

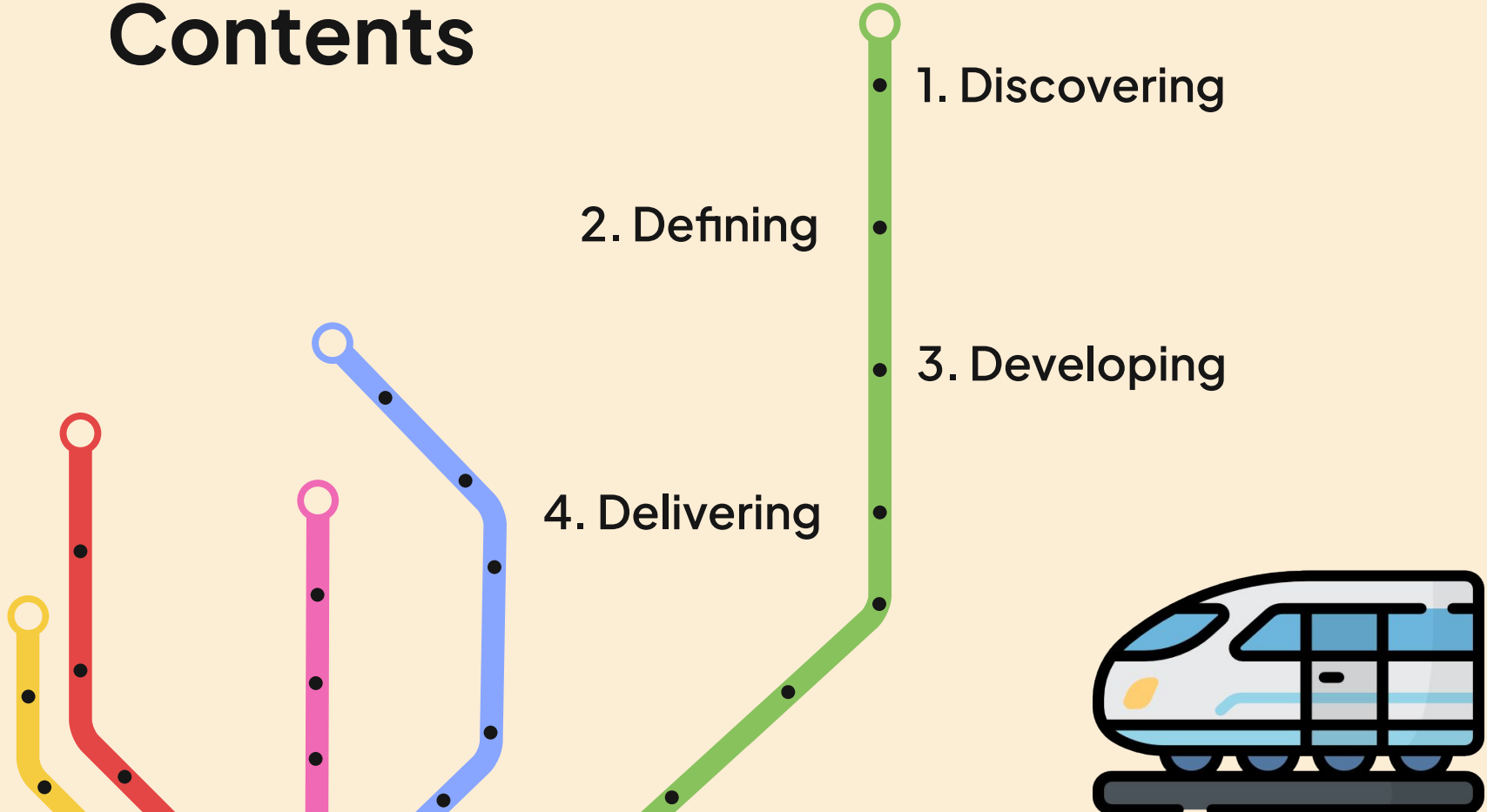
# The Hidden Networks of Mothers with Young Children on Stockholm's Metro

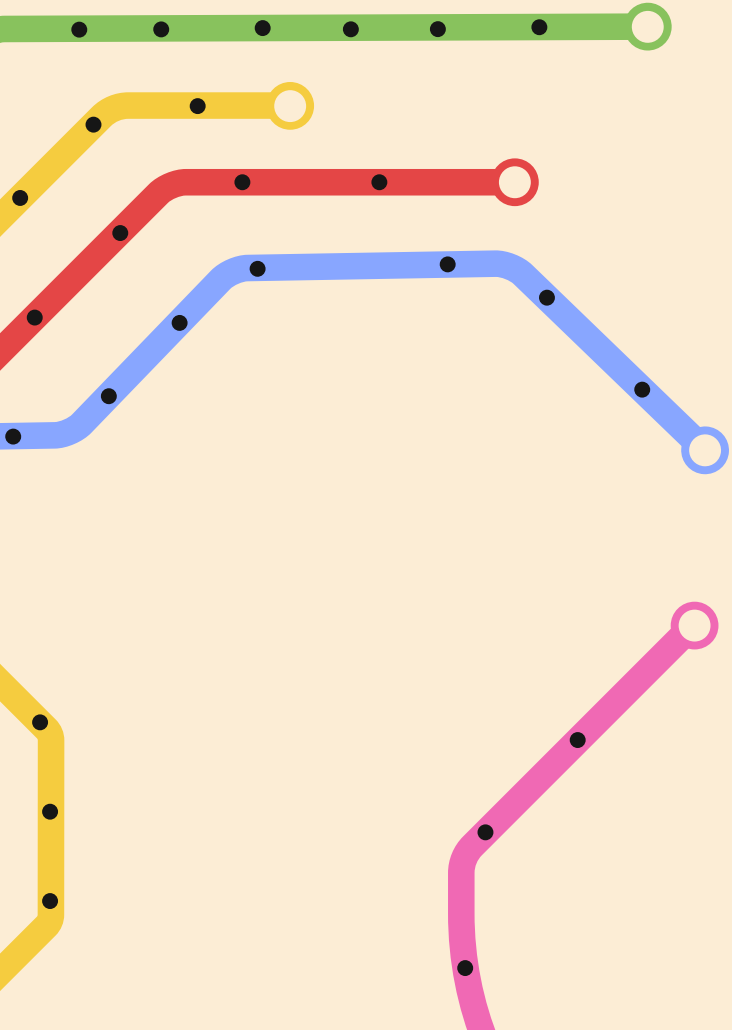
## Workbook

*Group 1*



# Contents





# The Discovery Phase



# Framing of the Design Brief

- **Every-day hidden ecology of care**
- **Interdependence in commuting**
  1. *Physical Space and Bodies*
  2. *Sensory Landscape*
  3. *Reacting to an Emergency*
- **Initial target group:** Commuters (too broad)
- **Final target group:** Mothers with children under 3 commuting by metro in Stockholm





# Discovering Methods

Literature Review

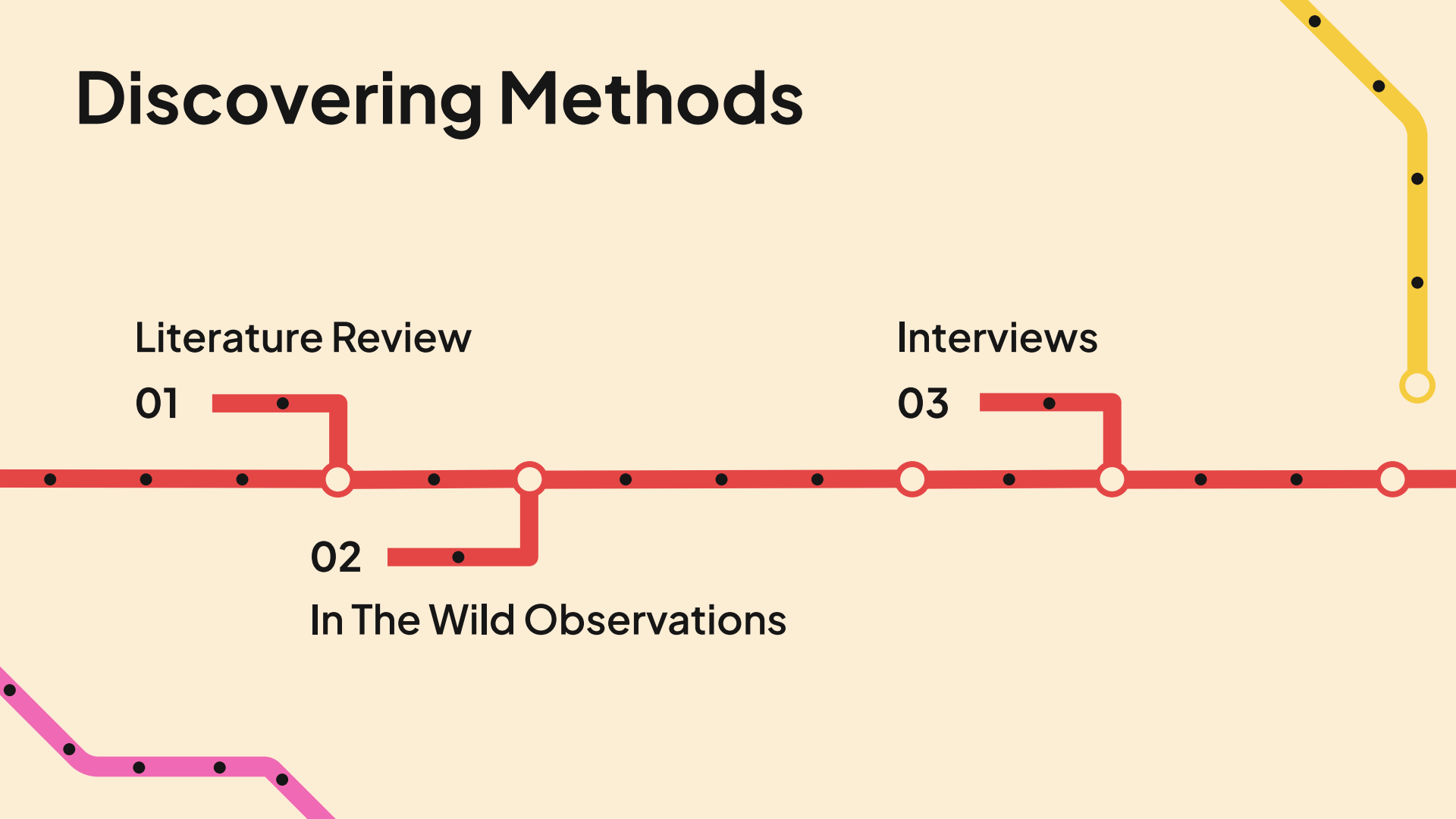
01

Interviews

03

02

In The Wild Observations



# Discovering Literature Review

## Literature 7

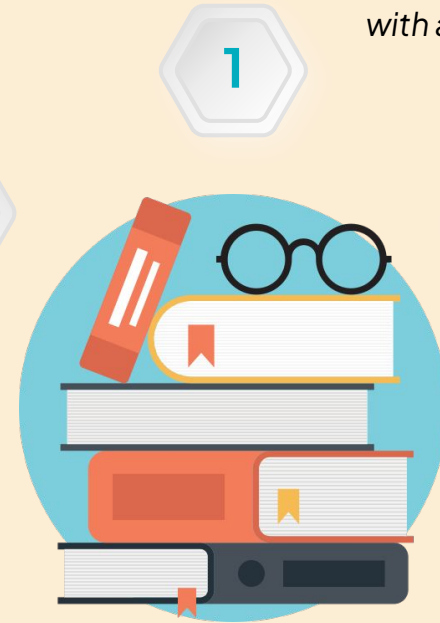
*Everyday Travel for Families with Children Using Wheelchairs: Parents' Perceptions of Constraints and Adaptation Strategies*

## Literature 6

*Motherhood, mobility and materiality: Material entanglements, journey-making and the process of 'becoming mother'*

## Literature 5

*An Interdependence Analysis of Commuting Decisions*



## Literature 1

*Creating Resources for Designing with and for Care Ecologies in HCI*

## Literature 2

*What Drives Them to Drive?—Parents' Reasons for Choosing the Car to Take Their Children to School*

## Literature 3

*Examining Transit Accessibility for Families with Young Children in San Francisco*

## Literature 3

*Travel Time as Quality Time: Parental Attitudes to long distance travel with Young Children*

# Interdependence and Care



transition to motherhood occurs in part through entanglements with the more than human in the course of becoming mobile (Boyer et al.)

