

# MOTIVE

A NORWEGIAN RAIL EXPERIENCE

BOXASPEN + LUND  
AHO DIPLOMA 2019

# motive

*/'məʊtɪv/*

**1. A reason for doing something.**

reason, motivation, motivating force, rationale, grounds, cause, basis, occasion, thinking, the whys and wherefores, object, purpose, intention, design

**2. A motif in art, literature, or music.**

motif, theme, idea, concept, subject, topic, leitmotif, trope, element

**3. Producing physical or mechanical motion.**

kinetic, driving, impelling, propelling, propulsive, operative, moving, motor

**4. Causing or being the reason for something.**

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This project is an industrial design diploma by August Denizou Lund and Jens Christian Boxaspen. Through the course of 6 months with a focus on experience, service and human interaction we conceptualized and designed our vision of high-speed rail service in Norway.

Thanks to an extensive network of both roads and small airports Norwegians are the ones traveling the most domestically by air compared to other countries. Weekend travelling students, tourists experiencing attractions and commuters going from A to B. In the winter we might fly up north to Lofoten to ski or have the weekend off in a remote hotel on the west coast. The cheap airfares have made us more flexible and our world smaller. But they have also made us responsible for releasing tremendous amounts of greenhouse gasses. In a time where global warming and climate change is on the agenda, and 'flying shame' has become a 'thing' it's perhaps time to look at the alternatives? Norway has abundant amounts of clean hydroelectric power throughout the country. We are living in a country with the population spread thin across, and are we to provide clean, safe and efficient transport to all inhabitants and visitors we can not rely on potential castles in the air, promising electrified aviation and hyperloops.

Our goal with this project is to start a discussion about high-speed rail in Norway, where our contribution will be how we feel something like this could and should be executed, and to fully take advantage of the possibilities.

All aboard!

**CONTEXT**

Our project is set in the context of Norway. Like mobile architecture we want our vision to move seamlessly between urban and rural environments, adapting to them as it moves through the country.

**WHY HIGH-SPEED RAIL?**

We believe that high-speed rail would provide a better travel experience, shorter travel times, be an identity builder for Norway, all whilst playing a part in providing drastic cuts in CO2-emissions.

**HOW**

Through traditional industrial design research methods such as field trips, observation, expert interviews, discussions and general information gathering we have been able to generate ideas that we could further develop. Through the use of physical and digital sketching, physical modelling with clay and paper, CAD and rendering we have ended up with engaging visualisations.

**DELIVERY**

Our delivery is Motive, a conceptual vision on how a high-speed train with focus on experiencing Norway would look like. Our delivery is a completely new way of using and experiencing public transport, achieved through tangible service design.

**STRUCTURE**

The diploma is structured as an industrial design project with a heavy focus on the underlying service. Through four phases, ranging from research, ideation, conceptualizing directions, to form development, finalising and delivery.

**INTRODUCTION AND BRIEF**

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RENDERING AND VISUALS  
COMMUNICATION  
MODELMAKING  
REFLECTIONS



# ***TO RETHINK THE NORWEGIAN RAIL EXPERIENCE***

The snow-capped mountainous terrain, deep blue fjords, lush valleys, wild and untouched nature, cold winters and mild summers. All this and more makes Norway to what it is. But also contributes to making Norway a challenging land for building railway infrastructure. We believe that those disadvantages are exactly what would make Norwegian high-speed rail into more than just a transport leg. We believe that it could make for one of the most amazing rail experiences in the entire world!

For that reason our primary objective is to design a high-speed train in and for Norway with focus on the experience of the service.



# PHASE ONE | DESIGN REQUIREMENTS AND FRAMEWORK

**Methodology**  
6 weeks

## **Data collection**

Observation  
Interviews  
Photography  
Filming  
Timelapse

## **Initial Analysis**

Sort information  
Mapping  
Timeline

## **Further Analysis**

Insight  
Potential  
Design Intent



Photo: VY



norsk bane

From an early stage, we got in touch with the national rail company VY and high-speed rail lobbying organisation Norsk Bane. They became involved as facilitators and sources of information in the initial phase and as validators of our findings. Throughout this report there will be quotations and insights from both companies.

The finished project was presented for VY at the 16th of May, it was well received, and feedback from them has had an influence on the finalisation of this report.

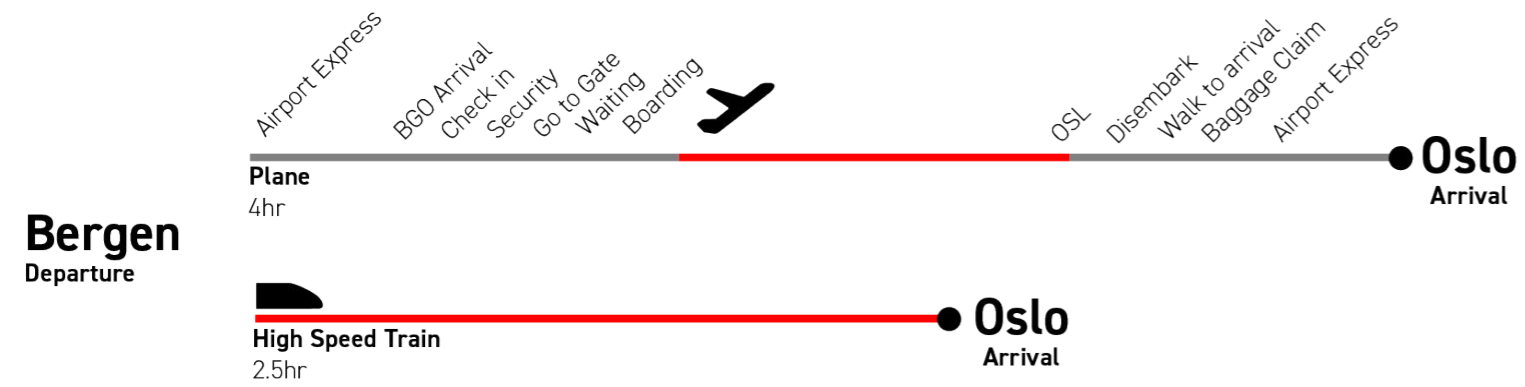
The threat of global warming and the consequent need for cuts in CO2 emission is currently one of mankind's greatest challenges.

The transportation sector accounts for 14% of the world's emissions. And in order for us to reach our goals, and meet our obligations from the 2018 Paris accord, measures need to be made. In every sector, we have to innovate and be brave to meet such bold targets. In the transport sector this can be achieved only through developing and designing sustainable modes of transport comparable to or better than the ones we have today.

With a track record of ten years shy of two centuries, rail technology is well proven. Instead of waiting for the promise of electrified aviation, high-speed rail can be implemented tomorrow.

**The impact of improved railway systems in Norway:**

- Railway journeys from Oslo to Trondheim, and from Oslo to Bergen, Haugesund, and Stavanger would cut CO2 emissions equal to 318 000 cars driven for one year.
- Giving 80% of the Norwegian population access to efficient travel.
- Cutting travel time with as much as 50%.
- An investment that when built and paid for will stand for centuries.
- Play part as an identity builder for the nation
- Making our fantastic nature and the experience of it accessible to more people.



**SCENARIO AND POTENTIAL HSR SERVICES**

In the example above the journey time is clearly shorter for plane vs. rail. But when taking the total travel time including express service to the airport, going through security, baggage claim, etc into consideration it is considerably longer. The fact that the journey time for rail is three times longer than for the plane makes for a sufficient amount of time that can be utilized efficiently, making rail far superior from a socio-economical point of view.

We have chosen to base most of our supporting data on the feasibility studies by Deutsche Bahn for Norsk Bane, in addition to secondary sources by Transport Økonomisk Intitutt (The Norwegian Centre for Transport Research) and Statistisk Sentralbyrå (Statistics Norway).

A connection between Oslo and the three major cities, Bergen, Stavanger and Trondheim is most suited for a high-speed rail connection. On an average 30 000 persons travel between those cities every single day. And nearly 50% of them are business travellers or daily commuters. According to numbers from the International Union of Railways 75% of all travellers chose rail over plane if the travel time is less than 2.5 hours. And if those passengers got transferred to rail, in addition to those travelling by rail today, it would make for a sufficient passenger base to make high-speed rail viable.







In order to create a high-speed rail-service tailored for Norway, it was imperative to experience how the existing service works. Our intended outcome of the journey was to get insights into the emotional aspect of the journey. But insights acquired from emotional research might be difficult to quantify, also from a service/experience design perspective. This is due to obvious factors such as with a cut in travel time from 7.5 to 2.5 hours your service and also the product itself changes drastically. With the higher speed in mind, we also realised the project and its intention may be perceived paradoxical. Something we later coined the "The Depth Perspective Paradox", which describes the paradox between the high speed and the environment you are supposed to experience. Depending on the distance of the view - close attractions will sadly be gone after seconds, while distant mountains will be more engaging as the scenery is changing more rapidly. In other words, there are drawbacks but also advantages; a service like this would also allow even more people to experience the nature, who otherwise would not have time to take on a long train journey.

Bergensbanen (The Bergen Line) is the most popular regional rail service in Norway. The 110 years old, 371-kilometer long line from Oslo across the scenic Hardanger Plateau to Bergen was according to King Haakon the 7th when opened in 1909 "The nation's pride and our people's great achievement".

#### Travel Diary

After buying the compulsory morning cup of coffee we boarded a half full train together with a group of Chinese tourists, the odd student, some older couples and several skiers on their way to some of the skiing destinations on the way. The train departed a lightly snow covered Oslo Central Station bound for Hønefoss, running along the

scenic Drammensfjorden, where the actual start of the Bergen Line begins. The number of settlements thins out as we start our climb up the mountain after passing Hønefoss. Three hours after departing Oslo we pass through Nesbyen, the village famous for holding the national heat record of 35.6 degrees. Before arriving at Geilo, one of the popular ski resorts in the country, where a dozen of people equipped with skis and snowboards get off to enjoy the slopes.

After departing Geilo, the landscape starts to grow more deserted and wild. And due to the fairly flat topography of the Hardanger Plateau, the snow on the tracks gets whirled up as the train picks up speed, creating stunning plays in colors and shadows as it is hit by the sunbeams radiating towards us from the end of the plateau. At Finse we reach the journeys highest point at 1237 meters above sea level and the highest situated train station in Norway. Just as the train rolls on we can spot people basking in the sunshine outside the many cabins that hide in the terrain next to the line. We pass a party of snowmobiles on the outskirts of the plateau as the train starts its descent and returns to the tree line. The terrain becomes more brutal as the train speeds through steep ravines and past mountains too tall to see the peaks of. We reach Voss, a little village known for its extreme sports festival and freestyle skier Kari Traa. And a little more than an hour later the landscape opens up hinting at the arrival in the coastal city and World Heritage site of Bergen. The train slows down upon entering the outskirts of the city and we roll into the stunning wrought iron building of Bergen Station, eager to explore it before returning to Oslo the following day.

***Emotional field research from Oslo to Bergen and back.***



From the 17th - 23rd of January we went on our high-speed field trip around Europe. While our trip in Norway was an emotional research trip, the main outcome from this journey was to acquire tactile insight into existing high-speed rail services. Going into the functional aspects of the journey, including the layout of the trains, how the users interact with the train and the service, and how the normal A-B trip pan out.

**Travel Diary**

The journey started in London's St.Pancras Station with boarding of the Eurostar to Paris. Two and a half hours and 344 km later we rolled into Gare de Nord. After a short break in Paris, we got onto the SNCF run double-decker TGV-service bound for Lyon. After arriving we spent the night in the city famed for its gastronomy before we again boarded the TGV, this time towards the slightly anonymous town of Mulhouse on the border of Switzerland. A day later, and after covering 15,000 m<sup>2</sup> of exhibition space at the national train

museum we crossed the border and got on our way to the Swiss capital, Bern. From here we boarded a Swiss federal railway service en route to bankers paradise Zurich. A while later, we checked in on the Giugiaro designed tilting train bound for Italy. We skirted the amazing Lago di Lugano and Lago di Como, before arriving in Milan. Even though our main focus was on high-speed rail services we also wanted to draw inspiration from conventional rail and experience riding the overnight service from Milano to München. Waking up at 9 o'clock in the morning with views of the Austrian Alps at the end of your bed was nothing short of breathtaking. We arrived in Munich around noon, and time was of the essence as we just managed to board an ICE 2 towards Nürnberg, where we made change onto the ICE 3, with destination Berlin.

**Tactile field research on existing HSR-services in Europe**

# TIMELINE

In order to create a comparative study between the different rail services we experienced, we compiled all our findings ranging from pain points to areas of interest, into a timeline of the typical rail journey, from embarking the train, the journey itself to disembarking on arrival.

## STORE LUGGAGE

- Where is the optimal location for storing luggage?
- Is there room near the seat?
- Will I see my luggage from my seat?



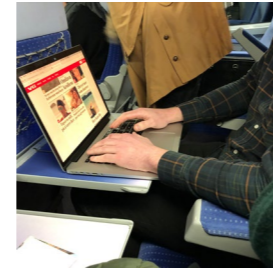
## IN THE SEAT

- Organized in rigid rows.
- Two options; upright or slightly declined.
- Caters to all kinds of positions half well.
- Swiss army knife!



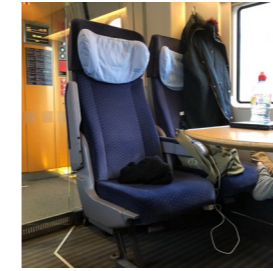
## WORKING

- No designated areas; bound to the seat.
- To little space to work effeciently.
- Noise



## LEISURE

- Not designed with personal devices in mind; adhoc solutions.
- Activities other than sitting is difficult.
- Noise



## EATING

- Bring your own food or you buy food in the cafe .
- Recycling options after the meal are limited.
- Eating in the seat is mostly suitable for smaller snacks.



## TOILET VISIT

- Usually situated in the carriages extremities - potentially far away.
- Dark and uninviting.
- Availability (is it occupied?)



## TIDY UP

- Bins specific to each pair of seats.
- Often situated in full view.
- Some trains have 'recycling points' -feels both more hygienic and ordered.



## FIND LUGGAGE

## EMBARK

## TRAVEL

## DISSEMBARK

### FIND COACH

- Which coach to board?
- Which door to enter?



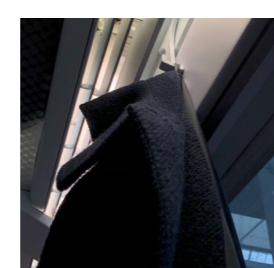
### FIND SEAT

- Often congested!
- Some bring their luggage all the way to their seat.
- Bad signage for locating seat.



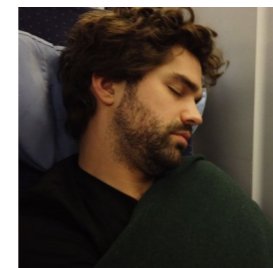
### HANG CLOTHES

- Hooks are often fixed in unfavorable spots.
- Either blocking view or invading your space.



### SLEEPING

- Seats are limited to 'sitting';
- Sleep = uncomfortable.
- defying the purpose of resting.
- Noise

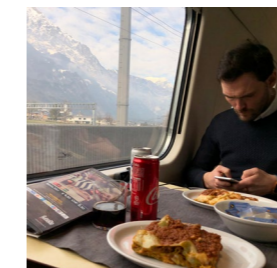


### SOCIALIZING

### FOOD AND DRINKS

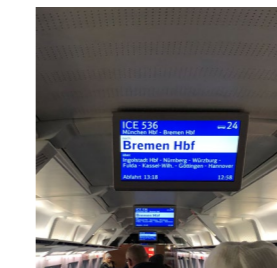
- Usually located in the middle of the train; walk the length of train to reach.
- Often empty and inactive; excessive?

Is the service trying to achieve more than it needs?



### PLAN FOR ARRIVAL

- Information is displayed oncentrally ceiling mounted screens.
- Have to seek the given information.



### GET DRESSED

### QUEUE

### EXIT

- Minimal amount of stops; passageways becomes congested upon arriving and exiting.
- Differences in platform - floor height can also create dodgy situations.





**Layout**

The travel experience (or rather the lack of it) onboard all of the European HSR-services has a lot to do with how the train and its service is organized. The trains followed the typical recipe of business (larger seats, fewer seats per row), the efficient economy class, and in between of those two, the restaurant or cafe-coach. All of which were flanked with toilets in the extremities of the coaches. This layout, forces the users to walk long distances, back and forth from seats, toilets, and the café, thereby creating highways through the length of the train. Resulting in being left with inactive areas which can be difficult to navigate.



**Cité du Train, Mulhouse**

Since we wanted to build a train for the future it was vital that we looked at the historical lines in rail history. We visited one of the largest train museums in the world, Cité du Train in Mulhouse, on the border to Switzerland. To our interest there was a lot more exploration in the past and a lot of interesting solutions, which put the experience itself in the centre. Times have changed and this approach has diminished. Ettore Bugatti's Autorail on the left, is a good example, where the train driver sits in a bubble in the middle of the train, freeing up the front view to the passengers.



