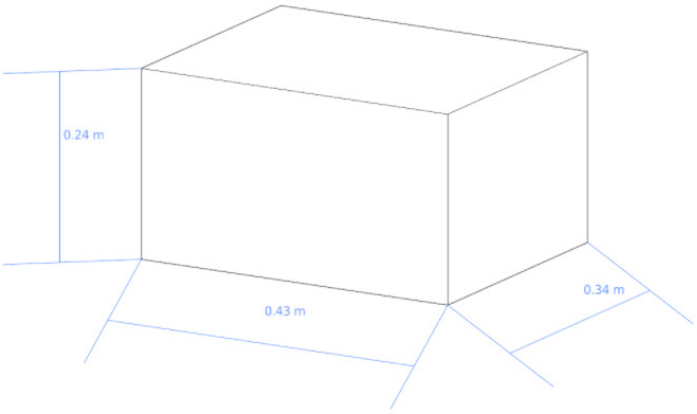
All sizes of green folding crates

Appendix XIV

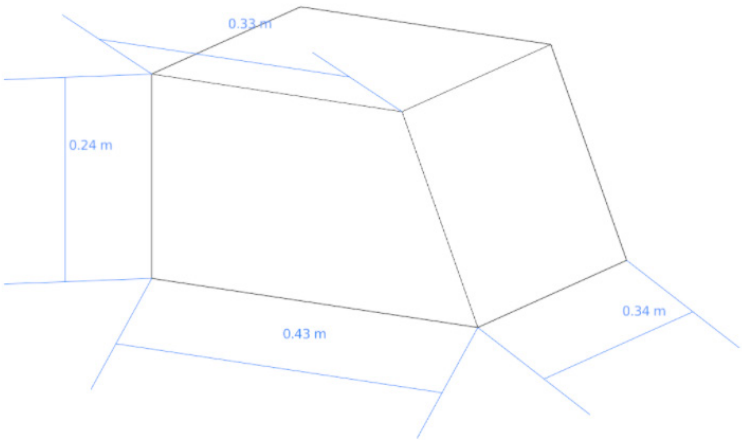
Order volume calculation

To figure out what kind of crate would be sufficient for the orders and how many fridges would be needed for the v3, a calculation was made to measure how much space an order takes up on average.

Data from the v1 was used for this. First, the average number of slots needed for one order was multiplied by the volume a cloth slot could hold. The volume a cloth slot can hold was determined by my own experience with the cloth slots together with their dimensions. A cloth slot could never be fully utilised since a side is open, so items will fall out if you try to stuff too many products in it. Therefore a corrected volume was used for the calculation.



Actual size of a cloth slot



corrected size of a cloth slot

After the volume of order was determined to be 44.5 L of ambient products, that number was multiplied by the ratio of ambient/cooled products in an order. From this calculation, it became apparent that the v3 would need around 5 fridges. Meaning that a minimum of 6 fridges need to be installed in the v3 to ensure some headroom is kept.

	Total	Cold	Ambient		
#Orders	417				
#Order lines	5135	1829	3306		
#Suborders	2171	1004	1167		
#Items per order	12.3	4.39	7.93		
#Items per suborder	2.4	1.82	2.83		
#Slots	1178	580	598		
#Slots per order	2.82	1.39	1.43		
#Suborders per slot	1.84	1.73	1.95		
	Average	cm2	cm3		
Average slots per order:	2.82	1532	62975		
Average slots ambient:	1.43	1170	50318		
Average slots cold pull	1.39	445	17803		
Average slots cold slide	1.39	362	12657		
Verhouding pull door		**2.6**	**2.8**		
Verhouding slide door		**3.2**	**4.0**		
	Width	**Height**	**Deep**	cm2 front	cm3
Size ambient*	38.3	22	58.1	843	48955
Size ambient cloth	34	24	43	816	35088
Size cold pull	16	20	40	320	12800
Size cold slide	13	20	35	260	9100
* A-1-j; d-1-e;d-1-f;d-1-g = Bulk locations					
** "X-4-x" = 24cm deep due to unit					
liter koelruimte nodig (max aantal orders x inhoud gekoeld per order)					
v2 (L):	1694.608				
v3 (L):	1265.707				
	klapdeur	schuifdeur			
volume koelkast:	250	260			
koelkasten nodig v3:	5.062829	4.868105			

measured data from the v1 combined with calculations for cooled area needed

	v2		v3
	stofzak (absoluut)	stofzak (reëel)	europool krat
Inhoud (L)	35.1	31	48
gem order inhoud (L)	50.3	44.5	
slots nodig gebaseerd op reëele order inhoud	1.43	1.43	1
totaal aantal slots in kar*	192	192	100
aantal orders wat in kar kunnen	133.8862876	133.8862876	100

