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Redefining urban travel

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AI DECLARATION

AI was used in this project to improve the writing and to help identify sources used for research. I have thoroughly reviewed all content and verified that it aligns with my intentions and the outcome I aimed to achieve.

AI was also used in the final render to place a person in the scene as context for use and as a size reference. This is clearly marked in the document.

ABSTRACT

ENGLISH

This project explores how luggage can be redesigned to better support urban travel. It focuses on a defined target group that needs to carry heavy luggage across both indoor and outdoor environments.

The concept further examines how different parts of the luggage can be rethought and rearranged to better support the ergonomic needs of the target group. The user group is also central in determining the price range as well as the choice of materials.

SWEDISH

Detta projekt undersöker hur bagage kan omdesignas för att bättre stödja resor i urbana miljöer. Fokus ligger på en definierad målgrupp som behöver transportera tungt bagage genom både inomhus- och utomhusmiljöer.

Konceptet utforskar även hur olika delar av bagaget kan omformas och omorganiseras för att bättre möta målgruppens ergonomiska behov. Målgruppen spelar också en central roll i valet av prisklass och material.

TABLE OF CONTENTS

1. TIMETABLE	7	8. COMPONENT ANALYSIS AND IDEATION	29 - 62
		8.1 COMPONENTS	30 - 62
2. INITIAL BRIEF	8	8.1.1 OUTSIDE CASE	31 - 43
		8.1.1.1 BRAINSTORM	32
3. MOTIVATION	9	8.1.1.2 MARKET	33 - 34
		8.1.1.3 DETAILED COMPARISON	35
4. MARKET	10 - 13	8.1.1.4 SOFT VS HARD CASE	36 - 37
4.1 MARKET VALUE	11	8.1.1.5 WEIGHTED DIAGRAM	38
4.2 MARKET RESEARCH	12 - 13	8.1.1.6 DECISION	39
		8.1.1.7 MATERIALS	40 - 41
5. TARGET GROUP	14 - 20	8.1.1.8 DECISION	42
5.1 FINDING THE TARGET	15 -18	8.1.1.9 LOCKS AND SECURITY	43
5.2 PERSONA	19	8.1.2 WHEELS	44 - 56
5.3 USER SCENARIO	20	8.1.2.1 BRAINSTORM	45 - 49
		8.1.2.2 MARKET	50 - 51
6. RESTRICTIONS AND PREFERENCES	21 -27	8.1.2.3 DETAILED COMPARISON	52
6.1 CARRY-ON VS CHECKED-IN	22-23	8.1.2.4 SINGLE VS DOUBLE WHEELS	53
6.2 SIZE RESTRICTIONS	24	8.1.2.5 WHAT KIND OF WHEELS?	54
6.3 EXPECTED RESTRICTIONS	25	8.1.2.6 WHEEL FEATURES	55
6.4 CHOSEN DIMENTIONS	26	8.1.2.7 DECISION	56
6.5 CUSTOMER PREFERENCES	27	8.1.3 HANDLE	57 -62
		8.1.3.1BRAINSTORM	58
7. REDEFINED BRIEF	28		

8.1.3.2 MARKET	59 - 60	10.6 COMPAIRISON	89
8.1.3.3 DETAILED COMPARISON	61	10.7 DECISION	90
8.1.3.4 LERNINGS AND FUTURE TESITING	62		
9.CONCEPT DEVELOPMENT	63 - 73	11. REALISATION	91 - 100
9.1 USER TESTS	64 - 71	11.1 FORM DEVELOPMENT	92 - 93
9.1.1 WHEEL AND HANDLE POSITION	65	11.2 FINAL MODEL	94
9.1.2 RESULTS	66 - 68	11.3 MEASUREMENTS	95
9.1.3 DECISION	69	11.4 TECHNICAL DRAWINGS	96
9.1.4 HANDLE DESIGN AND OPENING	70	11.5 ASSEMBLY DRAWINGS	97
9.1.5 DECISION	71	11.6 MATERIALS	98
9.2 SUMMARY OF DECISIONS	72	11.7 INTERIOR	99
9.3 FINAL PARTS AND PLACEMENT	73	11.8 COLOR SCHEME	100
		11.8 CMF CHART	101
10. DESIGN THEMES	74 - 90	12. REFINEMENT	102 - 103
10.1 DESIGN THEME 1	75 - 76		
10.1.1 FIRST SKETCHES	76	13. RESULT	104 - 109
10.2 DESIGN THEME 2	77 - 79	13.1 RENDERS	105 - 107
10.2.1 FIRST SKETCHES	78	13.2 SENARIO RENDER	108
10.2.2 REFINED SKETCHES	79	13.3 USER RENDER	109
10.3 DECISION	80		
10.4 DESIGN THEME 3	81 - 84	9. REFLECTION	110
10.4.1 FIRST SKETCHES	82		
10.4.2 REFINED SKETCHES	83	10. REFRENCES	111 - 115
10.4.3 AI GENERATED SKETCHES	84		
10.5 DESIGN THEME 4	85 - 88		
10.5.1 FIRST SKETCHES	86		
10.5.2 REFINED SKETCHES	87		
10.5.3 AI GENERATED SKETCHES	88		

1. TIMETABLE

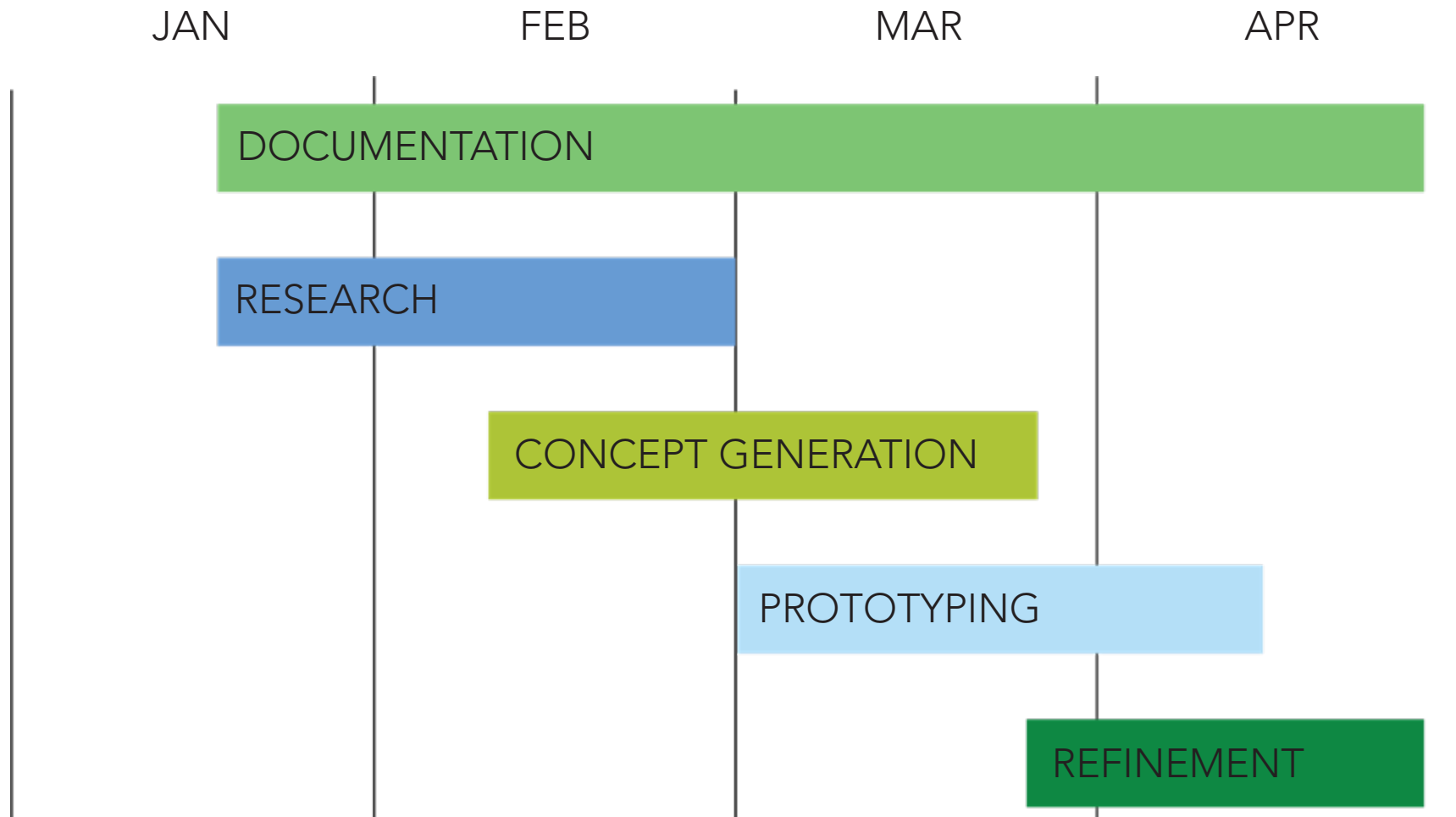


Figure x. Illustration of timetable (Source: Author's own work).

2. INITIAL BRIEF

Design a suitcase that enables users to transport heavy luggage efficiently across varied terrain.

3. MOTIVATION

I have been traveling a lot lately and often needed to carry heavy luggage. For these trips, I needed to use a suitcase. While it performed well in airport environments, it quickly became problematic in more demanding outdoor conditions.

When moving through varied terrain such as muddy streets, gravel, and uneven paths, the suitcase was not designed for this type of use. As a result, it suffered significant wear and became increasingly difficult and heavy to handle.



4. MARKET

4.1 MARKET VALUE

According to Pangarkar, T. (2026) report about luggage statistics, the market value for suitcases 2024 is valued at **427.59 billion SEK.**

The Eminent (2024) Luggage statistics, explains that the global market for luggage is expected to reach **733.07 billion SEK** in 2027, and will continue to grow.

4.2 MARKET RESEARCH

Helly Hansen - Sport Exhibition Trolley

This suitcase is made to fit as much as possible with a soft shell and compression straps. It also made with a durable and waterproof 420D-poly fabric. If the wheels break, they can easily be exchanged with Inlines wheels.

Price: 3000 kr

Volume: 40 L

Measurements:
55 x 40 x 20 cm



Figure X: Sport Exhibition Trolley (Helly Hansen, n.d.).

Salomon - Container 40

The Salomon suitcase is made for both short and longer trips. It has convenient storage solutions, such as a computer pocket and a compartment that can be reached from the top. The wheels are supposedly silent as well.

Price: 1750 kr

Volume: 33 L

Weight: 3.15 kg

Measurements:
53 x 35 x 31 cm



Figure X: Container 40 (Salomon, n.d.).

Samonite - Nexis

This suitcase has a multilayered durable material and design. It is also very lightweight. It also has larger silent wheels, is expandable and has well planned interior. It's also customizable with engravings.

Price: 5899 kr

Volume: 40 L

Weight: 2.7 kg

Measurements:

55 x 40 x 20 cm



Figure X: Nexis (Samonite, n.d.).

Rimowa - Cabin

Rimowa is a luxury suitcase brand suited for leisure and business travel. It has features such as ball bearing and cushioned wheels, a telescopic handle, TSA - approved locks, flex dividers, and a hard aluminum shell.

Price: 13700 kr

Volume: 35 L

Weight: 4.3 kg

Measurements:

55 x 40 x 23 cm

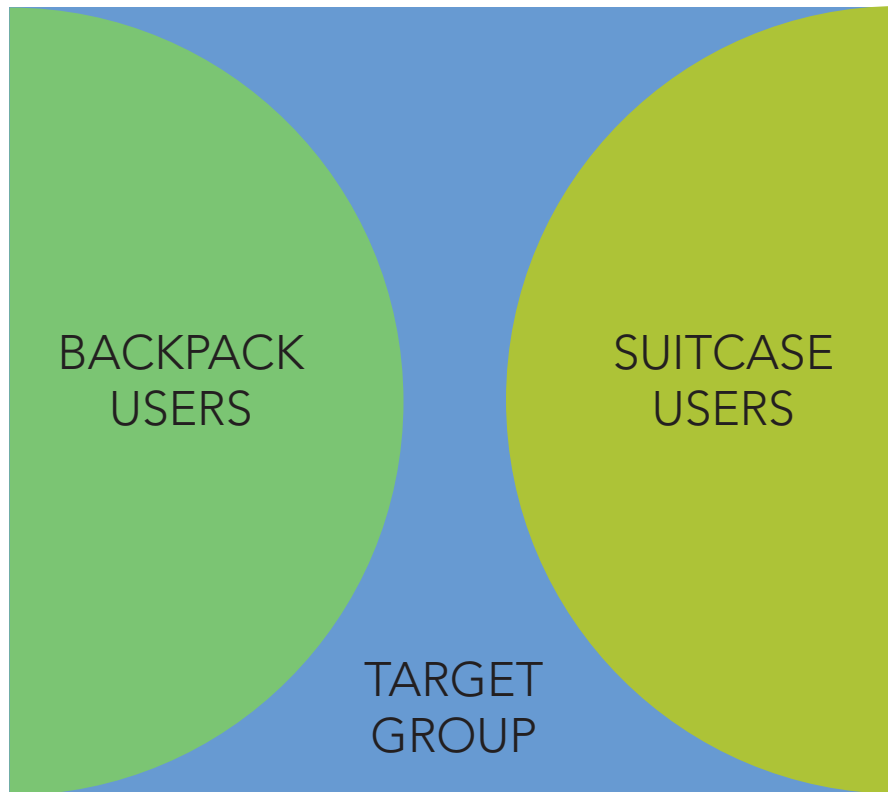


Figure X: Cabin (Rimowa, n.d.).



5. TARGET GROUP

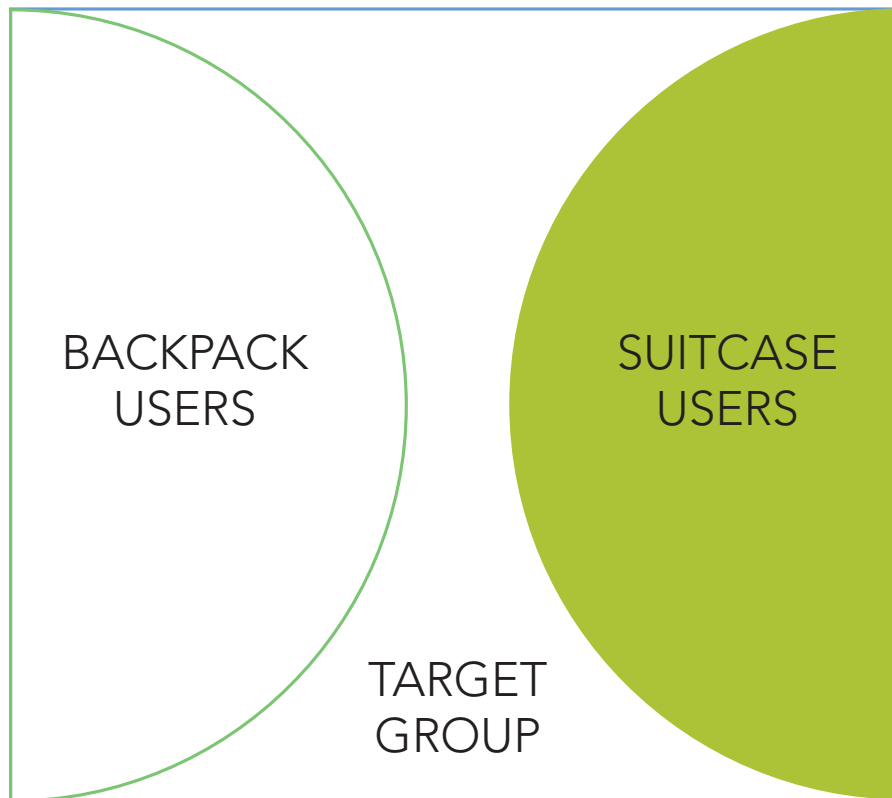
5.1 FINDING THE TARGET



Determining the target

The diagram was created to determine the what the target group that would fit the suitcase, see figure x. It shows the users for backpacks and the users for suitcases. The remaining space is what determines the target group.