**CAF Type 78**

In March we had the opportunity to attend the new airport express train unveiling, where we got a glimpse into state of the art solutions. We found the flat-floored handicap/ family coach particularly interesting. The lack of the typical parcel shelf and its increased ceiling height gave the whole coach a sought after roominess.



Photo: Sverre Hjørnevik

Photos: Ragnar Hartvig

**Electric Sightseeing**

Because our main focus is on the experience we looked at other means of transportation, which has done something similar, that we could draw inspiration from. The award-winning Vision of the Fjords has optimized interior and exterior spaces to accommodate for watching nature. And panoramic windows that display stunning, ever-changing views and friendly lounge and café areas that invite to sticking around.



Interviewing Head of Product Design, Paul Marchant at TfL headquarters, Stratford, London

**“Autonomy creates greater certainty about your service, ie. improving reliability and reducing cost”**

*“Maybe people who consume luxury are looking for something else, something more? ...we have phones, live busy lives, and maybe we want to be removed from all that?”*

As well as the importance of making an inclusive and democratic service and that:

*“Comfort vs. Standard makes more sense than 1.st vs 2nd. It doesn't matter if you are rich or not. You just want a pleasant journey.”*

Furthermore that it was crucial that the spaces you make are balanced, you don't overdo the inclusive design to such a degree that it discriminates:

*“Just because it's a wheelchair user you don't make the space all orange and yellow so that it becomes like a ghetto. You create a space that can be used for people with luggage, elderly and moms and dads with strollers”*

On the 17th of January, we went to Transport for London's headquarters at the Olympic Park in Stratford to meet up with the head of product design, Paul Marchant. Transport for London is the government body responsible for public transport in Greater London. Even though the service is of completely different character, the essence is still the same.

For the better part of the morning, we discussed the importance of building identity by providing a great service:

*“The new routemasters look like they do due to sentimental reasons. The old ones, on the other hand, became iconic because requirements were met first. They provided a great service. And if the service is good enough, the product itself might become iconic.”*

Before moving on to autonomy and why self-driving trains would make sense:

*“Autonomy creates greater certainty about your service, ie. improving reliability and reducing cost”*

And that we might see a more similar thing in rail as in aviation, where pilots have become more managers that control and govern, rather than fly.

We also discussed the topic of what a high-speed rail service of the future could look like:



Photo: Wikipedia creative commons

**“High-speed trains are the best solution for transportation over moderate distances”**

Since our two facilitators, NSB and Norsk Bane work with respectively train services and lobbying of high-speed rail we felt that we needed to get in touch with someone that could give us an unbiased view on the future of rail transportation. We got in touch with the independent non-profit organization, Bellona, started by Frederic Hauge in 1986. Who works with identifying and implementing sustainable environmental solutions to fight climate change.

Together with Frederic Hauge and senior advisor on energy-questions, Christian Eriksen, we discussed the challenges related to the future of the transportation sector, such as the electrification of aviation. Even though battery development shows increased promise and has helped to revolutionize the car industry they felt that:

*“High-speed trains are the best solution for transportation over moderate distances”*

Because:

*“By making use of existing, foolproof technology which rail is one can start planning and building high-speed rail tomorrow and have the infrastructure up and running before Avinors promises of air transport electrification by 2040. A solution with a lot of uncertainty when it comes to infrastructure, charging and battery technology”*

In other words, rail is an existing and foolproof technology that can be built tomorrow, and provide clean, emission-free transport for the masses.

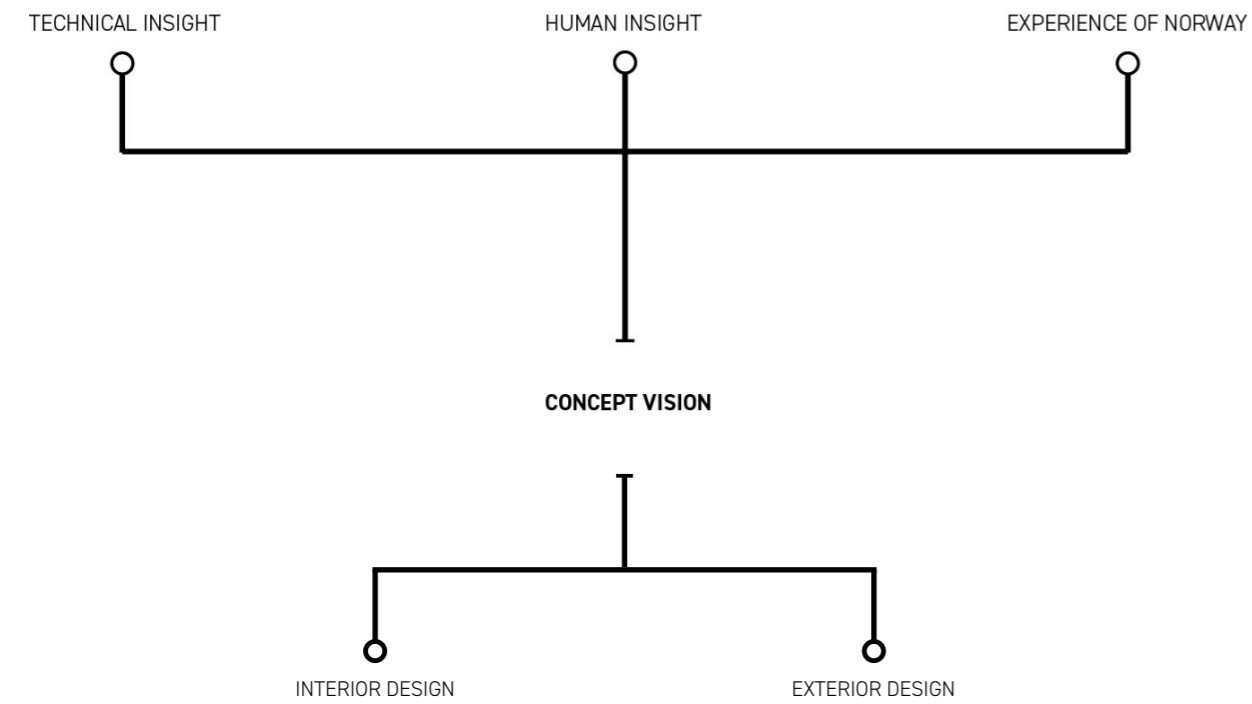


**FREDERIC HAUGE**  
FOUNDER/CEO



Photos: Bellona

**CHRISTIAN ERIKSEN**  
SENIOR ADVISOR, ENERGY



**REACHING OUR VISION**

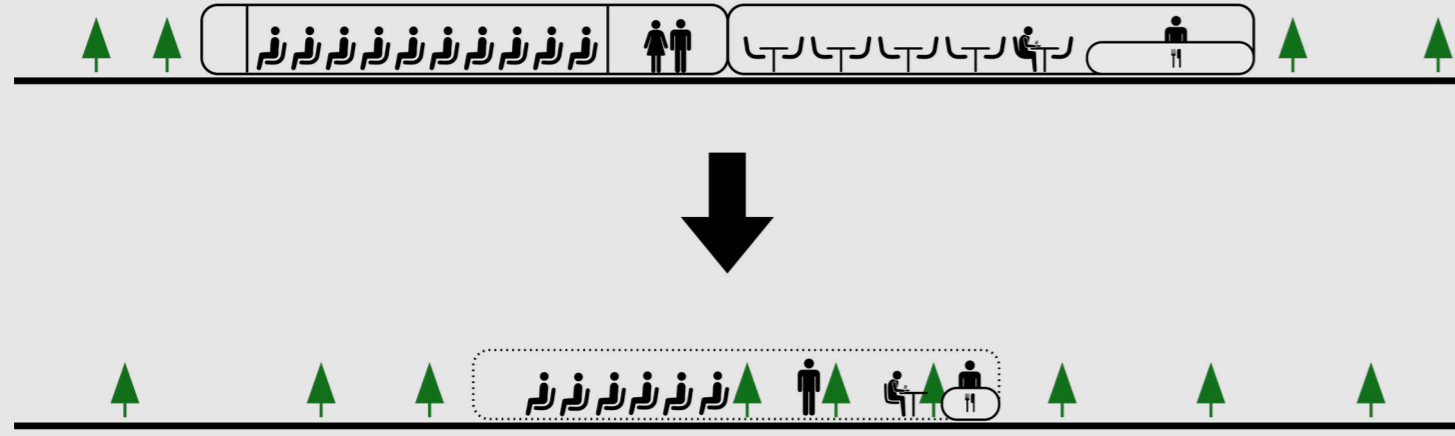
Our conceptual vision for a high-speed rail in Norway, MOTIVE is achieved through a combination of human and technical insight joined with the experience of Norway.

The main focus in this project has been the experience for the user, how travelling on our train should be a different and enhancing experience. The design decisions has then informed the looks, feel and usability of the interior design, from the seats to the toilet, luggage storage, and window placements. Which in turn has informed the exterior design, reflecting the decisions made from the interior.



**MEETING THE NEEDS OF ALL**

We have worked towards a democratic mode of transport where the different needs of the users have been met through universal design. Making it more accessible and attractive to more people than the current situation. Facilitating for business users with shorter travelling times, allowing for the tourists to experience more of Norway, and for giving commuters a reliable and efficient way of travelling.



**OUR VISION**

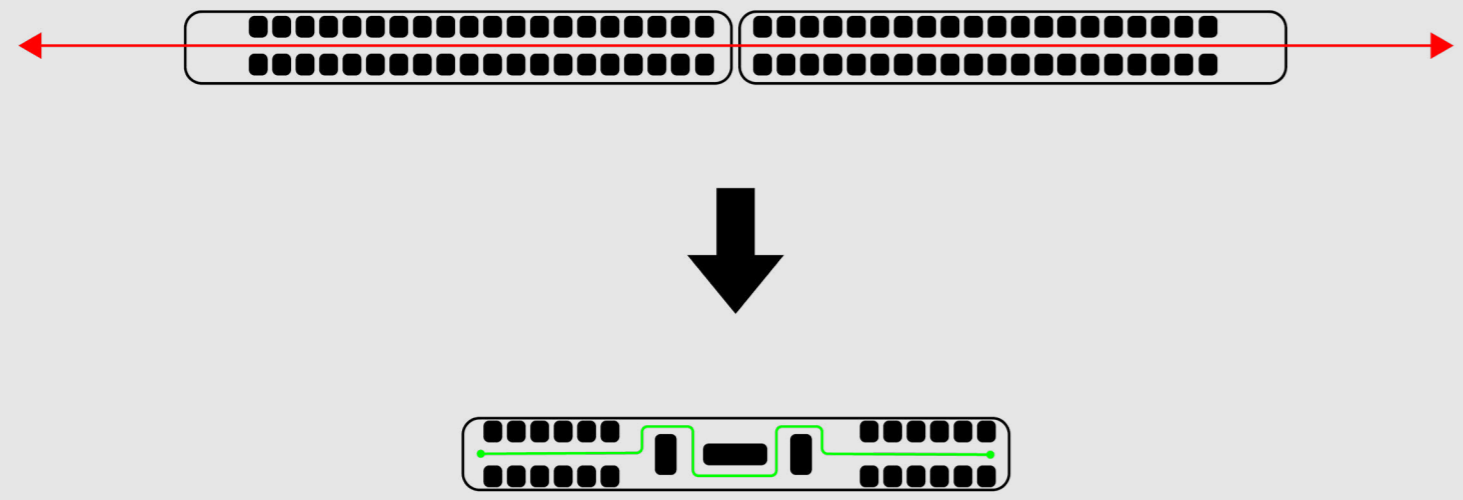
The rail journey itself is opened towards the outside. Internal barriers within the train, such as separate areas for dining, seating, and viewing is condensed into one single experience where you as the user decide the content of your journey and moving seamlessly between environments.

**Before:**

Due to the 'hallway' layout of the common interior, the train acts as a corridor, creating unwanted traffic to and from toilets, restaurants, and seats.

**After:**

From having the whole train available we limit movement to one coach, creating a new and efficient pattern of movement and a more seamless experience.





# PHASE TWO | CONCEPT DEVELOPMENT

**Methodology**  
5 weeks

## **Implementation**

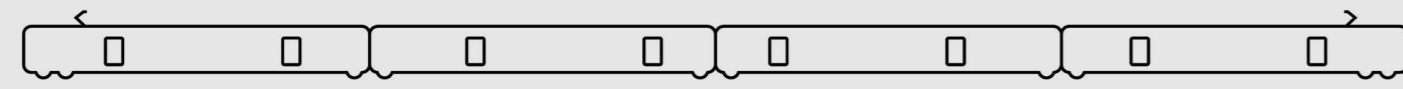
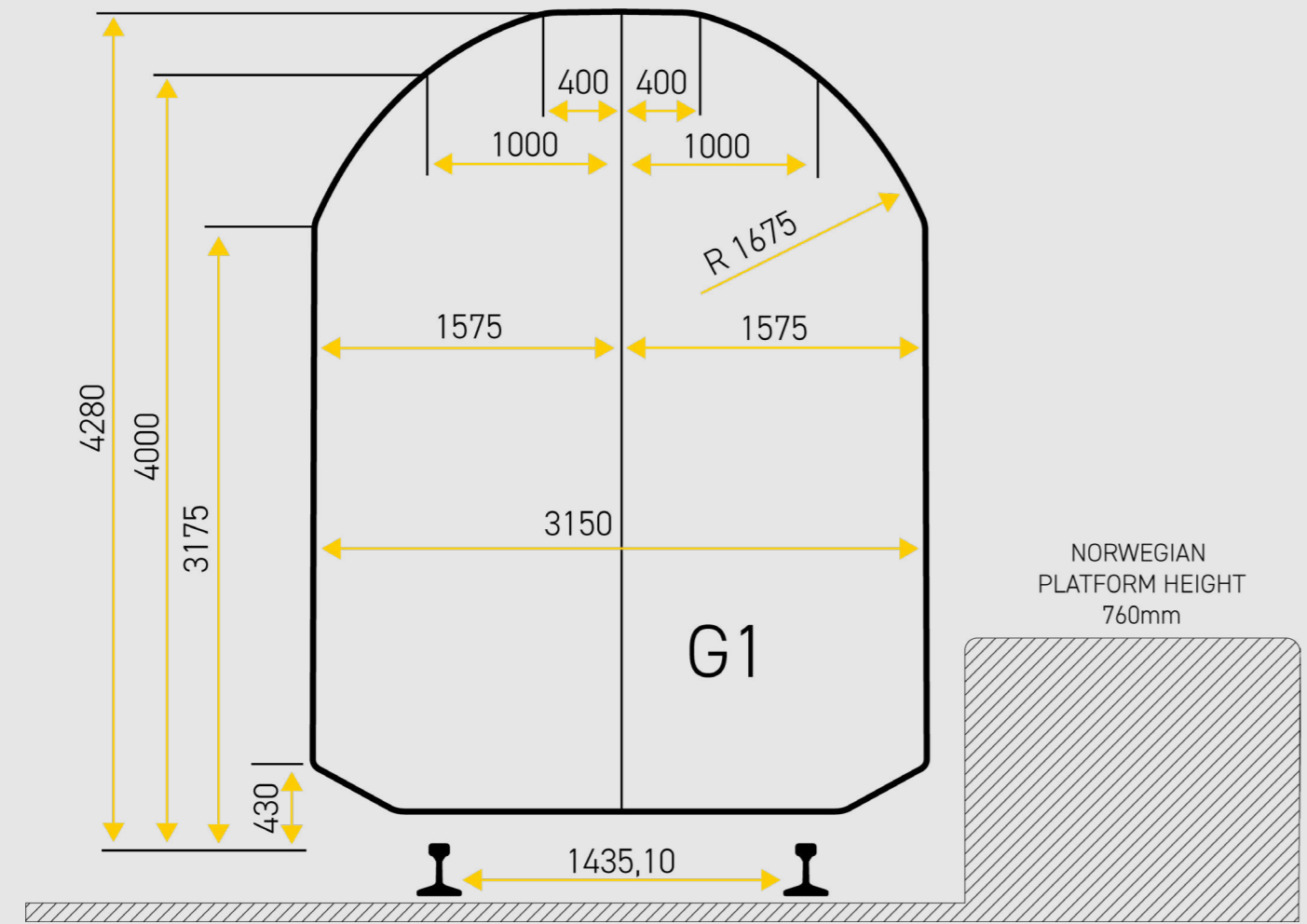
Framework  
User Analysis  
Strategic Development  
Concept Development  
Validation

***“I have the second best office window in Norway, the train driver has the best!”***

GRY TOFTNER, NSB TRAIN CONDUCTOR

Autonomy is clearly the future. Teslas can drive themselves, the small town of Kristiansund is getting the worlds first self-driving shuttle ferry, airplanes have been able to take off, fly and land for decades and the first fully autonomous rail journey was completed late in october last year. It was on grounds of this, natural to remove the driver from the equation when designing a train for the future. But to us, the most interesting factor when looking at autonomy is not the autonomy itself, but the opportunities presented when freeing up the driver's area to the travellers. Offering a ringside view to the incredible nature outside.





