

guru

Industrial Design Project by Lisha Li

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REDESIGN
HAND LUGGAGE
FOR AIR TRAVEL





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01 INTRODUCTION



<http://www.travelandleisure.com/airlines-airports/akron-canton-airport-self-cleaning-trays>

Airport security screening, and the amount of time it costs travelers, has been a persistent concern to travelers. Airport authorities, and airlines particularly in recent years with the prosper of cheap flight which cost extra fees for baggage, there's been a 27% increase in roller-bag carry-on at checkpoints that have caused great uncertainty relating to security transit times, which could cause delays and inconveniences for travelers and for airport operators. During holidays and summer periods, airports will have to reduce sophisticated electronic screening and resort to less sophisticated screening to avoid causing operation delays.

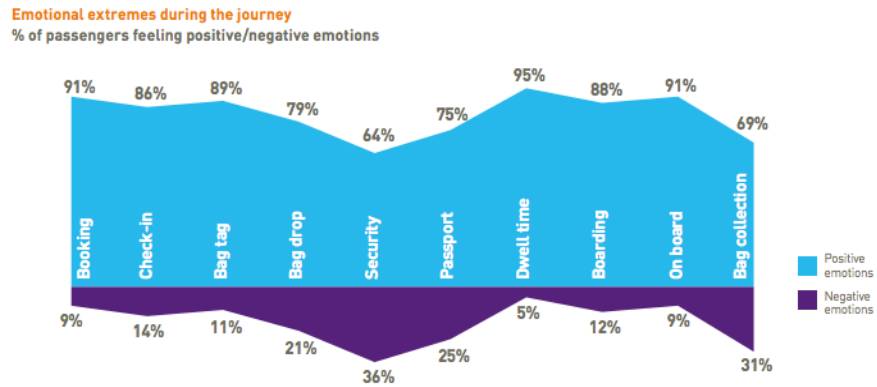
INSIGHTS

“People still have not gotten the message. We do appreciate that there are a lot of things to remember when traveling and frequent travelers are very much aware of what to do but others who travel less may not be. That’s why we are constantly trying to remind people of the regulations.”

- Nick Careen IATA

“People don’t want to check bags because it’s pain in the ass, people don’t want to line up to drop off bags, they don’t want to run the risk of airlines losing or damaging bags and they don’t want to wait for their bags on the other end. “

*- Siobhan O’Donnell
the Dublin Airport Authority*



Non-frequent fliers that aren't always familiar with the screening process and can slow down the lines if they are not prepared. People who don't move out of the way once they are through the security often lead to bottlenecks, too. It would help if people were better prepared the security process could be quicker. In addition, it is also necessary to be mindful of the regulations about laptops, belts, buckles, earrings and all the other things that also have to be processed.

Therefore, it is worth investigating **packing** and **hand luggage**, as it could be very relevant for more efficient security screening.



TOPIC

Every airline passenger experience comes with baggage, literally and allegorically. Recently there is a trend people carry more on board, which lead to inconveniences for security screening, especially non-frequent travelers who are not well prepared for the luggage. Instead of questioning the security check service, I want to question how to gain flexibility and accessibility of the carry on luggage.

SCOPE

This is a product design project on designing a suitcase for air travel, more specifically, security screening. For the preparation stage, the product will look into storage for objects that is going to be checked, which helps users to keep things organized and make them be aware of what to put inside. For the screening stage, it will look into ways of accessing different objects, which would help the users to pack their things quickly.

AMBITION

I want to design a hand luggage trolley which contribute to a more enjoyable travel experience. On one hand, I want the travelers have a good habit of packing, and pack properly before the flights. On the other hand, I hope it would help to speed up the security check process, make it less annoying.

CONTEXT

My project mainly focus on urban travelers who are having a trip of 3-5 days, and they want to make travel a little easier, just like me. The reason why I choose this area is they are the largest group using hand luggage for the whole journey. Meanwhile, for this kind of travel, experience seems rather important when it comes to the decision of travel method.



DESIGN OUTCOME

The diploma is delivered with

- Observation and interviews which showing my insights
- Tests that can illustrate how I made decisions during the process
- A working prototype that could work for the context

TIMEPLAN



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02 RE-DEFINE

01/OBSERVATION

02/WORKSHOP

03/KEYWORDS

04/CRITERIA

Through observation and workshops, I gathered insights which led me to understanding the situation and users' need. Then I came up with the criteria for my further design.

OBSERVATION

I spent one afternoon watching people go through security check. Looking at what they had in their hands, what they took out from their suitcase, calculating the time they spent for screening.

FINDINGS

01. Nearly one third of the travelers take hand trolleys with them.

02. Most travelers would put their liquids into the transparent bags offered at the airport before security check.

03. The time for security check (exclude waiting time) varies from 2-10 minutes. What's worse, the whole lane would stop working if they found something unknown.

04. Mostly, they just take out a laptop/a bag of toiletries from their hand luggage during the check.



Observing how people go through security check has given me an understanding of how things are packed in the hand luggage.



Image description: A man resting at the waiting hall.



Image description: A woman gathering her toiletries at the preparation desk.

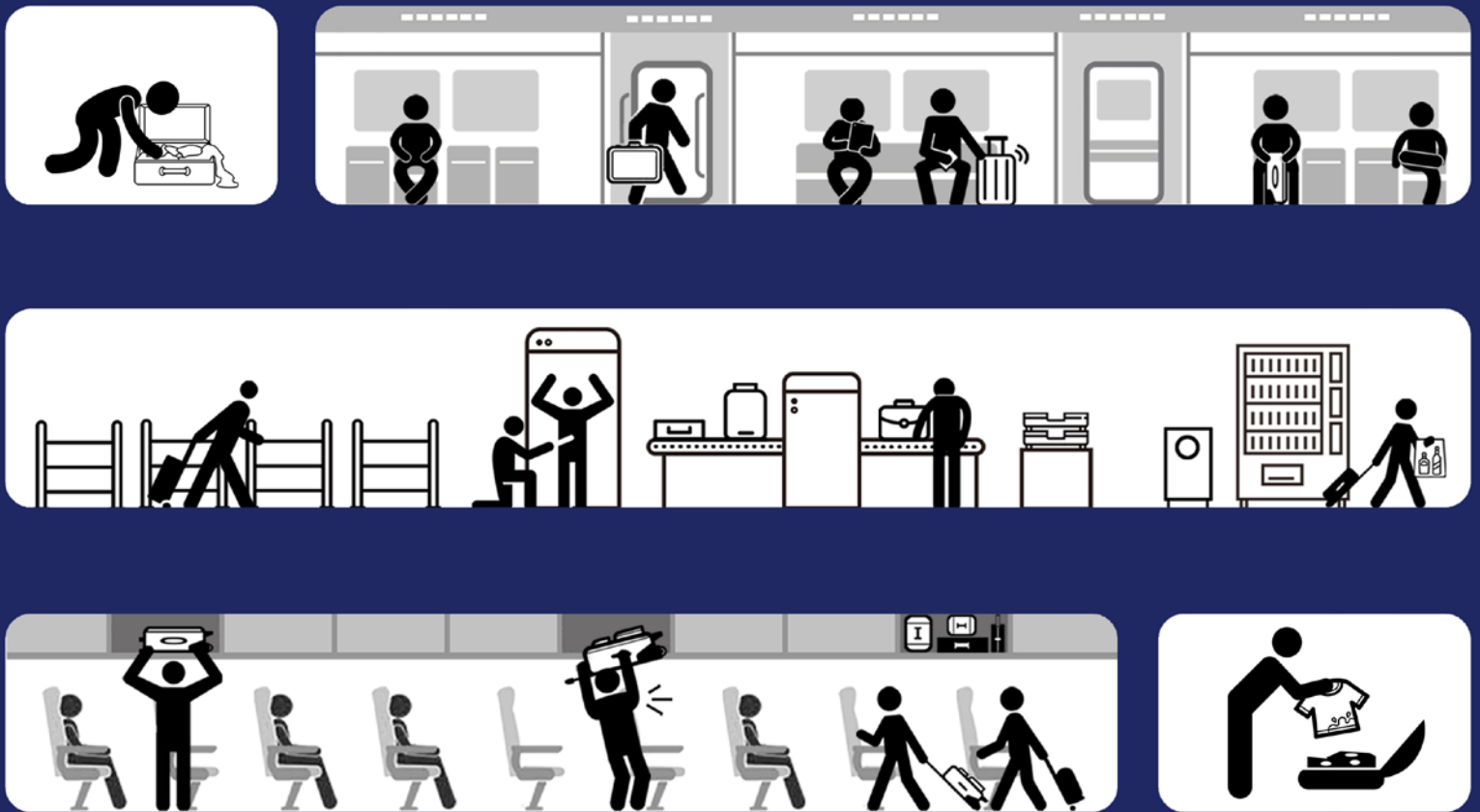
CONCLUSION

The efficiency of security check is directly effected by how people take things out from their suitcase. In other words, it is the **accessibility** of the luggage that really matters. Moreover, the accessibility of the luggage can be influenced by its interior, its way of opening, and how people organize their belongings, however, most travelers don't prepare their luggage very well.

The security check here seems to be only part of the problem, in order to know what really matters to travelers, I started to look at **the whole travel process**.