The first step to deducting the target, is to look at who fits in each of the individual groups. To determine the needs of both backpack users and suitcase user. Only after that see what both groups have in common and are lacking. This will determine the specifications for the target.



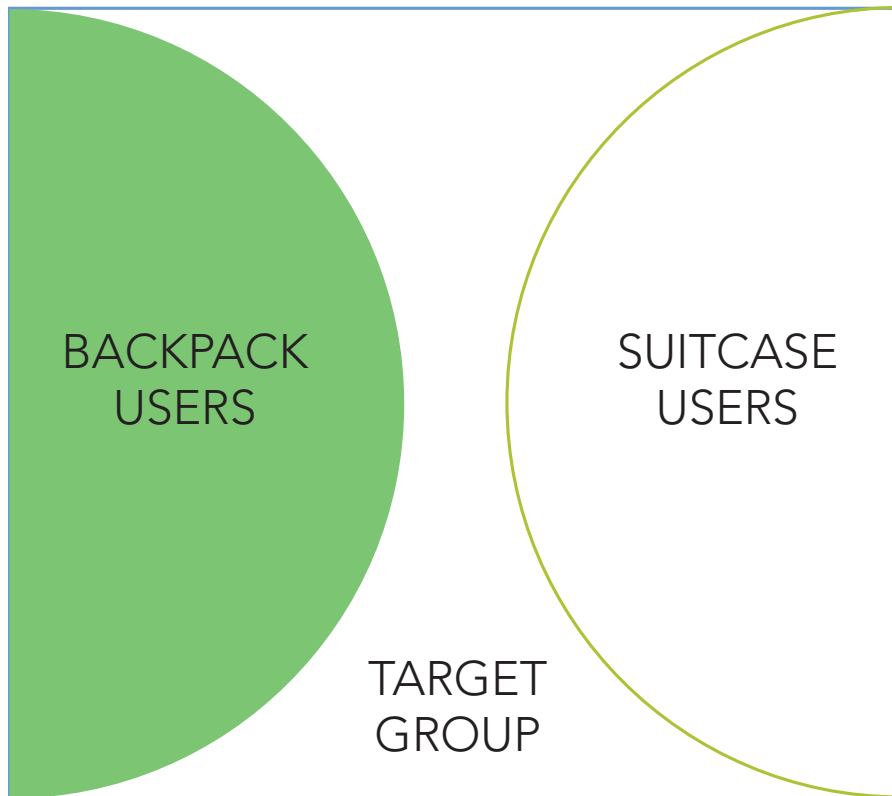
Suitcase users

The first group that was examined, was users of the suitcase, see figure x. The reason the use a suitcase is often that the user need to carry a lot of luggage. The luggage could also be to heavy to carry for a long periods of time.

Another reason to choose a suitcase, is that the user might need several bags. If they are already carrying a backpack it would be easier to have a suitcase, instead of another backpack. This would also provide a resting place for the backpack. A suitcase is often easy to maneuver in an airport.

Summary

- A lot of heavy luggage
- Already is wearing a backpack
- Easy to maneuver at airport

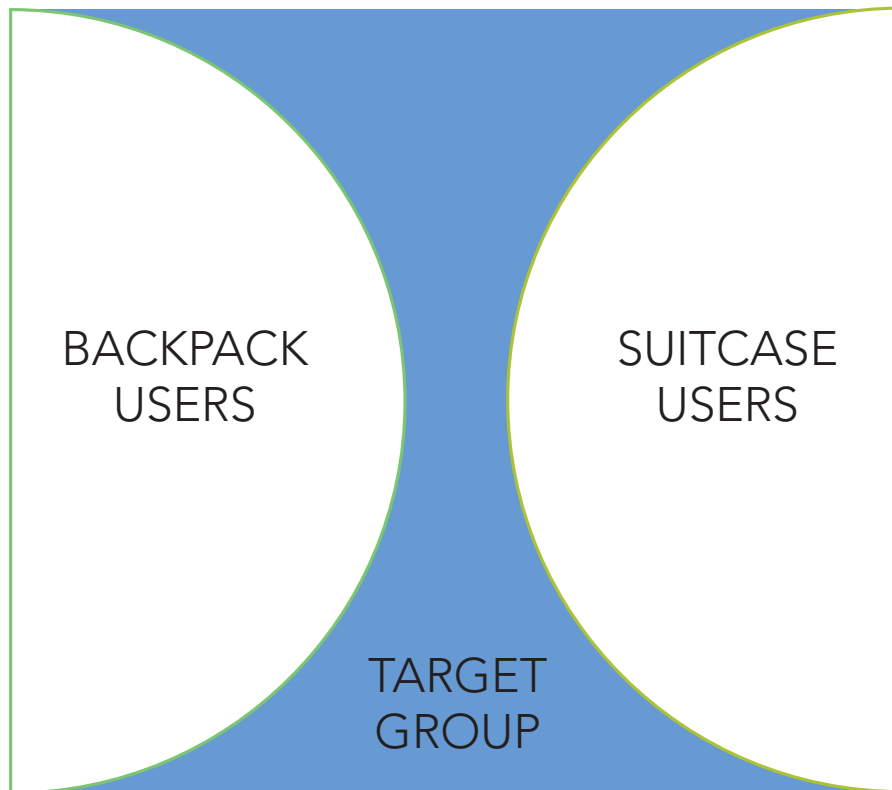


Backpack users

The backpack users was examined as well, see figure x. Because backpacks have no contact with the ground they have more advantages if your traveling outside. When walking on uneven terrain, backpacks are favorable. It is also great for walking in stairs. The luggage is preferably light and small, because it is can cause a lot of stain to carry for a longer period of time. Backpacks are also easy to carry in an airport.

Summery

- Waking i rough terrain
- Lighter luggage
- Easy to maneuver at airport



Target group

If the two groups are compared, It is easier to Determine the outcome of the target group.

Backpack users have an advantage being carried in outdoor terrain, witch is one of the weakest points of a suitcase. However suitcases are a lot more proficient at carrying heavy loads. It is also allows you to carry more luggage. If the user is already wearing a backpack the suitcase can allow support for the backpack.

This is a whole int the market and would allow for a new solution, witch is a suitcase that would be easier to handle in outdoor terrain.

Backpack users

- Waking in outdoor terrain
- Lighter luggage
- Easy to maneuver at airport

Suitcase users

- A lot of heavy luggage
- Already is wearing a backpack
- Easy to maneuver at airport

Target group

- Outdoor terrain
- A lot of heavy luggage
- Already wearing a backpack

5.2 PERSONA

Name: Elin

Age: 25

Occupation: University Student

Location: Sweden

Hobbies:

- Traveling on a budget
- Exploration
- Meeting friends
- Knitting



Motivation & Goals

I love traveling and exploring new places, but since I'm on a student budget, I mostly walk and use buses and trains instead of taxis. That means I need a suitcase that works in different environments. Uneven streets, stairs, and muddy paths often make traveling tiring and frustrating.

Pain Points

- Walking long distances with a heavy backpack is exhausting.
- Small suitcase wheels struggle on uneven terrain and break easily.
- Need to make tight turns in crowded buses and trains.
- Carrying suitcases up stairs in train stations is hard.

Needs & Expectations

- Lightweight, compact suitcase
- Can handle hard terrain such as gravel, dirt and uneven surfaces
- Smooth-rolling, durable wheels
- Easy to carry when needed
- Affordable price point
- Practical storage and organization
- Durable materials for frequent use

5.3 USER SCENARIO





6. RESTRICTIONS AND PREFERENCES

6.1 CARRY-ON VS CHECKED-IN

While both carry-on and checked luggage have their advantages, there is a growing preference for carry-on travel due to its efficiency and reliability.

Deiss (2025) explains that increasing instances of delayed baggage, inconsistent airline policies, and shorter layover times have made traveling with only carry-on luggage more appealing. Carry-on bags allow passengers to avoid check-in queues and baggage claim delays while keeping essential items accessible throughout the journey. In addition, they reduce the risk of lost or delayed luggage and help travelers avoid extra fees (NerdWallet, 2024).

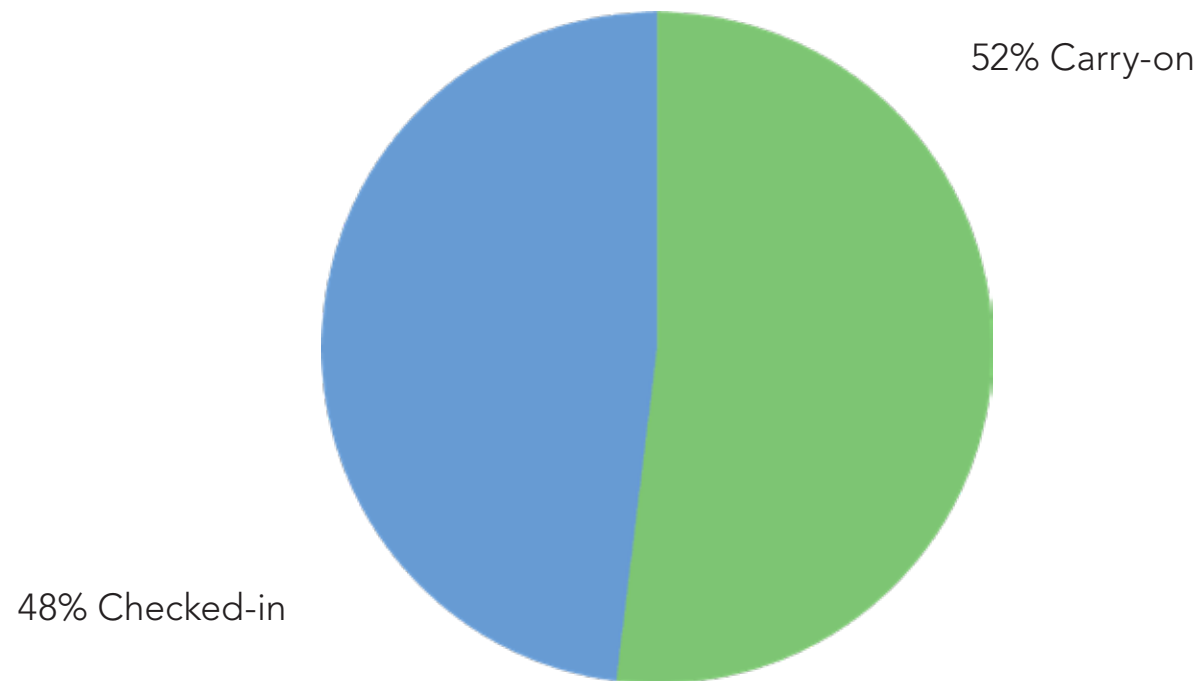
However, carry-on luggage also has limitations, including strict size and liquid restrictions, as well as limited packing capacity, which can make it less suitable for longer trips.

In contrast, checked luggage provides greater storage space and fewer restrictions on what can be packed, making it more practical for extended travel or transporting bulky items (Forbes, 2024).

Nevertheless, checked baggage introduces drawbacks such as longer waiting times at the airport and the risk of delays or loss (NerdWallet, 2024).

For this project I restricted myself to making a carry on bag. Although checked luggage remains useful in certain situations, carry-on travel is often the more efficient and dependable option for modern air travel.

According to Eminent (2024), the International Air Transport Association reports a growing global preference among passengers for carry-on luggage over checked baggage.



6.2 SIZE RESTRICTIONS

Carry-on luggage rules vary widely between airlines, and enforcement has become stricter in recent years. At the same time, increasing baggage fees, new measurement technologies, and proposed regulations are changing how airlines manage cabin luggage and how passengers prepare for air travel.

Carry On Gear Guide (n.d.) explains that there is no universal standard for carry-on luggage, and that size limits vary between airlines. The article states that depth is often the most restrictive dimension. While height and width are usually more flexible, the depth of a bag often determines whether it meets airline requirements. Enforcement practices also differ. Budget airlines frequently use physical sizing cages to check bags, while major carriers measure less often. The author further notes that budget airlines tend to enforce restrictions more strictly.

Airlines such as Ryanair, Spirit Airlines, and Frontier regularly check bags using sizing tools, whereas major airlines such as United Airlines, Delta Air Lines, and American Airlines typically verify carry-on size only when overhead space is limited.

Travel and Time (n.d.) similarly explains that budget airlines such as Spirit and Ryanair charge for most additional services in order to keep base fares low. In contrast, full-service airlines like Delta and Emirates generally offer more generous baggage allowances. The article also notes that most major U.S. have more unified size regulation.

6.3 EXPECTED RESTRICTIONS

In the EU

The European Union is planning new rules (from 2025) to standardize hand-luggage allowances across EU flights. EU lawmakers have proposed removing fees for small cabin bags.

Proposed allowance includes:

Cabin bag up to **100 cm** total dimensions and **7 kg** weight. Plus a free personal item. Airlines warn the changes could lead to higher ticket prices, especially impacting light travelers. The proposal is not yet final and still needs approval from the European Parliament.

In the US

Luggage size limits are becoming stricter, with stronger enforcement across the industry.

A more unified carry-on size standard of **56 × 36 × 23 cm** is expected by 2026.

New rules require measuring the entire exterior dimensions of the bag. Measurements must include:

Height from bottom of wheels to top of handle
Full width, including side pockets.
Depth from front to back.

6.4 CHOSEN DIMENTIONS

Carry-on luggage

According to Carl Friedrik's article European carry-on size guide (2025), each airline has different restrictions. However, within Europe there are reasonably standardized carry-on measurements of approximately $55 \times 40 \times 20$ cm.