Four carriages, 25 meters each, jacobs-bogies on each joint

**CAPACITY AND DIMENSIONS**

The feasibility studies by Deutsche Bahn, Norsk Bane and Jernbanedirektoratet and the consequent capacity analysis lay the foundation for our train's overall length of 105 meters divided on 4 wagons, with a carrying capacity of a minimum of 200 PAX.

**MEASUREMENTS AND GUIDES:**

The foundation for the measurements of the train, such as profile-height and -width, platform heights, curvatures, and gauge size is based on standards from the International Train Union. Measurements concerning those with reduced mobility are based on the EU commission's Technical specifications. For all other measurements, we have used Henry Dreyfuss and Associates' "The measure of man and woman" as a guideline.



EMPLOYEES



TRAVELLERS

In today's situation the users consist of two main categories, the employees, ranging from the restaurant workers, the train conductors and to the drivers. And the travellers, usually divided in two, the business travellers and the economy travellers.

To be able to meet our design intent we are drastically rethinking how these two categories interact with each other and how the service is provided.



Photo: Einar Hugnes

*"We want to add value to the journey, like giving information about attractions along the way."*

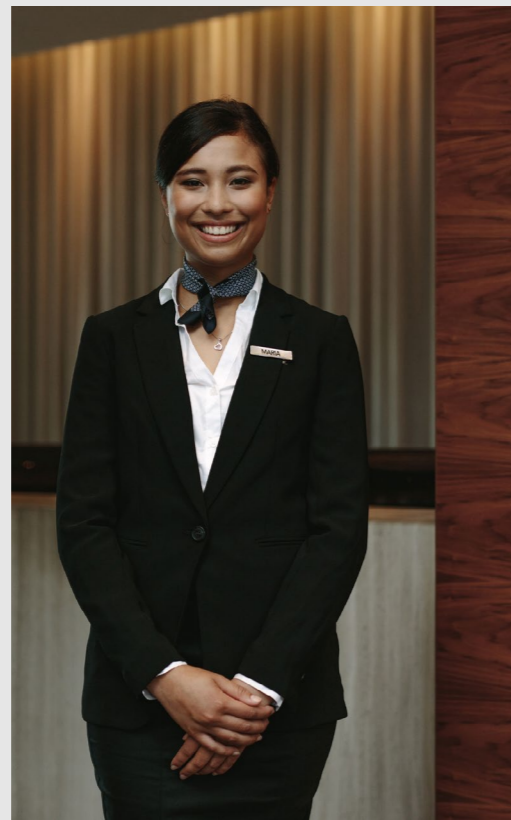


Photo: iStock

*"The role of the train conductor is becoming more and more like a host. To be present and watchful"*



Photo: VY

*"There are too few conductors onboard to provide sufficient service!"*

With insights provided from interviews with NSB-conductors we realized that the job of the the conductor has evolved into a more unclear and vague role than the job requirement states. From making sure the train leaves in time, to ticket sales and scene commander in emergency situations.



Photo: Belmond

*"There is a great demand for experience travels. A journey like The Orient Express would have sold out years in advance"*



Photo: aamanns

*"Every customer have different needs. Some just want a stripped down service while others expect luxury, -something more than a cup of coffee and a newspaper."*

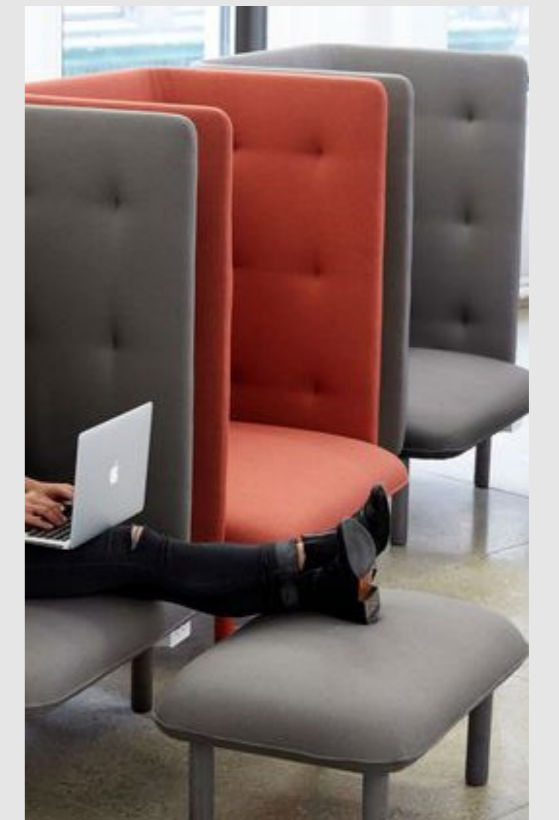


Photo: Poppin

*"Many customers strive for privacy, so making areas where they can withdraw is a good idea"*

In both the current situation here in Norway and abroad the traveller is becoming more complex, from those wanting the stripped down service to those who want the opposite. To be able to meet the increase in complexity regarding the user base one has to rethink the way the service is offered and used.



Photo: iStock



Photo: QuickOrder



Photo: JANS



Photo: Louis Hansel

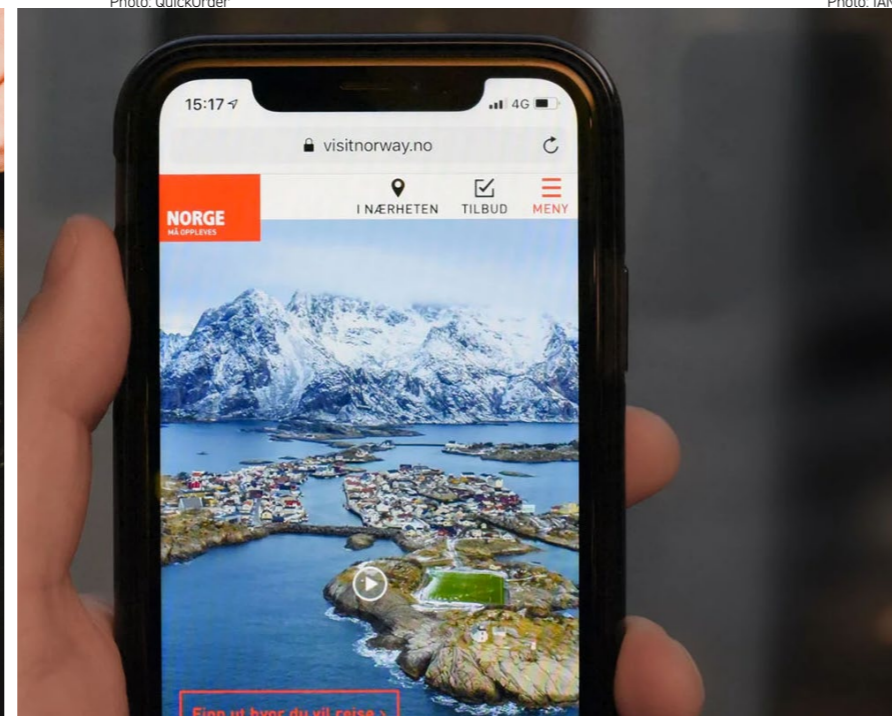
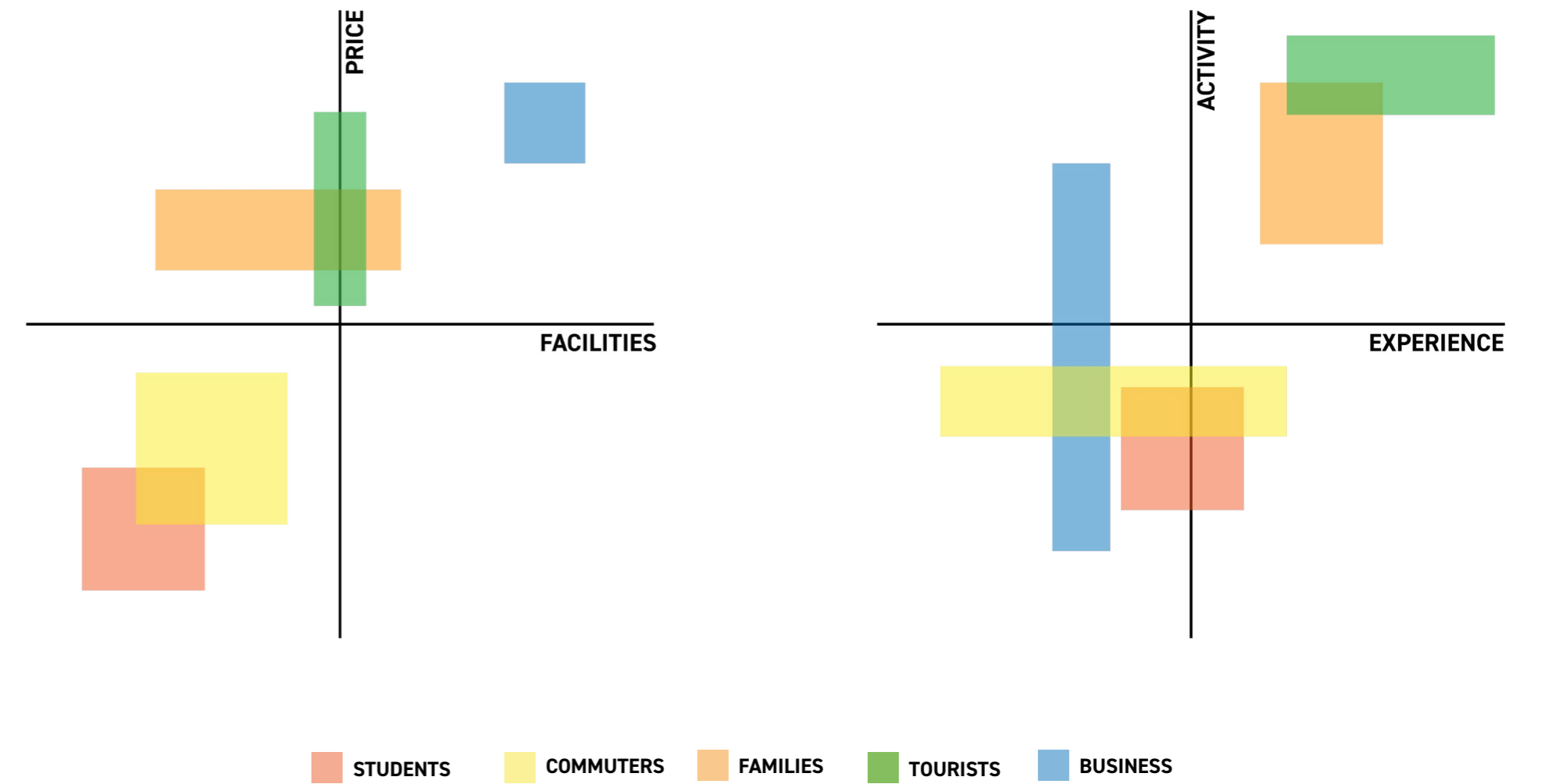
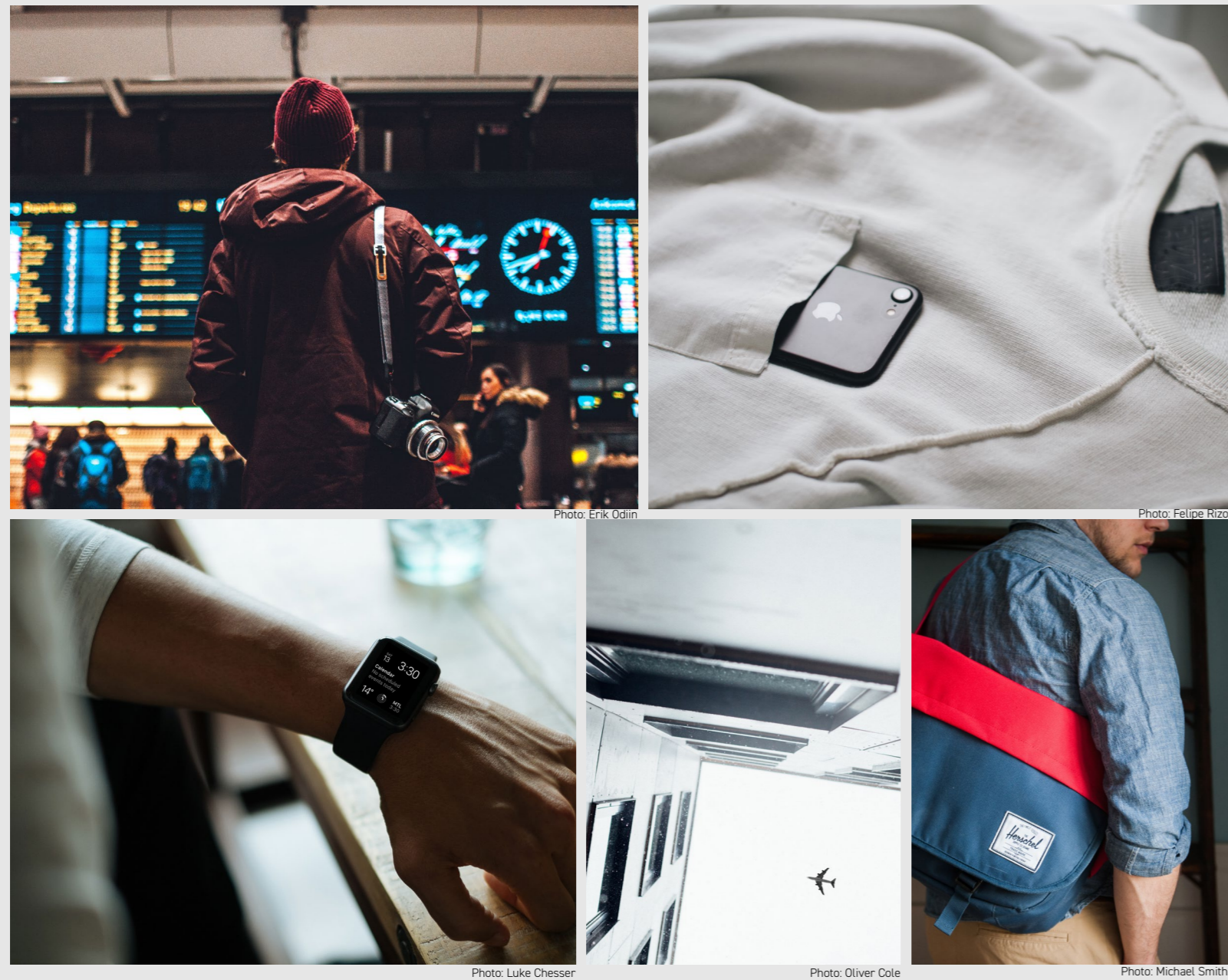


Photo: Visit Norway

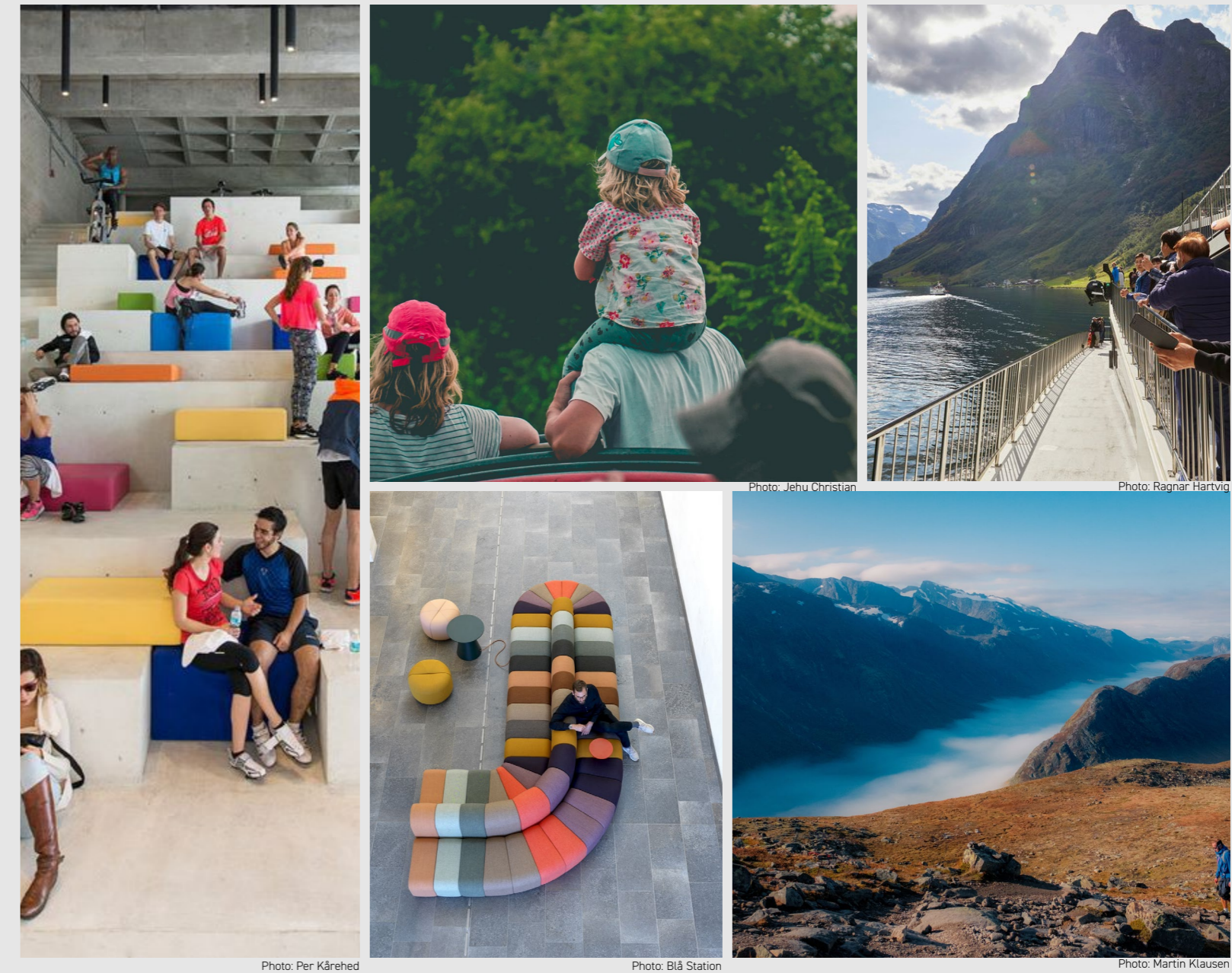


**THE COMMON DENOMINATOR**

To be able to meet the complex needs of varied user groups, we had to find out what they shared. Through positioning analysis, we were able to narrow down the needs and zones required to meet such demands. Where we ended up with the colors converging we have room for innovation. And after several positioning analysis and discussions, we came to the conclusion that three zones fulfilling different needs within different user groups were needed.