***De v2 heeft per kant ruimte voor 96 slots ambient**

Calculation of how many orders the v3 could hold

Appendix XV

Design Brief

Mobile distribution centre and customer pick-up point for Local Heroes

project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 15 - 02 - 2021 28 - 06 - 2021 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

In the past few years, online grocery shopping in the Netherlands has been on the rise, putting pressure on the sales of physical stores (Meijsen, Online groei AH kannibaliseert op winkelomzet, 2021). A big factor for this growth is the current corona pandemic (Meijsen, Aandeel online knalt door naar 6,7 procent, 2020). The fast growth of the e-grocery sector is not only visible in the Netherlands. Worldwide, the sector has experienced a 41 per cent increase in sales in 2020 compared to 2019. This makes online grocery shopping the fastest growing e-commerce sector (Jansen, 2021). The fact that online shopping, combined with the corona pandemic, is putting extra pressure on physical grocery stores means more bad news for smaller local stores in cities. Already in 2015 did the Central Bureau of Statistics (CBS) identify that the shopping streets in the city were losing to the online stores (Dam, 2015). And this trend is only a continuation of the past couple of decades. Small speciality stores have been losing ground to the larger supermarkets for a long time already. between 1994 and 2004, the number of vegetable speciality stores has decreased by almost 50 per cent. The number of butchers shops decreased by 45 per cent in the same period (CBS, 2005).

On the other hand, we see a trend in shorter food-chains. The past few years have been particularly good for small alternatives of locally produced food. Companies like 'Boerschappen' and 'Support Your Locals' have been growing explosively in 2020. These companies try to sell products directly from the farmers to the customers. and with success. In 2020 alone the revenue of Boerschappen increased by 335 per cent (Kamsma, 2021).

Local Heroes (LH) intends to exploit this growing market to the advantage of local stores. By providing small stores with an online platform to sell their products they want to make them more resistant to the growing online supermarkets. And by including initiatives of shorter food-chains like Landmarkt they try to keep the customers close to where the food comes from.

In the centre of this food distribution system stands a hub. This is best described as a small mobile distribution centre (DC). Here, located on one of the daily markets of Amsterdam, employees of LH receive products from local stores which have been ordered by customers in the accompanied App. Then the products are sorted by type and name of the order and distributed to customers. The DC also functions as a pick-up point for people in the neighbourhood.

Local Heroes intends to expand its business in the city of Amsterdam by working together with the city municipality and local shops. In order to succeed they need more and better mobile DCs. A second version has already been designed and build by InnovaN trailers in Ede. This new DC will be deployed for testing somewhere in February 2021.

The hub or DC is an interesting product. It must not only function as a pick-up point for customers but also function as a base from which deliverers of LH set out to deliver groceries to customers on a bike. All while being just 20m^2 in size. The DC also needs to be able to 'shrink' since it is based on a trailer which can be driven away with a van. This makes for a challenging logistical problem, products need to be sorted and stored. A loading bay is needed for delivery bikes, and a pick-up point should be integrated for customers. Considering these points, a new design for the DC is requested, with an extra wish of the company to make everything modular. In order for the design to be able to grow together with the company.