The limited space for prams ... illustrate how urban form is stratified for particular kinds of bodies...favouring those with the most immediate link to wage labour (Boyer et al.)

Such encounters highlight the extent to which built form anticipates bodies that are not only able-bodied...but also individuated. (Boyer et al.)

a number of participants expressed the worry of disturbing other passengers with their children (Price et al.)



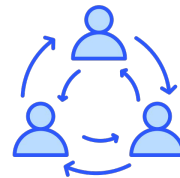
## A APPENDICES

### A APPENDIX A

Day 1	Right now, when I think about care I think
Day 2	I give care to these people...
Day 3	These people give care to me...
Day 4	Ways I care for myself are...
Day 5	Can you tell me three words you associate with care today?
Day 6	A caring thing you have done this week...
Day 7	A care routine I have is...
Day 8	A person who cared today...
Day 9	This is how I show care...
Day 10	A place that I care for is...
Day 11	Yesterday I experienced care when...
Day 12	This thing facilitates care in my life...
Day 13	Which places do you feel care in?
Day 14	This is a strong care relationship...
Day 15	Which three items in your home bring you care?
Day 16	This is an act of care...
Day 17	When I need care, I...
Day 18	This item brings me care...
Day 19	I care for this thing...
Day 20	What are the different forms of care you see in your life?
Day 21	Where have you found care this week that surprised you?
Day 22	Tell me about a time you cared for something that is not another person
Day 23	When someone needs care from me they...
Day 24	What is a caring environment for you?
Day 25	Have you seen any acts of care in your neighbourhood?
Day 26	When I think about care and the future, I think...
Day 27	Tell me about a time in your life where care was very important to you
Day 28	I went out of my way to care when...
Day 29	I didn't expect that care could mean...
Day 30	Right now, when I think about care I think...

### B APPENDIX B

Card Type	Card Example	Number of cards
Person Card	Neighbour	1
	Family Member	1
	Doctor	1
	Care Giver	1
	Friend	1
	Community	1
Place Card	DIY	6
	At Home	1
	In Nature	1
	In Private	1
	In Public	1
	In the Community	1
Thing Card	At the Doctor	1
	DIY	6
	Physical Object	1
	Technology	1
	Money	1
	Internet	1
Time Card	Data	1
	Artificial Intelligence	1
	DIY	6
	Today	1
	Often	1
	Never	1
Quality Card	Sometimes	1
	In the Near Future	1
	In the Far Future	1
	Recently	1
	In the Past	1
	DIY	4
Care Activity Cards	Positive	1
	Negative	1
	Presumptive	1
	Inclusive	1
	Isolating	1
	Simple	1
Introduction Cards	Complex	1
	Unexpected	1
	DIY	4
	Care Stories Activity	1
	Randomised Care Stories	1
	Connecting Care Spectrums	1
Introduction Cards	Freestyle Spectrum Mapping	1
	Focused Spectrum Mapping	1
	Mapping	1



# Discovering In The Wild Observations (16 Instances)

No.	Space (the physical place or places)	Actor (the people involved)	Activity (a set of related acts people do)	Object (the physical things which are present)	Act (single actions that people do)	Event (a set of related activities that people carry out)	Time (the sequencing that takes place over time)	Goal (the things people are trying to accomplish)	Feelings (the emotions felt and expressed)
1	Metro: pram section (empty)	Mother and Father and baby	?	Pram	Talking, hushing, crying, screaming	The baby crying -> people looking	10:30?	Navigating to a good space, Calming down the baby	<b>Parents:</b> Stress, frustration <b>Surroundings:</b> Annoyance
2	Metro: pram section (empty)	Father and baby	?	Pram, baby food	Talking, playing, crying	Navigating to pram section -> picking up baby from pram and sitting down in a seat -> baby crying -> people staring -> getting some baby food for the baby -> exiting the metro with baby in one arm and pram in the other	10:50?	Navigating to a good space, calming down the baby, feeding the baby	<b>Parents:</b> Happiness, unease <b>Surroundings:</b> Curiosity
3	Metro: pram section (moderate)	Mother and Father and toddlers + baby	?	Pram, baby-carrier shirt, other baby equipment	Talking, laughing, jumping, disciplining	Navigating to pram section -> two people giving up their seats for the family -> one child crawling up and down the floor in a burst of energy -> all children sitting down on their parents laps on the seats -> the energetic child calms down	18:00?	Navigating to a good space, calming down the children, making sure they all sit down	<b>Parents:</b> Contentment, relief <b>Surroundings:</b> Curiosity, contentment
4	Metro: corner section (moderate)	Mother and baby	?	Double pram	Frowning	Navigating to the corner since the pram section was blocked -> frowning after seemingly being ignored -> exiting the metro after some logistical manoeuvring	09:15?	Navigating to a good space	<b>Parents:</b> Frustration, annoyance <b>Surroundings:</b> Obliviousness
5	Metro: pram section (empty)	Mother and baby	?	Pram	Leaning back, closing eyes	Navigating to the pram section -> leaning back on the support railing -> closing her eyes -> swiftly exiting the metro	09:35?	Navigating to a good space	<b>Parents:</b> Calmness, contentment <b>Surroundings:</b> Obliviousness
6	Metro: pram section (empty), chairs a few empty, crowd around the doors	Mother, pre-schooler (around 5), and baby	Managing the baby's behaviour while waiting for the right stop	Stroller, baby backpack, pre-schooler backpack	Pre-schooler sitting on an empty chair, mother facing the pre-schooler from a chair, baby sleeping in the stroller	Pre-schooler was impatient -> A few people glanced over -> Mom was trying to calm down the boy while making sure the baby was not waking up -> Takes backpack from pre-schooler -> Pre-schooler calms down a bit -> When the stopped approached, the mother struggled to keep both the stroller safe and the pre-schooler calm	around 10:30, on 6th of Sept	Keeping the child calm, making sure the baby was asleep, trying to get out of the crowd safe	<b>Mother:</b> Mild frustration, embarrassment <b>Pre-schooler:</b> Impatience, a lot of energy <b>Surroundings:</b> Mostly indifference, some looks were given
7	Metro: crowded all over	Grandmother and school-aged child (around 8)	Keeping the child close, navigating crowded space	Child's school bag, grandmother's purse, shopping bags	Grandmother holding the child's hand, balancing shopping bags while the child shifts uncomfortably and fidgets around, wants to leave grandmother's hand to go around the metro	Child tries to move toward the door -> Grandmother pulls the child closer -> Other passengers block their way -> Grandmother asks the child to stay still -> Child fidgets, pulling at school bag straps	around 16:30 (rush hour), on 9th of Sept	Ensuring the child stays safe and close, managing the crowded space, preparing to exit at the next stop, handling heavy shopping bags	<b>Grandmother:</b> Cautious, slightly stressed <b>Child:</b> Restless, bored, curious about the surroundings <b>Surroundings:</b> Impatience, indifference
	Metro: moderately crowded	Mother, child (around 4)	Child sitting on a seat, using the mother's phone to play TikTok videos loudly	Phone, toys, candy	The child is loudly playing TikTok videos, while the mother attempts to divert the child's attention by offering toys/candy or engaging in conversation. The child resists and grabs	Child playing TikTok video loudly -> mother tries to take back phone -> child resists and kicks nearby passenger -> passengers frown or glance over -> nearby passenger expresses mild annoyance but remains silent	09/08 6:45:00 PM	Calm the child, stop the loud video	<b>Parent:</b> Embarrassment, frustration <b>Surroundings:</b> Disturbance, mild annoyance, curiosity



Space

Feelings

Actor

Goal

Act

Event

Object

Time

**Sept. 8, 11:55**

(moderately crowded metro)

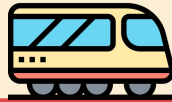
A dad with a stroller is waiting for the metro, his toddler eating Cheerios. As they board, the dad tickles the child, and gives him a water bottle. The woman across from them watches and smiles. As more people board, the dad adjusts the stroller, and he shifts when older women enter, giving them space. He eventually prepares to exit the train, adjusting the stroller and looking for the right stop.

# Interviews

We role-played as our target users in mock interviews to test and refine our questions for better insights.