The essential zone is the place intended for the commuter, student and A to B traveller. This is the area where you get what you need on the journey, nothing less, nothing more. All the usual amenities such as luggage storage, toilets, and immense views. But there is no personal service provided at this zone, and consequently no food service. This is done to facilitate for more people in a more passive space.



The immersive zone is tailored for experience. A host welcomes you onboard and is always present. Great panorama windows offer unparalleled views, enough room for children to play, and the restaurant section is offering great Norwegian food for you to enjoy in the coach's lounge and open atmosphere. The former conductor will serve as both host and tour guide.



Photo: Herman Miller



Photo: Poppin



Photo: Kelly Sikkema



Photo: Andrea Natali



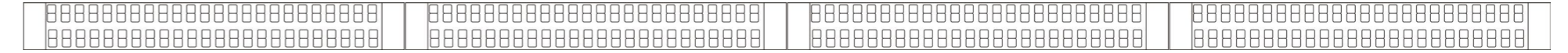
Photo: Simone Scarano

The productive zone is where the job gets done. The host works more as a conference host and concierge than a tour guide, making sure that the needs of the user are met. Whether getting documents printed, help with setting up a phone conference in the secluded area or serving snacks and drinks in the bar the host is at your service. More room, privacy and calm atmosphere makes for a pleasant, seamless and serious experience allowing you to focus.





With framework, guidelines, insights and our visions as a base, we could start with concept development. On the grounds of the insights from our field research, we produced 4 different categories of concepts. With concept 1 being the most conservative and concept 4 being the most radical, we tried to meet our design intent, eventually landing on a concept where we picked different elements from each making for a holistic concept.



### Concept 1

The least radical of our concepts. The idea was that through the use of traditional, and strict seating throughout the train we would provide food and drinks on demand delivery, making for a personalized but passive experience.



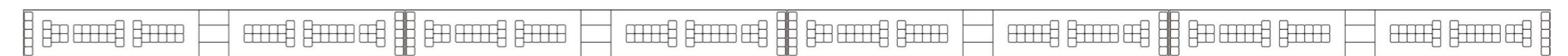
### Concept 2

Closer to our final solution. Here the concept was panorama zones in both ends, laid out openly like lounges with traditional seating in the two center coaches. The entryways were moved to the middle of the coach, providing the user access to the open lounge before proceeding to the seats.



### Concept 3

Taking the ideas of concept two further, having a center lounge in each coach, flanked with traditional seating. The doors were located on each side of the lounge, giving access to the area of interest without passing through the other areas, making the lounge a focal point of the train.

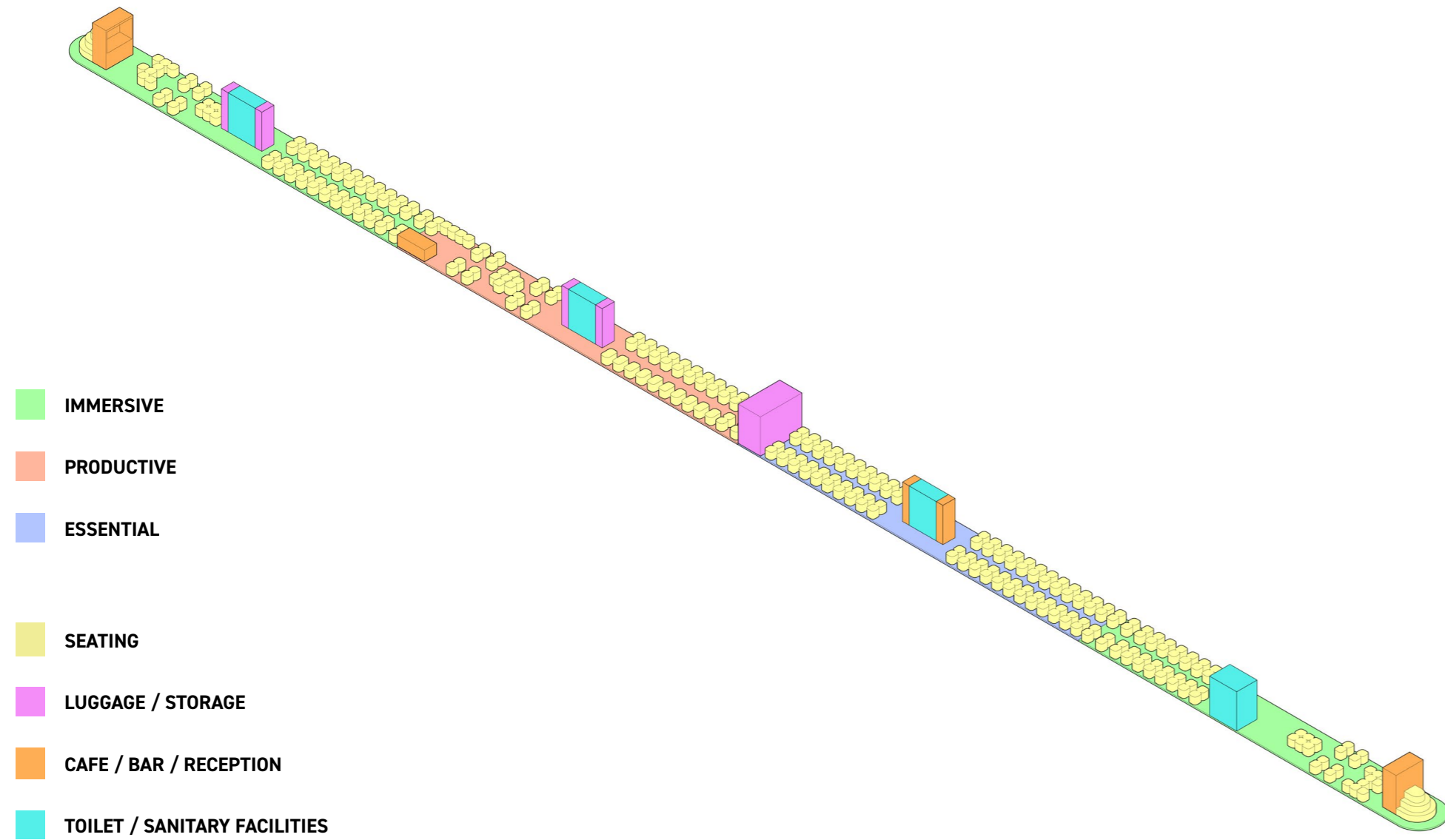


### Concept 4

The most radical where we used the panorama layout of concept two throughout the train, with a centrally located entrance. This would make for an active and social experience for all, but extremely difficult to differentiate between the user groups.







**Platform**  
The train consists of four wagons with the possibility of connecting four of these together, creating a total of 16 wagons.

**Zones**  
The train consists of three different zones corresponding to the need of the user.

**Seating**  
Seat placement is different from zone to zone. The productive coach offer the most room, slightly less in immersive, and least in essential.

**Facilities**  
In each zone, there are separate cafes, centrally placed toilets, and luggage space.



Before proceeding with our chosen concept we reached out to our facilitators at VY. Over the course of an afternoon, together with Train Conductors Gry Toftner and Kent Marthinsen we discussed our solution. What would work and what should be given more attention? Since the normal day of the conductor is quite strenuous, with a lot of walking they felt that:

*"There is a lot of walking, up, down and through the train, so a solution like this with a flat floor and separate zones for the conductor would be smart."*

In regards to our idea of altering their role they felt that:

*"The role of the train conductor is becoming more and more like a host. So this makes a lot of sense"*

They welcomed our idea of creating lounge areas as:

*"Many customers strive for privacy, so making areas where they can withdraw is a good idea"*

Our ideas of larger windows was also well received and something they believed both tourists and domestic travellers would appreciate highly.

With the validation we needed in place, we were ready to proceed with our form development.

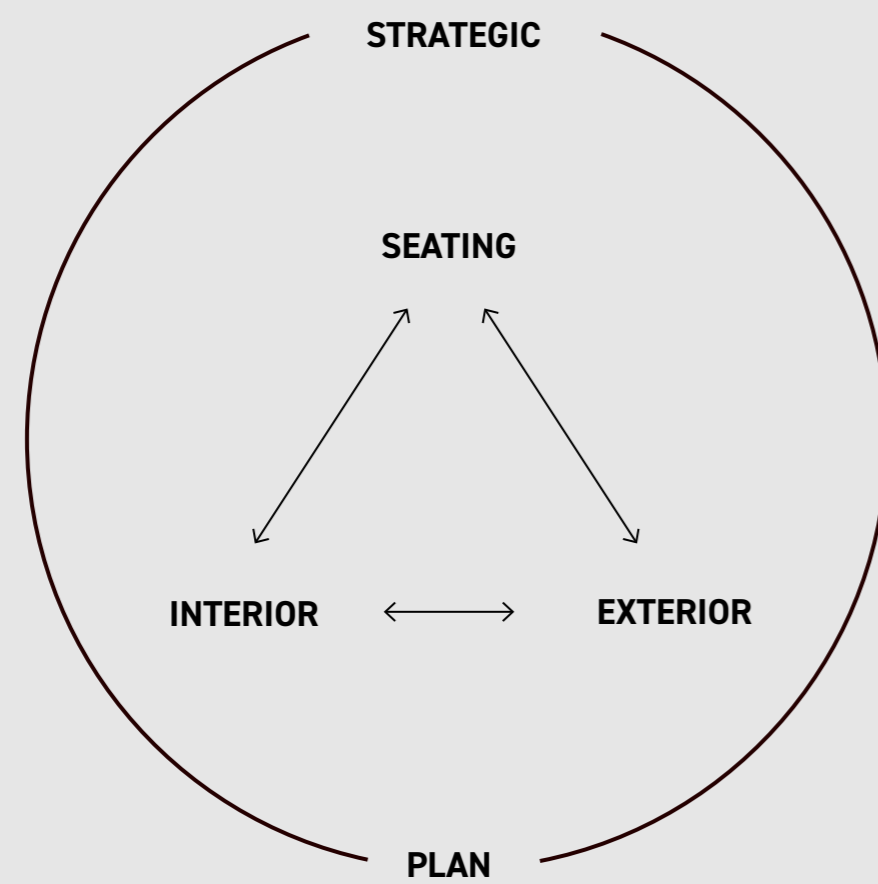
***"The role of the train conductor is becoming more and more like a host. So this makes a lot of sense"***

# PHASE THREE | FORM DEVELOPMENT

**Methodology**  
5 weeks

## **Form Development**

Moodboards  
Sketching  
Physical modelling  
CAD  
Rendering

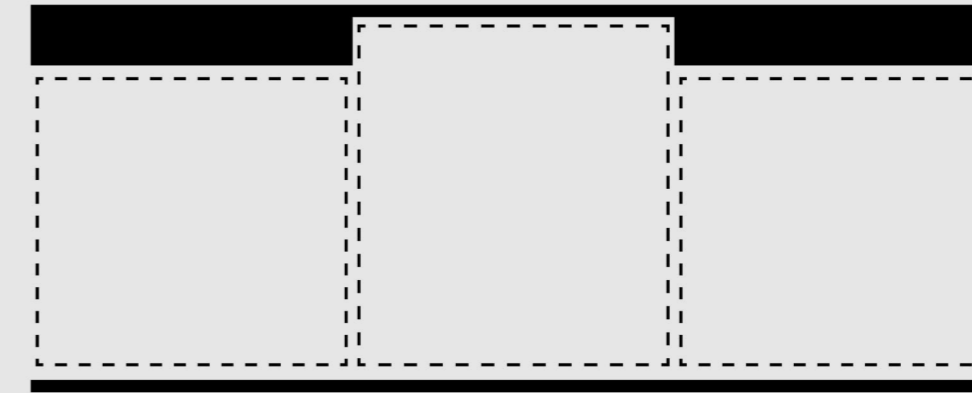
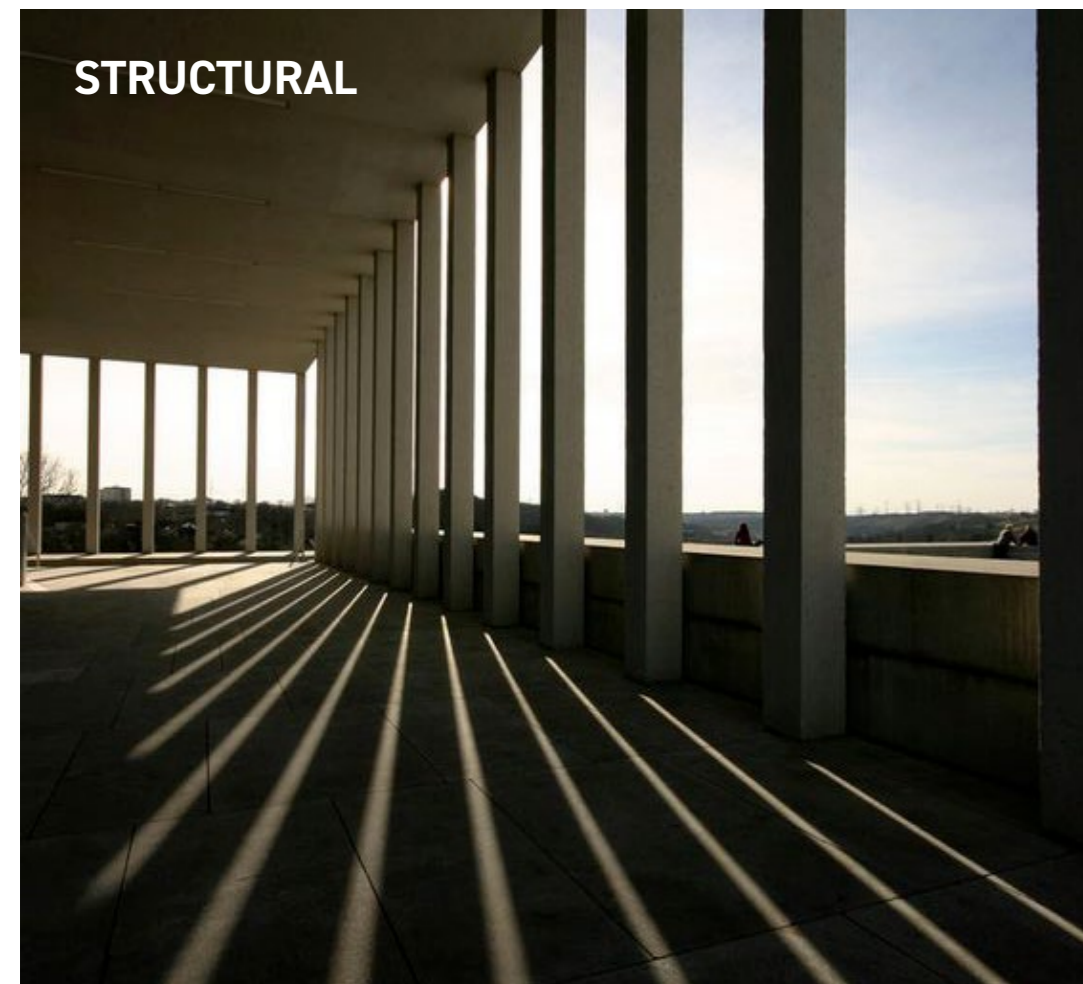


Our approach to the form development was to move back and forth between the interior the seating and the exterior, always having our strategic plan in mind.

# ***“FRAMING NATURE”***

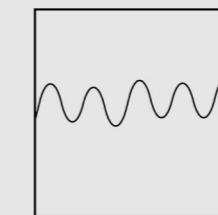
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We started inside out, with the objective to frame and encapsulate the bypassing nature. Creating unique 'pieces of art' wherever you are seated in the train.