space available for images / figures on next page

introduction (continued): space for images

image / figure 1: First version of the hub currently in use

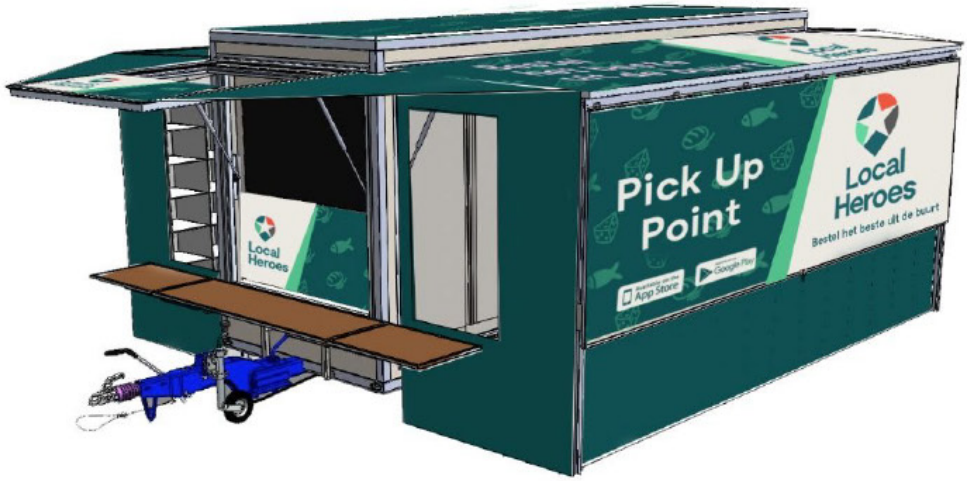


image / figure 2: Second version of the hub, to be launched in Februari

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

The current hub which is in use is in actuality more or less an ad-hoc manifestation of trial and error. No real design process was conducted for this product. As a result, many things are not as efficient as they could be. On top of that Local Heroes wants to grow as a company. They want to expand the business from only one market to up to 10 different areas in Amsterdam, possibly expanding to other cities as well.

Since the setup that is currently in use is not good enough to be deployed in other places, the company has already designed a second hub. This hub has been designed with the help of a logistics student. It improves on many areas of the current in-use design. While also being better equipped for larger amounts of orders. Unfortunately, this has not been tested in the real world and the company expects to find several areas of improvement in this new and improved hub.

One of the issues the second version already has is that it is impossible for one person to open up shop. Something that is possible with the first version. Another is that the design is not modular, which is a wish of the company. They want to be able to link up multiple hubs in order to increase capacity.

Apart from the physical hub, the company works with an app for their employees. This app works as a logistics program that helps in sorting, storing, and delivering orders. A highly integrated app-hub product could help the effectiveness of the end product largely, and is something that has to be researched further.

Lastly, customer satisfaction plays a big role in the success of the company. The hub is key to this satisfaction. Research on the customer journey and their contact with the hub should ensure that possible pain points between the customer and the hub will be addressed.

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

The main assignment is to thoroughly evaluate the current hub and design the next generation of the hub. The new hub needs to be scalable (read modular in design). It also should fulfill the wishes of the employees, it should be an efficient distribution centre, and it should facilitate a satisfactory user-experience from the perspective of the customer. The new hub will be designed and built during this project.

At the end of this project, a working end-product will be built. This new product can then function as a foundation for further development while also being capable of being implemented in the day to day operations of the company.

To reach this goal, research will be done on multiple levels.
- Customer research will help in designing the best possible experience on the outside of the hub.
- Research on the logistics will ensure an efficient and easy to use system will be used on the inside of the hub.
- Research on cognitive and physical ergonomics ensures a simple and logical way to operate the hub is implemented.

Next to research, there will also be other deliverables.
- Multiple mock-up solutions to test on-site in Amsterdam to evaluate concepts
- Fully designed product in CAD for use by InnovaN to produce the hub