## Before

01



02

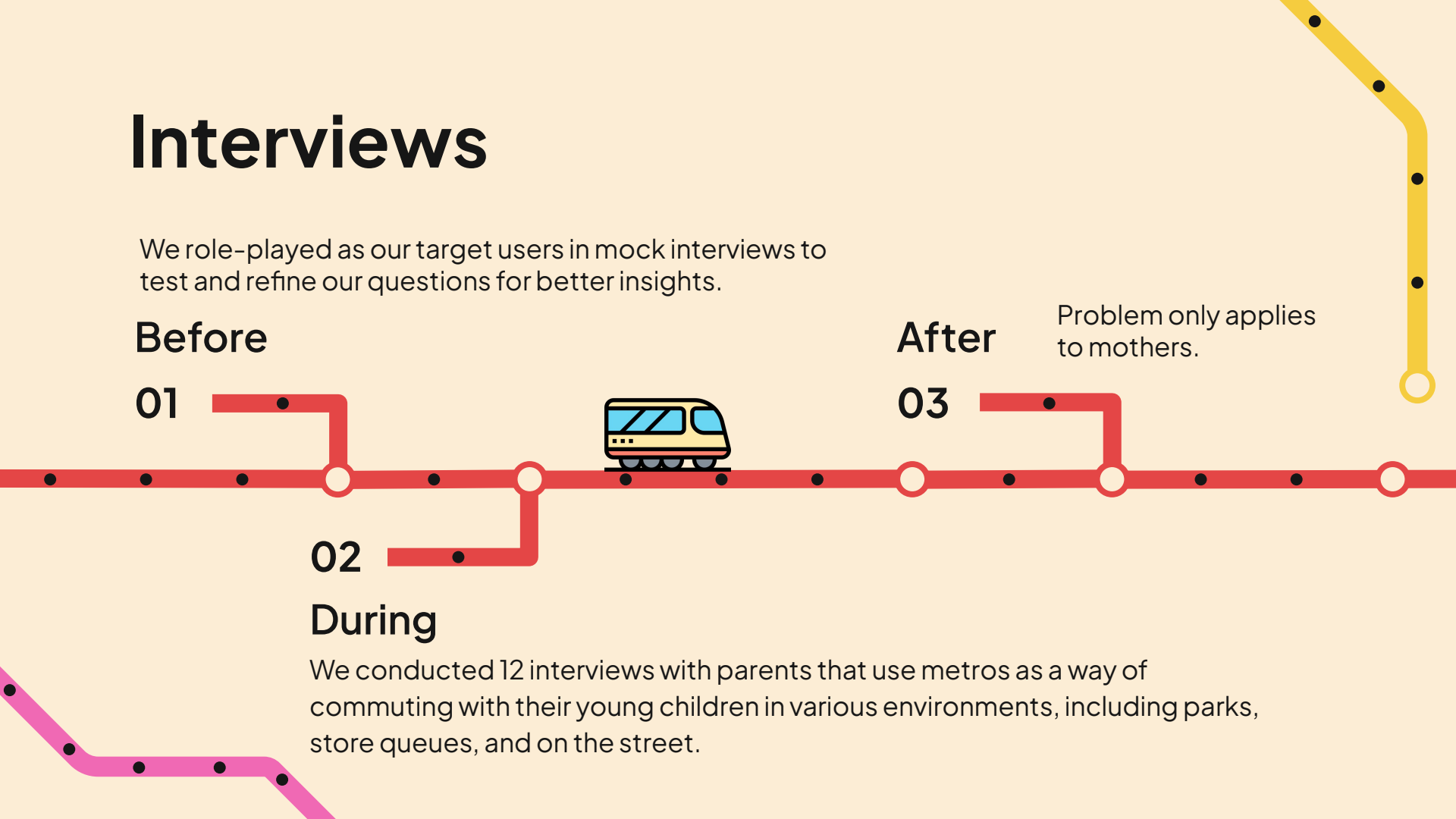
## During

We conducted 12 interviews with parents that use metros as a way of commuting with their young children in various environments, including parks, store queues, and on the street.

## After

03

Problem only applies to mothers.





**If you could dream big and imagine your ideal metro ride with your child, how would that look?**



“

I think that maybe it would be nice to have it marked somehow where the pram sections are on the metros before entering, cause otherwise I often have to like run on the platform or in the cart to make sure I get into the right door.

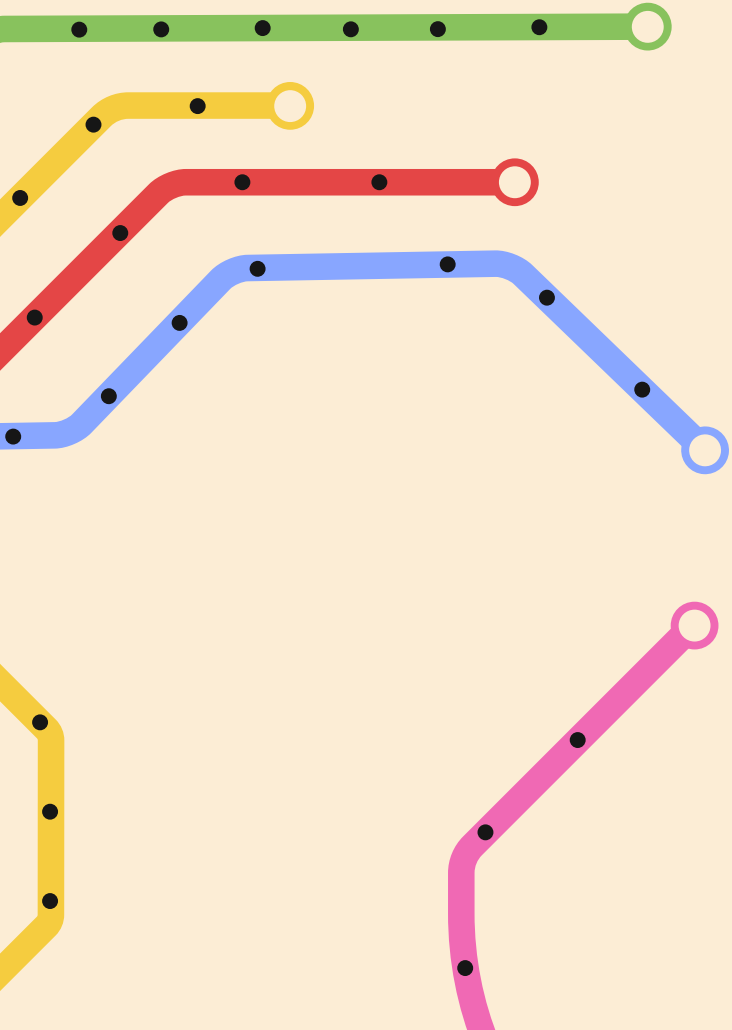
”

“

Some sort of display that shows that a section is empty or full, so that I can plan ahead for that.

”





# The Define Phase



# Defining

Affinity Diagrams

01

02

Personas & Scenarios

PMW + HMW

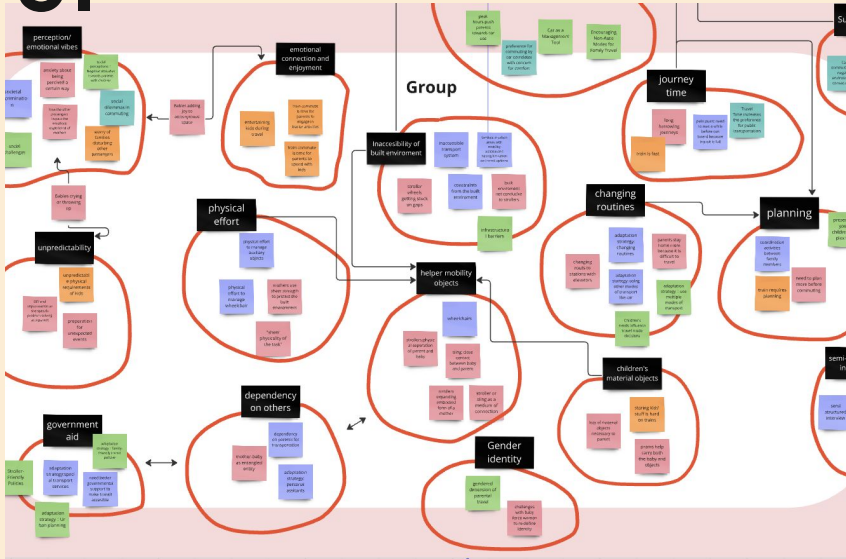
03



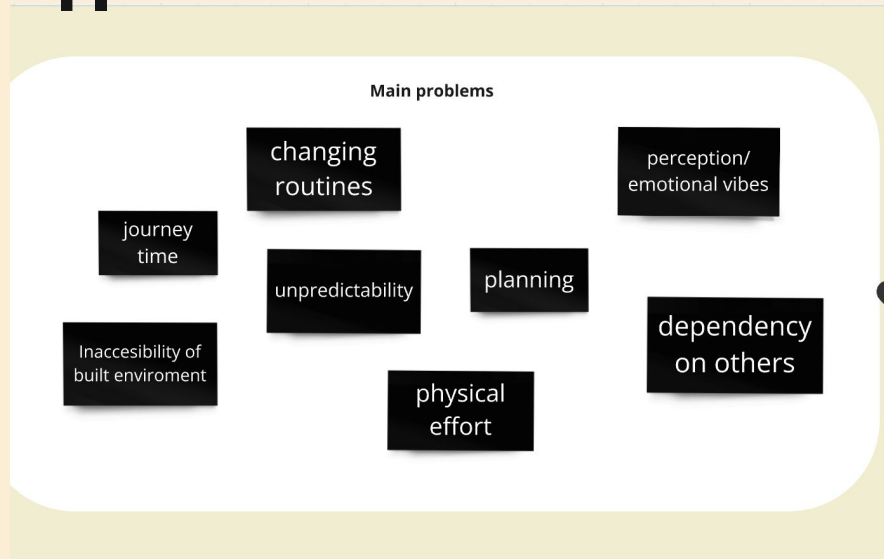


# Defining Affinity Diagrams: Literature Review

3.

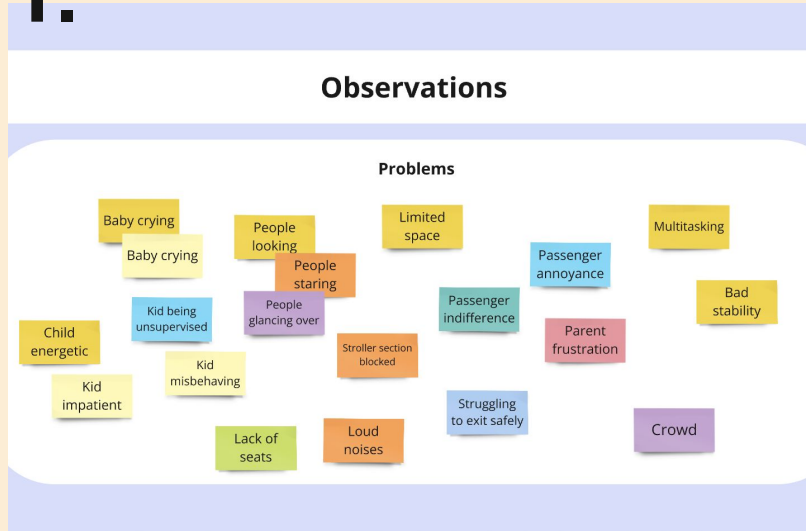


4.

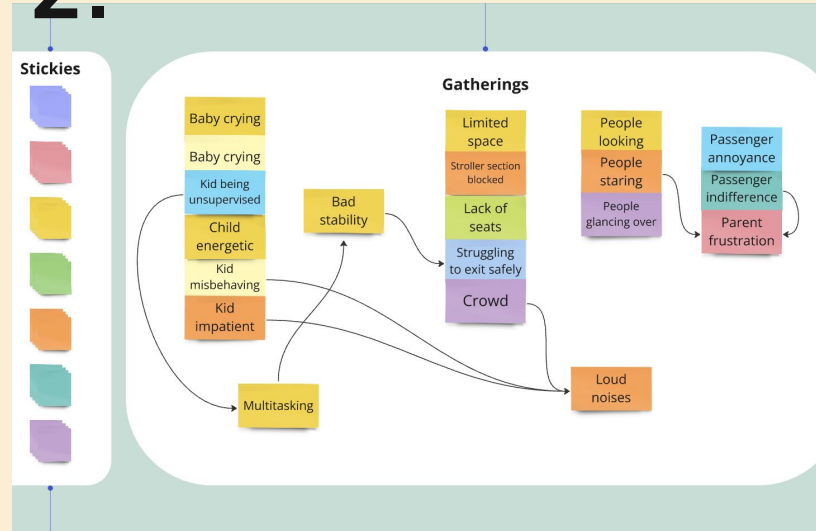


# Defining Affinity Diagrams: Observations

1.