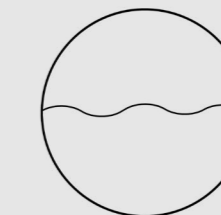
**SPACES WITHIN THE SPACE**

A big part of the structural concept was to create anechoic chambers between the beams of the train's structural frame. By creating a division every 2200 mm we aim to create smaller and more intimate spaces throughout the train. At every division we make use of windows offset from each other. And at every second offset, the ceiling is lowered with acoustic panels, both accentuating the 'space within space' mentality but also providing sought after acoustic damping.



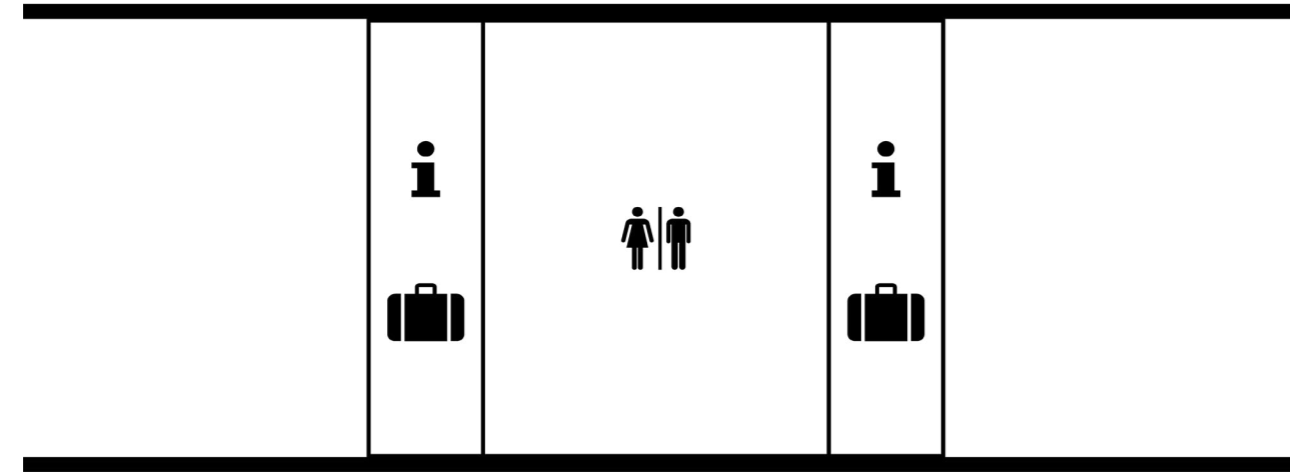
**HARD SURFACES**

The large glass surfaces will reflect sound and send the soundwaves further into the space resulting in annoying noise.



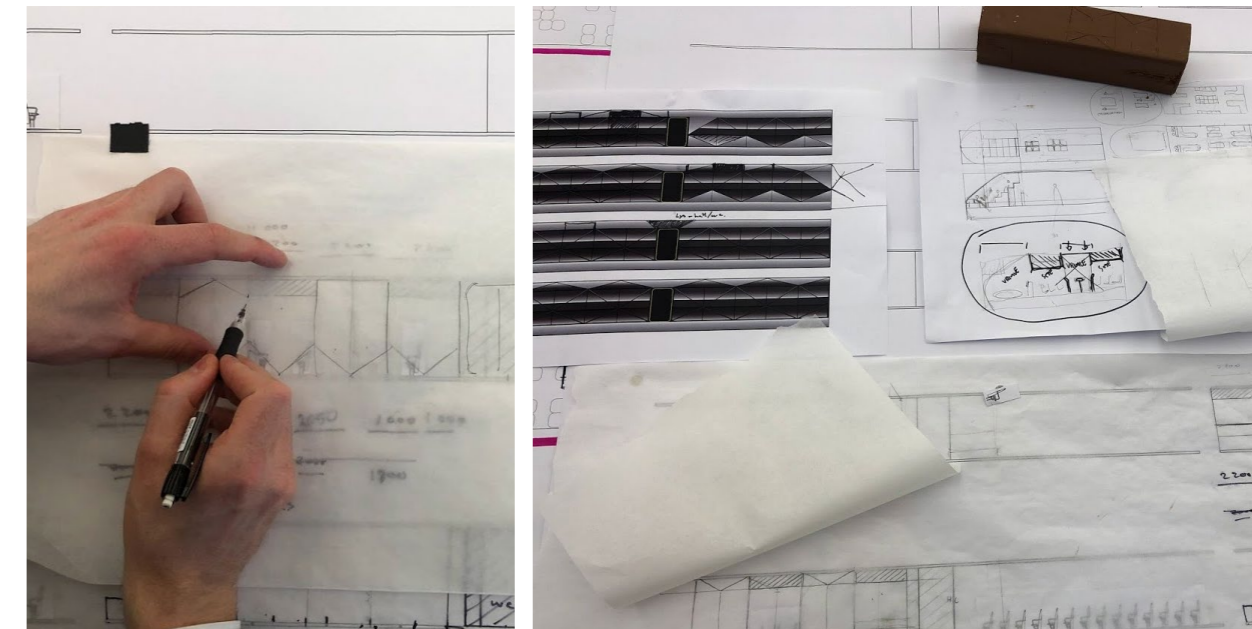
**SOFT SURFACES**

In dense public spaces, it is important to break these hard surfaces with soft absorbents resulting in a more comfortable environment.



**CENTRALIZED FACILITY UNIT**

Centrally located in each coach you will find units containing the core facilities - toilets which can be accessed at both doorways. These are flanked by luggage storage visible from all the seats adding to a feeling of security. At the end of each storage unit there are information screens, displaying whether or not the toilets are occupied, stops on the way, news bulletins and time and temperature.



With the previous design decisions in mind, we continued with the window study. Using an inside out approach, copious amounts of overlay sketching, and meters of tracing paper we went back and forth trying to achieve an optimal solution both for the exterior and the interior, getting the outside to line up with the inside and vice versa.



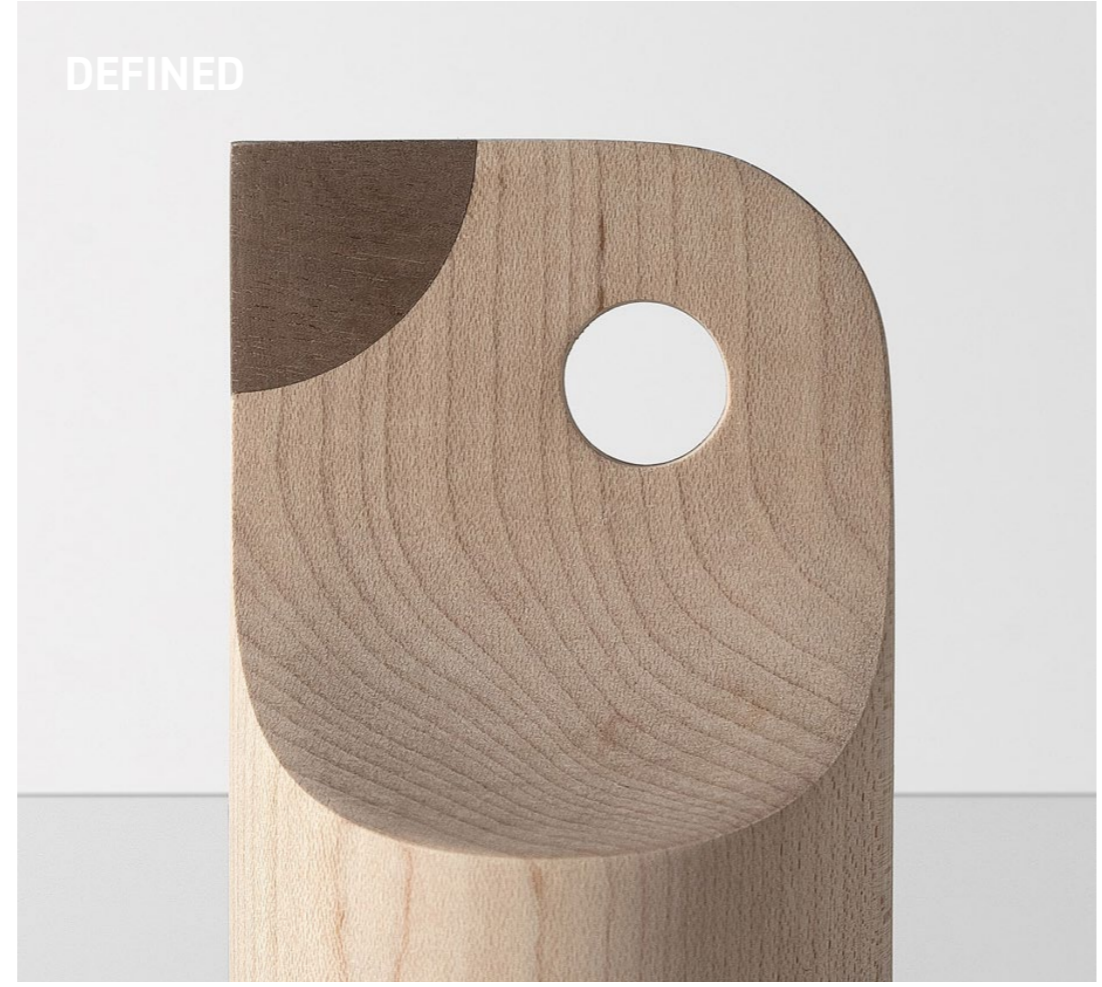
SOFT

Photo: KKNEWS



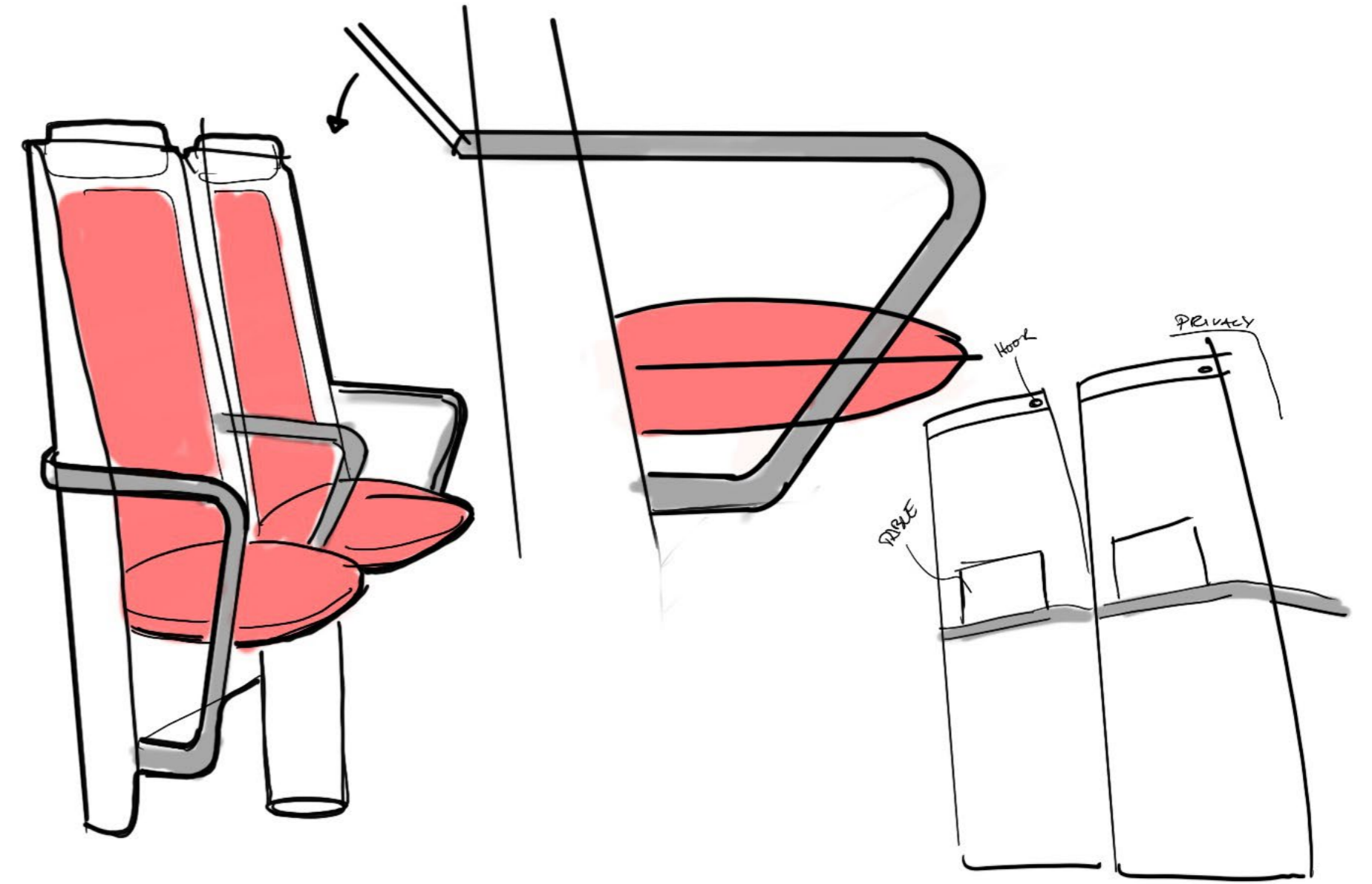
SHELL

Photo: Carl Hansen & Søn



DEFINED

Photo: LEMANOOSH




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The seat we ended up with is a plywood shell structure with defined lines and soft upholstery.



**THE RIGHT SEAT**

We approached the task of designing the seat through the exploration of three categories and several concepts within each.

How might a seat for the essential zone compared to the productive or the immersive look like?

The essential zone would need a seat that would provide seating comfort, the ability to take a nap, or watch a movie on a personal device. In the productive zone, there would be a larger focus on comfort, privacy and enabling for work ie. space for computers, papers, etc. While in the immersive zone, the focus would be more on the ability to socialize, dynamic seating, opening for freedom of movement and taking in the views outside.

Through the use of physical and digital sketching we produced several concepts. These were then translated into CAD sketches, which we then did overlay renditions of. And then repeating the previous steps until we had something we felt conveyed our design intent and references, and that we could further detail in 3D.

For the lounge furniture and the bar stools we have used designs from Norwegian furniture brand Fora Form. We believe they go well together with both the interior and our design intent and vision.



**1:1 PRINT OUT**

In order to validate our chair design, the measurements, and how colors work, we did several 1:1 printouts making alterations along the way.



**VIRTUAL REALITY**

To be able to approve the interior as a whole; how window height and ceiling height worked together, the overall floor plan in connection with the chairs and its materials and colours, we made use of virtual reality. It was valuable to step into this world to fully understand the scale we were working with and how all the elements affected each other.





STADLER FLIRT Photo: Øivind Haug



ICE 3 Photo: Thomas Wolf

**NORWAY**

Starting out with the exterior design phase we had a look at all existing Norwegian trains, many of them even produced in Norway. None of them are high speed trains, but there are a lot to be learned from the heritage.