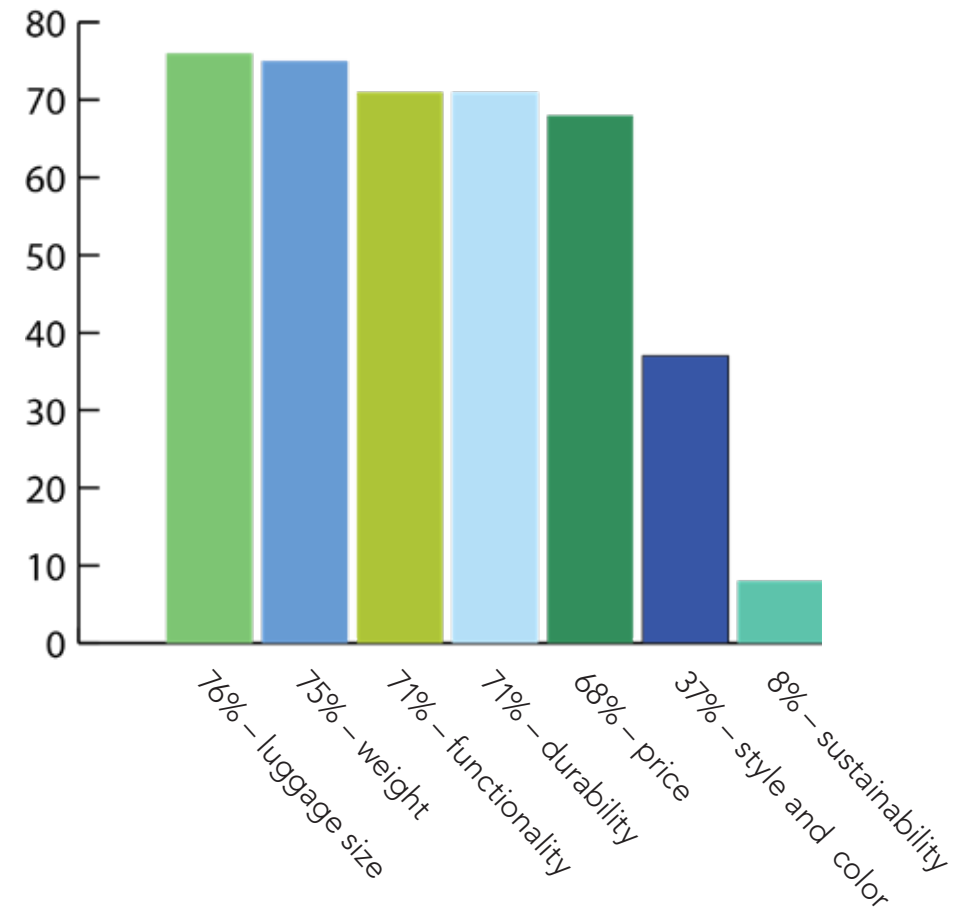


$55 \times 40 \times 20$ cm

6.5 CUSTOMER PREFERENCES

According to Pangarkar (2026), most customers consider luggage size and dimensions the most important factor when choosing a suitcase, followed closely by weight.

Other highly valued aspects include functionality and features as well as durability, while price is also an important consideration. Some respondents reported that style, color, and brand name influence their choice, although these factors are less significant. A small proportion of customers also stated that sustainability plays a role in their decision-making.



7. REDEFINED BRIEF

Design a **carry on** suitcase that enables users to transport heavy luggage efficiently across varied terrain.



8.1 COMPONENT ANALYSIS AND IDEATION

8.1 COMPONENTS

Outside casing

What kind?

- Hard or soft

What material?

- Durability
- Storage
- Waterproof

Handles

How many?

What kind?

- Ergonomics
- Materials

Inside casing

Internal storage

- Keep things safe
- What kind of luggage

Wheels

How many?

What kind?

- Attachment
- Shock absorbtion
- Steering
- Resting position





8.1.1 OUTSIDE CASE

8.1.1.1 BRAINSTORM

Here the case from the outside was explored. Both the look, properties and possible storage solutions was analysed.



8.1.1.2 MARKET

Oakley - Large Carbon Fiber Case

This case for glasses is made to hold. It's material and form makes it crush resistant and durable. The case don't have a zipper, but is instead hold together by a spring pressure.



Figure X: Large Carbon Fiber Case (Oakley, n.d.).

Synsam - Glasses Case Foldable

The case form synsam is a more affordable option, but is still durable due to it's triangular shape. It's also made to be folded flat for better storage.



Figure X: Glasögonfodral Foldable (Synsam, n.d.).

Fjellpunkten - Mountain sled Touring 125

A sled used for carrying heavy luggage while hiking in the mountains. The heavy luggage can be dragged behind the user with a string.

The soft bag is tightens and secured with both straps and a rubber band and hook attachment.

Terrain: snow and ice



Figure X: Mountain sled Touring 125 (Fjellpulken, n.d.)

8.1.1.3 DEATAILED COMPARISON

The suitcase has a soft textile case that is waterproof. This provides more room for packing irregularly shaped objects. It also has external, easy-to-reach pockets.



Figure X: Sport Exhibition Trolley (Helly Hansen, n.d.).

This is an aluminum-cased suitcase. It is more durable compared to the last one; however, it is also more expensive and heavier.



Figure X: Cabin (Rimowa, n.d.).

This is a combination of a hard and soft case, where the strong underside protects against impact, while the top side is made of fabric material, allowing more flexibility when packing.



Figure X: Mountain sled Touring 125 (Fjellpulken, n.d.)

8.1.1.4 SOFT VS HARD CASE

UC, C. (2025) explains that choosing between hard-shell and soft-shell luggage significantly affects travel convenience and protection, and several key factors should be considered.

Durability

Hard-sided luggage offers stronger protection and better resistance to moisture, making it suitable for rough handling and harsh weather (Deurlein, 2024). However, it may crack under heavy impact and is more prone to visible scratches. Soft-sided luggage does not crack but can tear, stain, and absorb dirt over time. (Popp, 2025).

Weight

Hard-shell luggage is generally heavier due to its rigid structure, although modern materials have reduced this difference. Soft-sided luggage is typically lighter and allows for easier overpacking, which can help travelers maximize baggage allowances (UC, 2025; Popp, 2025).

Flexibility and Capacity

Soft-sided luggage is more flexible, making it easier to fit into tight spaces and expand when needed. Hard-shell luggage maintains its shape and offers less flexibility (UC, 2025).

Organisation and Storage

Soft-sided luggage often includes external pockets for easy access, while hard-shell luggage relies on internal compartments. Hard-shell suitcases use a clamshell design for better organization, whereas soft-sided luggage provides simpler access and more packing flexibility (UC, 2025; Popp, 2025; Adelman, 2025).

Security and Weather Resistance

Hard-shell luggage is generally more secure and water-resistant, often featuring integrated locks. Soft-sided luggage is more vulnerable to moisture and tampering unless specially treated (UC, 2025).

Design and Price

Hard-shell luggage has a modern appearance but shows scratches more easily and is often more expensive.

Soft-sided luggage is typically more affordable and available in a wider range of styles (UC, 2025; Adelman, 2025).

Conclusion

The choice depends on travel needs: hard-shell luggage offers better protection and security, while soft-sided luggage provides greater flexibility, lighter weight, and easier access (UC, 2025).

8.1.1.5 WEIGHTED DIAGRAM

Criteria	Weight	Soft - shell	Hard - shell
Carry-on dimentions	0.18	5	5
Mobility	0.17	4	4
Price	0.16	5	3
Durability	0.14	3	4
Weight	0.12	5	4
Weather restistance	0.8	2	4
Organisation	0.6	5	3
Portability	0.5	3	3
Aesthetics	0.4	3	5
Score:		35	35
Weighted score:		10.7	11.6

8.1.1.6 DECISION

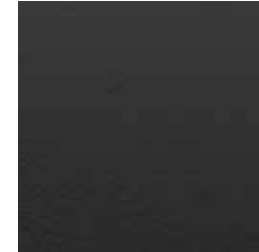
Both the research and the weighted diagram point toward a hard-shell design. It would be the most durable and waterproof option, which is especially important since it is intended for outdoor use.

8.1.1.7 MATERIALS

Business Research Insights (2024) describes that based on type, the global market can be categorized into ABS Luggage, PP Luggage, PC Luggage, Leather Luggage and Aluminum Luggage.

ABS luggage is made from Acrylonitrile Butadiene Styrene, a lightweight and affordable material. It is popular for its bright colors and easy moldability. While slightly less durable than polycarbonate or aluminum, it remains fairly sturdy and requires little maintenance, making it suitable for occasional travelers.

PP luggage is made from polypropylene and is known for its flexible, crack-resistant design. It is lightweight yet strong, with good resistance to chemicals and moisture. Its durability makes it a reliable option for frequent travelers. (Business Research Insights 2024)



PC luggage is made from polycarbonate, offering high strength and impact resistance. It is lightweight but very durable, able to absorb shocks without cracking. Its glossy finish and modern design also make it appealing to style-conscious travelers. (Business Research Insights 2024)



Leather luggage is valued for its classic and sophisticated appearance. Made from treated animal hides, it develops a unique patina over time. Although heavier than synthetic options, it offers durability and a luxurious look. (Business Research Insights 2024)



Aluminum luggage is known for its durability and sleek design. Made from strong aluminum alloys, it resists impacts and harsh conditions. Reinforced edges and secure locks provide extra protection, making it ideal for travelers seeking maximum security and durability. (Business Research Insights 2024)



8.1.1.8 DECISION

For the suitcase shell, **polycarbonate** is selected because it offers an effective balance of low weight, strength, and impact resistance, while remaining relatively cost-efficient and resistant to cracking.

Polyurethane is used for the wheels due to its durability and elasticity. It provides good shock absorption, smooth rolling, and strong resistance to wear over time.

Aluminium is chosen for the handle rails and reinforcements because it is strong and rigid while still lightweight. It also resists bending and corrosion, making it suitable for structural components.

Polypropylene is used for the handles because it is lightweight, flexible, and highly resistant to fatigue, allowing it to bend repeatedly without cracking.

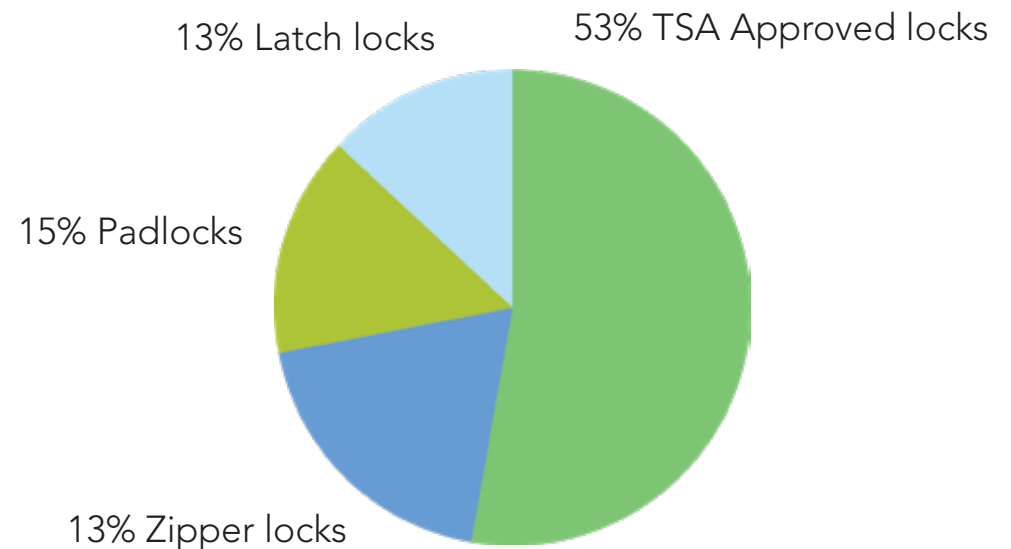
8.1.1.9 LOCKS AND SECURITY

Pangarkar (2026) notes that the market for anti-theft luggage has been growing, indicating that consumers are increasingly focused on protecting their belongings. The study projects that by 2025, approximately 35% of premium luggage brands will incorporate biometric locking technology to enhance security.

Similarly, Eminent (2024) reports on a study examining preferred luggage locking mechanisms. The findings show that the majority of consumers favor TSA-approved locks due to their added security and convenience during airport screenings. Zipper locks were the second most popular option, followed by padlocks and latch-lock systems.

Travel Sentry (2025) also emphasizes that security remains a key concern for travelers, with luggage lock technology continuing to evolve. By 2025, advanced features such as fingerprint recognition and app-controlled locks are becoming increasingly common, offering improved protection and greater peace of mind.

However, some research suggests that luggage locks may have limited effectiveness in preventing theft, indicating a potential gap between perceived and actual security.





8.1.2 WHEELS

8.1.2.1 BRAINSTORM

How many wheels?

Different questions was brainstormed, to open up as many possible outcomes as possible. Starting with how many wheels is needs.



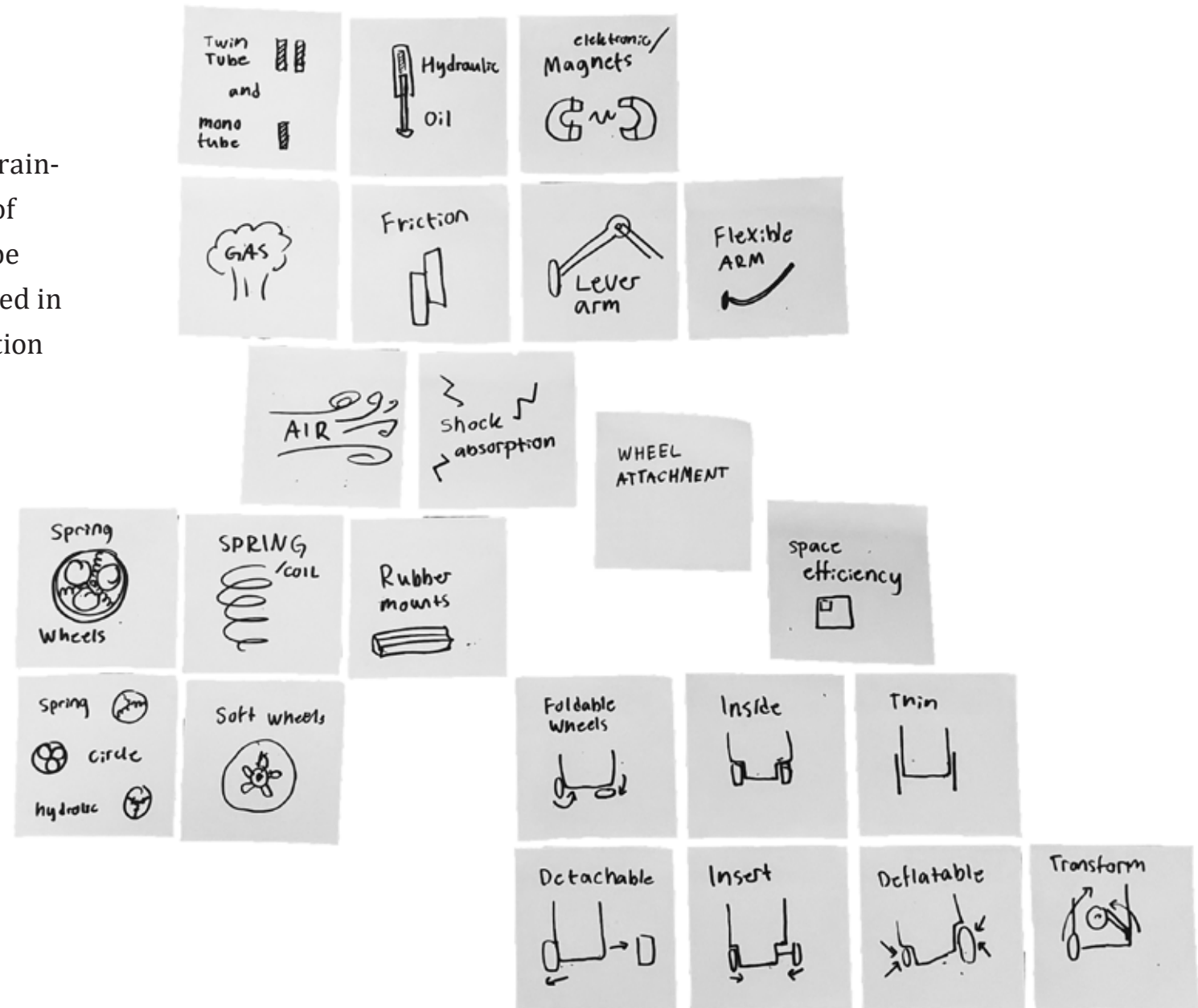


What kind of wheels?