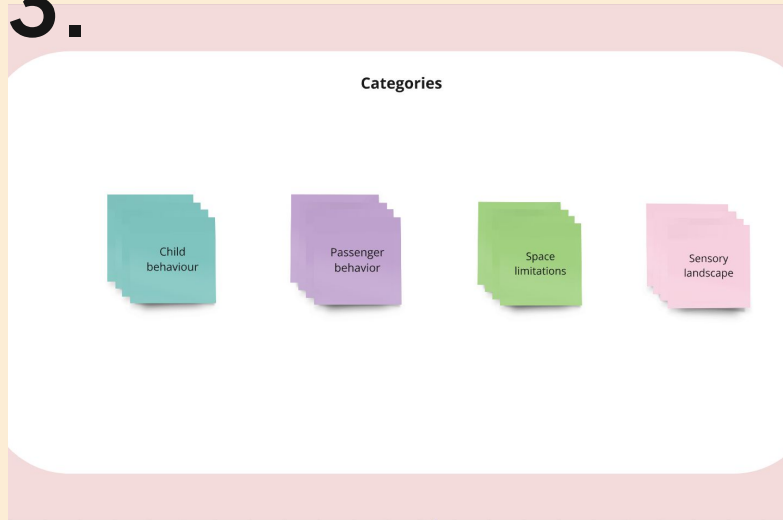


2.

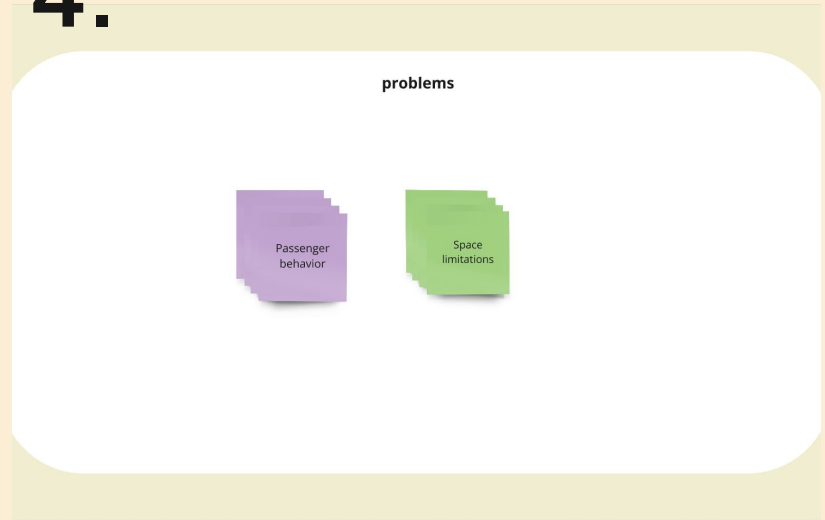


# Defining Affinity Diagrams: Observations

3.



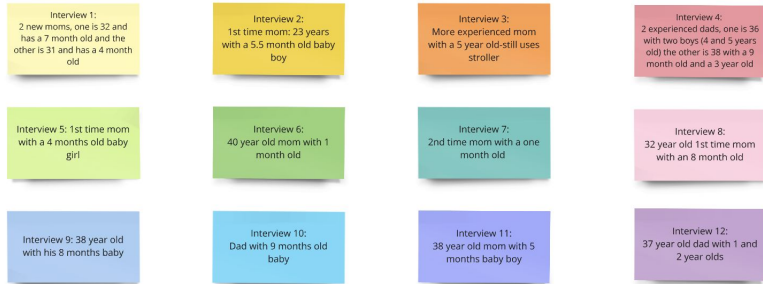
4.



# Defining Affinity Diagrams: Interviews

1.

## Interviews



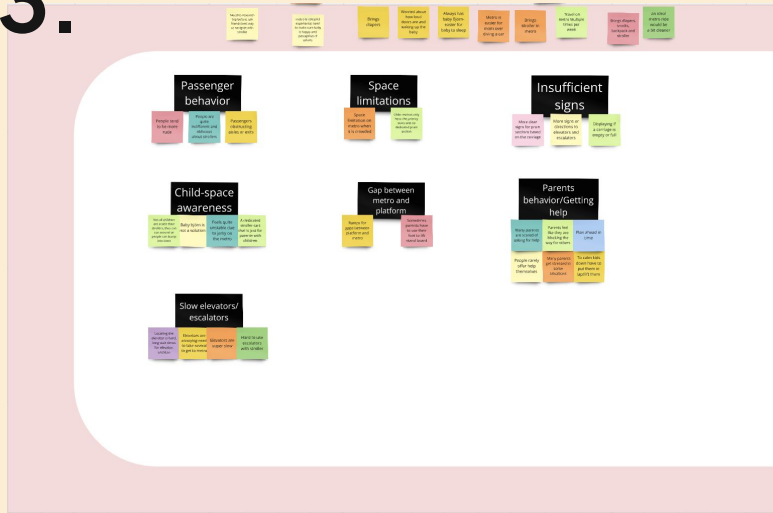
2.

## Stickies

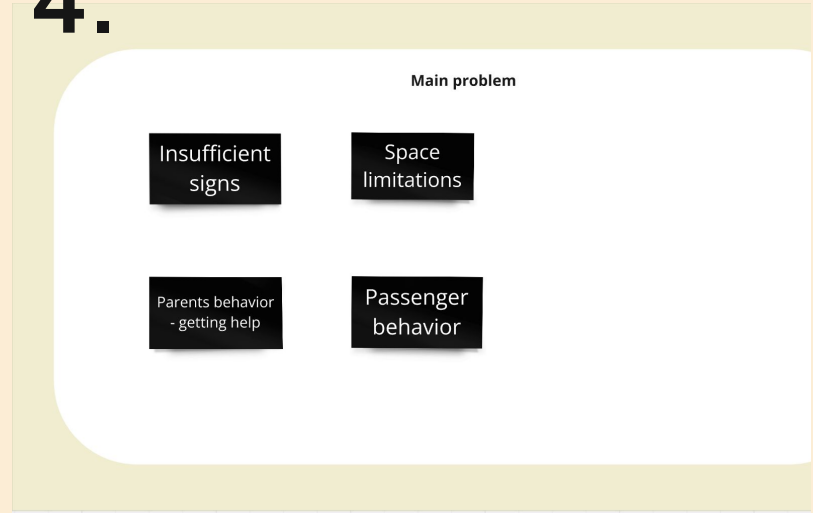


# Defining Affinity Diagrams: Interviews

3.

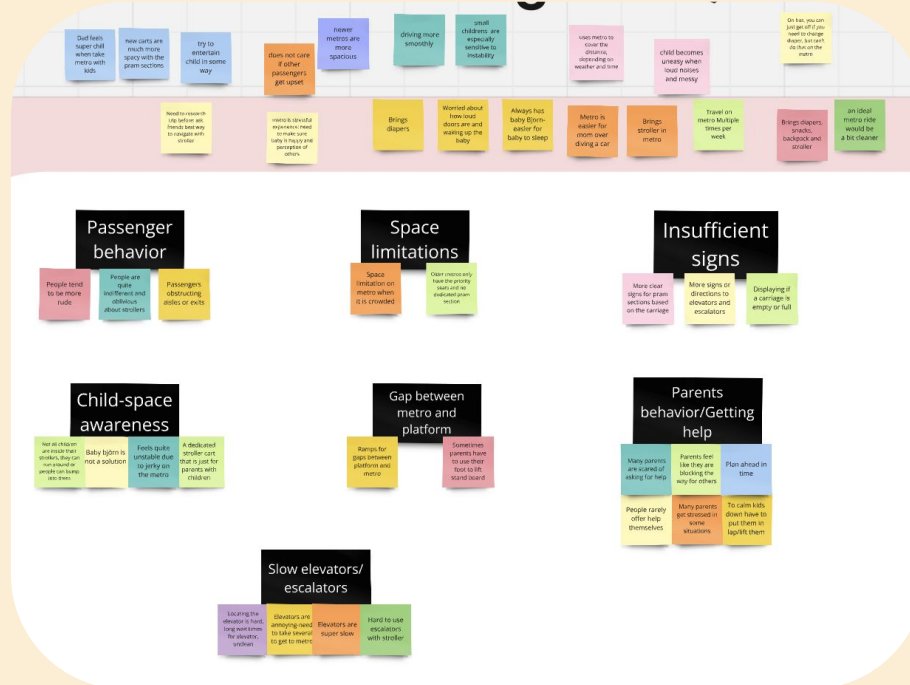


4.





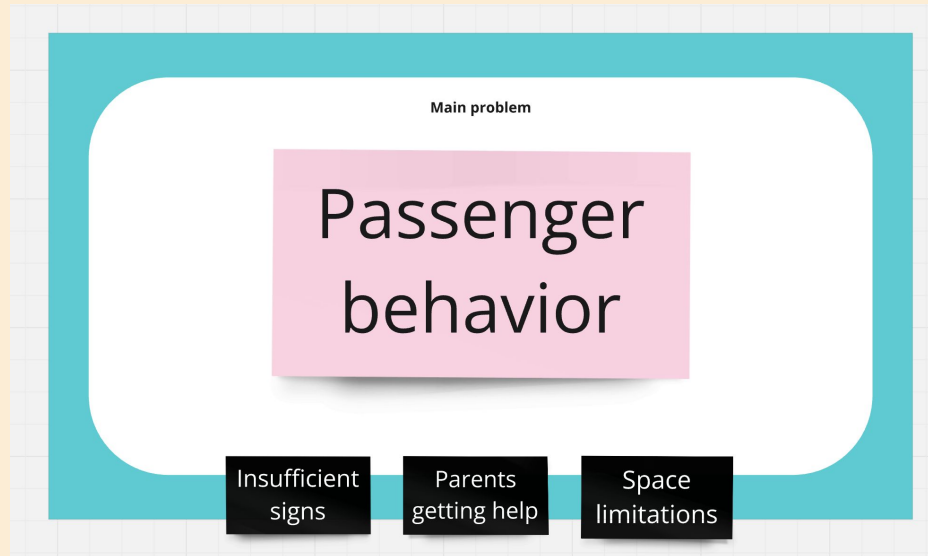
# Defining Classifying from the Affinity Diagrams



# Defining

## Affinity Diagrams: Conclusion

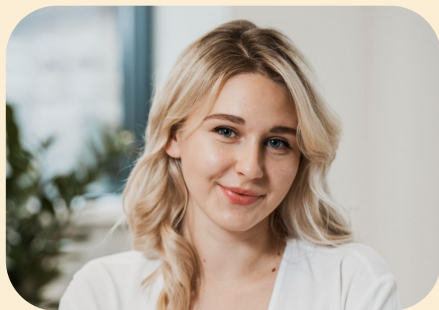
We concluded that the three subcategories are actually side effects stemming from the main problem: passenger behavior.