ADTRANZ TYPE 73

Photo: Norske Tog



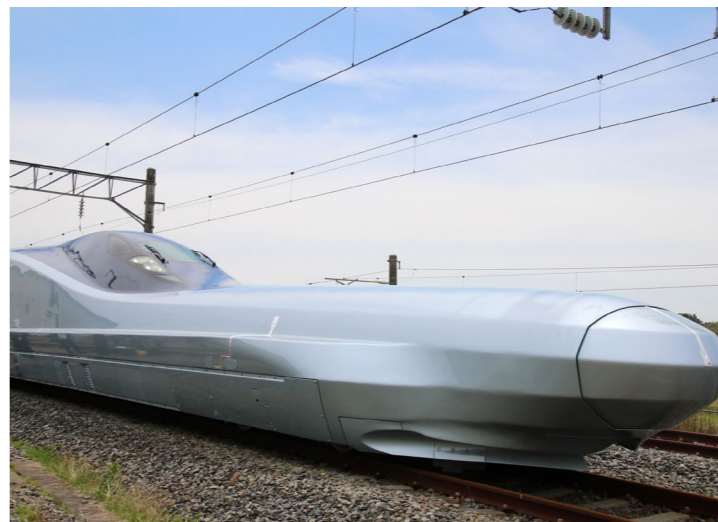
DUEWAG TYPE 92

Photo: Norske Tog



Laview

Photo: Seibu group



Shinkansen ALFA-X

Photo: AFP/Jiji Press

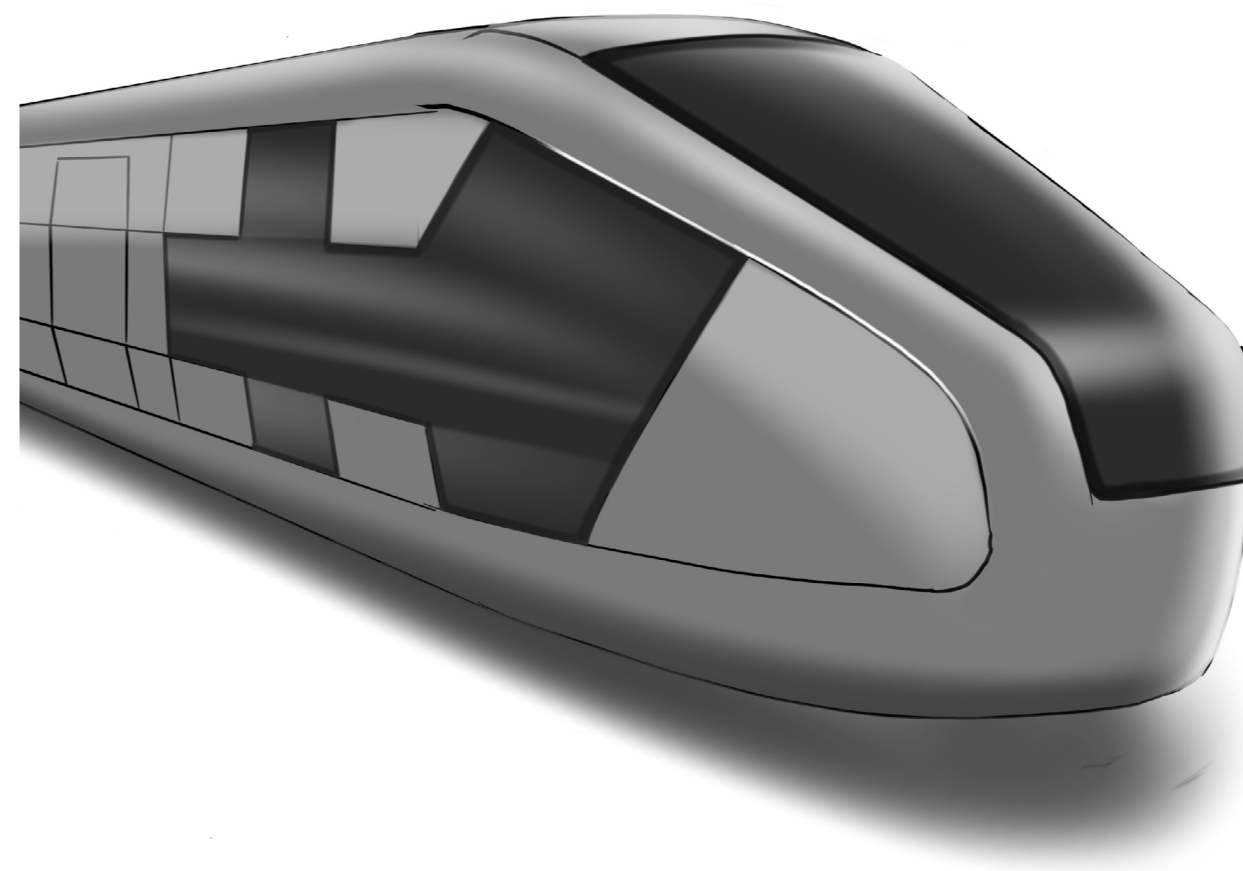
**GLOBALLY**

We wanted to have an overview of existing high speed trains around the world to get a grasp of what has been done before in this scene. This was in turn made into an analysis of the different form languages, from the radical and extreme Japanese trains to the pragmatic and clean german trains, which helped us choose directions for the moodboards.

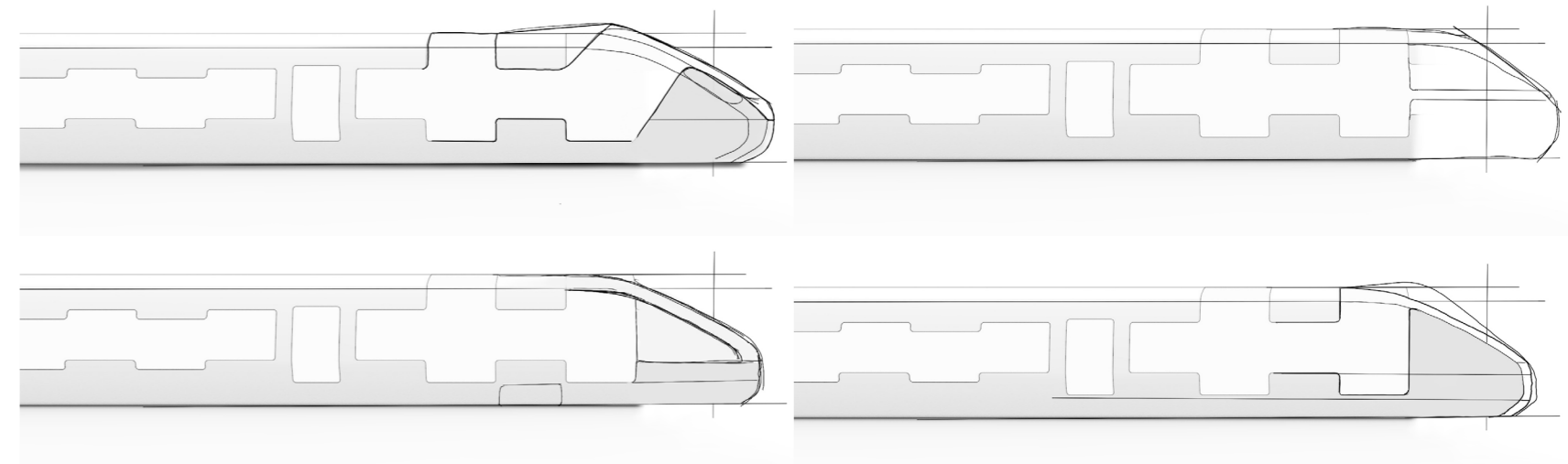
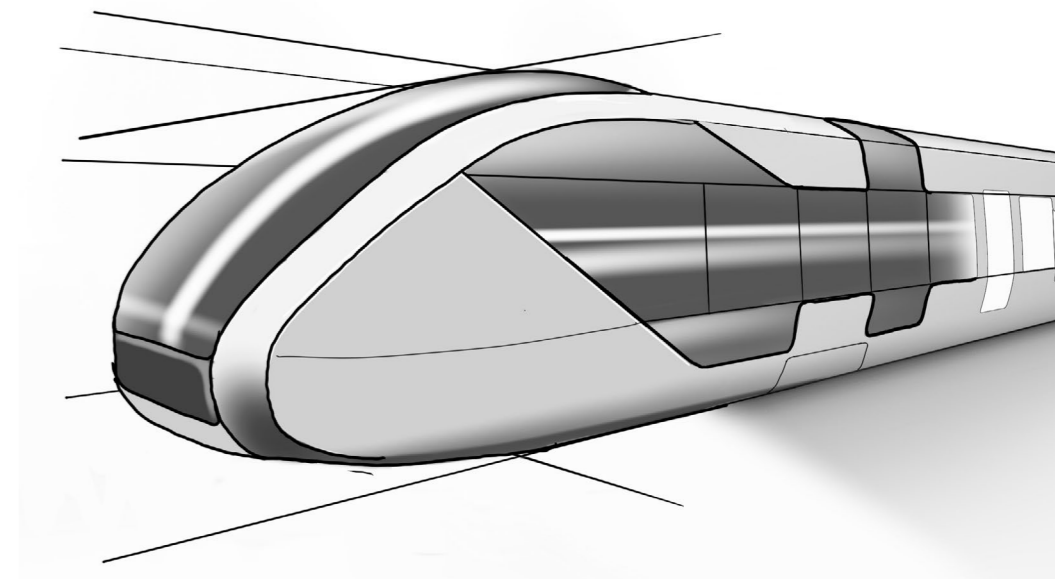
ORIGINAL



Photo: BIOMEGA



Taking inspiration from the moodboards, we started to develop the exterior. Even though the main focus was on the experience itself, we felt it was important to have a clear and original aesthetic vision to make the concept more tangible. We strived to create something which was not dominating, yet still having presence. A difficult task as design features like this can easily overshadow the intent of the concept.



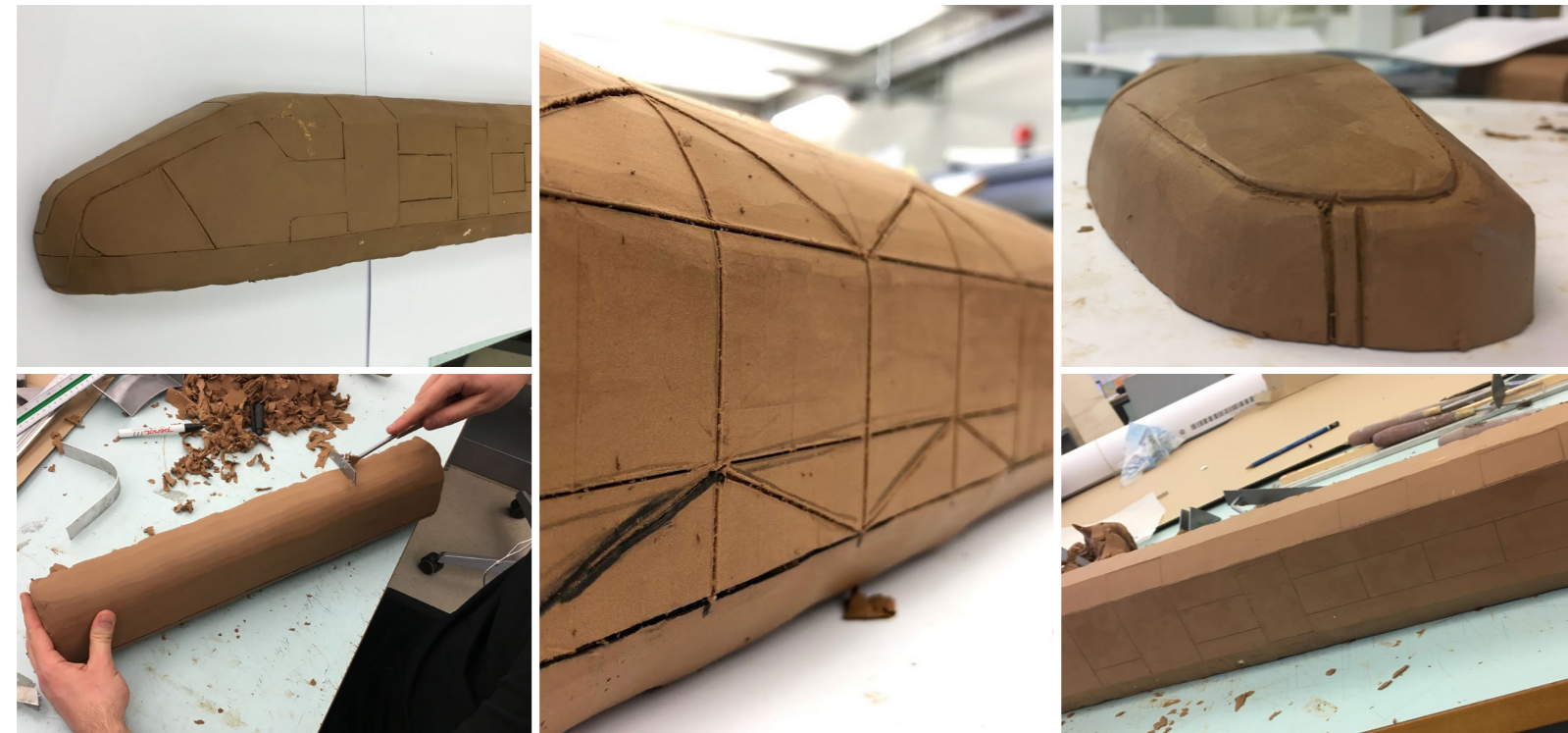
PLAY

Photo: Erik Hattrem



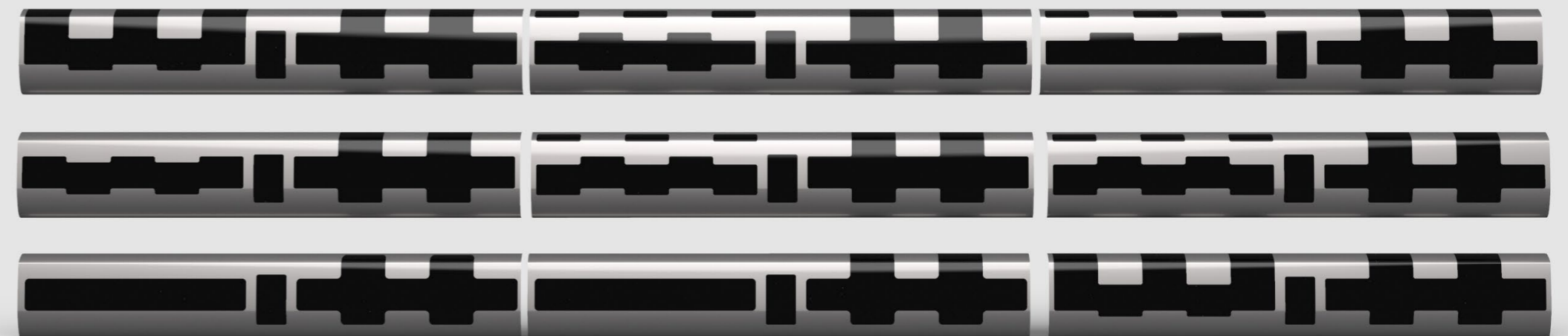
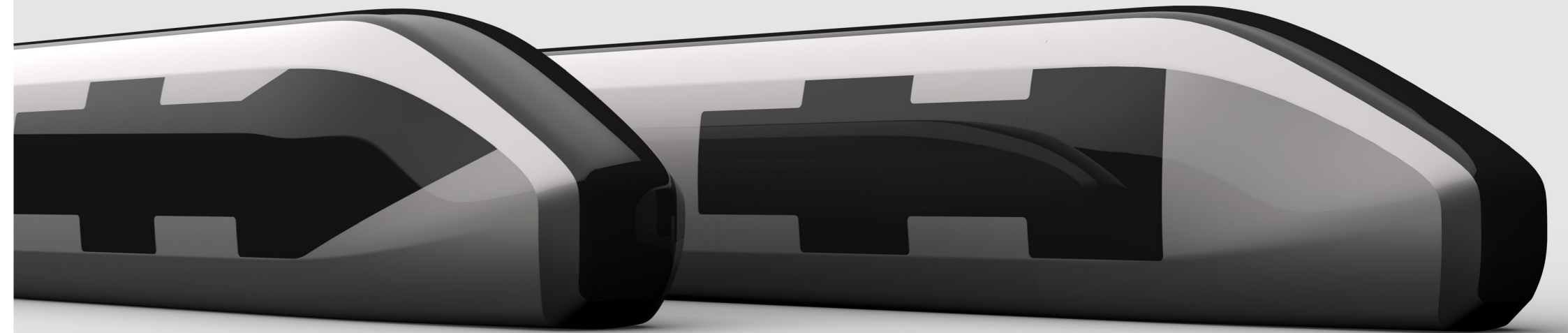
ACCENT

Photo: BMW



**CLAY MODELLING**

To fully understand proportions and relations we needed to translate our sketches to clay. It was especially important regarding the windows and the profile section of the train, as you get a lot of distortion when going from flat to three dimensional, when you are working with curved surfaces.



**OUTSIDE IN**

Through exploration in CAD, illustrator renders and overlay sketching from the interior process we were able to create a large basis for making discussions and decisions. After making decisions regarding the windows from the exterior clay study, we continued with an iterative CAD development process. This was an efficient method to push out directions and assess the ideas in both side view and perspective.