The next question was what kind of wheel that could be used for my suitcase.

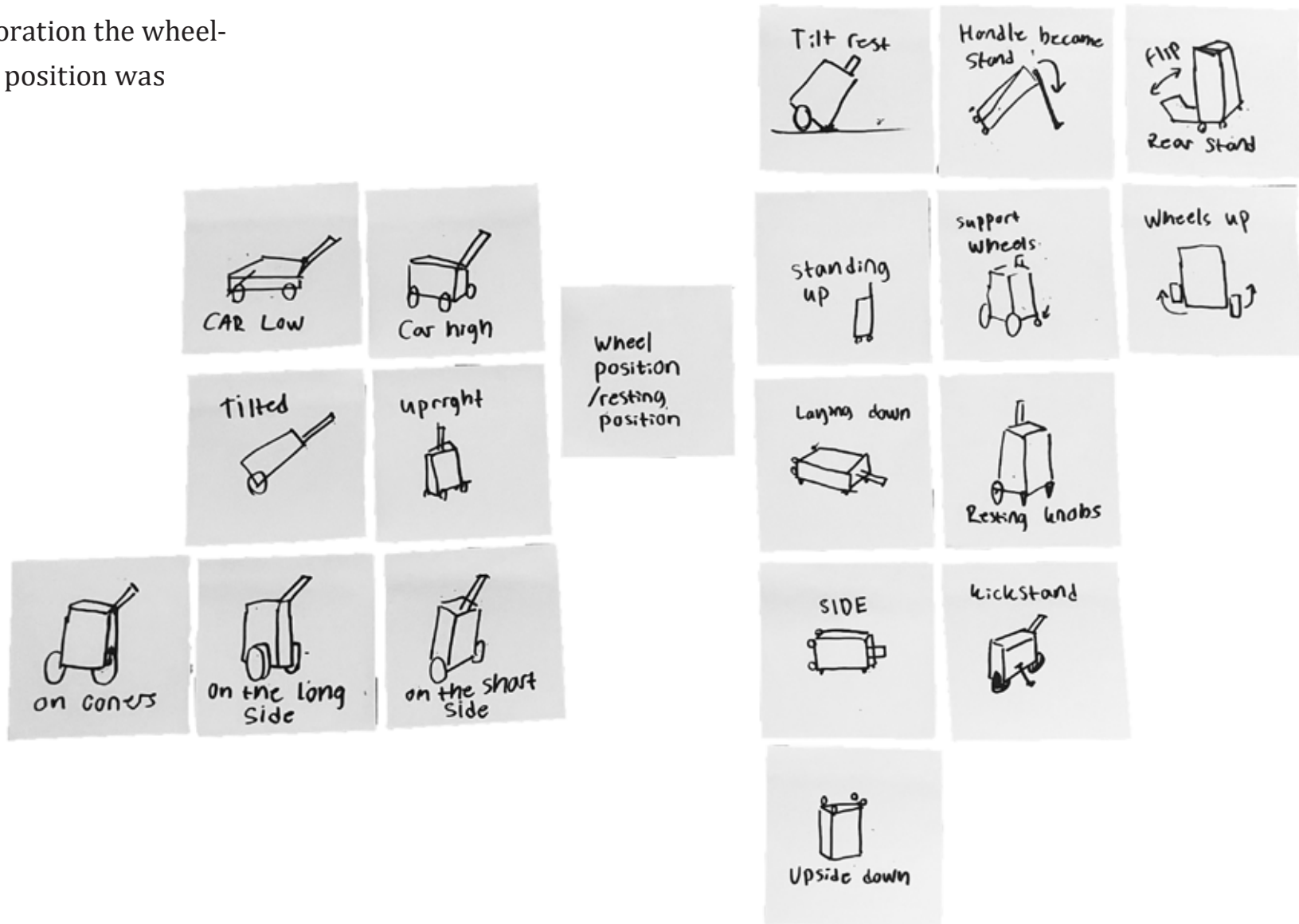
Wheel attachment?

The next topic that was brainstormed, was what kind of wheel attachment could be used. The topic was divided in categories. Shock absorption and space efficiency.



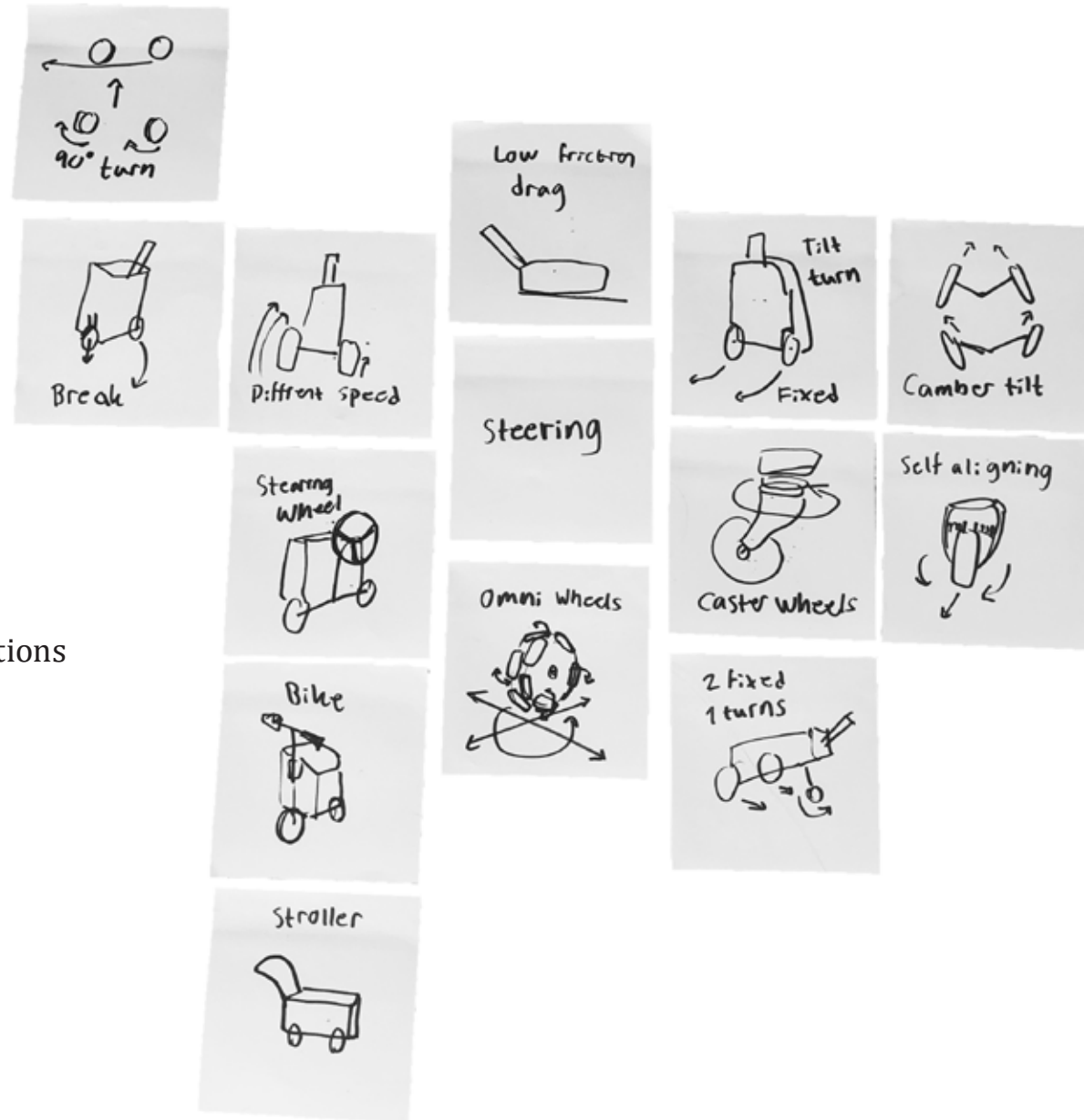
Wheel- and resting position?

In this exploration the wheel- and resting position was confronted.



Steering?

The possible steering options was explored.



8.1.2.2 MARKET

Britax Römer - Smile 5Z

The stroller has several mechanisms that make it suitable for both urban environments and outdoor terrain. The wheels feature a central suspension system, allowing smooth movement over uneven surfaces. The front wheels are swivel-mounted, improving maneuverability in city settings. In addition, the wheels include a locking mechanism that enhances stability and performance on rough terrain.

Terrain: Urban streets, mud, gravel, grass, hills

Price: 8495 kr



Figure X: Smile 5Z (Britax Römer, n.d.)

Thule - Thule Urban Glide 3

This stroller is designed for both outdoor terrain and urban environments. Its three wheel construction, combined with a swivel front wheel, provides excellent maneuverability in both city and off-road conditions. The rear wheels feature suspension, which improves comfort and makes it easier to navigate uneven terrain.

Terrain: Urban streets, mud, gravel, grass, hills

Price: 9799 kr



Figure X: Thule Urban Glide 3 (Thule, n.d.).

8.1.2.3 DEATAILED COMPARISON

The suitcase has **fixed wheels**, which are good for stability and outdoor terrain. The single-wheel design prevents dirt and mud from getting into the bearings.



Figure X: Container 40 (Salomon, n.d.).

The **spinner wheels** are easy to maneuver indoors and can handle tight turns. The suitcase can also be carried in front of you. The double wheel design makes it more stable.



Figure X: Cabin (Rimowa, n.d.).

The stroller has **spinner wheels in the front** for maneuverability and large, **stable wheels in the back** for stability on outdoor terrain.



Figure X: Thule Urban Glide 3 (Thule, n.d.).

8.1.2.4 SINGLE VS DOUBLE WHEELS

	Single wheel	Double wheel
Advantages	Thicker and more durable. Less likely to break when hitting obstacles.	Better balance and stability. Easier movement on uneven surfaces Lower risk of debris jamming the wheel
Disadvantages	Debris can get stuck between the wheel and housing	Wheels are thinner and more exposed to damage.

8.1.2.5 WHAT KIND OF WHEELS?

Here are some different types of suitcase wheels. Understanding the main wheel types helps compare luggage options.

Single Wheels

Common on many modern four-wheel suitcases. The wheel sits between two supports on the axle, making it thicker and durable. However, debris can sometimes get trapped between the wheel and housing, which may cause faster wear.

Double Wheels

These have two slimmer wheels on each axle, similar to car wheels. They distribute weight more evenly and are less likely to jam from debris. Many travelers prefer them for stability and smoother movement, though the exposed design may make them slightly more prone to damage.

Castor Wheels

Often integrated partly into the suitcase shell and usually found on two-wheel suitcases or wheeled holdalls. They are typically larger and durable. Two-wheel designs are easier to pull over rough terrain and are less likely to roll away when stationary.

Inline Skate Wheels

Inspired by inline skates, these wheels are usually larger, made from hard polyurethane, and often include ball bearings for smoother rolling. They can be used as single or castor wheels. Performance depends heavily on wheel quality and they may add some weight.

Spinner / Swivel Wheels

These are not a separate wheel type but describe wheels that rotate 360°. This feature is standard on most four-wheel suitcases.

8.1.2.6 WHEEL FEATURES

Silent Wheels

Many brands advertise “silent” wheels. These usually have a thicker rubber or polyurethane coating that reduces noise but may wear slightly faster.

Ball Bearings

Ball bearings reduce friction and create smoother rolling. They are common in inline skate wheels but rare in standard suitcase wheels because they increase weight and cost. Frequent travelers may benefit from them more than occasional users.

Suspension

Some suitcases include suspension systems to reduce vibration. In practice, these usually have limited impact, especially on rough surfaces like cobblestones.

Wheel Size

Wheel diameter significantly affects performance:

Budget suitcases: ~4 cm wheels

Mid- to high-range suitcases: 5–8 cm wheels

Larger wheels roll more easily over rough surfaces but can reduce packing space and may be more exposed to damage. Many brands settle around 5–6 cm as a compromise.

Wheel Housing

The wheel housing connects the wheels to the suitcase and helps prevent structural damage. Reinforcements inside the suitcase shell often support this area.

8.1.2.7 DECISION

Based on the research, the best option for my project would be double wheels. They're more stable and have easier movement on uneven surfaces. There's also lower risk of debris jamming the wheel

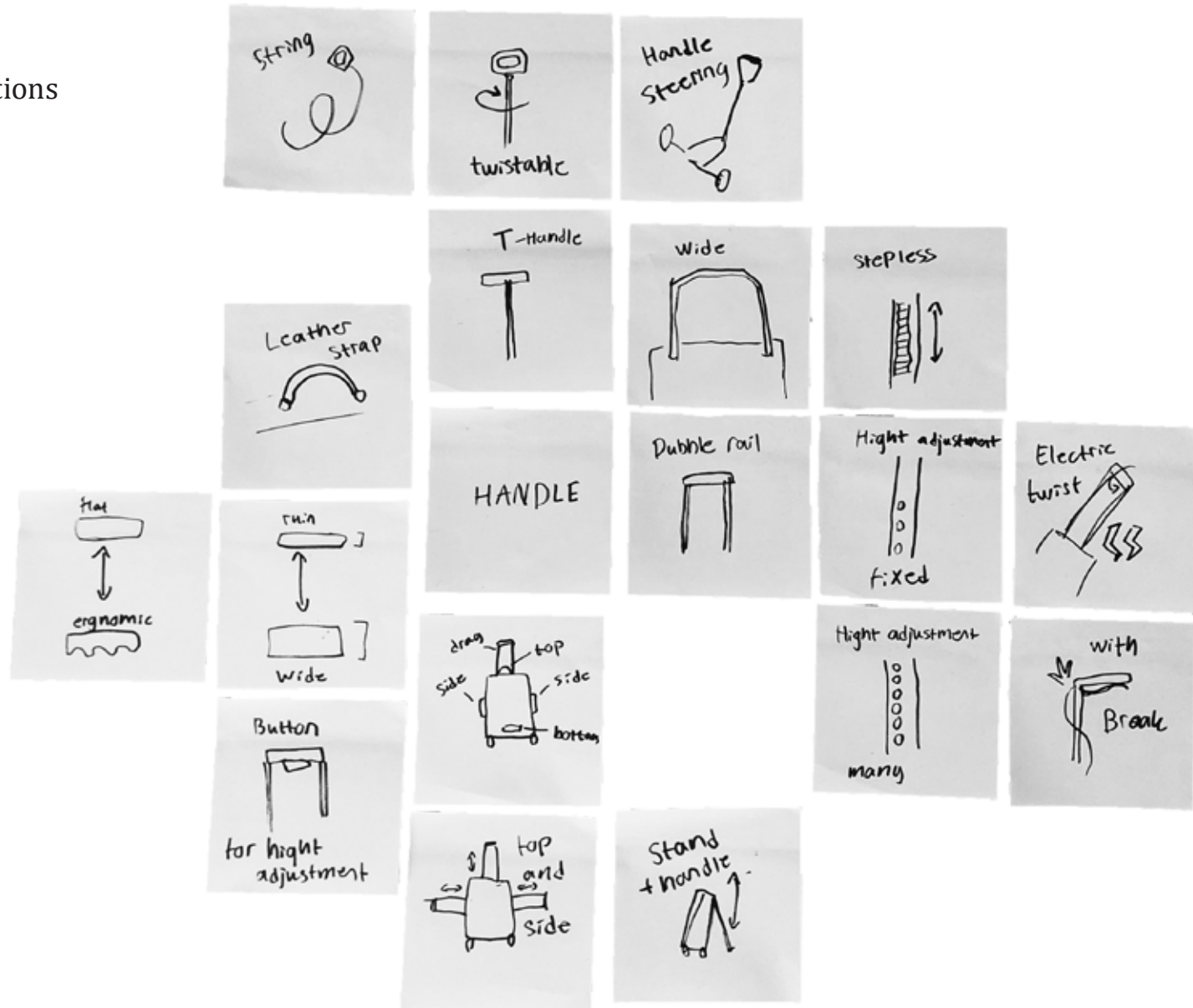


8.1.2 HANDLES

8.1.3.1 BRAINSTORM

Handle?