USER JOURNEY



User Journey Map: Making the user journey map helps me digging out the problems we will meet at different stages of air traveling, I further used it for holding the workshop.

WORKSHOP



I invited my friends who travels a lot to have a workshop together. We shared our travel experiences and discussed the problems that can be relevant at each stage of travel, gathering as many problems as possible, then the group of people were asked to vote for the problem they want to solve most.

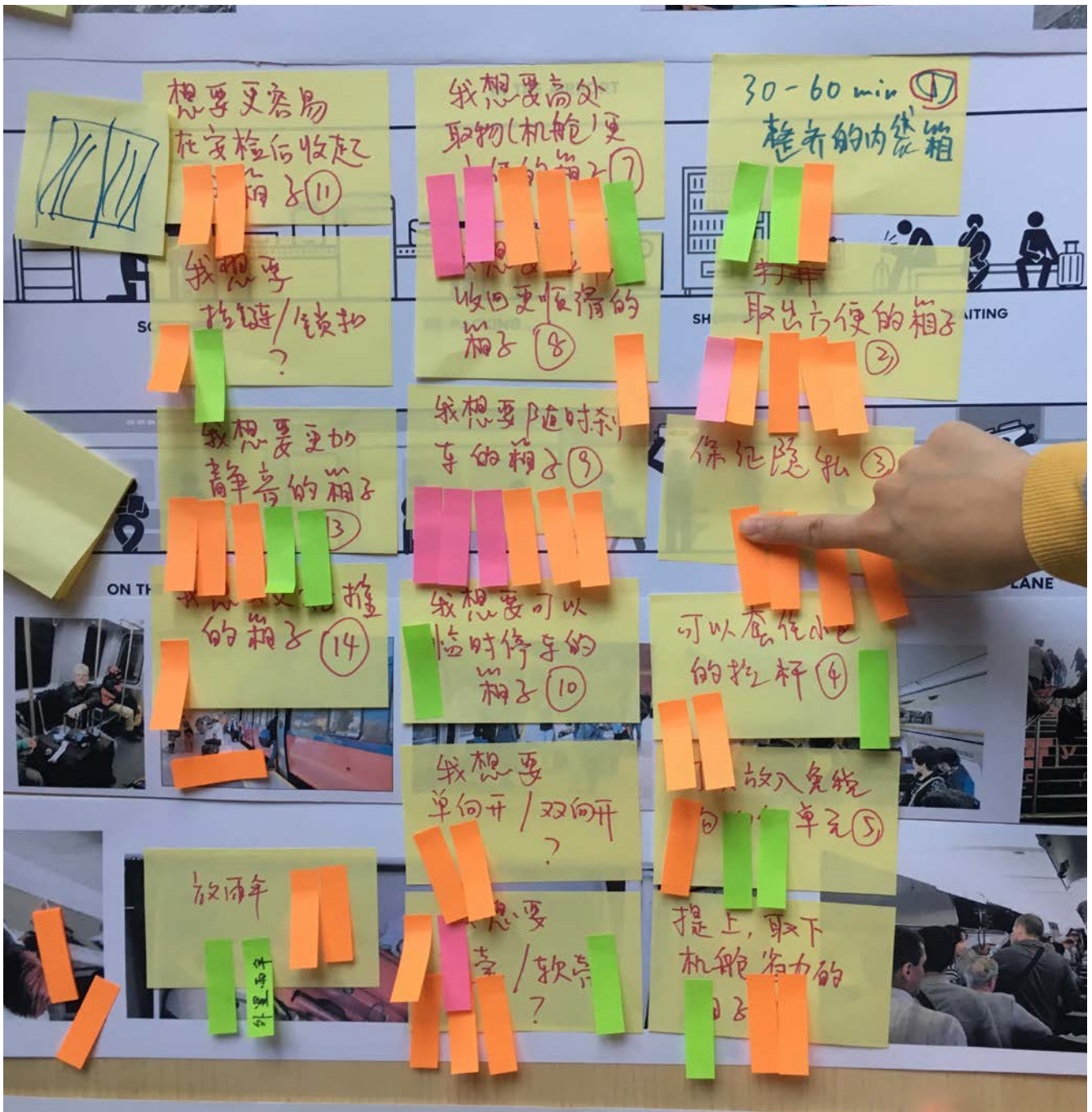


Discussion: Firstly, we just talked about our travel experience, and when we gathered a lot of stories, I asked my friends to write the problems they had with luggage and air travel.



Evaluation: Secondly, we use stickers to vote for different problems which you want to solve most.

WORKSHOP



EVALUATION RESULT

| | | |
|---|-------------|----------------------|
| I want a luggage that is easy to access. | ● ● ● ● ● ● | Accessibility |
| I want a trolley that its wheels can stop which makes it easier for me to take the bus/train. | ● ● ● ● ● ● | Mobility |
| I want a luggage that would take good care of my privacy. | ● ● ● ● | Accessibility |
| I want a luggage that moves silently. | ● ● ● ● | Mobility |
| I want a place for umbrella. | ● ● ● | Storage |
| I want a stronger drawbar that can hold my shopping bags. | ● ● | Storage |
| I want a hadle which makes it easier for me to take the luggage to the overhead bin. | ● ● | Mobility |

Most voted problems

Votes

Field

DESIGN KEYWORDS

I summarized the result to 3 keywords, the most important one, **accessibility**, which refers to how you open your luggage and take things out. The second one, **mobility**, which refers to how the luggage moves and how you control it. Last but not least, **storage**, which refers to how things are organized inside your luggage.



ACCESSIBILITY

MOBILITY

STORAGE

CRITERIA 01 / ACCESSIBILITY



Scenario 1: Security Check *pic from Shutterstock*
Can you take out these objects immediately?



Scenario 2: During the Flight *pic from Alamystock*
Can you take out something you need when it's inside the overhead bin?



Scenario 3: Waiting Hall *pic from HDFootagestock*
Would it keep your privacy which makes you feel like opening it in the waiting hall?

Based on the 3 keywords, I selected the most relevant scenarios for each keyword to be the criteria for further development.

CRITERIA 02 / MOBILITY



Scenario 4: *During the Flight* pic from SandyHuffaker
Can you lift it to the overhead bin a little easier?



Scenario 5: *In the Airport* pic from Thither.com
Can you run with it in the airport?



Scenario 6: *On the train* pic from Gettyimages
Does it need to be holded tight like this?



Scenario 7: Passport *pic from Shutterstock*
Is there a secured and accessible place for passport and boarding pass?



Scenario 8: Laptop & Liquids *pic from NBC news*
Is there a quick accessible place for laptop and liquids?



Scenario 9: Packing & Unpack *pic from lifehacker.com*
Does it contribute to a better packing habit?

CRITERIA 03 / STORAGE

COMPETITORS

MUJI
無印良品

| | |
|----------------------|-------|
| HANDLE/ WHEELS- | ■■■■ |
| INSIDE ORGANIZATION- | ■■■■■ |
| PRODUCT QUALITY- | ■■■■ |
| APPEARENCE- | ■■■■ |
| ADDITIONAL FUNCTION- | ■ |

MUJI suitcase has a polycarbonate hard shell and caster wheels. It features a series of inner compartments for an organized interior.

Price: 1550 NOK





AWAY suitcase has a polycarbonate hard shell and caster wheels. It aims to bring best-quality product at an affordable price.

Price: 1800 NOK

COMPETITORS

RADEN



RADEN suitcase has a polycarbonate hard shell and caster wheels. From weight sensors to built-in phone chargers, their cases have the latest tech-enabled features.

Price: 2400 NOK





incase

| | |
|----------------------|------------|
| HANDLE/ WHEELS- | ██████████ |
| INSIDE ORGANIZATION- | ██████████ |
| PRODUCT QUALITY- | ██████████ |
| APPEARENCE- | ██████████ |
| ADDITIONAL FUNCTION- | ██ |

INCASE suitcase has a soft exterior and two wheels. It features a tech compartment, weather-resistant coating and an expandable main compartment.

Price: 2400 NOK

POSITIONING PRODUCT



I decided to work mainly on basic function and interior organization. My aim is to make a very practical luggage which features great accessibility, mobility and storage.





Target Groups: *Urban Trvelers*
The target group is urban travelers who loves travel.



Activity: *Short Trips*
It mainly focus on short trips around 3 to 5 days.

03 EXPLORATION

A comprehensive problem requires a systematic solution. I want to design a hand luggage trolley which contribute to a more enjoyable travel experience. On one hand, I want the travelers have a good habit of packing, and pack properly before the flights. On the other hand, I hope it would help to speed up the security check process, make it less annoying.

Based on the information I have gathered, I started to make some quick tests to better illustrate possible ideas.



APPROACH

01/INTERVIEWS

02/QUICK TESTS

03/DETAILED TESTS

04/INTERIOR

Firstly, I did some quick tests to find a direction of the body of the suitcase, when I decided which direction I would go for, I started to refine the current concept and at the same time coming up with ideas of its interior through observation and interviews with travelers.



INTERVIEWS

In order to fully understand the problems, I did several interviews. The two friends I interviewed are all travel lovers like me. I either did the interview before or after their trip, observing how they use the space inside a luggage, what they have in their luggage, and asking if they have any other special need for their luggage.