# PHASE FOUR | DELIVERY

**Methodology**  
5 weeks

**Completion**

Report  
CAD  
Rendering  
Model making  
Presentation

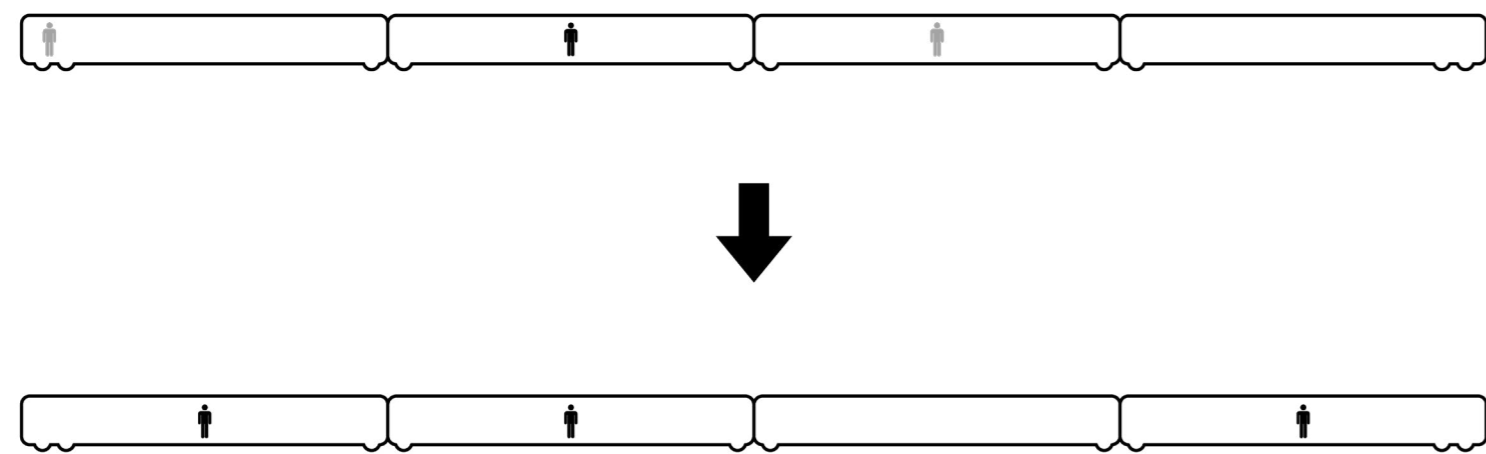




Original Photo: Axel Vervoordt Gallery and Thomas Bjørnstad  
Collage

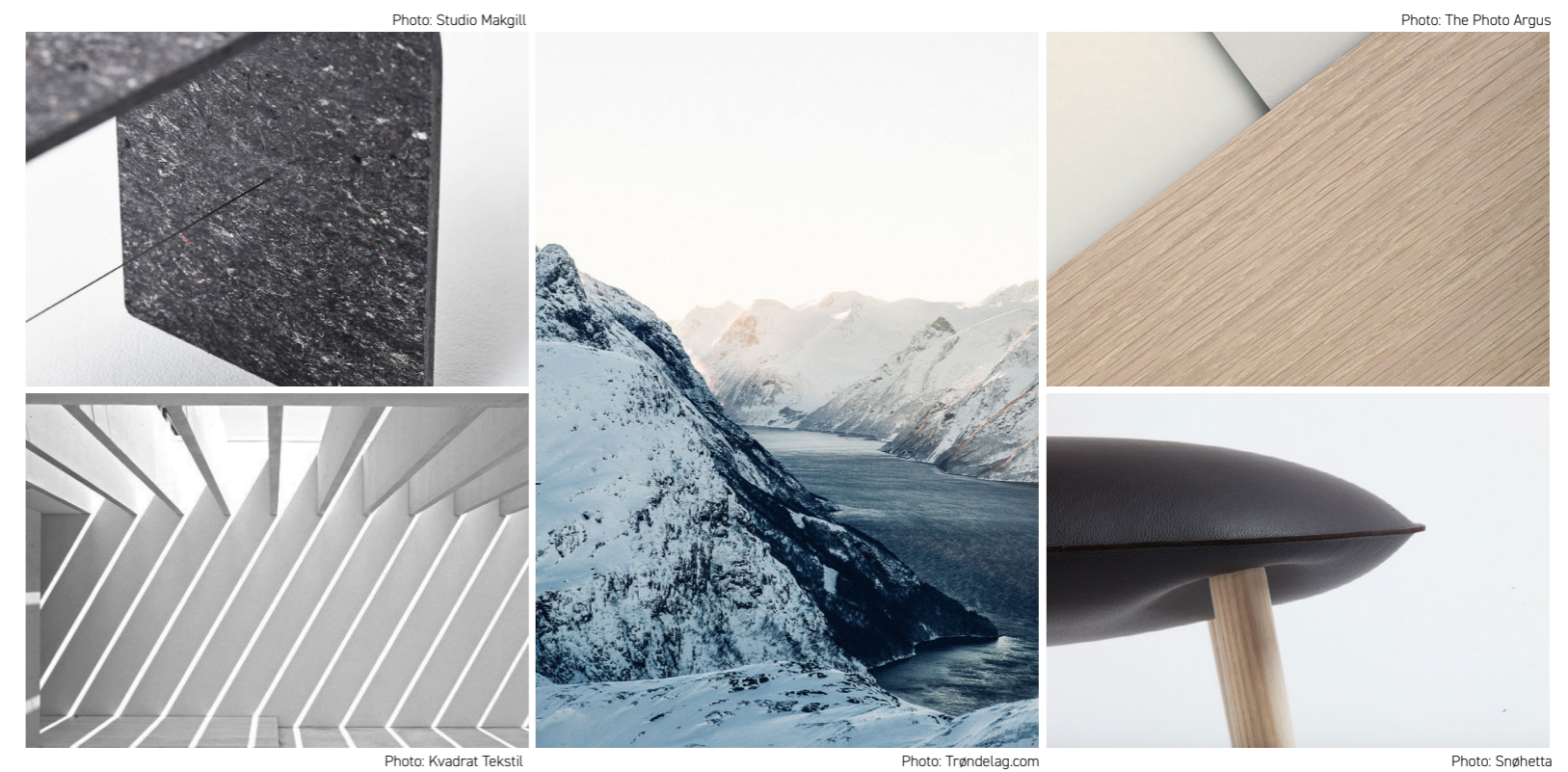
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The essence of what we have tried to achieve. A diverse demography with different needs and interests, gathered in one immersive environment where they are taken care of by a host.



**ADDING VALUE BY REINVENTING THE ROLE OF THE TRAIN CONDUCTOR**

With the introduction of autonomy, the role of the driver has become excessive. Through redevelopment of the conductor into both host, tour guide and onboard safety, the restaurant worker becomes an integral part of that role. Instead of three separate roles in one train, these are now combined into one. Making for a more streamlined and efficient way of providing service to the users.



To underline the different zones we developed three CMF directions.

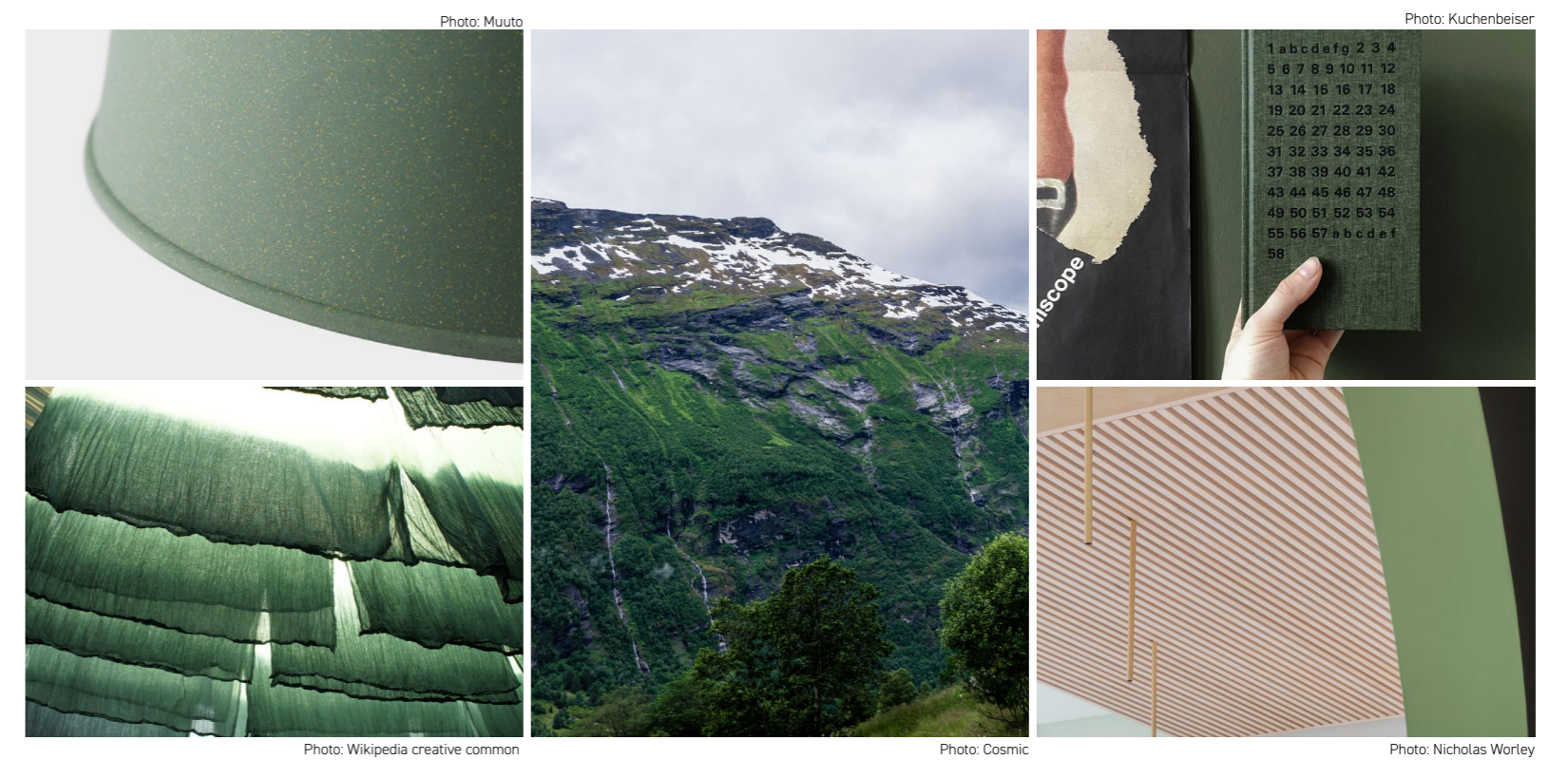
**NORDIC RATIONAL**

Nordic rational is the CMF mood board for the productive coach. Calm colors and materials inspired by winter and solid stone underline the users need for a relaxed and more serious environment for work and contemplation.



**NORDIC VIBRANT**

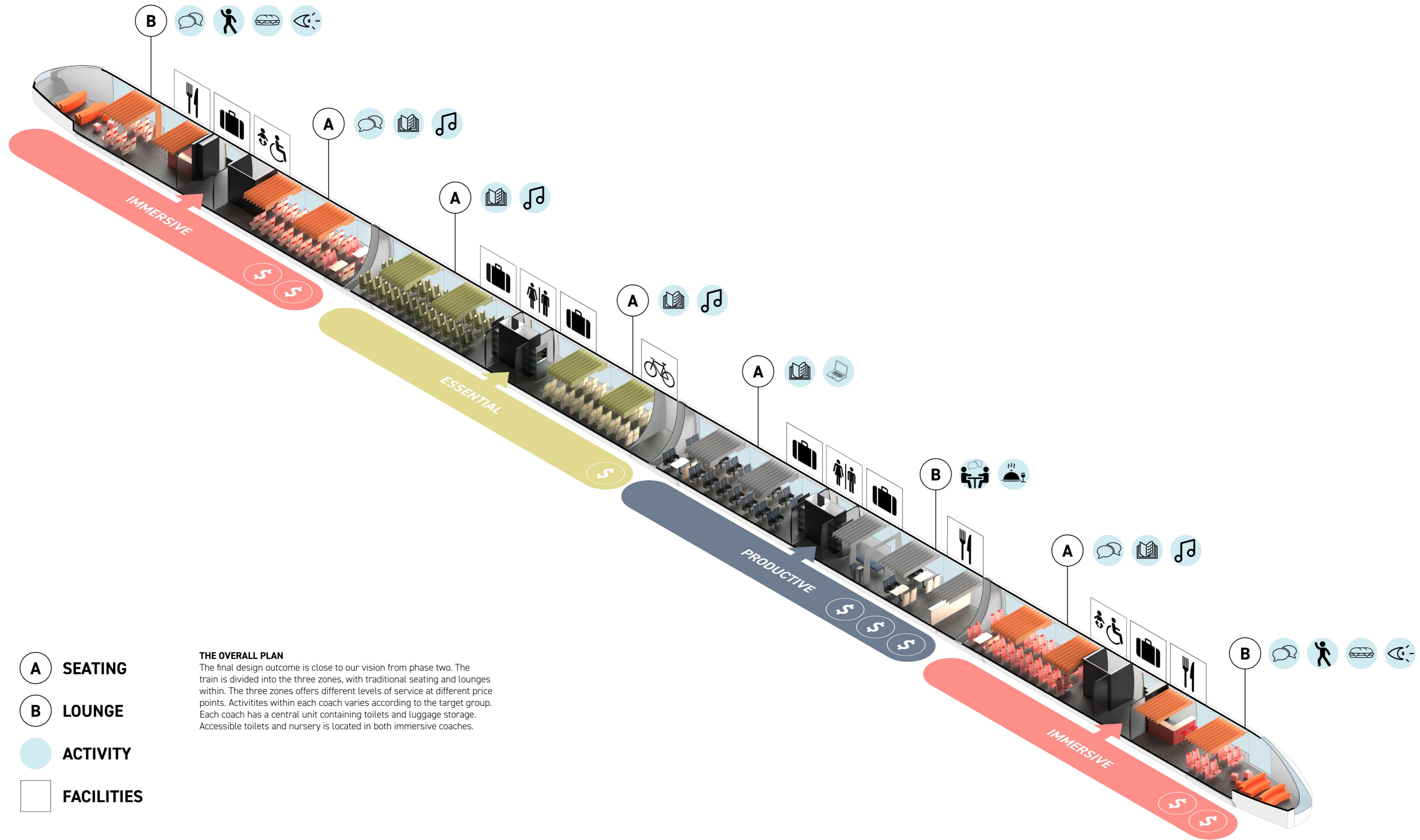
Nordic vibrant is the CMF mood board for the immersive coaches at each end of the train. Playful colors and materials inspired by the amazing Norwegian spring and autumn fills the space, hinting to the more engaging experience found here while catering for both tourists and families with children.



**NORDIC SOFT**

Nordic soft is the CMF mood board for the essential coach. The palette of summer greens gives a soft look and feel. Underlining the users need for an easy, relaxed and carefree journey from A to B.





- A SEATING**
- B LOUNGE**
- ACTIVITY**
- FACILITIES**



**THE INTERIOR SPACE**

Through the use of large ceiling hung felt panels we provide both sound damping and more dynamic rooms, accentuating the beam structure and the offset window configuration.



**CENTRAL FACILITY UNIT**

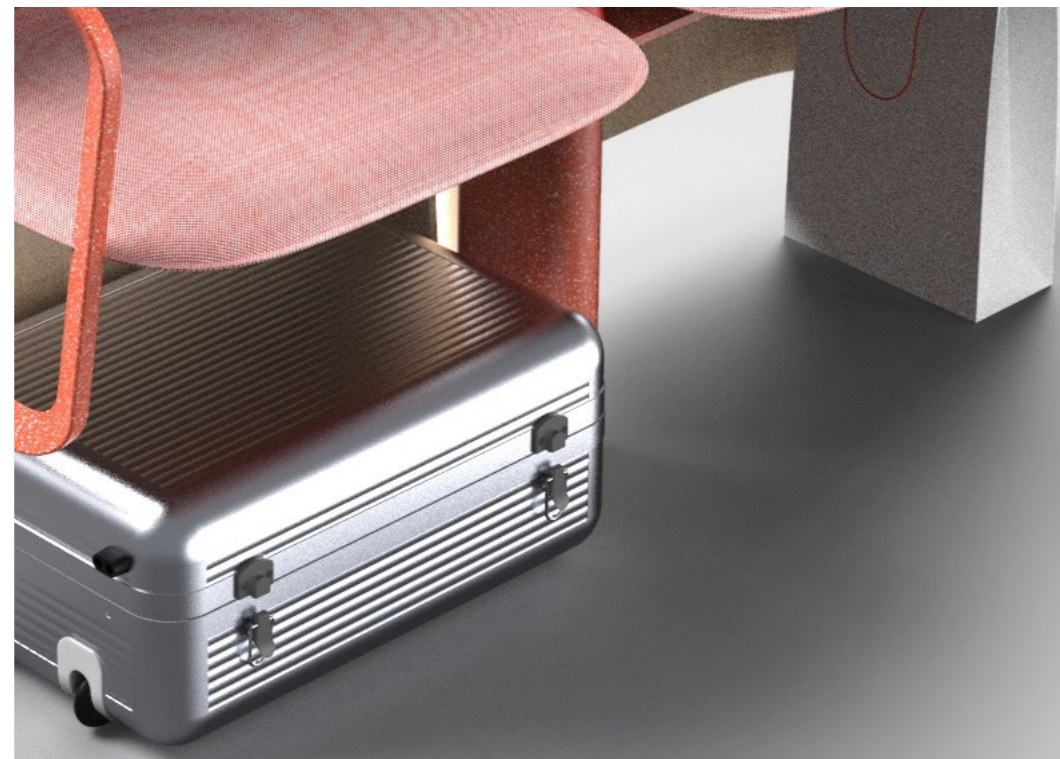
In each coach you will find a centrally located facility unit. This is the unit placed in both the Productive and Essential coach, while the Immersive coach has accessible toilet/nursery. All of them contain the most vital necessities; toilet, luggage storage and travel information. The central location in each coach ensures short travel wherever you are seated and direct overview of the screen and your luggage, in terms of security.



IMMERSIVE - ESSENTIAL



PRODUCTIVE



**THE MODULAR CHAIR**

We wanted to create a seat that conveyed the Scandinavian spirit, not being as sterile and industrial looking as most train seats, away with the moquette fabric, and crossing over into the furniture world.

A plywood shell makes up the whole back plate of the chair and underlines the Nordic furniture heritage further. By fixing the shell structures to a centrally fixed metal column we free up space for personal luggage. Then, in order to meet the different needs in different zones, we have used a modular approach with the seat and back cushion. The immersive and essential seat has an armrest in metal that encircles the two seats and provides mounting points for the fold down table. Together with the thinner back cushion, this gives a light and open feel, reflecting our thoughts for those zones. The productive seat, on the other hand, is a one-piece solid armrest, lumbar support,

with a thick backrest and broader head support. This hints to the Nordic office furniture heritage of the 60s and accentuates the executive look and feel.