The different handle solutions was explored.



8.1.3.2 MARKET

Trolley Company - Charcoal Mesh Trolley

The trolley is targeted towards workers. From gardeners to transport harvest to builder to use in construction sites.

It's a robust trolley with a turning mechanism in the handle, making it easier to maneuver in tighter spaces. It's also suggested that the wheels can be deflated to easily maneuver grave, sand and mud.

Terrain: mud, gravel, dirt, sand



Figure X: Charcoal Mech Trolley (Trolley Company, n.d.).

Mover X - 70L Folding Wagon

A wagon trolley that can be used for transporting luggage for camping, picnic or festival equipment. The compactable design makes it easier to storage after use.

Terrain: Gravel, dirt, grass



Figure X: MoverX 70L Folding Wagon. (Mover x, n.d.)

8.1.3.3 DEATAILED COMPARISON

The suitcase has a **double-railed** handle with a rectangular frame, which provides more structure.



Figure X: Container 40 (Salomon, n.d.).

This suitcase uses the same principle; however, the handle is **telescopic**, meaning it has endless adjustment steps and can be set to the exact right height for the user.



Figure X: Cabin (Rimowa, n.d.).

This wagon has a **single handlebar** with a steady grip. Its steering is connected to the wheels, making it easier to turn.



Figure X: Charcoal Mech Trolley (Trolley Company, n.d.).

8.1.3.4 LEARNINGS AND FUTHER TESTING

The reaserch indicated that an angled handle could improve ergonomics by making height adjustments easier and more comfortable for the user. Further testing is needed to compare a double-railed handle with a single-railed handle to determine which solution provides the best balance of stability, usability, and durability. The placement of the handle should also be investigated further, as its position may affect both ergonomics and the overall user experience.



9. CONCEPT DEVELOPMENT

9.1 USER TESTS

I conducted a series of user tests to determine the optimal wheel and handle positions. For these tests, I built a prototype suitcase with the correct dimensions. I then drilled holes in the prototype to allow different wheel and handle configurations to be tested.

To simulate the weight of a packed suitcase, I placed a sandbag inside the prototype. The sandbag was positioned slightly above the bottom of the suitcase so that the center of mass would be located near the middle of the bag, providing a more realistic representation of a loaded suitcase.



Prototype

9.1.1 WHEEL AND HANDLE POSITION

1.a Two large castor wheels, two stops.
Handle on long side.

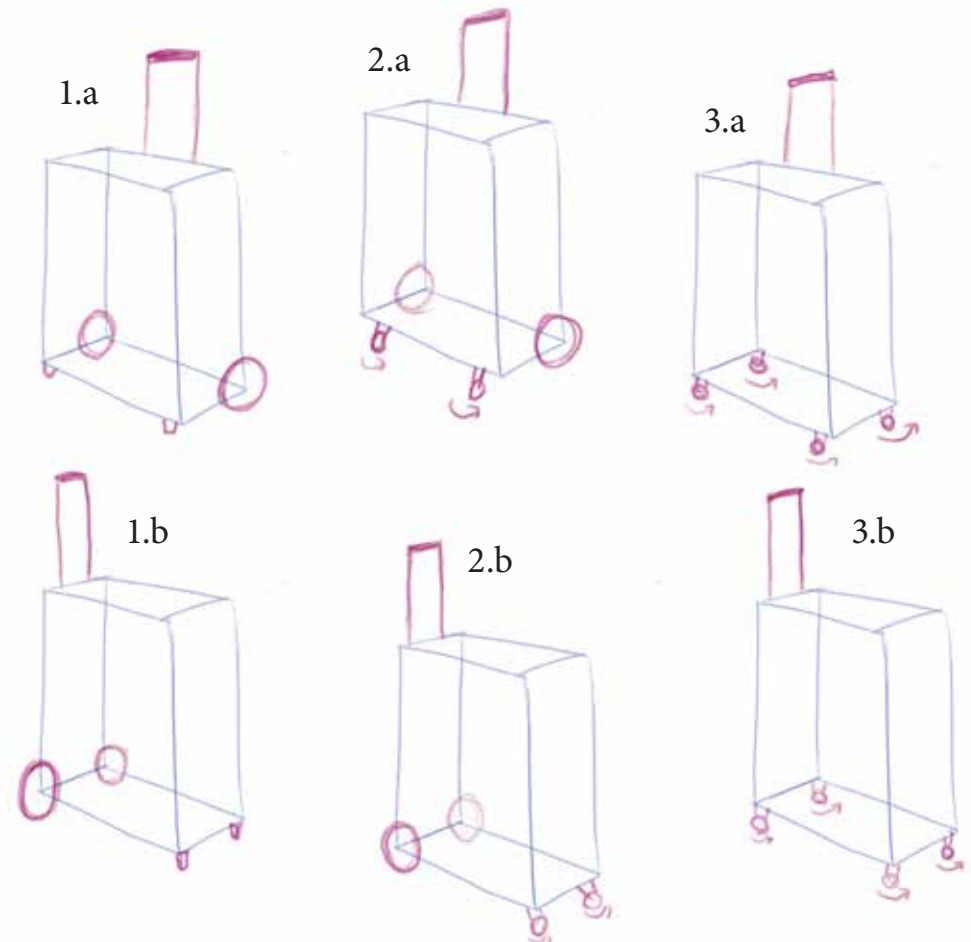
1.b Two large castor wheels, two stops. Handle
on short side

2.a Two large castor wheels, two stops. Handle
on long side.

2.b Two large castor wheels, two spinner
wheels. Handle on short side.

3.a Four spinner wheels. Handle on long side.

3.b Four spinner wheels. Handle on short side.



9.1.2 RESULTS

User test 1.a and 1.b both have larger, fixed wheels with stoppers on the other end. When the suitcase was tilted on the larger wheels- they performed well outdoors.

However, they were much harder to navigate indoors in tighter spaces. This is because of the fixed wheels, which gives it a larger turning radii. This was especially the case with user test 1.a, because the wheels are further apart. User test 1.b performed slightly better in the indoor environment.

The stoppers on the suitcase worked well for stabilizing the suitcase when standing still.

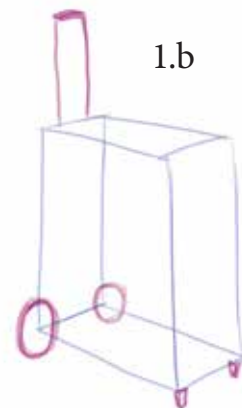
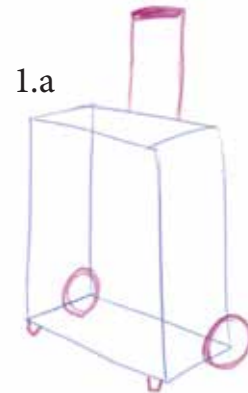


Image of user test 1.b

User test 3.a and 3.b both have spinner wheels, with the handle position being the main difference. They worked well indoors and were effective for navigating tight spaces. However, 3.b was somewhat harder to turn and slightly less stable. Both were difficult to use outdoors, as the spinning wheels could get stuck in the wrong positions and were also too small.

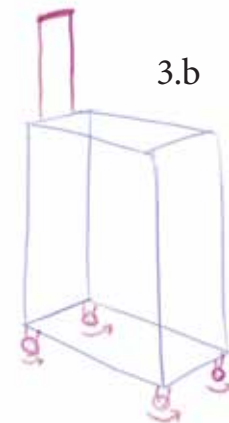
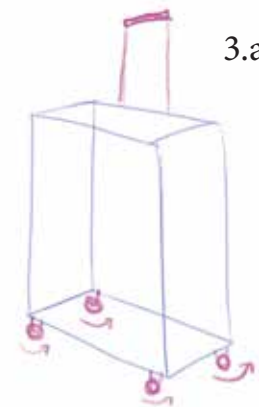


Image of user test 3.a

2.a and 2.b, like 1.a and 1.b, performed well outdoors thanks to their large fixed wheels. They also worked well indoors in tight spaces due to the spinner wheels. 2.b performed somewhat better because its turning axis was smaller.

Though the design of 2.b performed the best, it also created new problems. Because the handle is on the short side it and the opening is on the same way, is isn't possible to open.

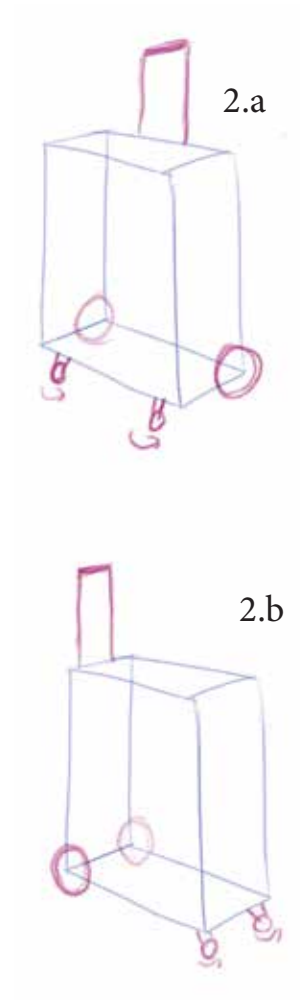


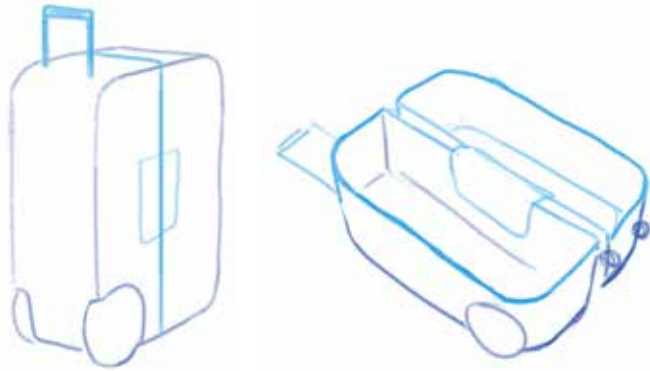
Image of user test 2.b

9.1.3 DECISION

Based on the results of the User Tests. I decided to continue with the Wheel and Handle arrangement of test 2.b, as it demonstrated the best performance in both indoor and outdoor environments.

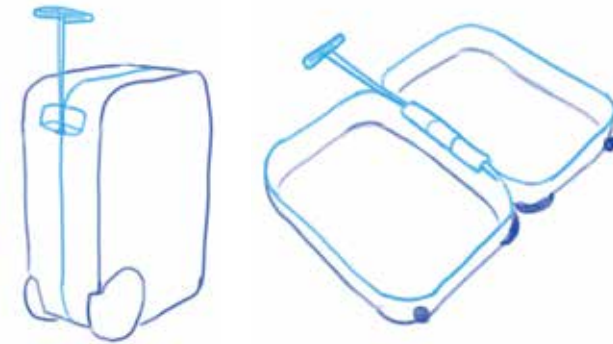
9.1.5 HANDLE DESIGN AND OPENING

CONCEPT 1



This concept opens along the long side, allowing a stable double-rail handle, less floor space when open, and better depth for taller items. However, it reduces visibility, may be harder to close, and puts more strain on the zipper.

CONCEPT 2



Like most suitcases, this one opens along the short side, but with a modified design. It uses a single-rail handle integrated into the hinge for added strength and easier repair. This layout improves visibility of contents but requires more floor space when open.

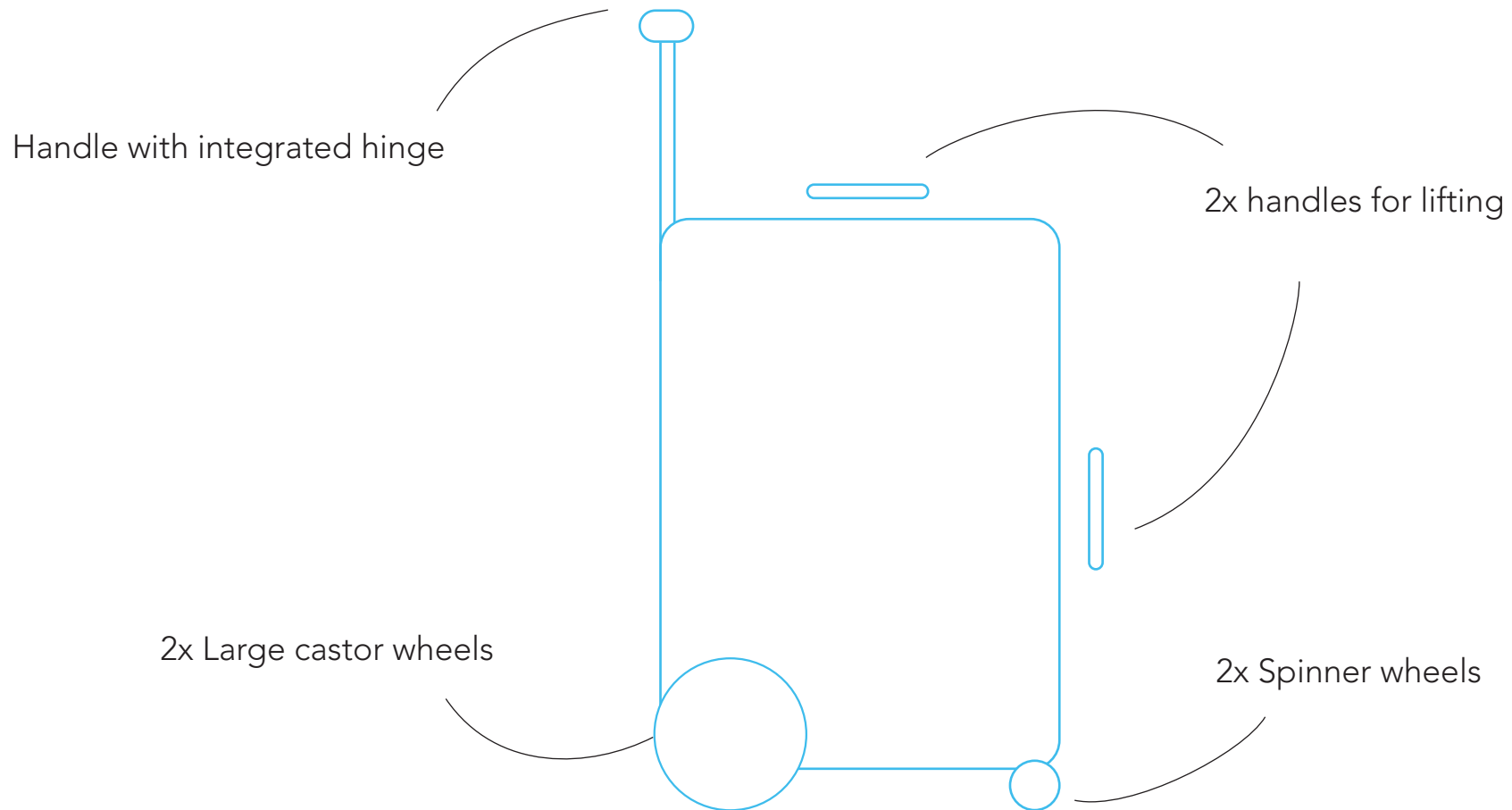
9.1.6 DECISION

I decided to proceed with Concept 2 because it provides a better overview of the contents inside the suitcase, making it easier to organize and access belongings. In addition, the design is sturdier and more durable, which should contribute to a longer product lifespan. The concept is also more stable, improving its overall usability and performance.