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Time: 5 days

Baggage: A trolley & a backpack



“I have thought about putting my laptop inside the suitcase as it is very heavy, but I give up because it can be really inconvenient to take out when I want to use it.”

Johanna is having a 5-day trip to Delft. She traveled with a hand trolley and a backpack. She put her liquids in the trolley and put her laptop, some frequent access objects like wallet, passport, earphones, and hand cream in her backpack.





Before the trip

Wenkai is having a 10-day trip to America. She also traveled with a hand trolley and a backpack. Her trolley has a front pocket where she puts her liquids. Her frequently accessed objects such as glasses, notebook, wallet, passport, IPAD, water bottle, and scarf are put inside her backpack. She likes to bring a scarf with her in case she feels cold during the flight.

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Time: 10 days

Baggage: A trolley & a backpack



“I need a secured and accessible place for my passport & boarding pass. I always put them in my pocket, but when it’s summer, there’s nowhere to place them but in my hands.”

After the trip



INTERVIEW FINDINGS



From the interviews, I find some common habits we have when packing a luggage. First, we like to have a backpack for quick access object and digital devices together with a hand trolley. Eventhough we don't have so many things with us, we like to have a bag because it's so hard to take something out when it has been put inside the trolley.



One reason is the zipping process. When you close the suitcase, you have to compress it hardly and zip it all around. So, when you want to open and take something out from it, you have to unzip, find the thing, compress it hardly, and zip it all around...which takes a lot of effort to do, this is why the objects inside the trolley can hardly be accessible.



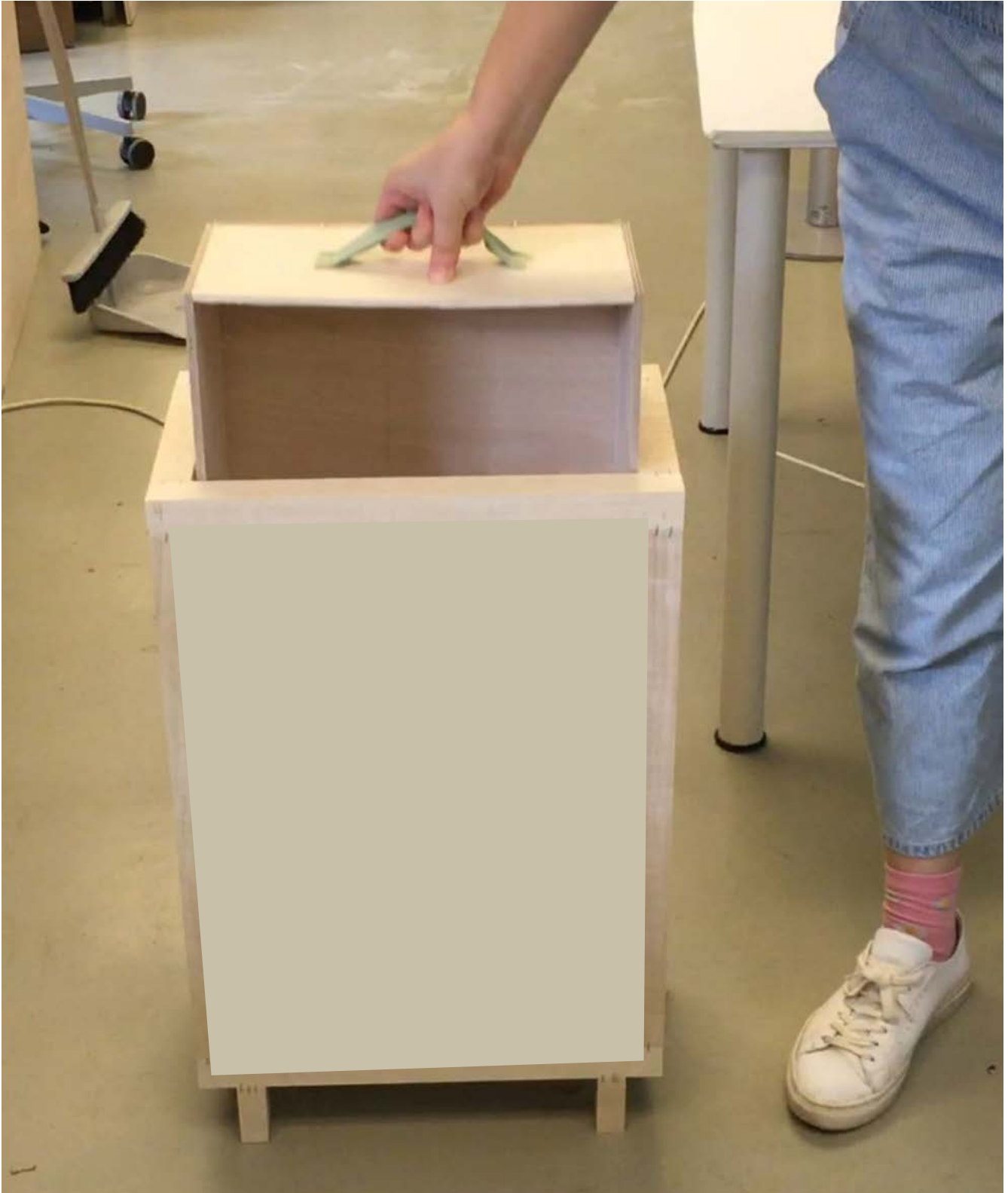
The other reason is we put all the different things together. As showed in the picture, glasses pills, comb and floss.....are messed up with cloths and shoes, which makes it diffucult to find the small objects inside the luggage.

MAIN QUESTIONS

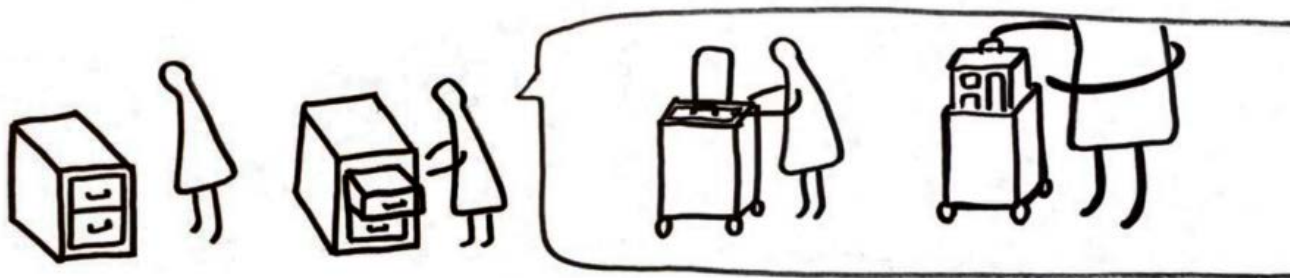
I summarized the findings to 2 main questions . The first one, how to open a suitcase ? To solve this problem, I'm going to explore various ways of opening a luggage. The second question is, how to pack a suitcase? To solve this problem, I want to design a more organized way of packing.

HOW TO OPEN A LUGGAGE?

HOW TO PACK A LUGGAGE?



QUICK TEST/ 01



DRAWER

Material: Wood

Concept description: The first mockup takes inspiration from the drawer which gains a quick access of the inside. It's very convenient when you take a small or medium size object from the top, but when it is placed in the overhead bin, it is really difficult to reach the objects inside.