# Defining Personas

## Anna Lindgren

Södermalm, Stockholm  
Married, with a 4-month-old  
daughter, Emilia



Not used



## *Daniel Lindqvist*

*Solna, Stockholm  
Not married, with a 2-year-old  
son, Hugo*

# Defining Scenarios

1

## Scene:

Tuesday, 10 am, relatively calm metro station  
Anna with her 4-month-old baby, Emilia  
Struggles to find pram section

## Events:

Finds space on train but passengers fill in around her  
Concerned about space when exiting

## Obstacles:

Passengers unaware of her need for space  
Has to ask others to move aside

## Need:

Need for clearer pram section signs and passenger awareness

2

## Scene:

Thursday, 3:30 p.m., quiet metro station  
Returning from yoga with baby, Emilia

## Events:

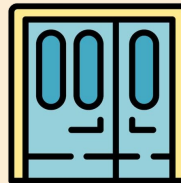
Easily finds pram section, fellow passenger helps  
Peaceful and relaxed ride

## Obstacles:

Minimal due to off-peak time

## Need:

Stress-free travel with proper facilities and planning



# Defining PMW + HMW

Andreas

**HMW**

How might we encourage surrounding passengers to be more considerate of the spatial needs of mothers with young children traveling by metro in Stockholm?

**POV**

Mothers traveling with young children on the Stockholm metro need passengers to be more considerate of the space necessary for strollers and the mother-baby-assemblage since passenger indifference and inaction lead to stressful and uncomfortable journeys for both parties.

Alex

**HMW**

How might we make use of technology to facilitate more cooperative interactions between regular passengers and mothers with strollers on the Stockholm metro?

**POV**

For a mother traveling with young children (under 3 years old) using strollers on the Stockholm metro, navigating public transport can be a constant challenge, especially when it comes to managing space. You quickly realize how crucial it is for other passengers to notice the space you and your stroller occupy—not out of rudeness, but simply because they aren't paying attention. They might stand in front of stroller areas or block the doors, unintentionally making an already stressful situation harder. If more passengers made a conscious effort to observe and respond to the practical needs of mothers and others with specific spatial requirements, the journey would be smoother for everyone. This isn't about asking for special treatment but about encouraging mindfulness—seeing the stroller, recognizing the space needed, and stepping aside. A little more spatial awareness could make the experience far less stressful, creating a more comfortable and efficient environment for all.

Hannah

**HMW**

How might we empower mothers traveling with small children to communicate their real-time spatial needs to other passengers effectively, quickly, and easily?

**POV**

"Mothers traveling with young children on the Stockholm metro need passengers to be more considerate of the space necessary for strollers and the mother-baby-assemblage since passenger indifference and inaction lead to stressful and uncomfortable journeys for both parties."

Zoe

**HMW**

How might we promote mutual awareness and communication between mothers traveling with young children and other passengers, ensuring that spatial needs are recognized and respected on the metro?

**POV**

Mothers traveling with young children need to effectively communicate their spatial needs to surrounding passengers because they often face challenges in finding enough space and support on the metro, while passengers are generally unaware of these specific needs, leading to discomfort and stress for both parties.

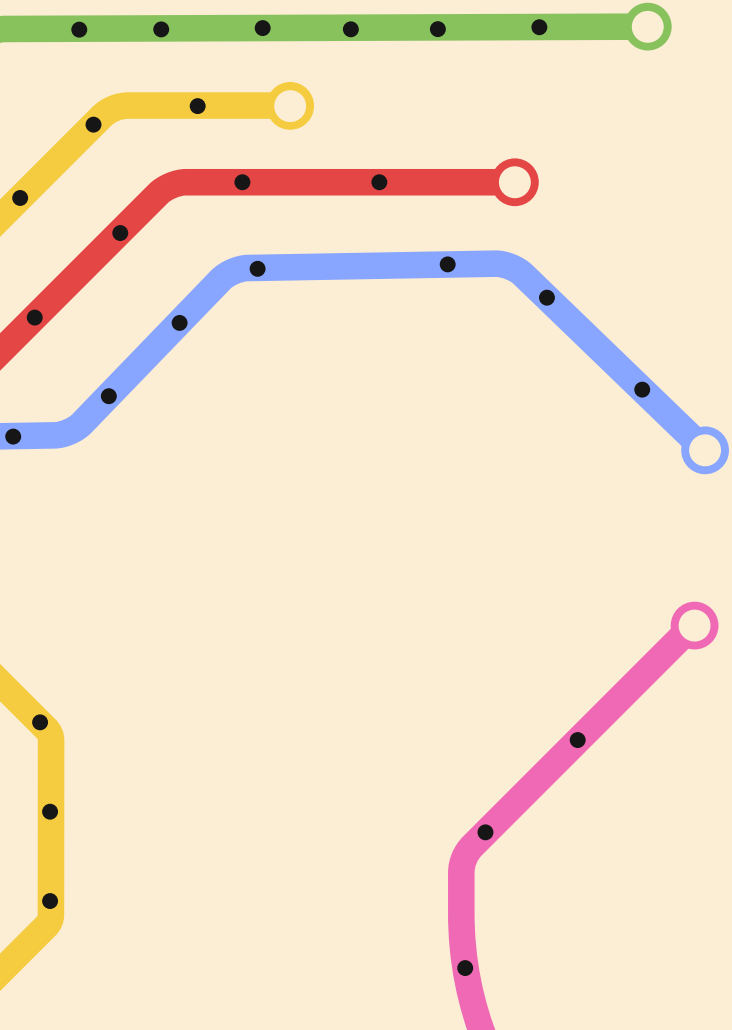
# Final Problem Statement

## POV

Mothers traveling with young children on the Stockholm metro need passengers to be more considerate of the **space necessary** for strollers and the mother-baby-assemblage since **passenger indifference and inaction** lead to stressful and uncomfortable journeys for both parties.

## HMW

How might we encourage **surrounding passengers** to be more considerate of the **spatial needs of mothers with young children** traveling by metro in Stockholm?



# The Develop Phase



# Developing

Brainwrite

01

Challenge Assumptions

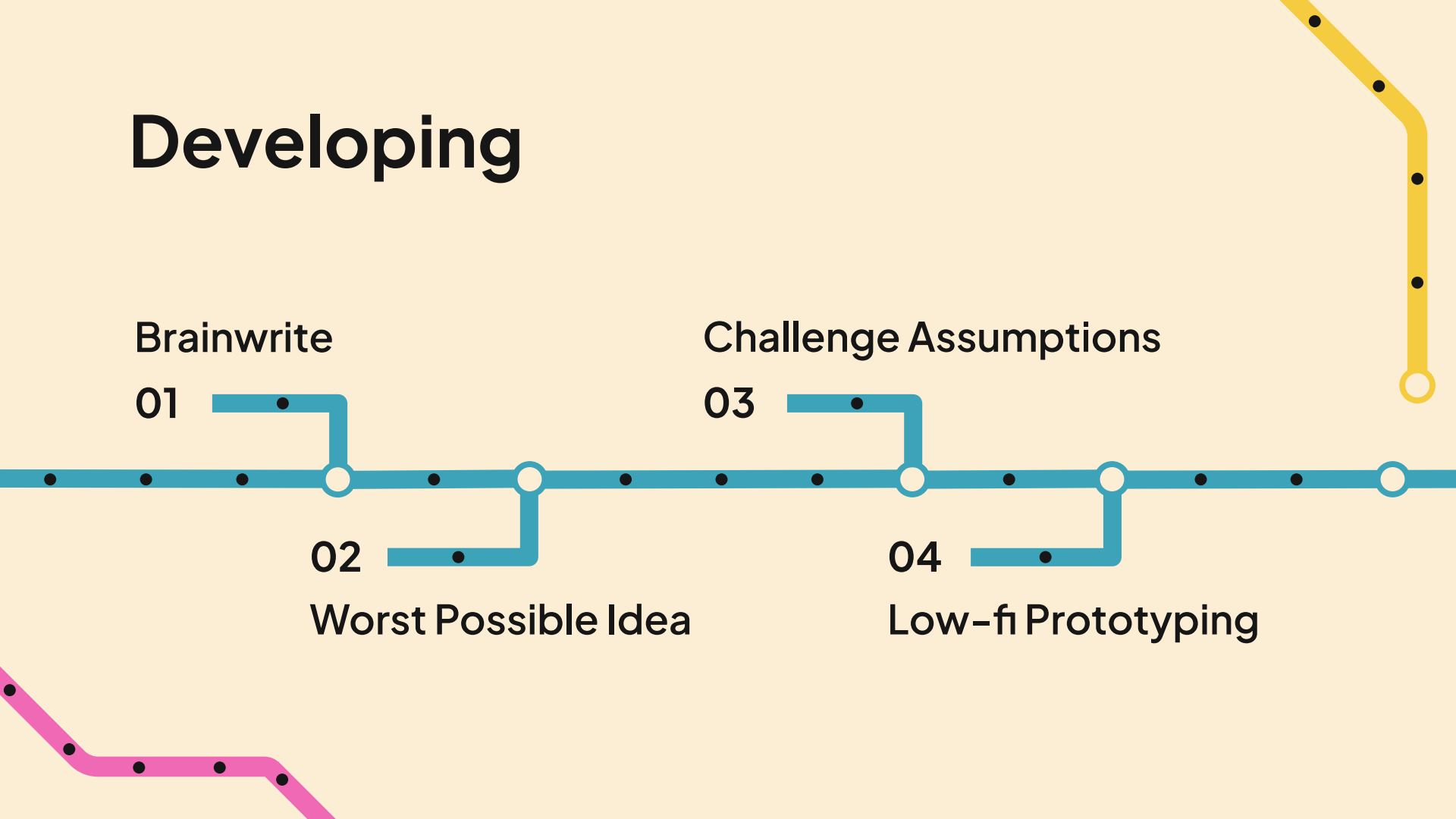
03

02

Worst Possible Idea

04

Low-fi Prototyping





# Ideation

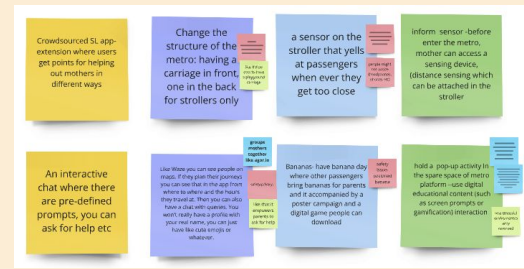
## Brainwrite

### Procedure

- 4 participants: our group members
- 3 rounds, lasting 5 minutes each
- Aim to generate 3 ideas in each round
- After each round we came together to discuss the solutions

### Ideas

1. SL app-extensions
  - a. Crowdsourcing information
  - b. Gamification
  - c. Chat rooms
2. Sensors and feedback
  - a. Phones vibrate based on distance
  - b. Project location on to ceiling
3. Restructuring metro interior to aid passenger-mother spatial collaboration





# Ideation

## Challenge Assumptions

### Procedure

- Write down assumptions that we have about our target group or that our solutions from other methods implied
- Answer “Why could the assumption be false?”
- Then brainstorm solutions that address these reasons and make the assumption false