9.2 SUMMARY OF DECISIONS

- **Carry-on** suitcase with dimensions of **55 × 40 × 20 cm**.
- Features a hard-shell exterior made from **polycarbonate**, providing durability and impact resistance.
- Equipped with **double wheels** made out of **polyurethane** to improve stability and maneuverability.
- Uses **aluminium** handle rails, selected for their high strength-to-weight ratio.
- The carrying handles are made from **polypropylene**, offering durability and comfort.
- Wheel and handle arrangement, with **two large castor wheels** in the back and **two spinner wheels** in the front.
- Incorporates a **single-rail** handle integrated into the **hinge structure**.

9.3 FINAL PARTS AND PLACEMENT

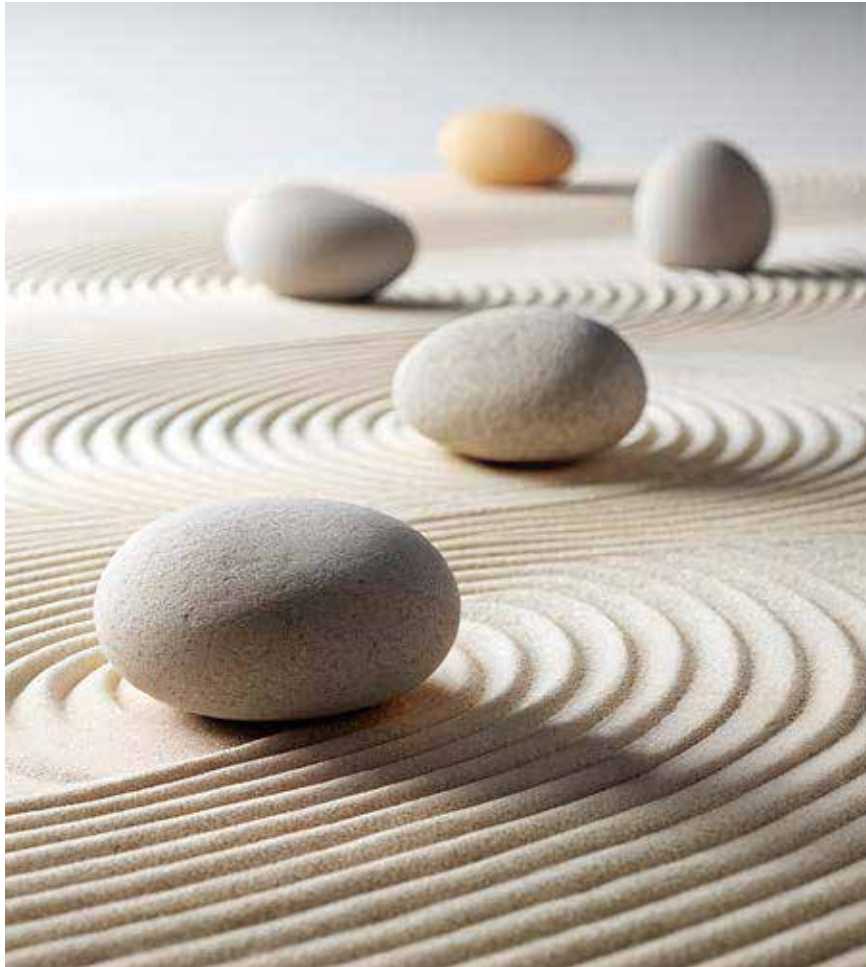




10. DESIGN THEMES

10.1 DESIGN THEME 1

SMOOTH IMPACT

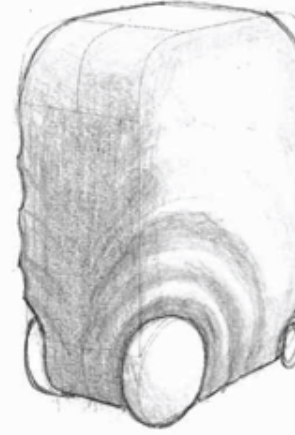
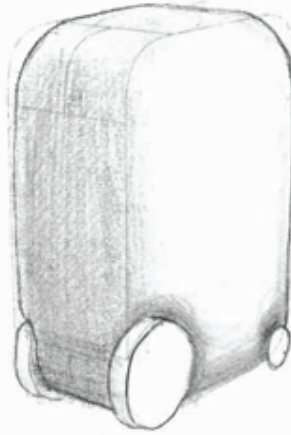


(Pixabay, 2024)



(Apple, n.d.)

10.1.1 FIRST SKETCHES



10.2 DESIGN THEME 2

CONVEX AND CONCAVE

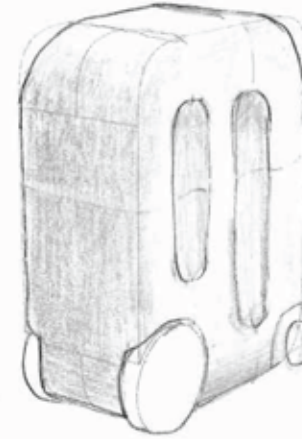
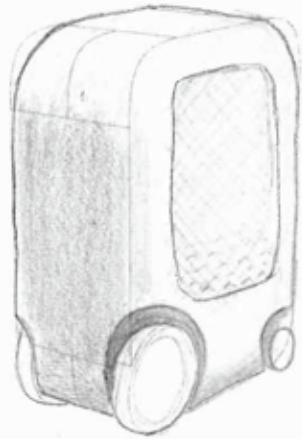
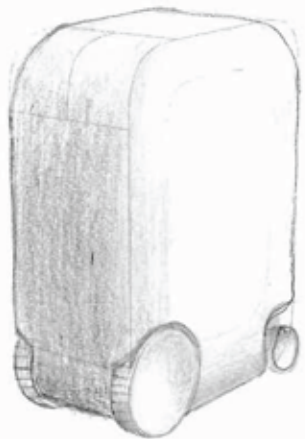
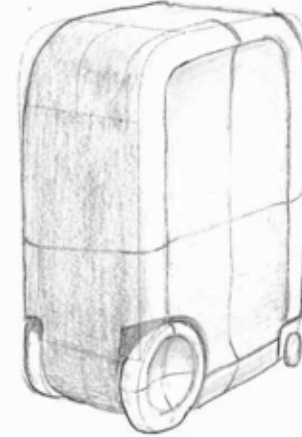
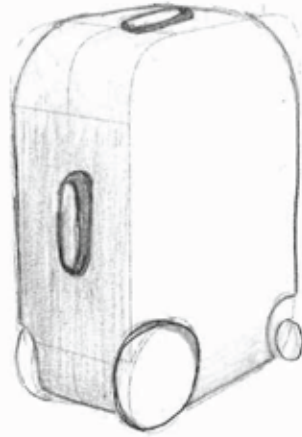
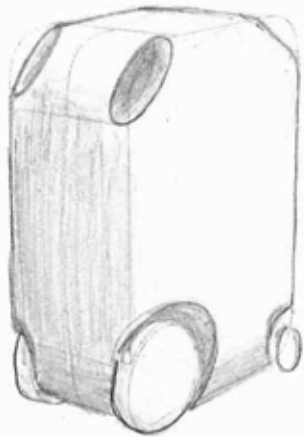


(Nothing, n.d.)

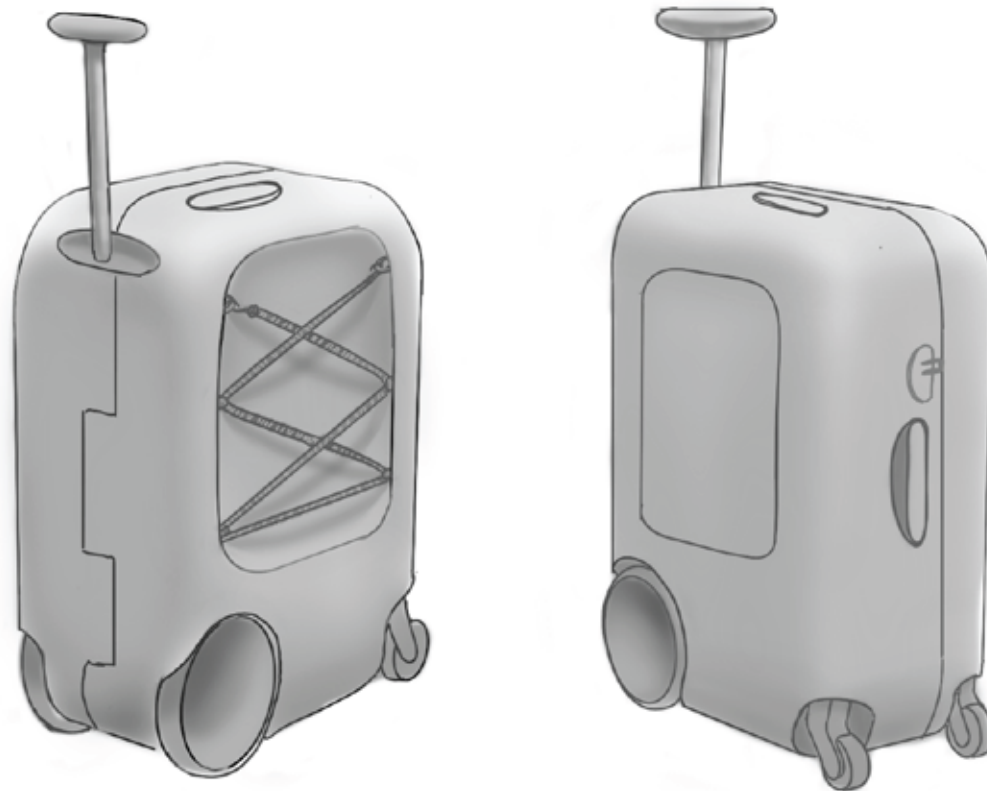


(Red Dot Design Award, n.d.)

10.2.1 FIRST SKETCHES



10.2.2 REFINED SKETCHES



10.3 DECISION

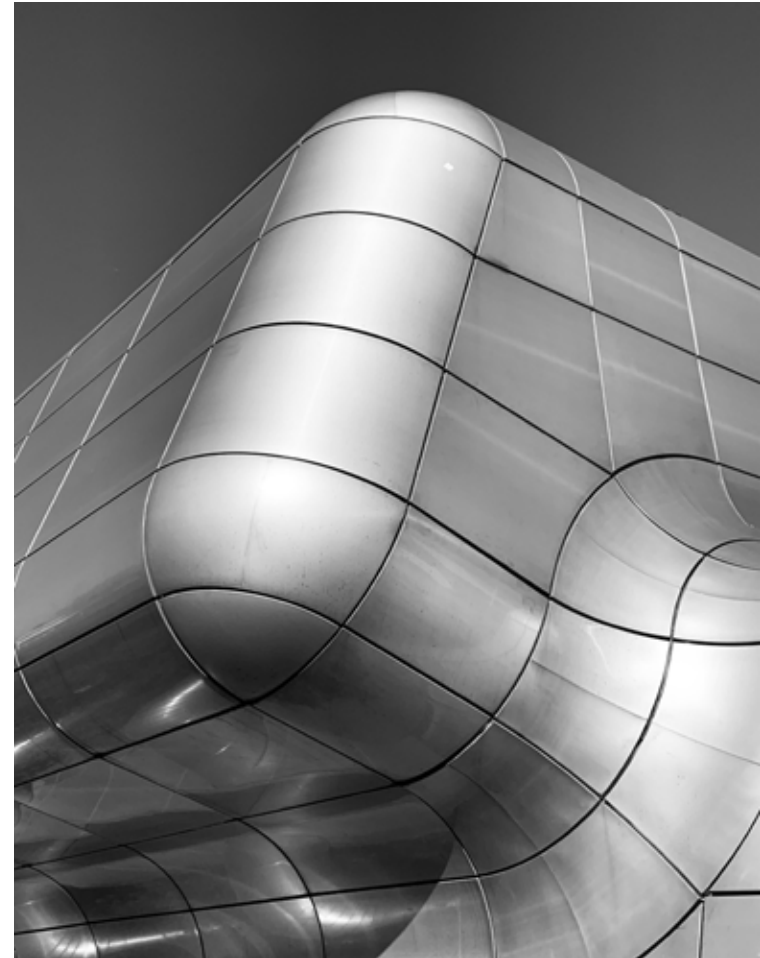
I decided not to continue developing the **Smooth Impact** and **Convex and Concave** design themes. The **Convex and Concave** concept was rejected because its shape reduced the available interior storage space. The **Smooth Impact** concept was also discontinued because it was too similar to existing products on the market, did not align well with the target group, and had a surface design that was too smooth for an outdoor-oriented product.

10.4 DESIGN THEME 3

SPLIT GEOMETRY

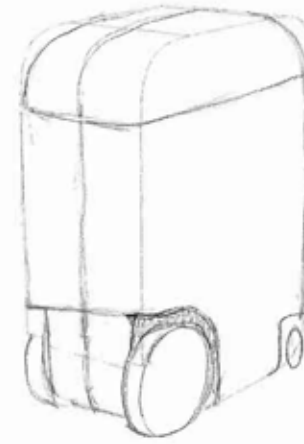
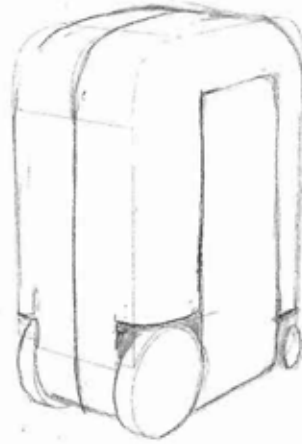
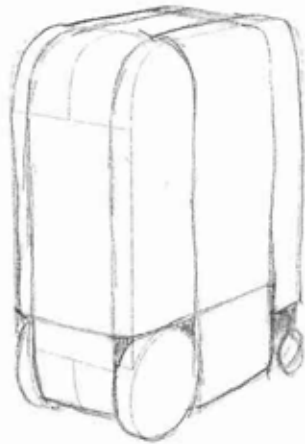
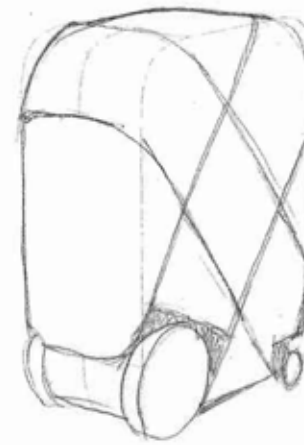
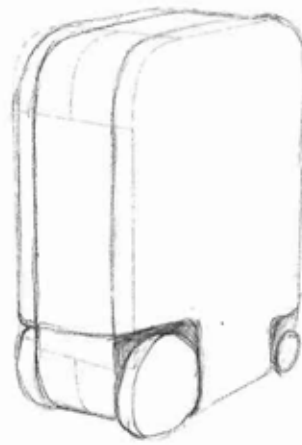
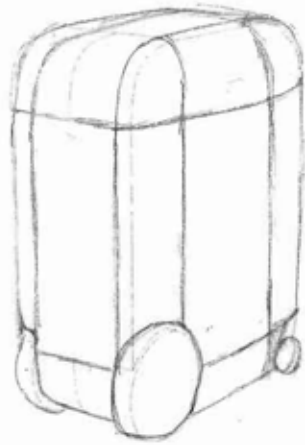


(Behance, 2021)

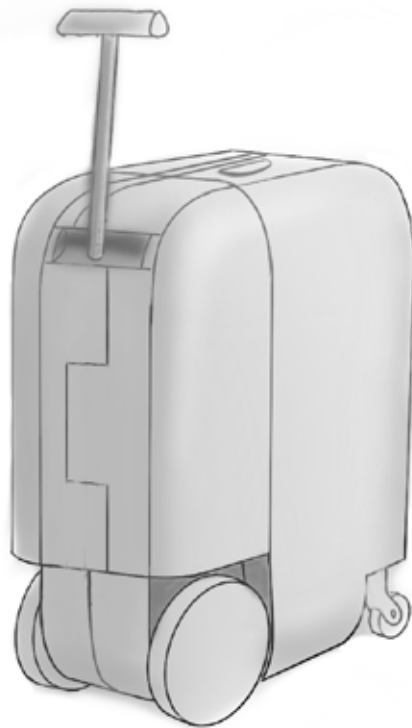


(Pixabay, 2020)

10.4.1 FIRST SKETCHES



10.4.2 REFINED SKETCHES



10.4.3 AI GENERATED RENDER



10.5 DESIGN THEME 4

CONTINUOUS CHAMFER



(Land Rover, n.d.)