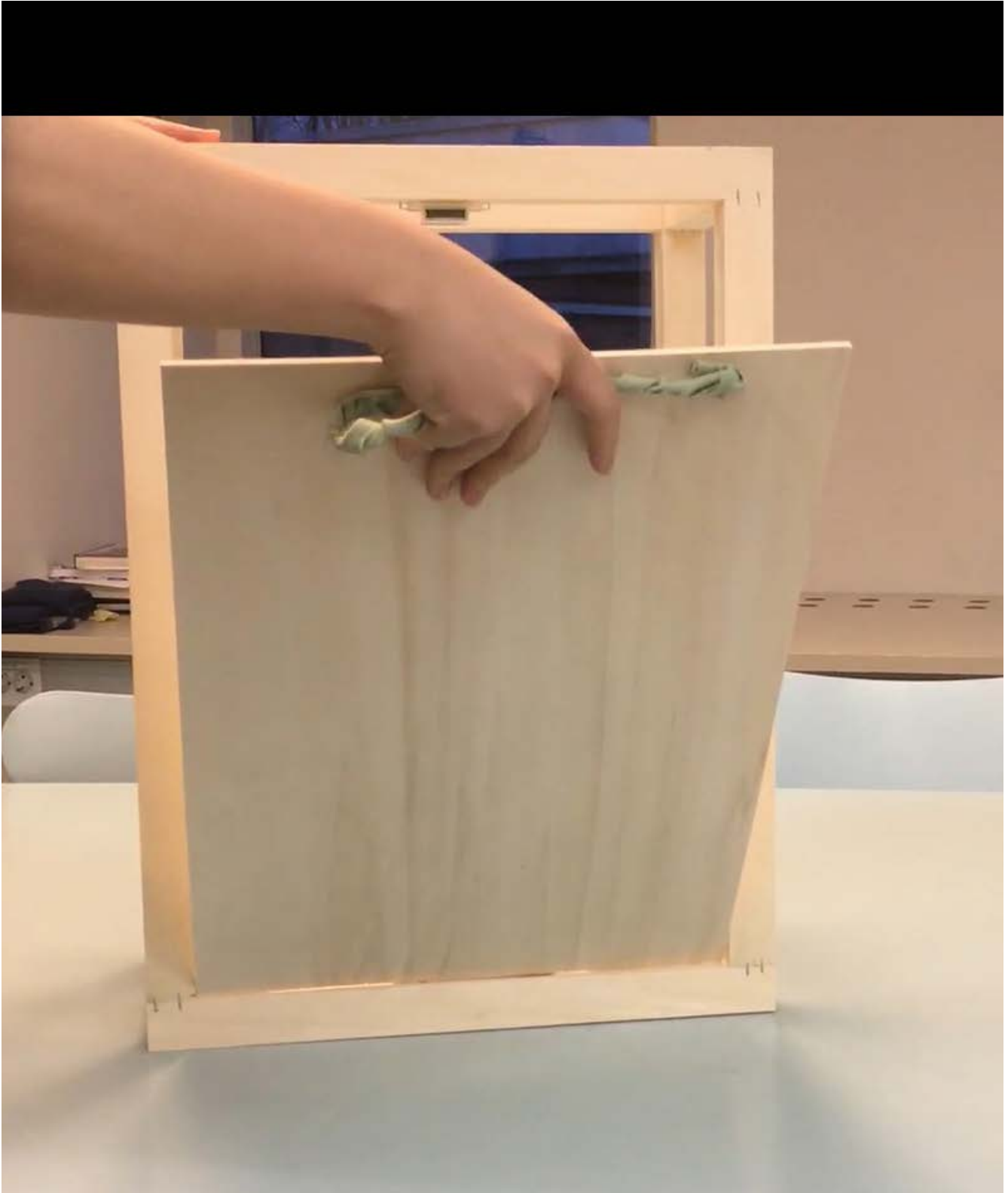
QUICK TEST/ 02



ROLLER DOOR

Material: Wood & Paper

Concept description: The second mockup takes inspiration from the roller door. The good thing about it is that it doesn't occupy extra space when you open it, also, you can roll the door to the place you want which helps to keep your privacy. The bad thing is, the roller structure need a little space inside the luggage.



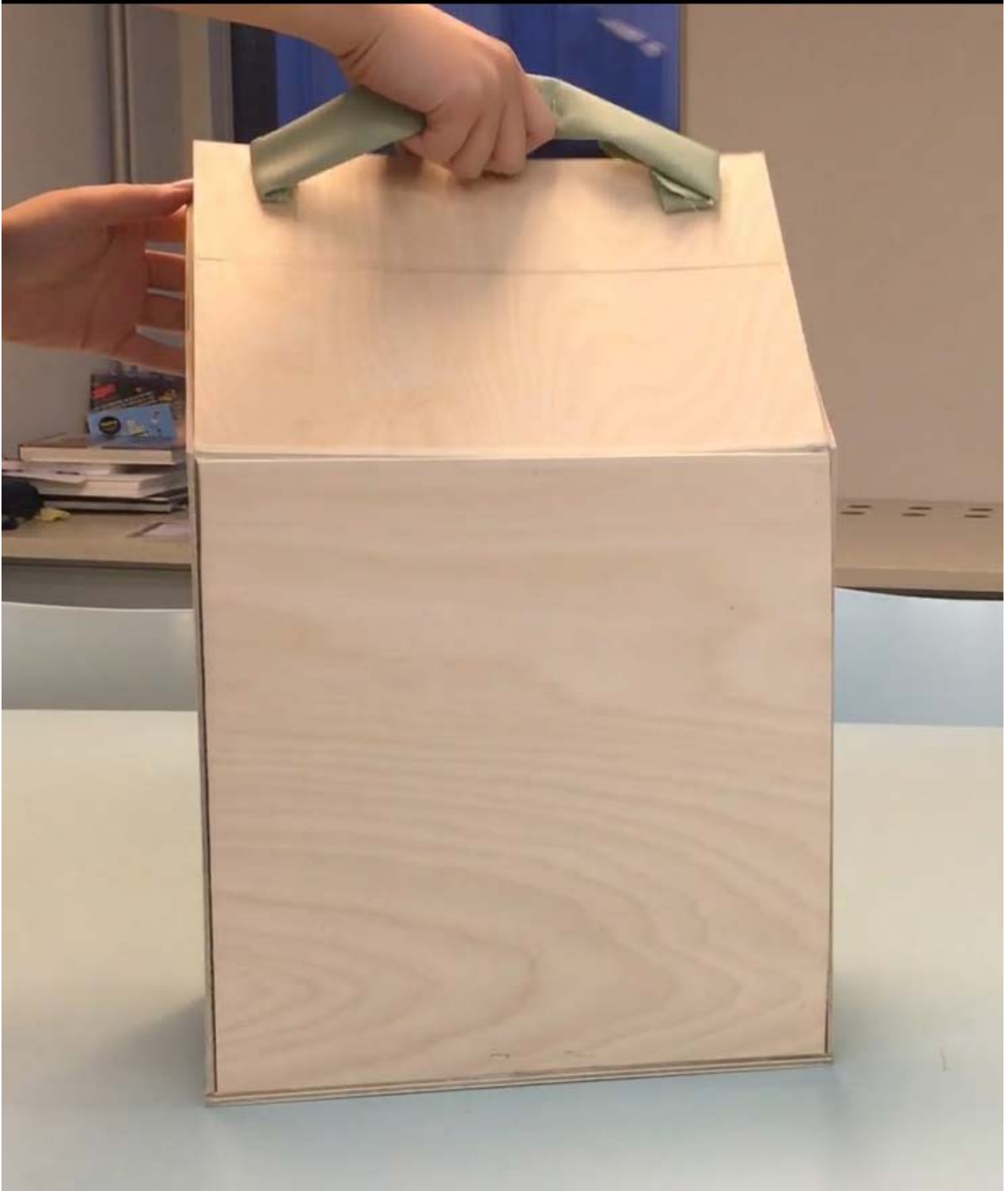
QUICK TEST/ 03



DETACHABLE HINGE

Material: Wood

Concept description: The third mockup takes inspiration from the hinge of digital devices. This is great for security check as you can take all your liquids and digital devices together immediately, but when it comes to accessibility on the plane, it doesn't work very well. One more thing is, the structure of the hinge may not be so stable, so this direction is not that considerable.



QUICK TEST/ 04



CASSETTE PLAYER

Material: Wood & Cloths

Concept description: This is an improved version of "detachable hinge". In order to gain a better structure, I change the detachable hinge to an undetachable one, and add a quick-access pocket. It seems to be more reliable than the old version, but still you have difficulties reaching your belongings when it is placed in the overhead bin.

03 EXPLORATION

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APPROACH

01/INTERVIEWS

02/QUICK TESTS

03/DETAILED TESTS

04/INTERIOR

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QUICK TEST/ 05



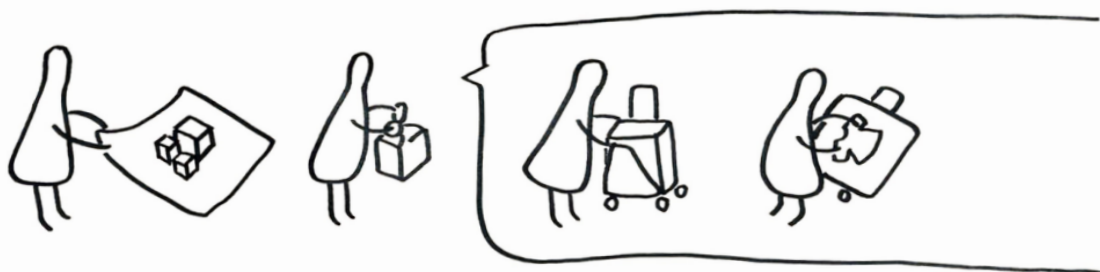
DETACHABLE

Material: Wood

Concept description: The fifth mockup takes inspiration from detachable devices like switch, I questioned if the suitcase can be divided to two parts? One for frequently accessed objects, and one for the others. Accidentally, I come across several similar suitcases on the internet, and they doesn't look so nice. One main reason can be people have their own preference on bags, especially for their everyday-use objects, another reason may be, it doesn't look like a suitcase when the small compartment is taken away.



QUICK TEST/ 06



FUROSHIKI

Material: Cupboard & Cloths

Concept description: The sixth mockup takes inspiration from a traditional packing method with only one piece of cloth-“Furoshiki”. If I can combine the cloth with metal structure, this suitcase would be super light and strong. What’s more, this will make packing much easier. But when it comes to accessibility, it doesn’t seem it will work very well.

TEST EVALUATION

Each concept has its pros and cons, so I choose 4 most relevant scenarios for evaluation, that is accessibility during security check, accessibility during the flight, accessibility when you are waiting, and storage in terms of packing and unpacking. After the evaluation, the result is quite clear.



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Evaluation result: From the evaluation result, I choose the roller window one which has a satisfied performance for each scenario.