### Assumption

Rewards are an effective incentive to do good



### Solution

Rewards that are inherently good, such as charity

An app is the best way to solve our problem



Added device/screen to stroller

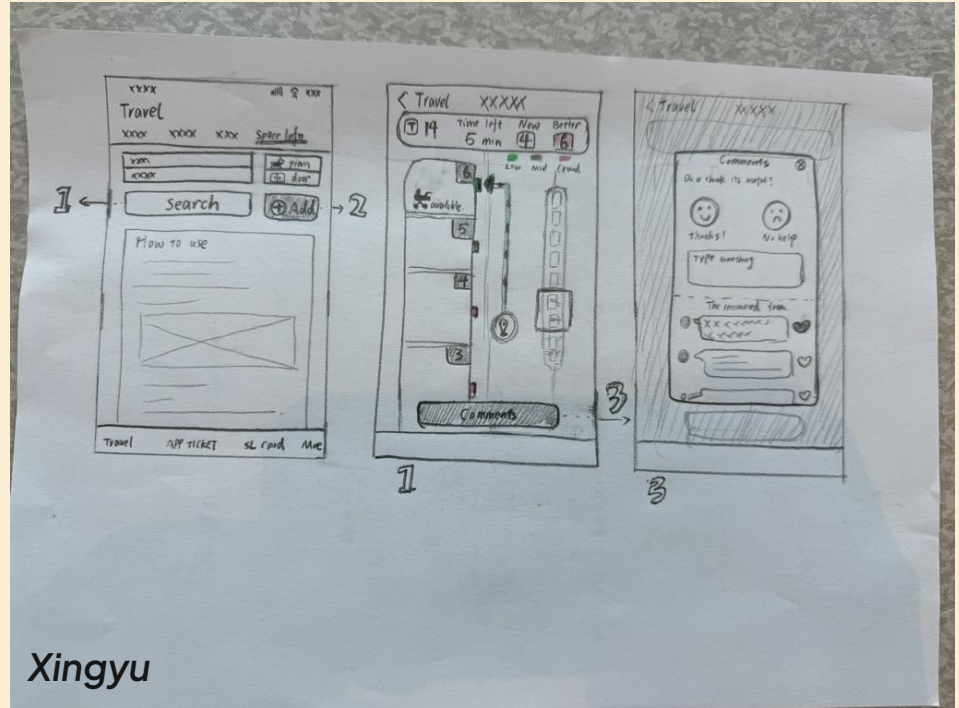
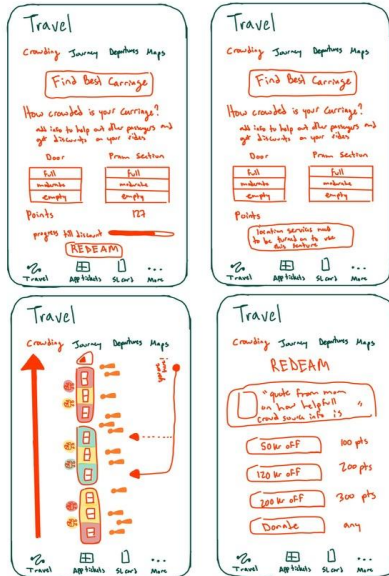






# Low-fi Prototype (Parallel)

Hannah



Xingyu

# Low-fi Prototype

*Mobile platform visualisation*

**TRAVEL**

SEARCH DEPARTURES MAP YOUR JOURNEY

FROM LEONARDO TO T-CENTRAL

1 2 3 4 5

PRAM SECTION DOOR SECTION

CHECK HISTORY

USER SECTION LOCATION TIME

TRAM DOOR 1 10:13

TRAM DOOR 2 10:13

TRAM DOOR 3 10:13

TRAM DOOR 4 10:13

TRAM DOOR 5 10:13

*Open this*

*This goes up*

*What do you see?*

*How crowded is it?*

*PRAM SECTION*

*DOOR SECTION*

*How crowded is it?*

*Empty Moderate Full*

*Especially you are all set to. Is that correct?*

*YES NO*

**MORE**

PROBLEMS THIS MONTH

SEARCH HISTORY

SEARCH HISTORY

SEARCH HISTORY

SEARCH HISTORY

*This can go up more or less a scroll if there are too many entries*

**Alex**

**Andreas**

**Journey**

SEARCH DEPARTURES MAP CROWDSOURCING

How full is this pram section?

Empty Moderate Full

Done

**Journey**

SEARCH DEPARTURES MAP CROWDSOURCING

How full is it by this door?