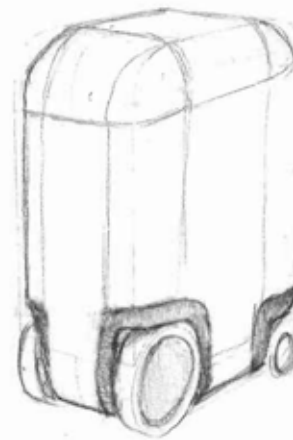
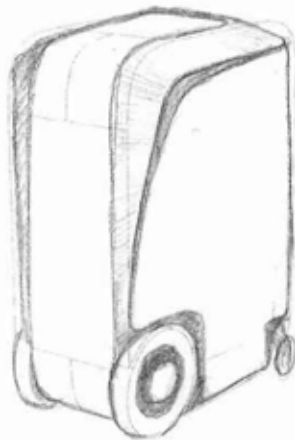
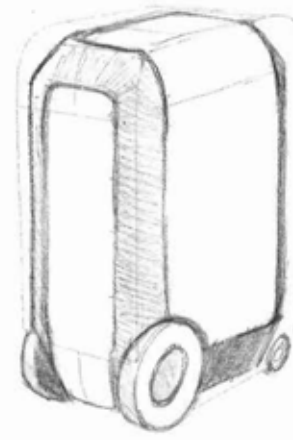
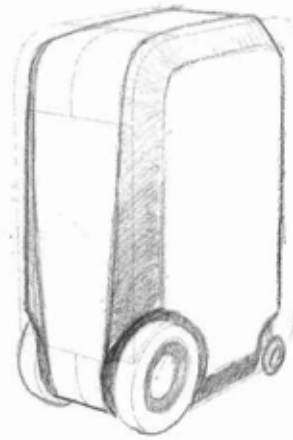
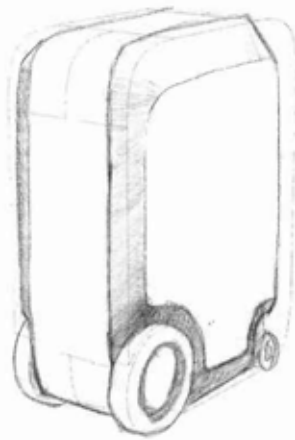


(POC, n.d.)



(iF Design, n.d.)

10.5.1 FIRST SKETCHES



10.5.2 REFINED SKETCHES



10.5.2 AI GENERATED RENDER



10.6 COMPARISSON

CONTINUOUS CHAMFER



SPLIT GEOMETRY



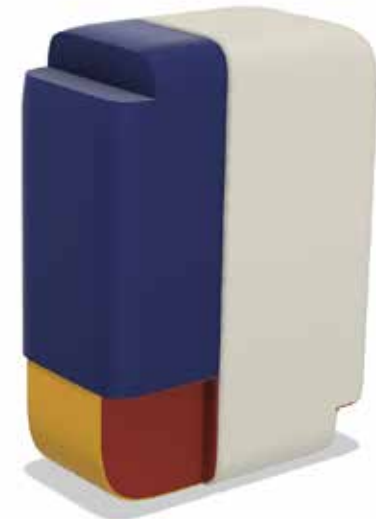
10.7 DECISION

I decided to go with the **Split Geometry** design theme because it emphasizes the form and details more effectively. The continuous chamfer design felt more off-road inspired, while the product is intended to be used in various outdoor environments, as well as cities and airports. Therefore, the Split Geometry theme suited the target better.



11. REALISATION

11.1 FORM DEVELOPMENT

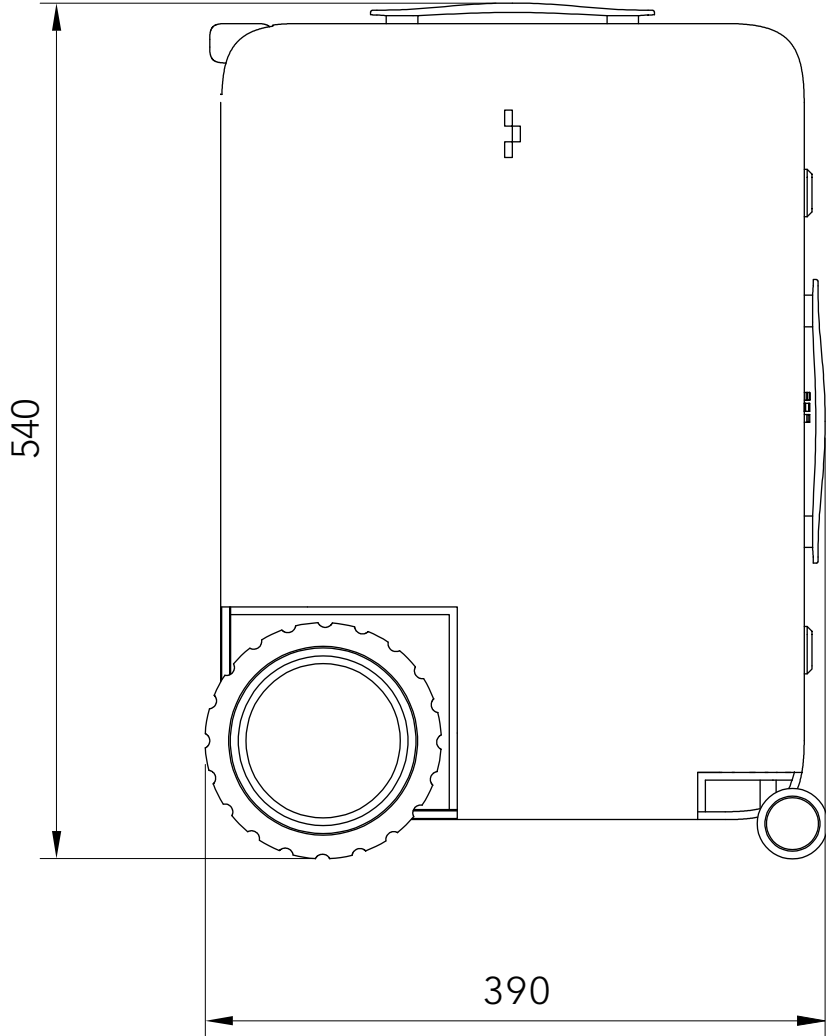
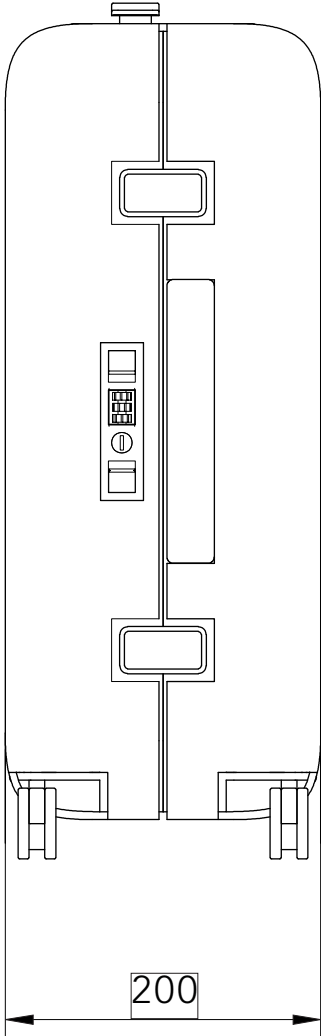