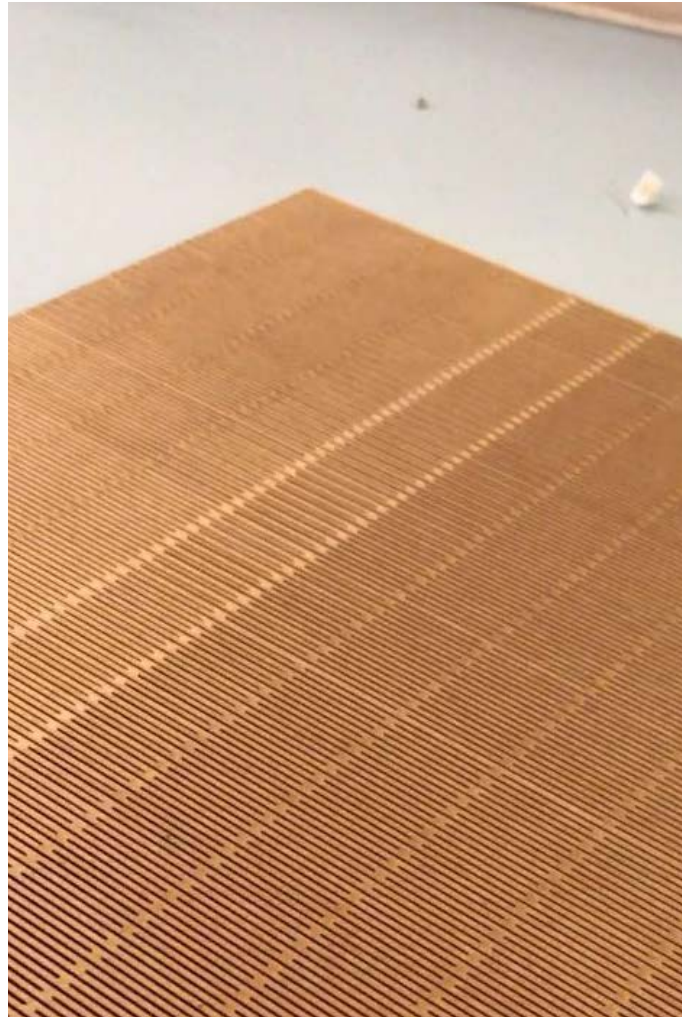
■ Accessibility during security check ■ Accessibility during the flight ■ Accessibility when you are packing ■ Storage in terms of packing / unpacking

TESTING THE ROLLER DOOR

I did another 3 tests based on roller window. In this section, I look into material and structure to get a clear vision on how the luggage would be.



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THE U SHAPE DOOR



It doesn't need extra space to open the luggage, By using the sliding door, you can open it very quickly.



It needs quite a lot space at the back side and the bottom of the luggage, which further can be a problem for placing the handle and the wheels.

For the first test, U shape door, I use laser cutting on a piece of plywood to gain a flexible and strong surface. With the help of CNC machine, I managed to cut a 1cm-deep groove on each side of the box.

As I expected, with the sliding door, I can open it very quickly, and it doesn't occupy any space outside the box. But the problem is, the sliding surface requires quite a lot space on the back and bottom side of the box, which would further be a problem for placing the wheels and the handle.

Material: Plywood 4mm & 10mm



THE TONGUE



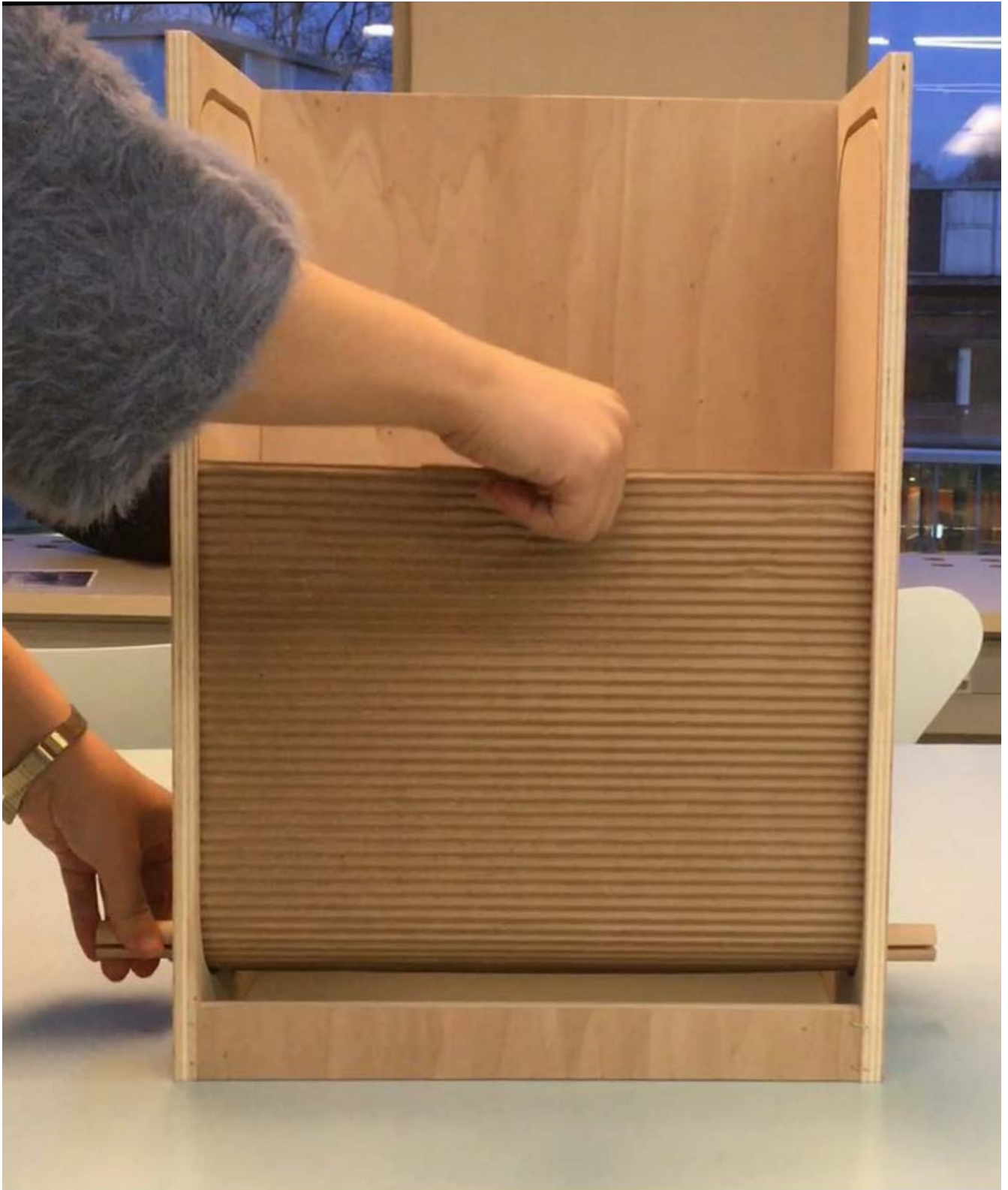
This structure doesn't occupy so much space either inside or outside the luggage,



It is not so convenient to unzip and roll it. It doesn't contribute to a better accessibility.

For the second test, the tongue, I try to find some way saves space inside the luggage, so I glue pieces of veneer boards on a piece of fabric to gain a strong and rollable surface. The surface and the body is connected by zippers. The good thing is this structure is very simple, and it doesn't need any space either inside or outside the box. But when I tried it, I find it not so convenient when unzipping and rolling the surface, which makes no difference with the traditional luggage.

Material: *Veneer, plywood & fabric*



THE ROLLER DOOR



It doesn't need extra space to open the luggage, and only takes a little space inside the luggage. Good accessibility.

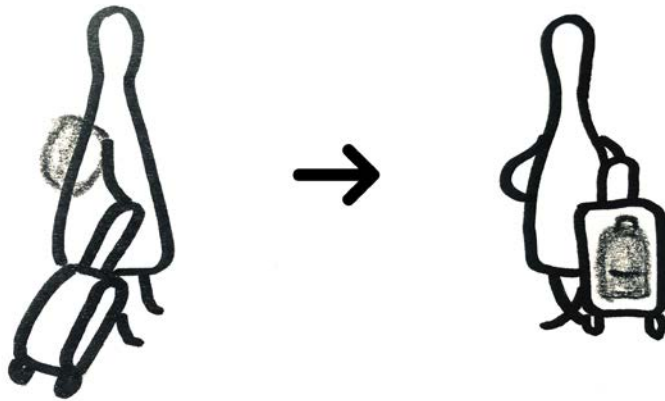


I need to find this material which is flexible vertically, very strong horizontally. It should be thin, light weight and water proof.

The third test, the roller door, I made a rotating shaft at the bottom of the box, with a piece of cupboard as surface, I try to see if this rotating surface would work. The result looks promising. Even though it needs a little space inside the box, but if the surface material can be as thin as possible yet strong, this could be a great concept for now. But still I need to find this material which is flexible vertically, and strong horizontally.

Material: *Cupboard, plywood*

INTERIOR CONCEPT



**a new trolley which function as a
trolley and a backpack**

Instead of having a backpack, if there would be a useful compartment inside for digital devices, liquids and other frequently accessed objects, the luggage would be more organized and accessible.

So, my concept is having a minimized "backpack" inside the luggage.