Empty Moderate Full

Done

**Journey**

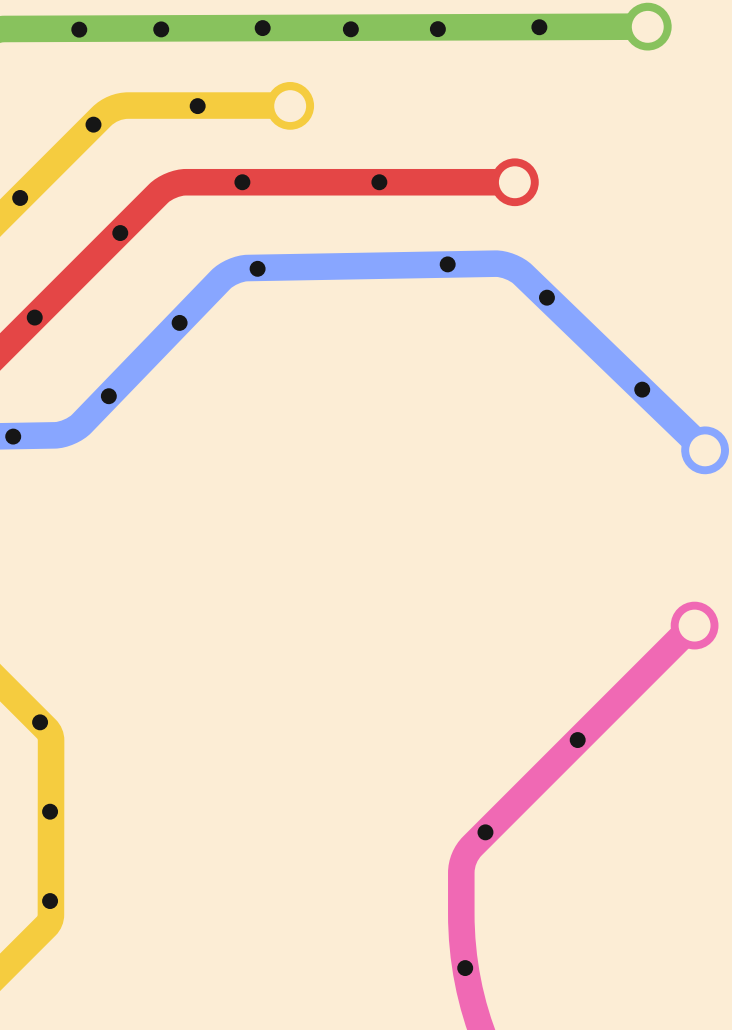
SEARCH DEPARTURES MAP CROWDSOURCING

Loyalty program

yadayadayayada

Done

*Andreas*



# The Deliver Phase





# Delivering

Low-Fi Evaluation

01

02

Hi-Fi Prototype

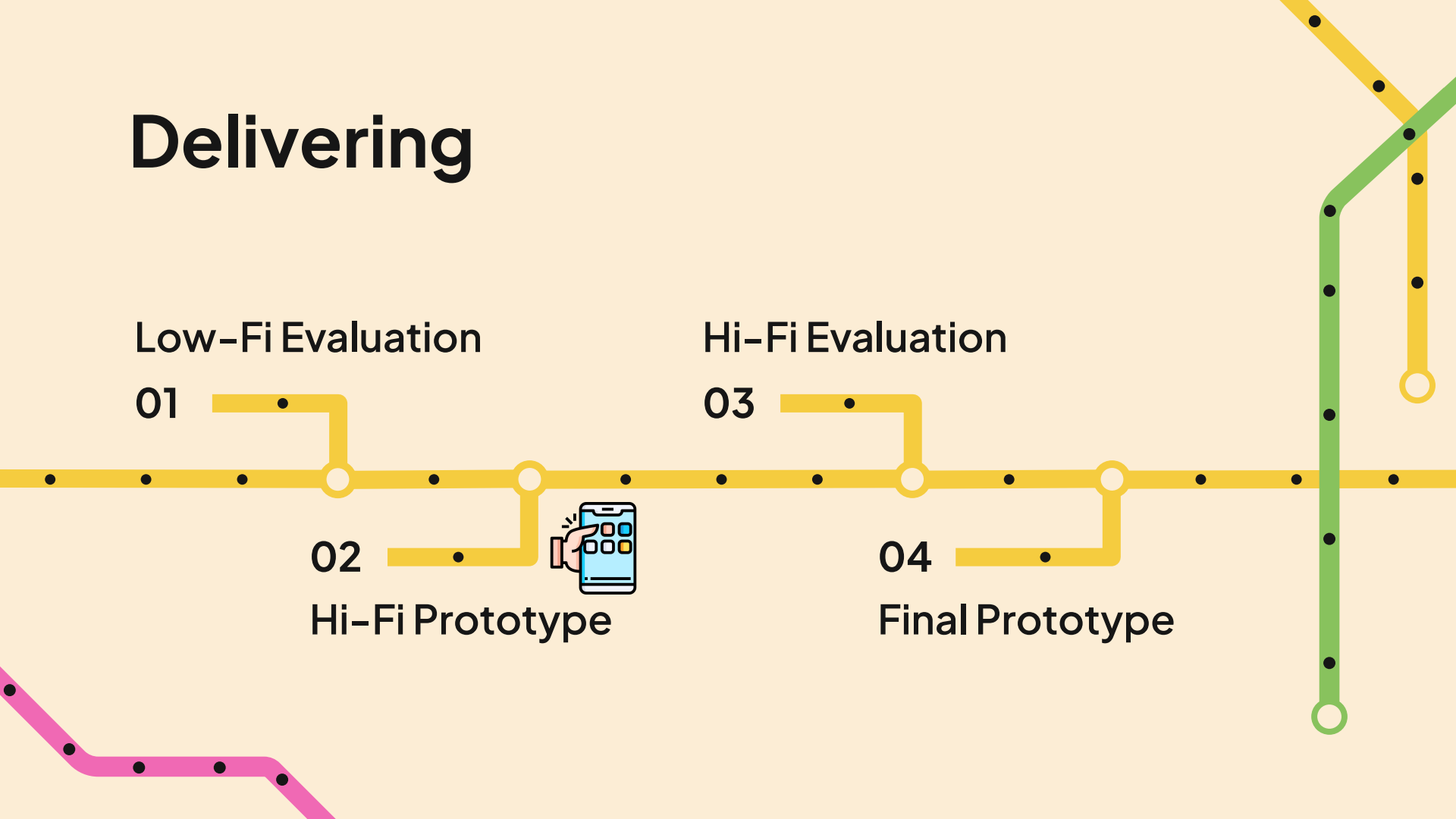


Hi-Fi Evaluation

03

04

Final Prototype



# Iterative Prototyping: From Low-Fi to Hi-Fi



Hand-drawn  
prototype on  
Figjam

Printed  
out



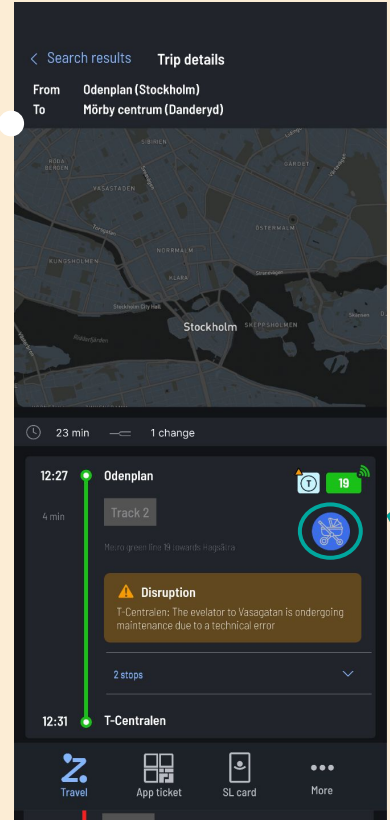
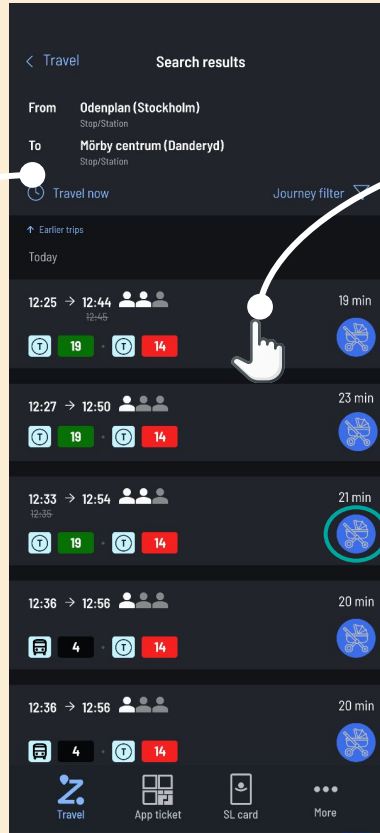
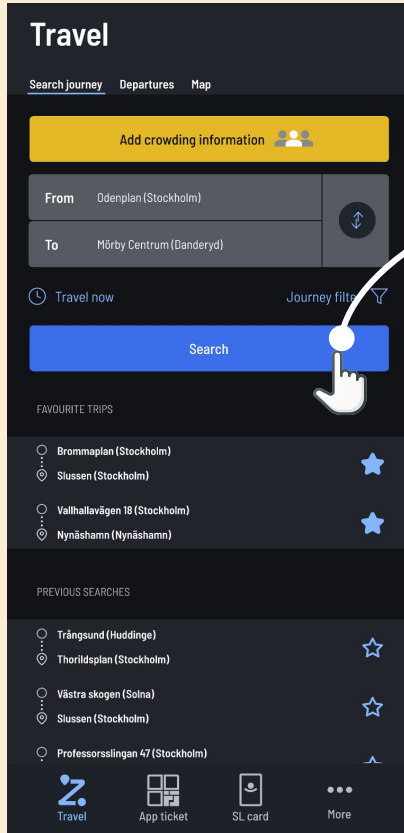
Talk out  
loud Lo-Fi  
evaluation

Figma Hi-Fi  
prototype

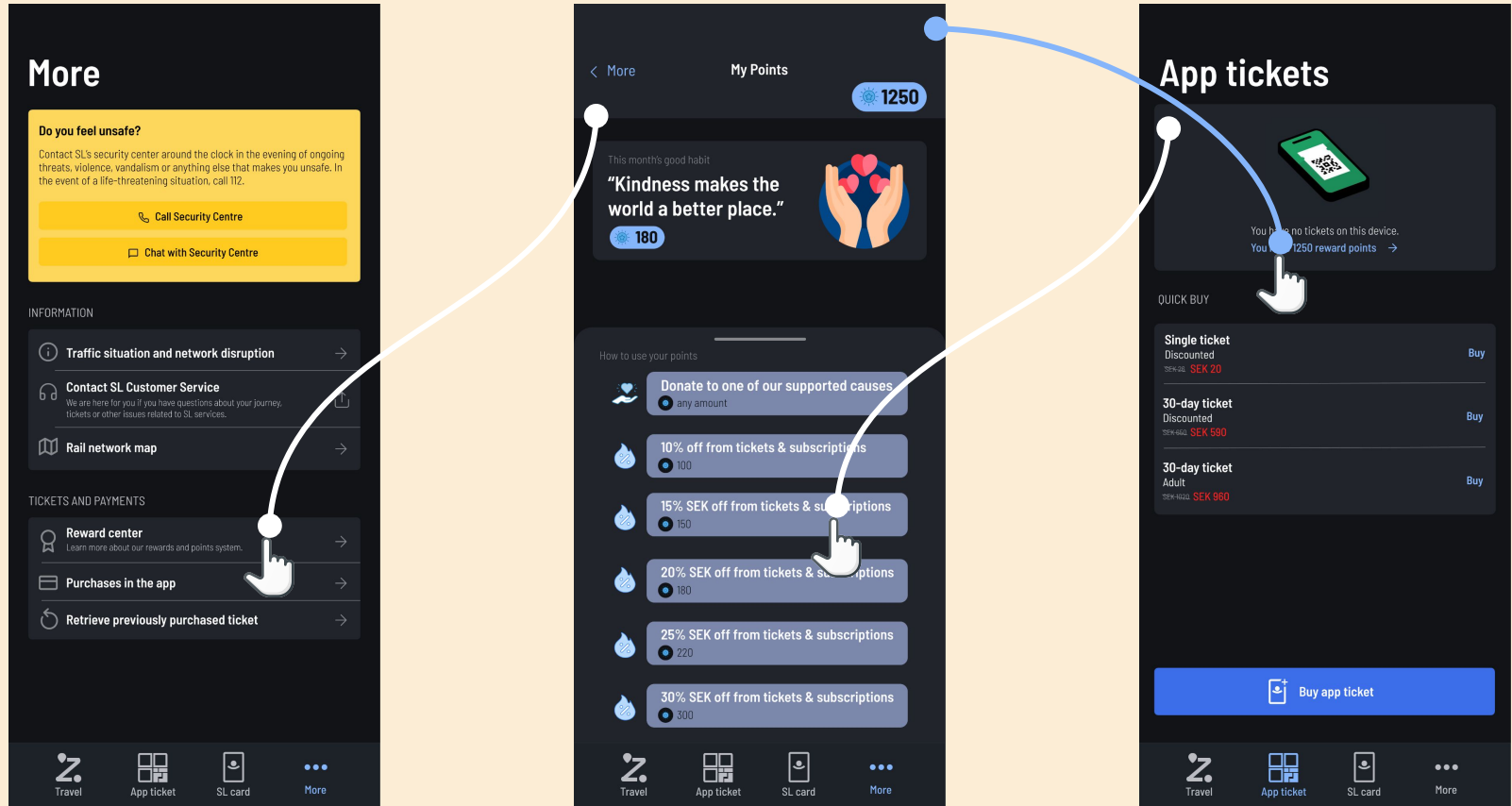




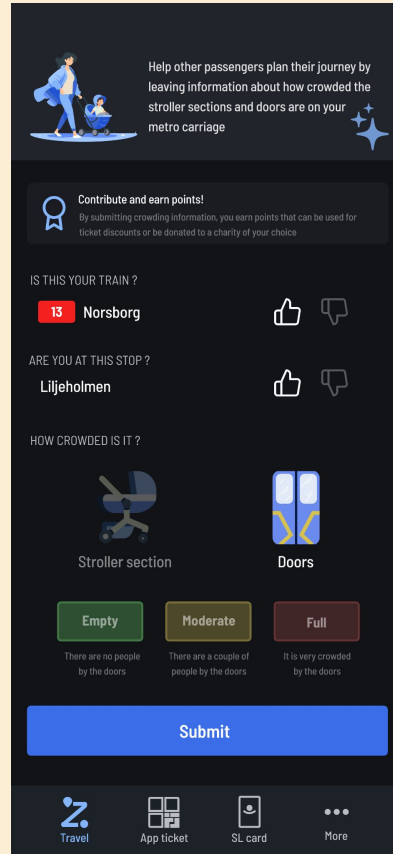
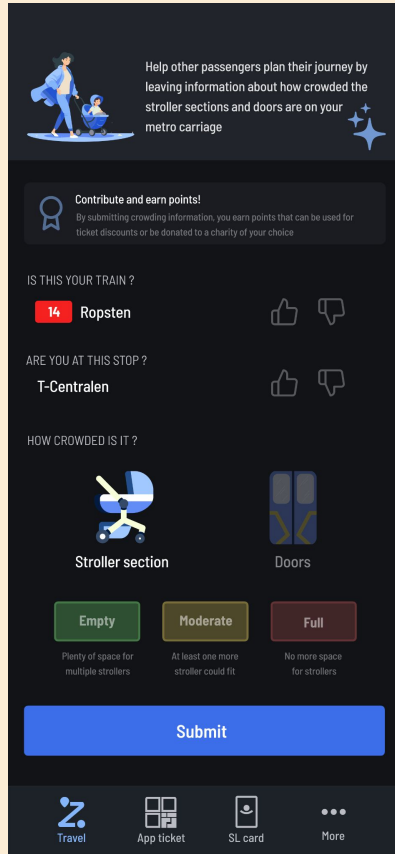
# Hi-Fi Prototype (Mother flow)



# Hi-Fi Prototype (Reward system flow)



# Hi-Fi Prototype (Passenger flow)



When adding crowding information we created both a happy and unhappy flow for our design to account for situations where the system may not correctly detect your travel line.


# Hi-Fi Prototype (Pop-ups)

What train are you on?

- 14 Mörby Centrum
- 13 Norsborg
- 16 Farsta Strand
- 15 Hässelby Strand
- 17 Hagsätra
- 12 Akalla

What station is your train at now?

- Liljeholmen
- Aspudden
- Örnsberg
- Axelsberg
- Mälarhöjden
- Bredäng



## Congratulations!


You received 5 points for your crowdsourcing information

Go to [Reward Center](#)

**Donate your points**


Choose an organization to donate to (1 point = 8 SEK)

- RFSL (LGBTQ+ rights)
- Stadsmissionen (housing rights)
- Green Forum (sustainability)
- RFSU (reproductive rights)



## Thank you for your donation!

We appreciate your support for our supported causes!



## Success! You've redeemed your points for a discount.

We appreciate your support in improving metro accessibility!

[Go to App Tickets for your discount](#)

How many points would you like to donate?