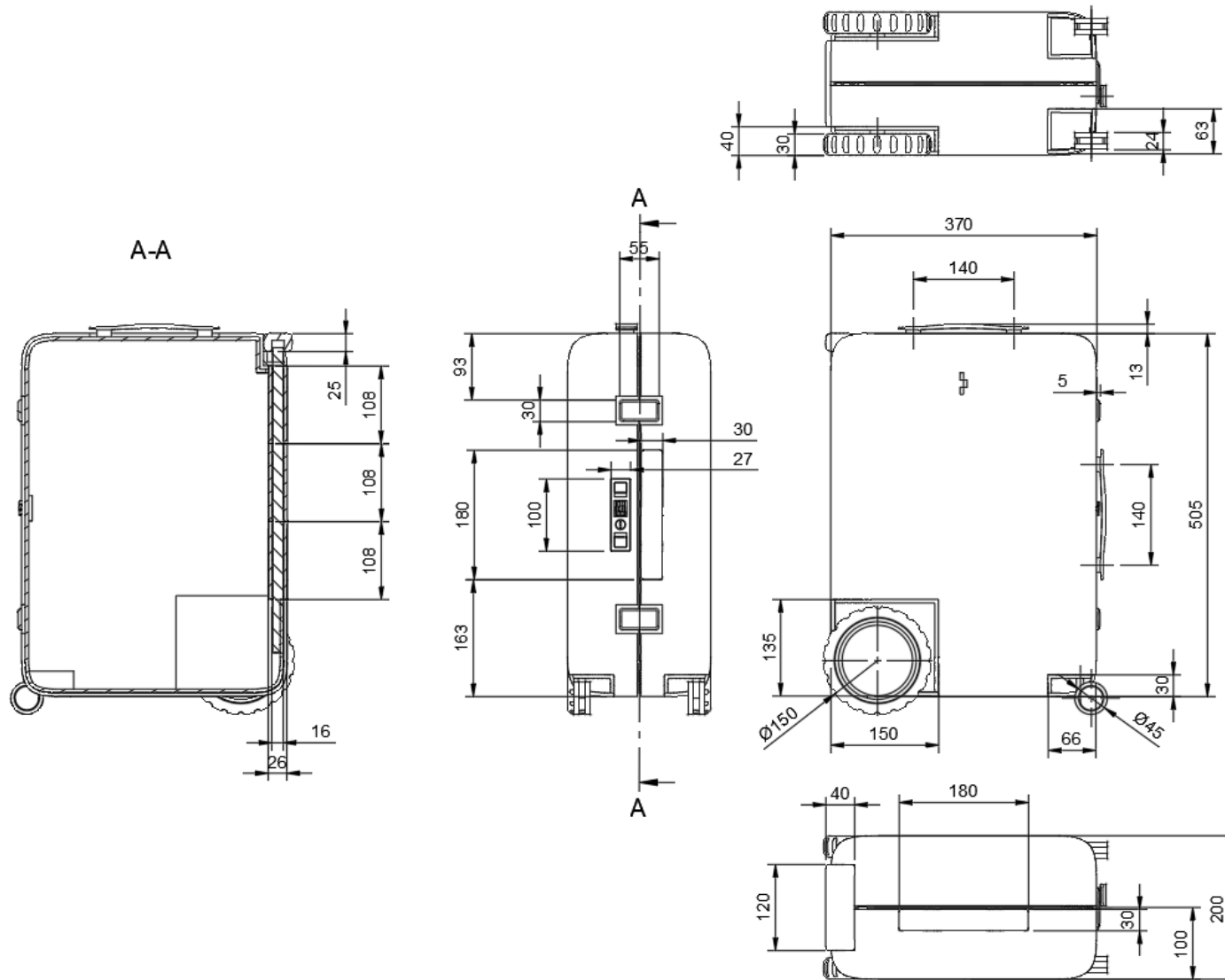
11.2 FINAL MODEL



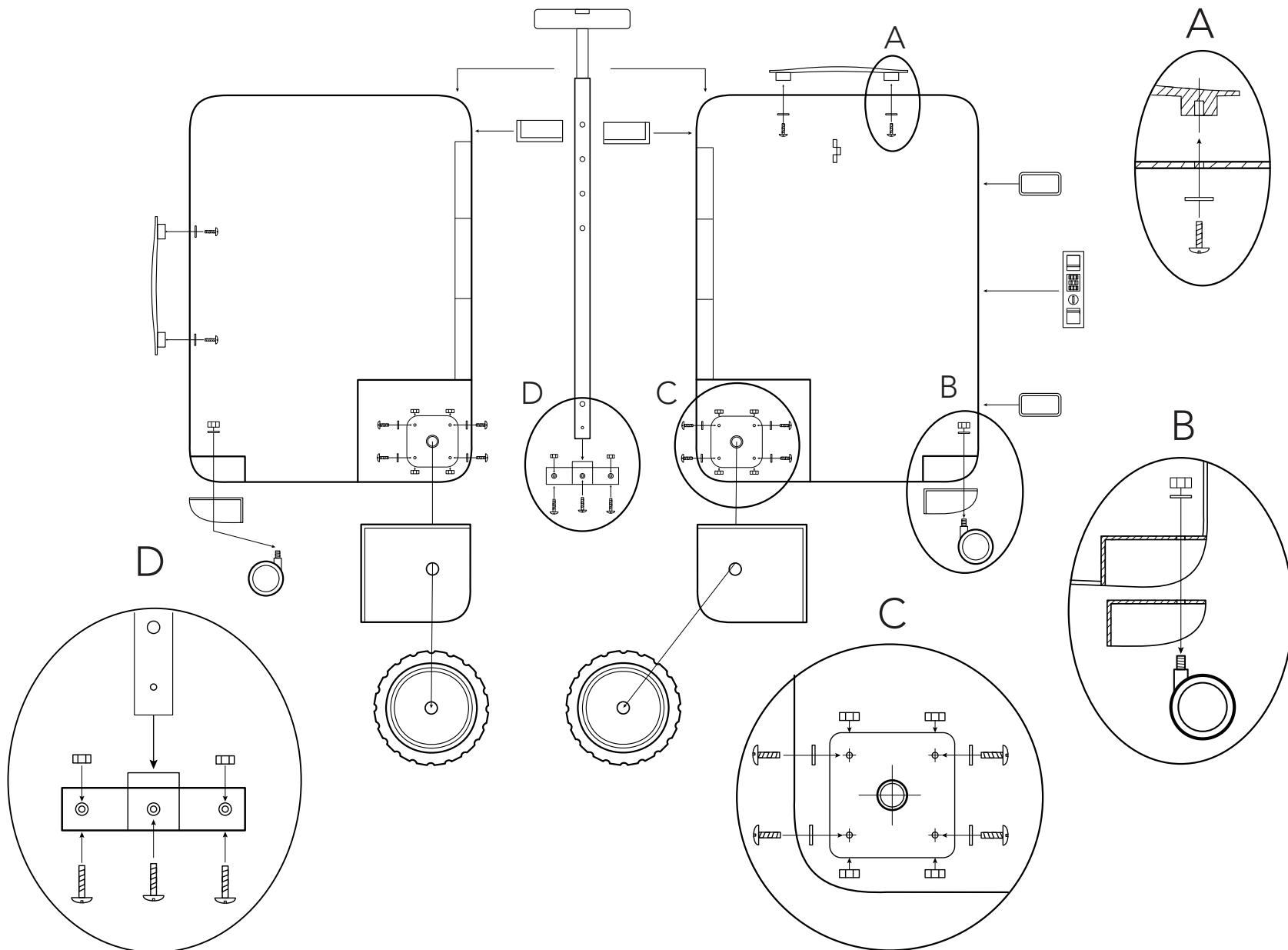
11.3 MEASUREMENTS



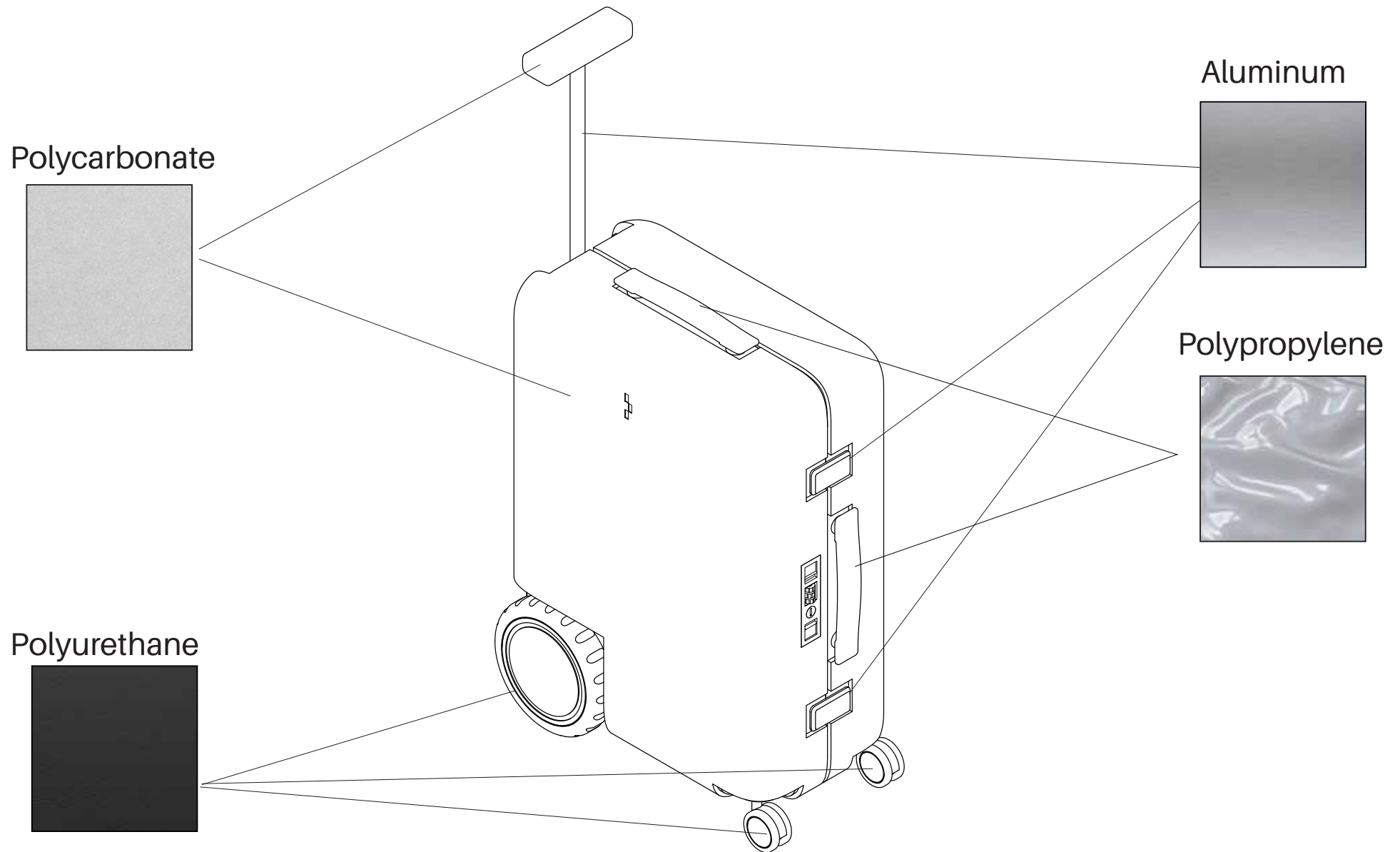
11.4 TECHNICAL DRAWING



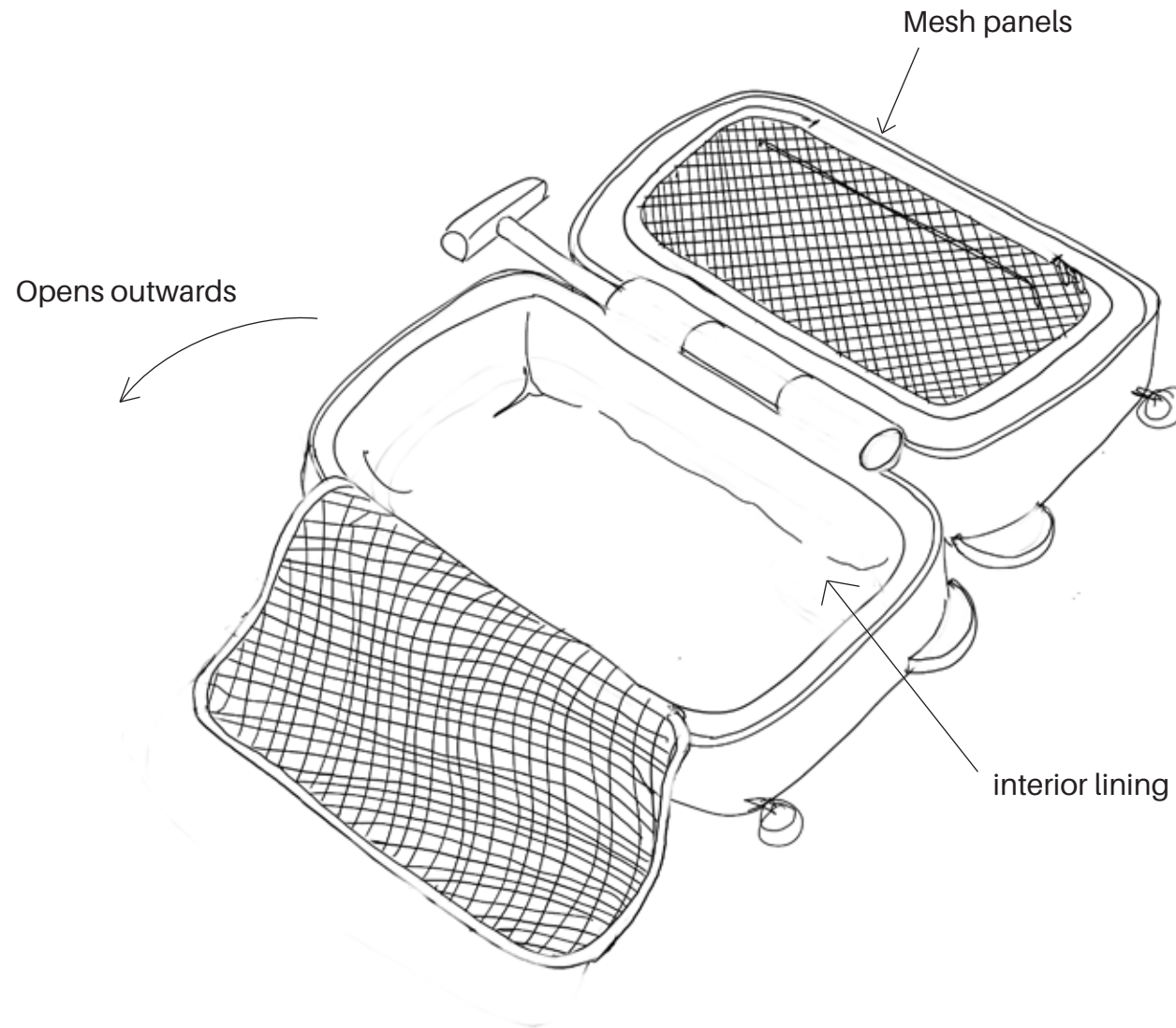
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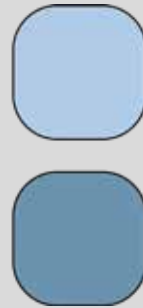
11.6 MATERIALS



11.7 INTERIOR



11.8 COLOR SCHEME



11.9 CMF CHART

STANDARD COLORS - MATTE, SEMI-ROUGH TEXTURE

B4692A



2B371F



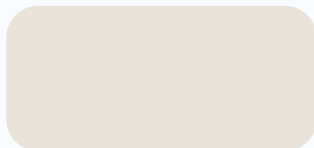
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E9E3D9



C1C37B



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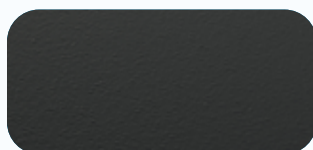
METALIC TEXTURE

BRUSHED ALUMINIUM



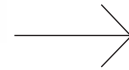
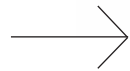
RUBBER TEXTURE

POLYURETHANE





12. REFINEMENT



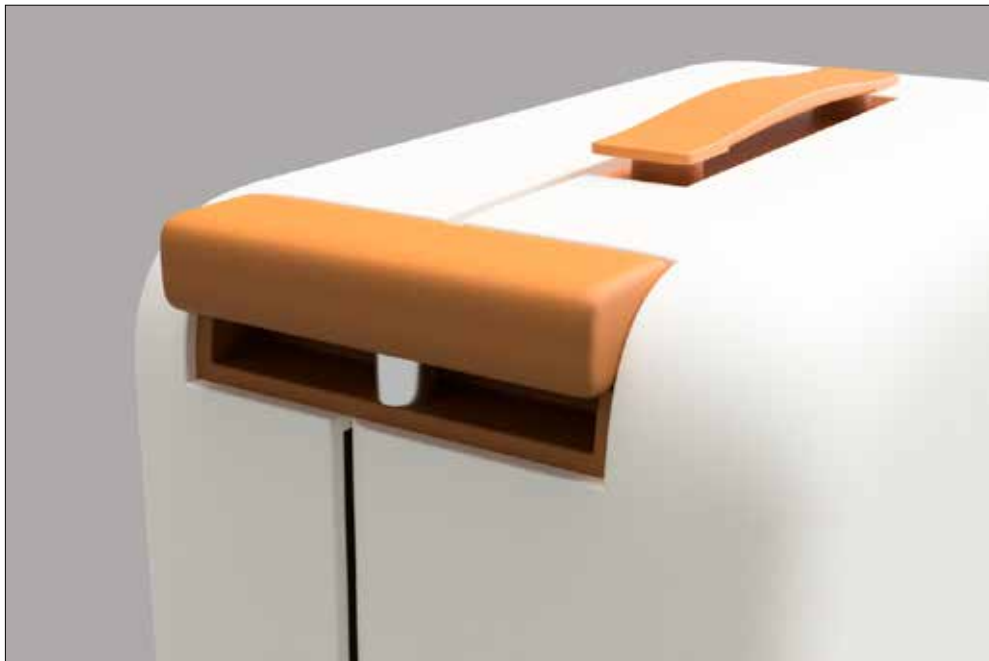
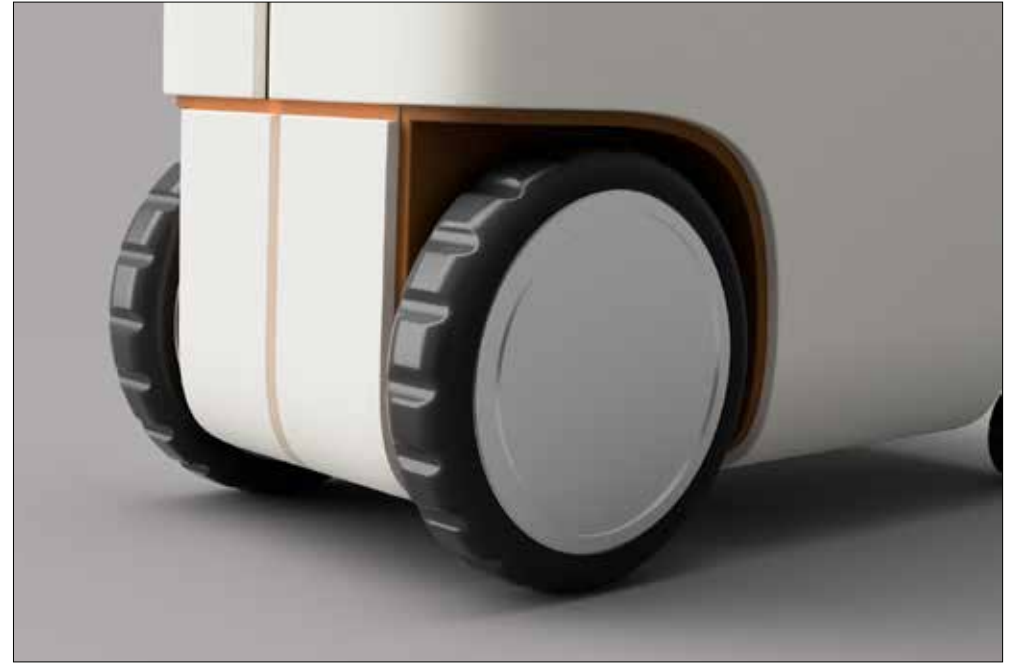
Final result



13. RESULT

13.1 RENDERS







13.2 SENARIO RENDER



*This image was not made with AI. I used a HDRI dome to render the picture.

13.3 USER RENDERS



*These images was made with the help of artificial intelligence.



*These images was made with the help of artificial intelligence.



9. REFLECTION

Material choices require reconsideration. The current CMF treatment of the wheels, particularly the use of aluminium, does not convincingly align with a product intended for rough terrain. Aluminium may communicate precision or urban sophistication, but it lacks the perceived durability and ruggedness associated with outdoor use. Exploring alternative materials or finishes that better signal resilience and adaptability would improve the product's narrative.

The final rendered imagery does not fully support the concept either. The environmental context appears too clean and controlled, failing to represent the rough terrain the suitcase is designed for. Similarly, the person depicted in the image does not align with the intended user scenario. There is a disconnect between the character, the environment, and the product's purpose. This suggests a need for more deliberate control over visual storytelling, especially when using AI-generated imagery. Ensuring consistency between user, context, and product is essential to clearly communicate the design intent.

Additionally, the user renders could be further developed. The way the suitcase is pulled or pushed may differ significantly depending on the environment, such as navigating an airport versus moving through a city or rough outdoor terrain. These scenarios should be explored and clarified to better define the product's usability and versatility.

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