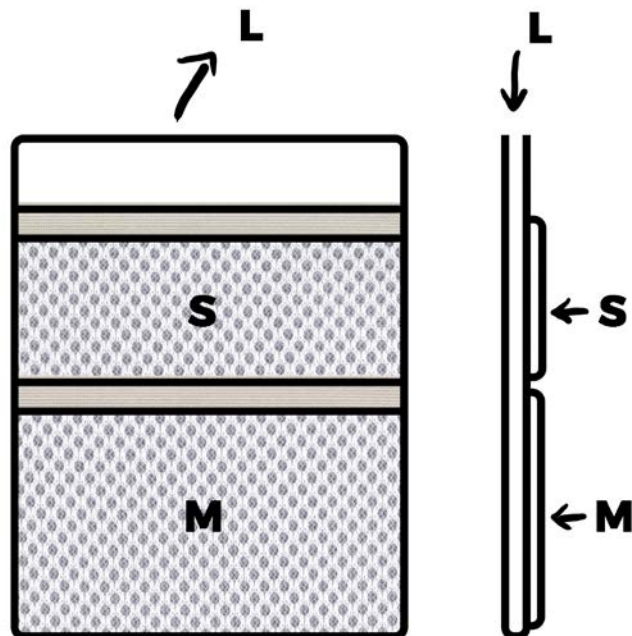
I divided the everyday objects inside a backpack to 3 categories according to their shapes and sizes.

First category-Small, squared-shape objects such as mobile phone, notebook,, glasses case. Small cylinder-shaped objects like umbrellas and bottles.

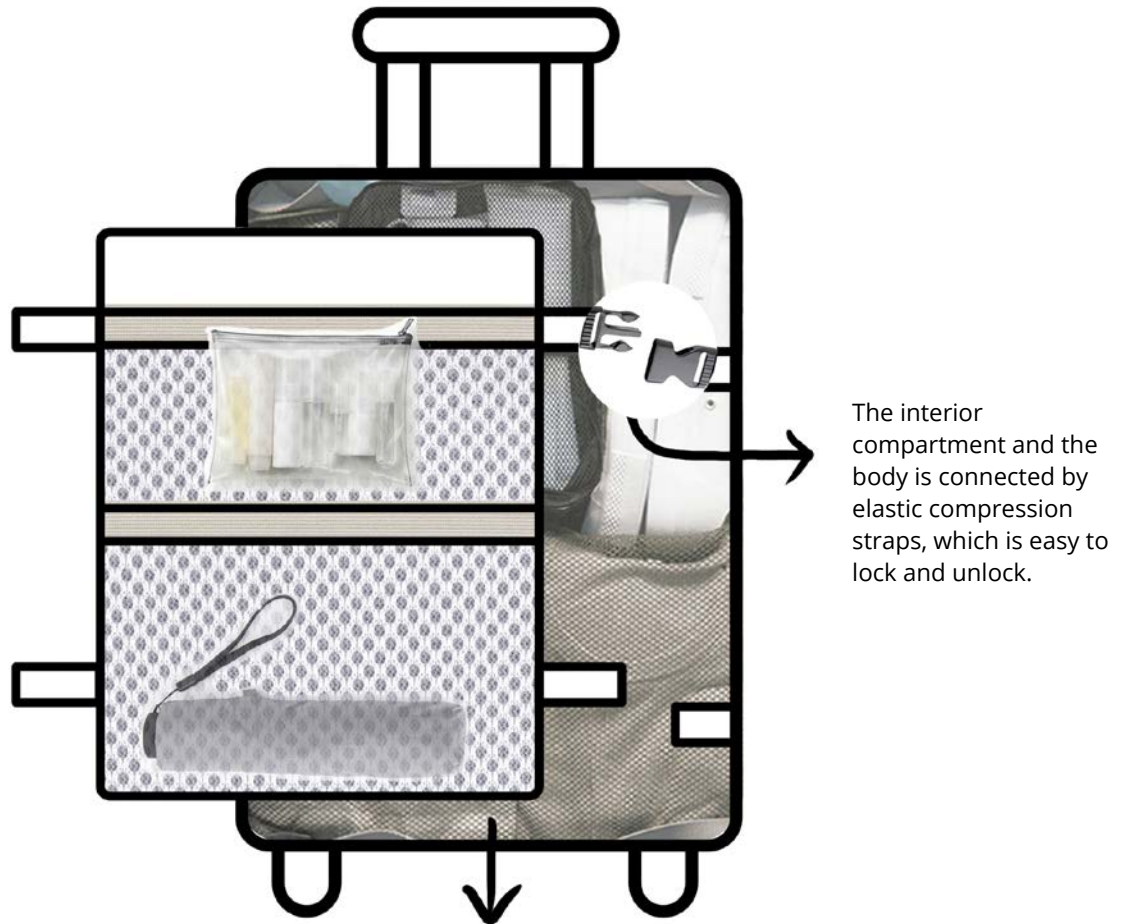
Second category-Middle sized object such as cameras, slippers,and scarves. And pouches for headphones, toiletries, cables.....

Third category-Large flat objects such as magazines, laptops, and IPADs.

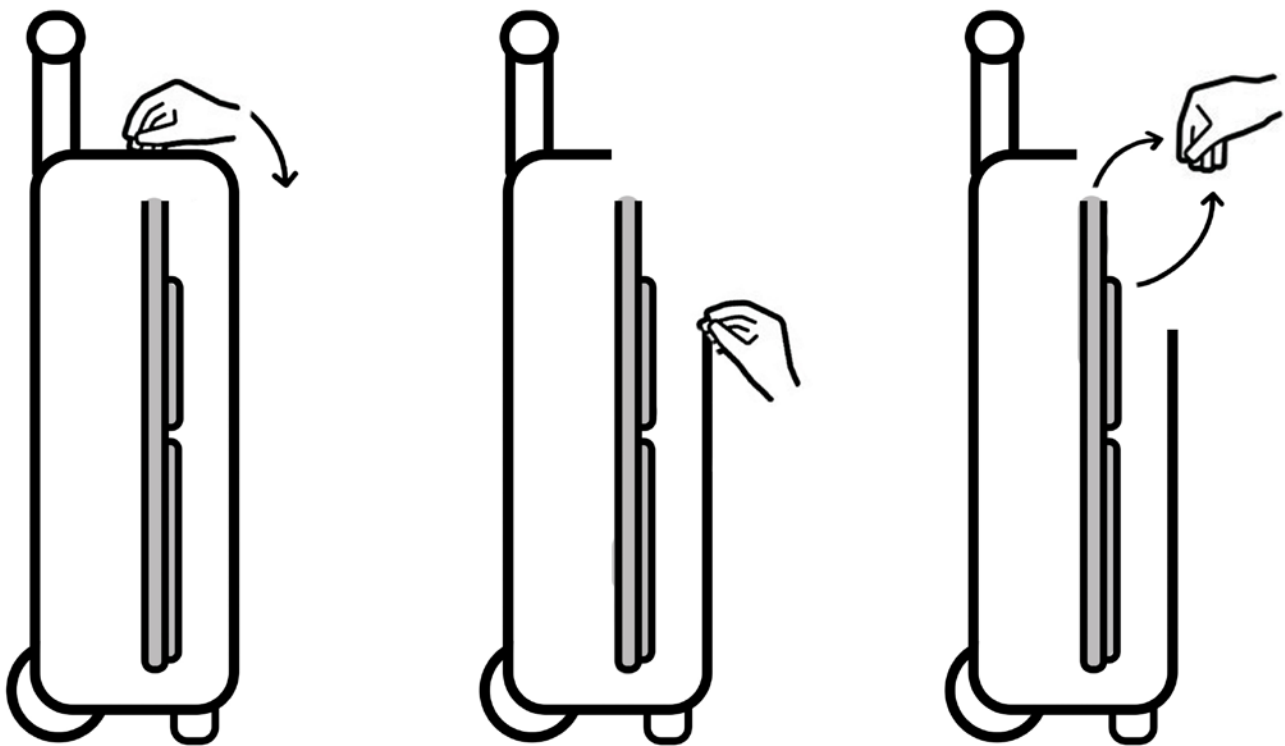
INTERIOR CONCEPT



A interior compartment is designed for frequently accessed objects inside the suitcase. As people have various objects in their backpack, there is no special pocket for certain objects in the interior compartment, but a large, flat pocket for laptop, IPAD, magazine..., a medium mesh pocket for scarf, slippers, cables..., and a small mesh pocket for toiletries, water bottle, notebook...You can place different objects as you want based on their sizes.