- 180
- 170
- 160

# User Testing on the Hi-Fi Prototype

## Mothers

## Cooperative Evaluation

Confusion about how to initiate the flow

The crowdsourcing button on the travel page stood out more

Metro visualization was not intuitive

Did not realize you can scroll

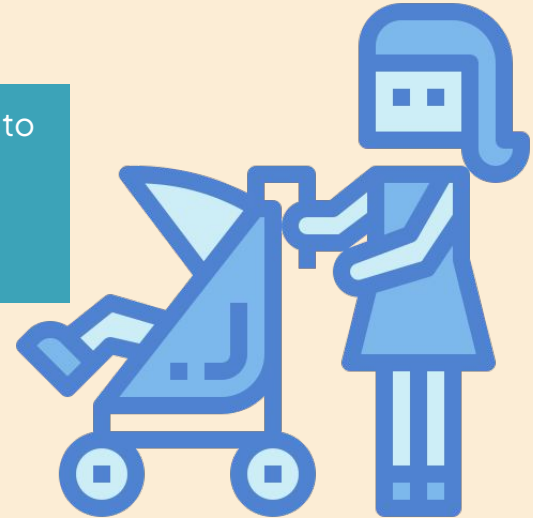
Train is not the same color as in real life

Confident navigation, familiar with SL interface

Enjoyed quick metro access visualization

Helps solve the problem

Convenient to use while pushing a stroller



# User Testing on the Hi-Fi Prototype

## Passengers

### Design and Navigation

- + Easy to navigate
- + Intuitive design
- + Seamless integration
- Skipped some steps in the flow

### Flow improvements

- Missed the "door" icon and pressed submit prematurely
- Crowdsourcing button placement seemed out of place

### Icons and Visual Separation

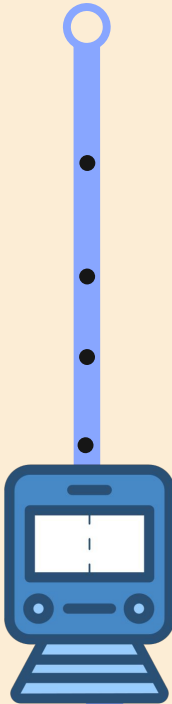
- Suggested clearer separation between stroller and door icons;
- Confusion when seeing stroller and door icons simultaneously;
- Suggested showing door selection first as it's the first thing users see.

### Point System

- + Liked the reward center

### Text Fields and Location Info

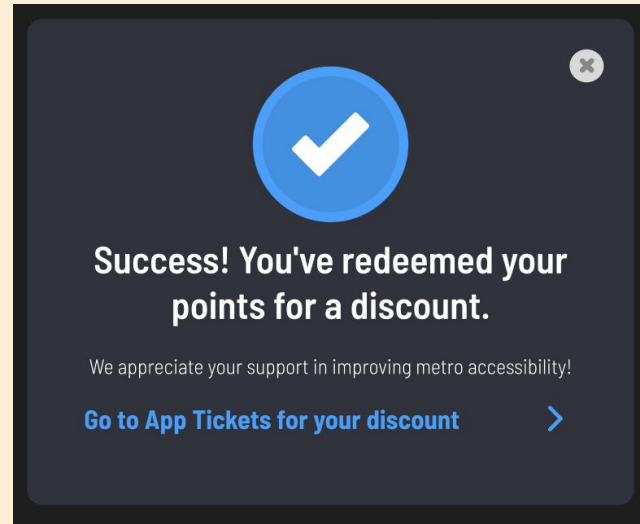
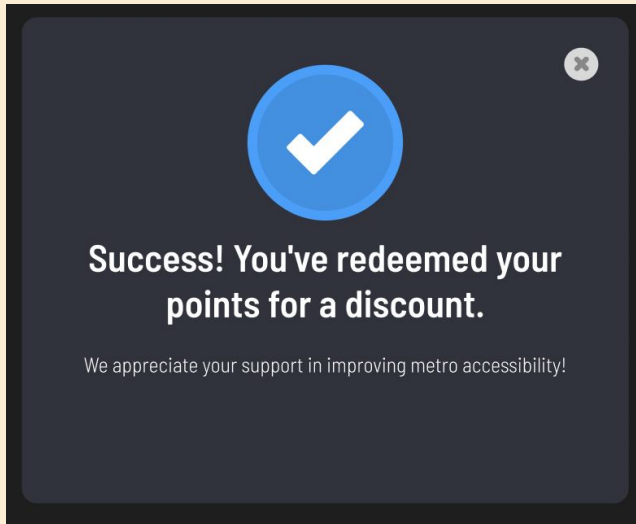
- Confusion with search text fields





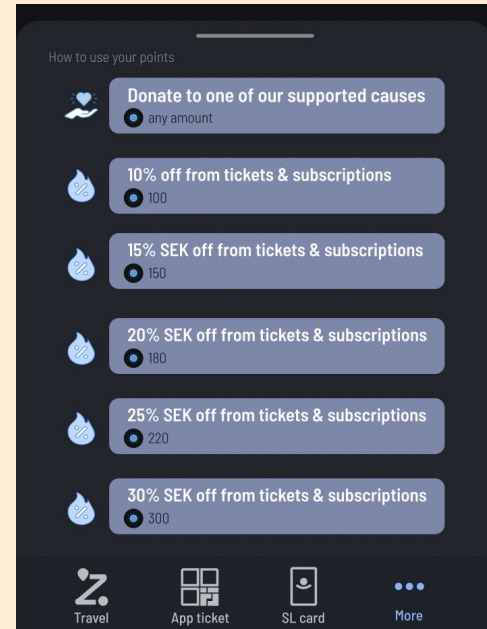
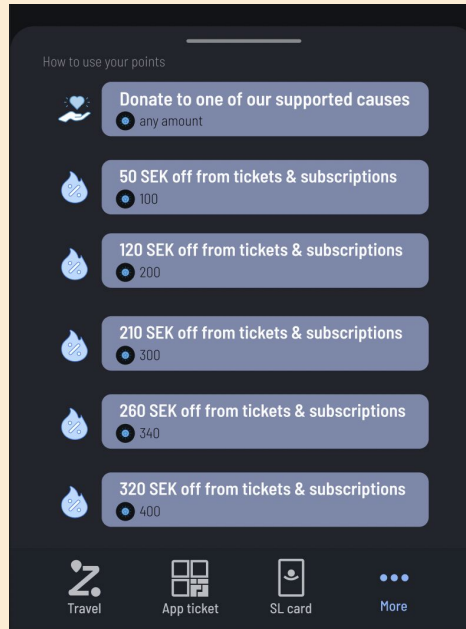
# Changes after User Testing

The popup in the Reward Center view now includes a navigation option to the App Tickets view after applying discount points.



# Changes after User Testing

Converted the discounts from fixed amounts (50 SEK) to percentage values (10%).



# Future Work

## Reward Center

Redesign to ensure fairness for all tickets and plans. Use cognitive psychology methods to motivate people

## Crowdsourcing Flow

Redesign layout based on user feedback to scroll

## Crowdsourcing Validation

Build a better system that can accurately validate crowdsourced information

## Metro Visualization

Revamp of colors and structure

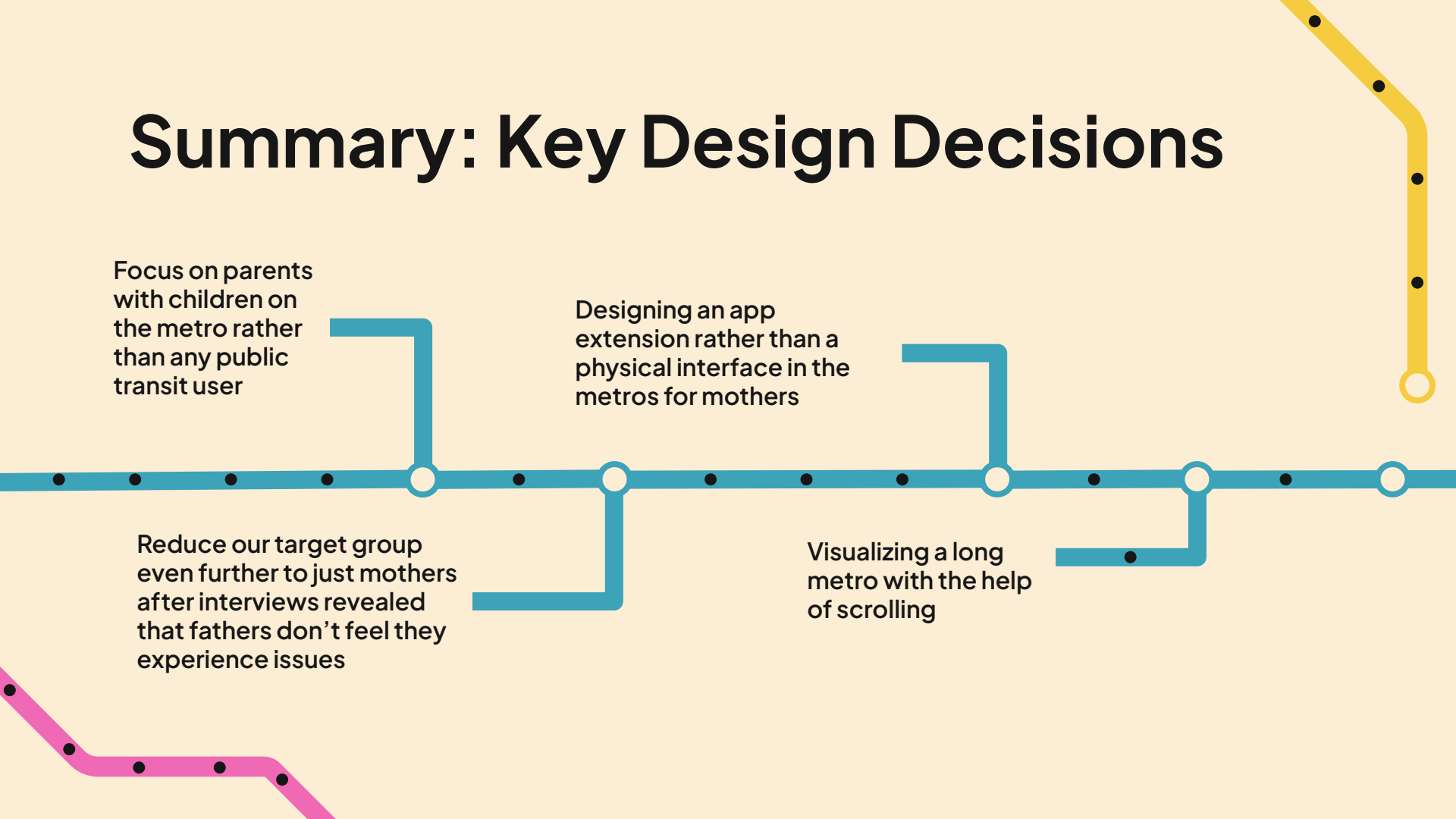
# Summary: Key Design Decisions

Focus on parents with children on the metro rather than any public transit user

Designing an app extension rather than a physical interface in the metros for mothers

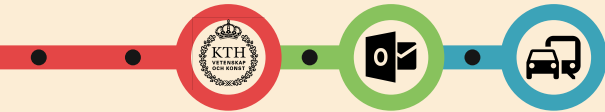
Reduce our target group even further to just mothers after interviews revealed that fathers don't feel they experience issues

Visualizing a long metro with the help of scrolling



# Fin

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Check out our prototype!