Bring Your Own Device (BYOD) is becoming the standard both in the work environment but also in the private sphere, that is the main reason that we did not implement screens in the seats.



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This is the Immersive coach seen from the outside with its panoramic windows. A space you seek to explore the outside without any distractions. The windows of the train is one of the most striking features, with its variation like picture frames on a wall. In combination with the acoustic panels it is creating a more exciting space from within and seen from the outside.

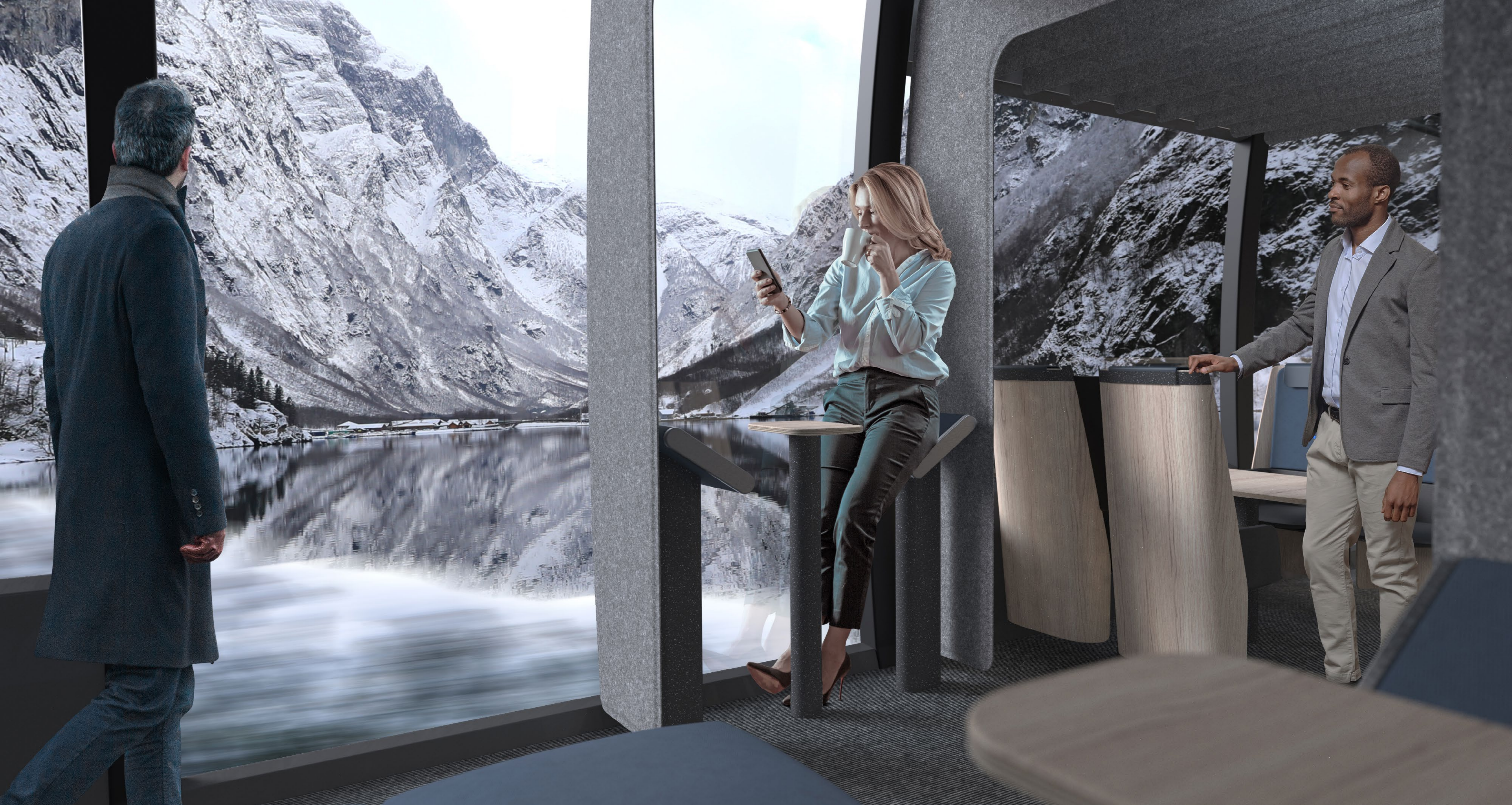


This is the traditional seating in the Immersive coach. Notice how the mountains follow the pattern of the windows, and the colours reflect the rust brown lichen of Rondane.



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The Essential coach is all about capacity and fulfilling the basic needs of commuters without any fuss. The green color tones is chosen to create an ambient space reflecting the colours of vegetation found throughout Norway.





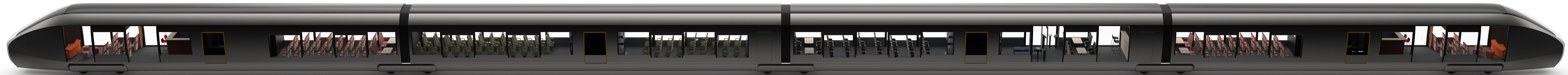
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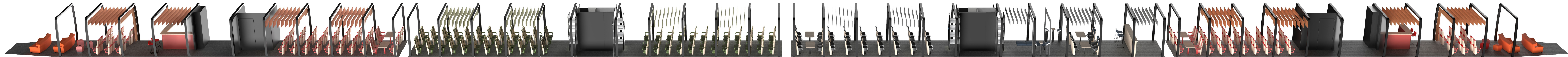
The Lounge area is an engaging space where you can stretch your legs, make a phone call, arrange a meeting or just have a cup of coffee and withdraw to the lounge furniture or at the standing table.



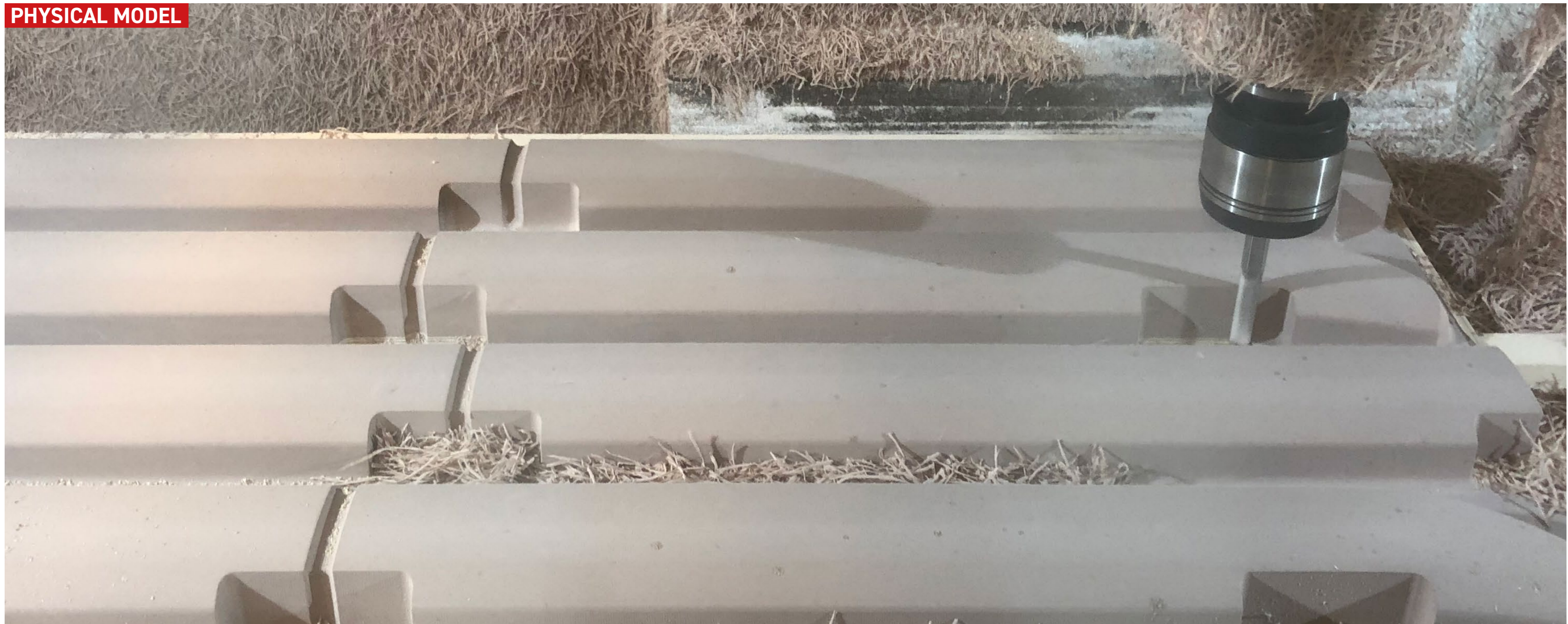
The Productive coach is tailored to business travellers and people who want something more. Seat pitch is longer, more privacy and distance and enhanced comfort. Tables are integrated into the armrest. The color palette is neutral and serious with grey felt panels, dark blue textiles and dark leather reflecting the raw and cold nature.





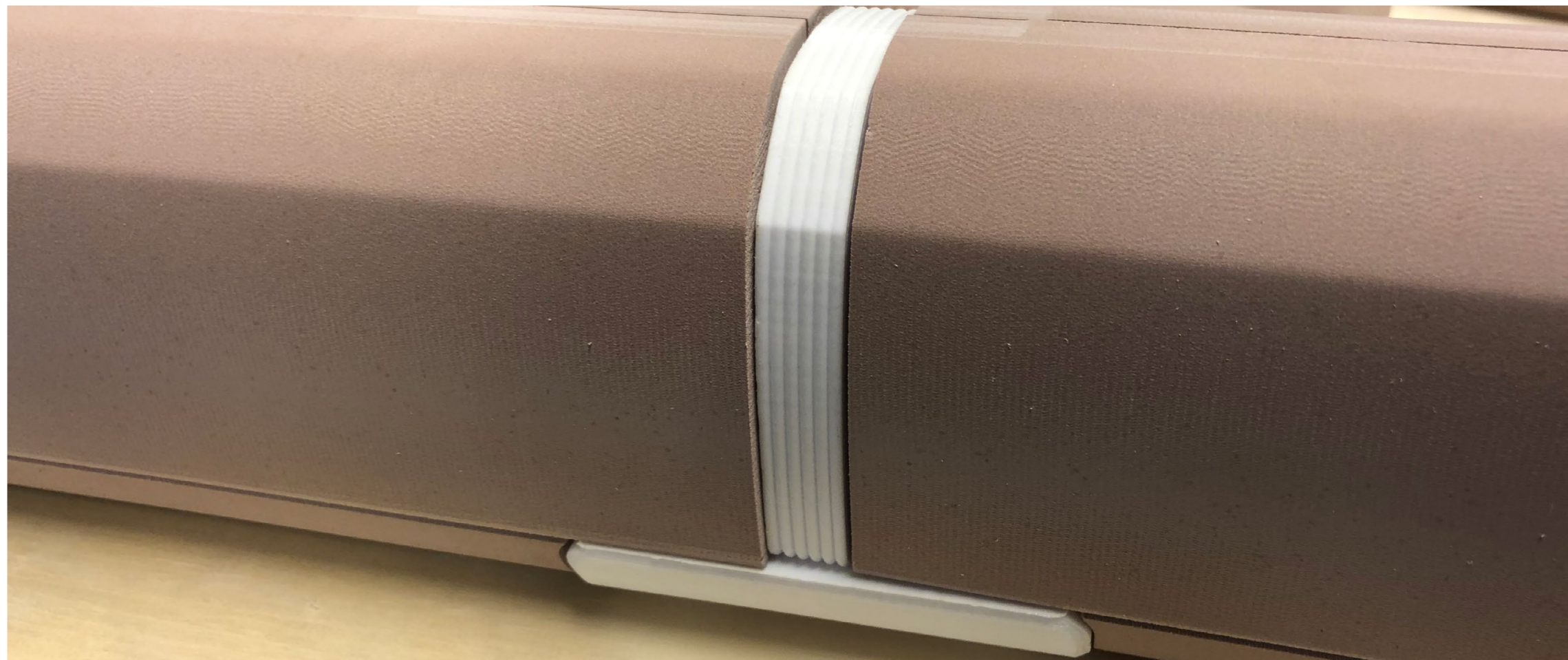


**PHYSICAL MODEL**



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The scale of the project makes for a better understanding through the use of computer rendering, rather than a model. Because of this we will build our model only as a show piece for the AHO Works exhibition.



**ANSWERING OUR BRIEF**

We believe that we have answered our brief to a higher degree. Especially as this project initially started out as a classic industrial design project. Later in the process it became clear that we had to implement just as much service design methodology into the diploma to fully be able to answer the brief. We believe that we have mastered both branches equally well. And feel that the diploma delivers both strong visualisations and the feeling of a new and refreshing service.

We believe that this project is in the intersection between industrial design, service design and architecture.

**WHAT WOULD WE HAVE DONE DIFFERENTLY?**

Although we feel that we have kept the project at the level needed to convey our original goal, in retrospect, we ought to have considered scaling down certain aspects of the project to achieve even more detail. The sheer size and complexity became apparent early, as both we and our supervisors were aware of from the beginning.

**DESIGNING CONCEPTUALLY**

As we have designed a conceptual vision of what a high-speed train for Norway would look like we have taken liberties in aspects relating to realism. Such as removing the overhead line from renders and letting aerodynamics and material technology take a back seat. Despite this, we believe that our final design is within the the realism needed to engage an audience.

**DIVISION OF LABOUR**

In the first three phases we worked side by side, laying the foundation and the framework of the project. But as the project progressed, the workload had to be divided between us. With one of us doing the 3D modelling and rendering, and the other one doing the report and additional research. Both giving and receiving input on each other's work along the way. This has worked well from a strategic point of view, and has been fundamental in finishing the project.

**FURTHER DEVELOPMENT**

Due to obvious time limitations, there are additional experiences that would have been interesting to implement. As the project is set in the near future, such things as the advent of new technology is one. With the design intent in mind, augmented reality would be such an experience.

Other than that, we would have liked to validate our concept with focus groups, and implement their feedback into further iterations.



Presenting the project for Sigurd Bay (middle) and Geir Remi Hammer (right) at VY's headquarter in Oslo, 16th of May.

**OUR FACILITATORS**

Our facilitators, Norsk Bane and VY has been instrumental in making us able to deliver a project at this level.

These reflections are based on our talk with VY on the 16th of may.

**WEBPAGES:**

<https://www.bloomberg.com/news/articles/2019-04-14/as-flying-shame-grips-sweden-sas-ups-stakes-in-climate-battle-flyskam>

<https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

<http://www.norskbane.no/default.aspx?menu=95>

<https://www.toi.no/publikasjoner/hoyhastighetstog-i-sverige-beregningsverktoy-og-resultater-en-vurdering-av-transport-og-samfunnsokonomiske-analyser-article34087-8.html>

<https://www.ssb.no/transport-og-reiseliv/statistikker/jernbane>

<https://www.ssb.no/transport-og-reiseliv/statistikker/flytrafikk>

[https://en.wikipedia.org/wiki>Loading\\_gauge](https://en.wikipedia.org/wiki>Loading_gauge)

<https://www.norsketog.no/tog>

<https://www.vy.no/>

<https://www.banenor.no/>

**BOOKS:**

Henry Dreyfuss Ass. (2001) The Measure of Man and Woman: Human factors in design  
Published by Wiley, New Jersey, USA

**ARTICLES:**

Transport og klima -Funn og fakta om klimapåvirkning  
Cicero and TØI

BELLONA -101 solutions to climate change

**BACKPLATE IMAGE FOR RENDERS (CHRONOLOGICAL):**

[https://en.wikipedia.org/wiki/Bergen\\_Station#/media/File:Inside\\_Bergen\\_Station\\_HDR.jpg](https://en.wikipedia.org/wiki/Bergen_Station#/media/File:Inside_Bergen_Station_HDR.jpg)

Wes Grant, Unsplash

Ulv E. Aasland

Erik A., Unsplash

Hyunwon Jang, Unsplash

Vidar Nordli Mathisen, Unsplash

**SYMBOLS:**

Point of view by Pablo Rozenberg from the Noun Project  
Price by designvector from the Noun Project  
Dinner by Vichanon Chaimsuk from the Noun Project  
Sandwich by Estevão Sarcinelli from the Noun Project  
Eat by Guilherme Furtado from the Noun Project  
Bicycle by PONDERA FM from the Noun Project  
Talking by Rose Alice Design from the Noun Project  
Meeting by Rose Alice Design from the Noun Project  
Laptop by Evgeny Katz from the Noun Project  
Music by Satisfactory from the Noun Project  
Book by pejyt from the Noun Project  
Fun by Adrien Coquet from the Noun Project

**THANKS TO:**

Our supervisors: Stein and Steinar  
AHO  
VY  
Paul Marchant  
Bellona  
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Flytoget

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