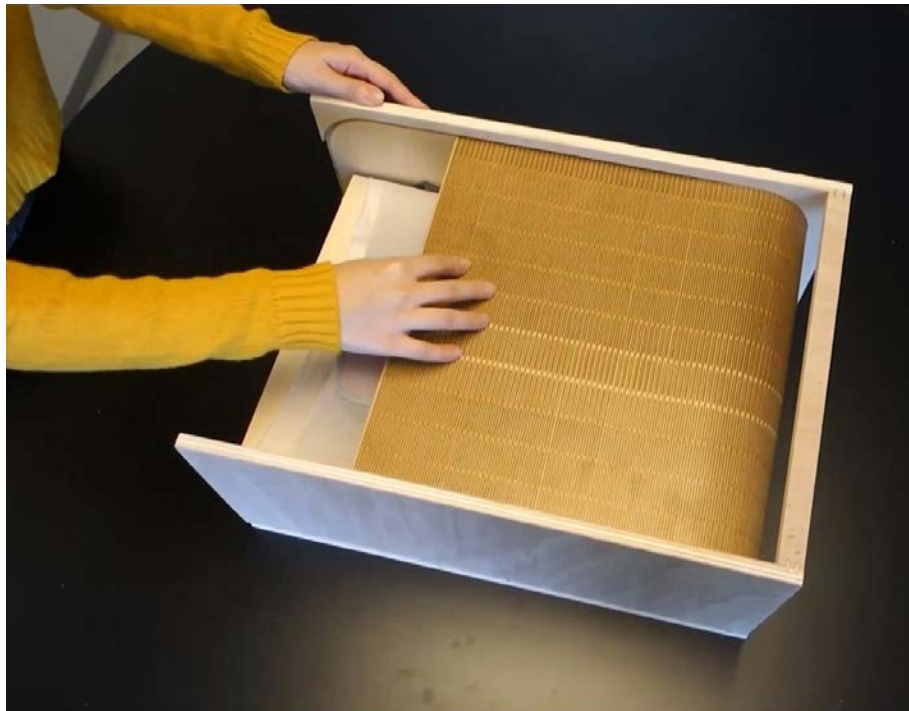
The interior compartment also function as a divider, compressor. You can put something soft, something large for instance cloths and shoes underneath the compartment, then something flat, something small for instance laptop and liquids inside the compartment, when you connect the compartment to the body, the cloths underneath would be compressed by the compartment which not only leaves more space for your frequently accessed objects inside, but also keeps your belongings stay at their place, being organized all along the journey.



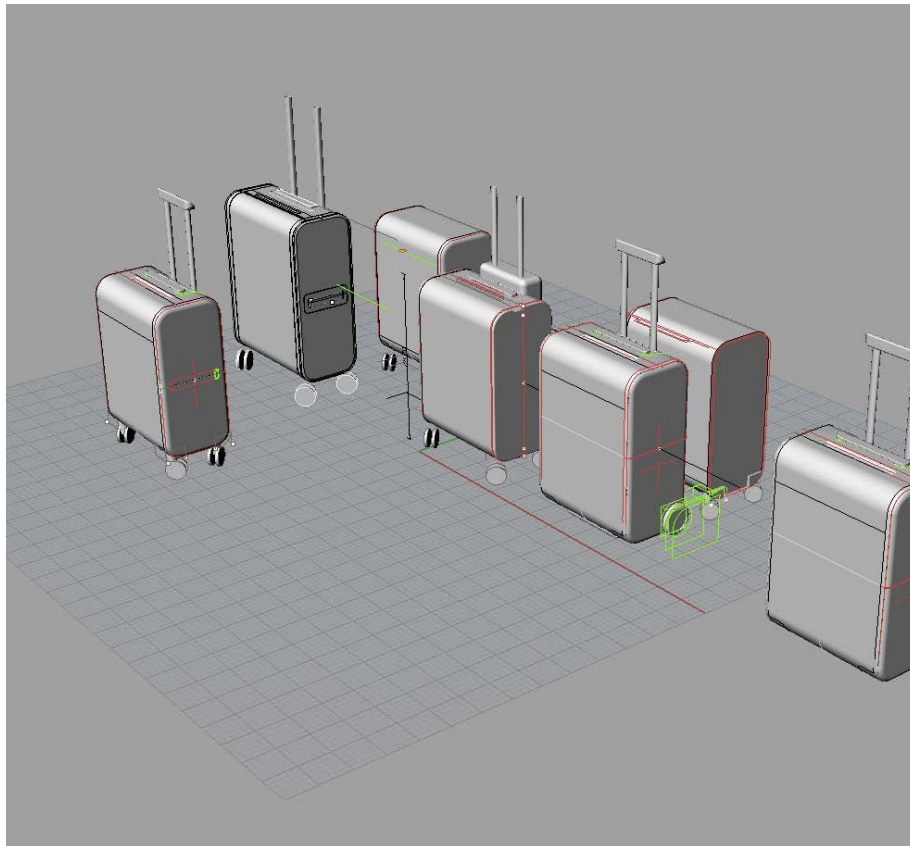
The best thing is when interior compartment and roller door come together.
 You only have to roll the door around 15cm, then you can take anything from inside compartment,
 from either the front side or the top side.

FEEDBACK

I made a rough prototype, and asked my interviewee to try it. They like this roller door concept and they also bring several questions to the table, among which the most concerned thing is how to control the roller to roll or stop? How to lock the roller surface? Do you have any idea on the surface material? And these issues became the further tasks I worked on.



04 REFINING

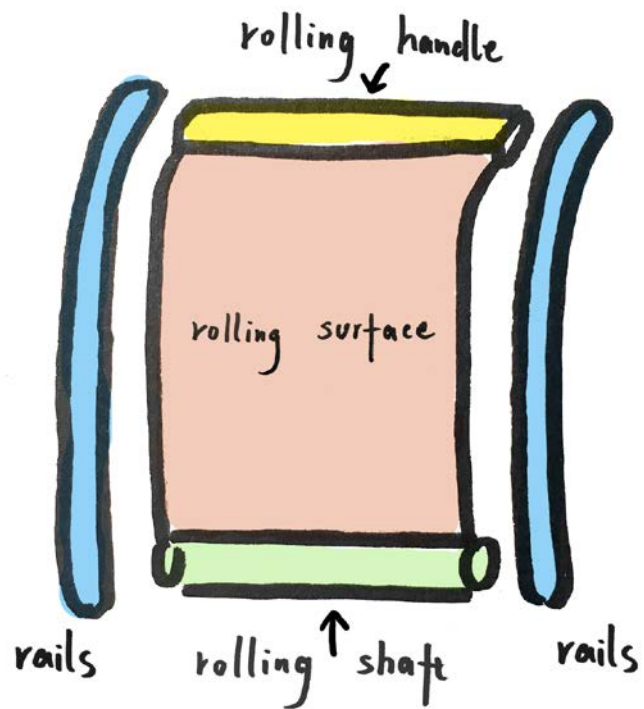


01/MECHANISM

02/SKETCHES

Firstly, I did some quick tests to find a direction of the body of the suitcase, when I decided which direction I would go for, I started to refine the current concept and at the same time coming up with ideas of its interior through observation and interviews with travelers.

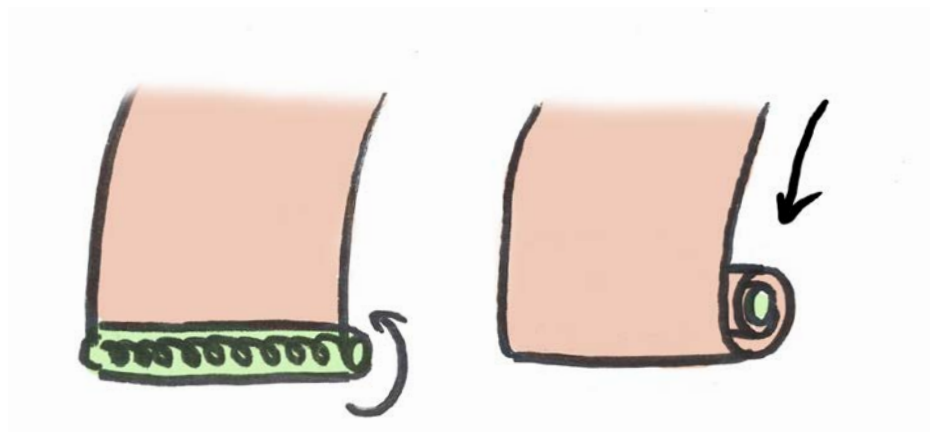
MECHANISM



It consists of 4 parts, the rolling surface, the rolling shaft, the rolling handle and the rolling rails on both sides.

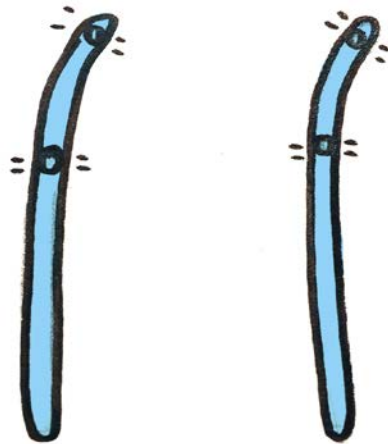


The rolling handle has two telescopic feet, which can be controlled by the user.

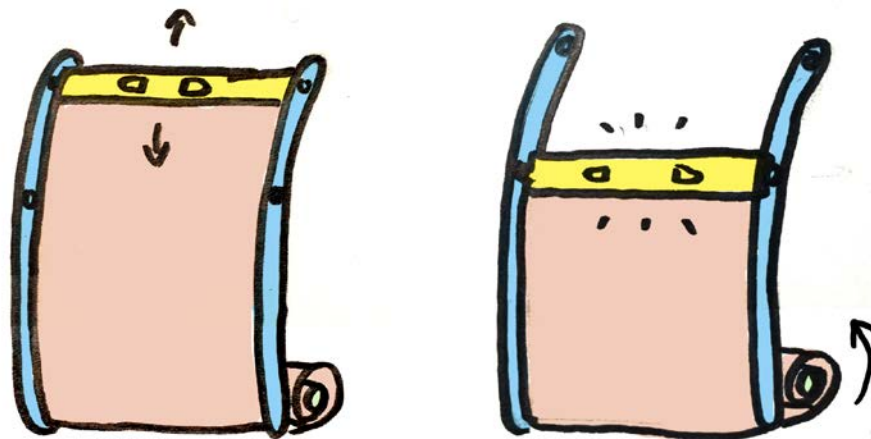


The rolling shaft is connected with a spring inside which allows it to roll automatically.