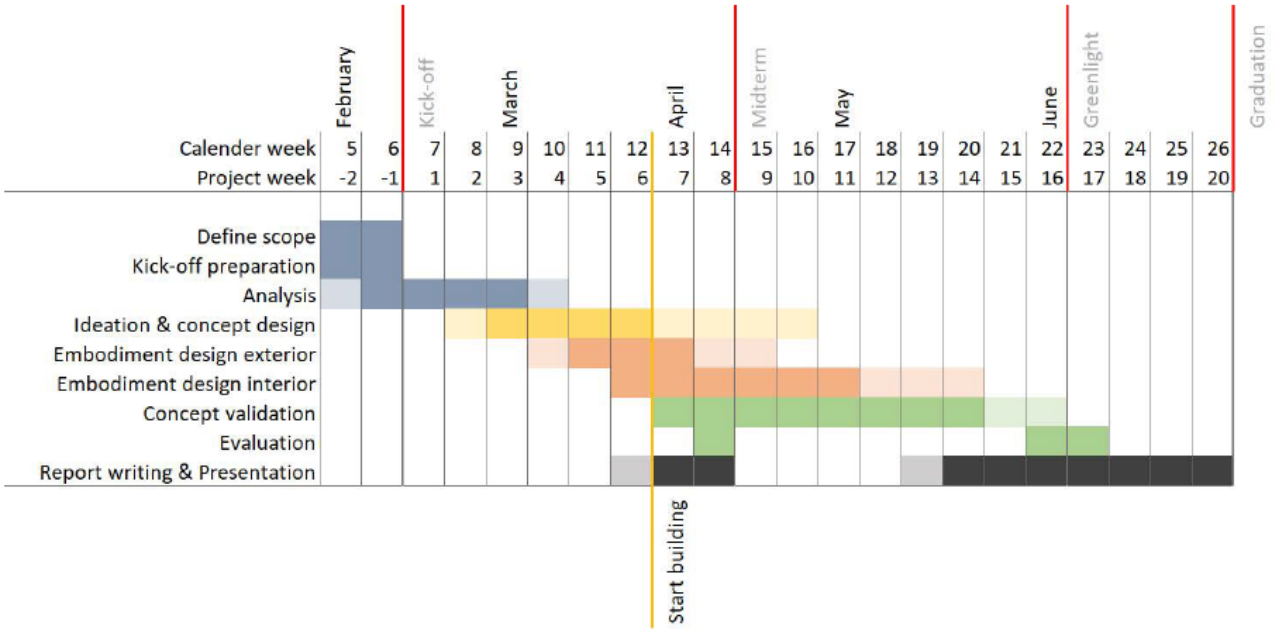
Initials & Name L Vermeulen 4793 Student number 4440617

Title of Project Mobile distribution centre and customer pick-up point for Local Heroes

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 15 - 2 - 2021 28 - 6 - 2021 end date



Since LH wants to start building the hub quite early, my initial planning is skewed a bit to the left. I will start with an elaborate analysis of the current product. Taking into consideration the largest stakeholders and different use scenarios of the DC. The results of this analysis will be used to generate a comprehensive LoR, making it possible to quickly generate ideas and concepts that meet the expectations. Due to the short time-frame, a start will also be made on the embodiment of the exterior design in this phase. This way InnovaN can start working while I keep the interior vague and open for changes.

At the time of the midterm meeting, InnovaN will be well underway on the exterior. I will conclude my concept phase and transition fully into the development phase changing my focus towards the embodiment of the interior. Here, most of the detailing will be necessary since this is the part with the most human interactions.

During the entirety of the period after which building has started, I will validate my ideas each week on-site. Ensuring the possibility of quickly iterating and improving on the concept and embodiment.

Possible risks during this project are my own ambition (by setting high goals) and talent for ignoring my own planning. I will mitigate this by having weekly meetings with both the company and my coach. Ensuring a steady work tempo and, where needed, a moment to make tie-breaking decisions.

Considering Covid can have a big impact on the mental state of someone, I will try to monitor my own mental wellbeing during the project. I'll make sure to give myself enough free time to recuperate my mind. And I'll talk to fellow students about their projects/problems to help one another through this weird time.

Initials & Name L Vermeulen 4793 Student number 4440617

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MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

During my bachelor and master, I often found myself in a project related to the field of mobility. From car/bicycle design to bicycle safety. Considering the importance of mobility, and it's topicality I have considered this as an interesting field to work in. I believe that this field of design will become increasingly important. A lot of new and inventive ways of mobility will have to be developed to keep the world moving.

Sustainability in mobility is also something I want to dive into. Green materials, local production, less carbon-heavy forms of mobility all seem relevant to this project. On top of that, I've yet to do a project in the distribution field, however. And this is an area that I wish to further explore, considering its great alignment with mobility and other points mentioned above.

Working with Local Heroes (LH) gives me the opportunity to learn more about the distribution of goods from up close. Since LH is a growing startup with the ambition to scale up greatly, I'll have the front seat in experiencing the way a company scales up the throughput of goods.

During my project with LH, I want to further develop my skills in communicating with a client and managing a larger design assignment on my own. Up until now I most of the time had the luxury of performing in a group. Now I'll be forced to work more on my own, something that is both exciting and challenging. I hope this project will allow me to develop a better understanding of myself on how I really function as a designer and in what kind of situation I feel most comfortable in.

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FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

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