MECHANISM



There are 2 holes on each rail which regulate the stop points of the rolling surface.

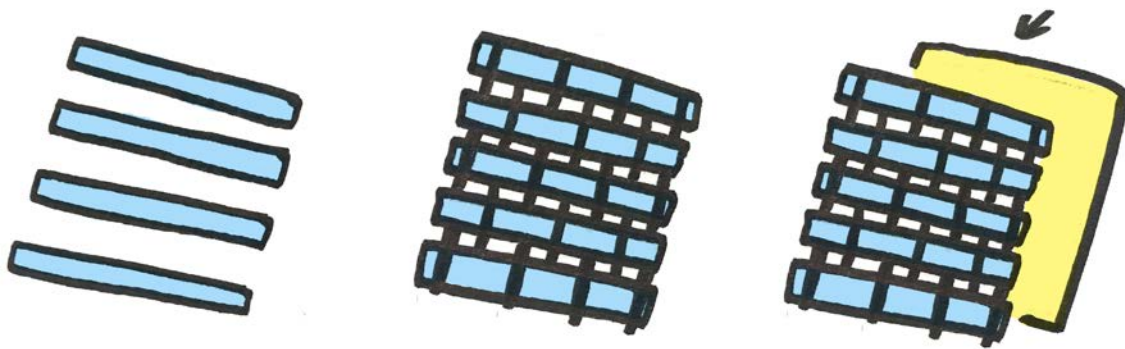


When the telescopic feet meet the holes, they would extend and stop at the stop points. When you want to move the rolling surface, just press the button on the rolling handle and the telescopic feet would retract.

MATERIAL



Then, I spent quite a long time searching for the right material for the surface. I was inspired by the bamboo mats sold in China, which is flexible vertically, and strong horizontally.

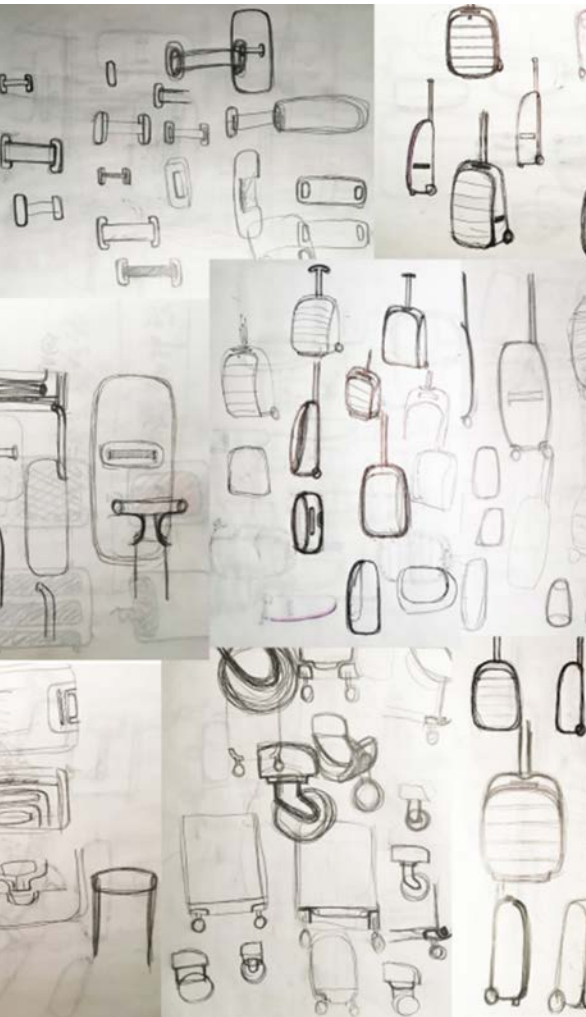


It's made from bamboo pieces, firstly, weave them together, secondly, glue the woven bamboo with a piece of water-resistant layer at the back side.
If the bamboo pieces can be changed into metal or carbon fibers, it would be the ideal material for the rolling surface.

SKETCHING & RENDERINGS



I mainly look into the factors like how to make the mechanism work, how to assemble, how to make it spacious ...when I designed the shape. In terms of style, I tried to keep it looks as simple as possible.



Chosen shape



Improved shape

05 FINAL PROTOTYPE



The final prototype is built in Shenzhen, China. I collaborated with a CNC modeling factory to build the suitcase body, and the interior compartment myself.

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01/HOW IT'S MADE

02/HOW TO USE IT

03/REFLECTION

BUILDING THE PROTOTYPE

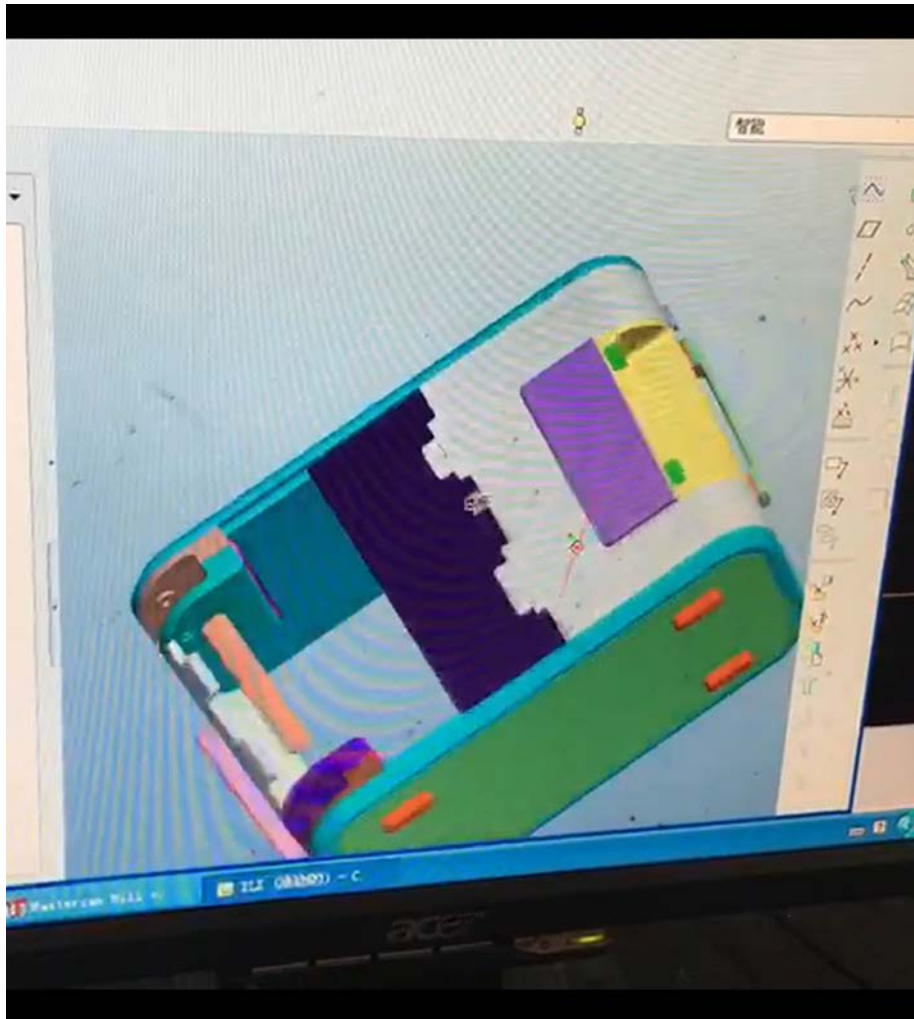


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I contacted a CNC model factory in Shenzhen, and build the prototype in ABS .

BUILDING PROTOTYPE



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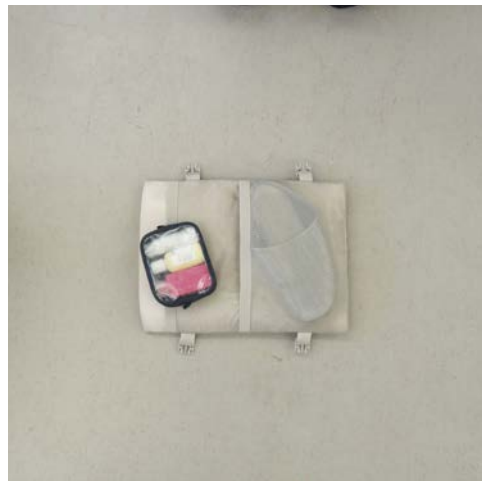


We spent quite a long time on the way to assemble the prototype.

FINAL PROTOTYPE



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REFLECTION

I consider diploma part of the learning process. The result in this diploma still left lots to refine in the future, it was a pity that I don't have more time polishing the design details, but I believe every obstacle that I had met in the whole process would be a great value to me.

The model building with actual factory made me learned a lot. I started to pay more attention to how to assemble a product, and how to communicate your ideas with makers who haven't learned design. This experience makes me know I should be not only a designer, but a professional designer who makes design easy ,understandable, and promising .

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