



# Silta

Bridging Pittsburgh and Beyond

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# Background

# Background · What is Future Mobility?

We wanted to design a system that will provide as a new form of transportation in a future where urbanization is increasing and leading to social conflicts as a result.

We wanted to:

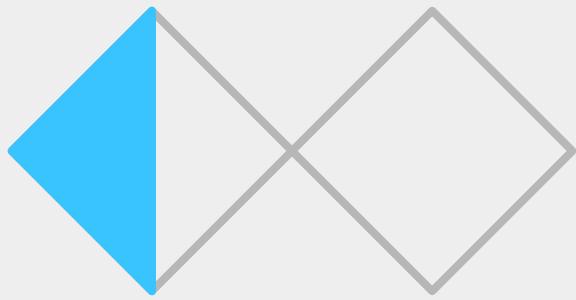
- Utilize existing infrastructure
- Encourage Newcomers to explore the city
- Blend the divide between old and newcomers
- Align values with OnePGH + Bridgestone

# Background · Why Pittsburgh?

Pittsburgh is a growing city. With the increase in students as well young working professionals coming into the city, Pittsburgh is estimated to become one of the largest cities in the U.S.

However, with this influx of individuals, there is also a divide that is created amongst the old and the new. Gentrification occurs in many of Pittsburgh's neighborhoods such as East Liberty. Miscommunication occurs and social divides begin.

# Research



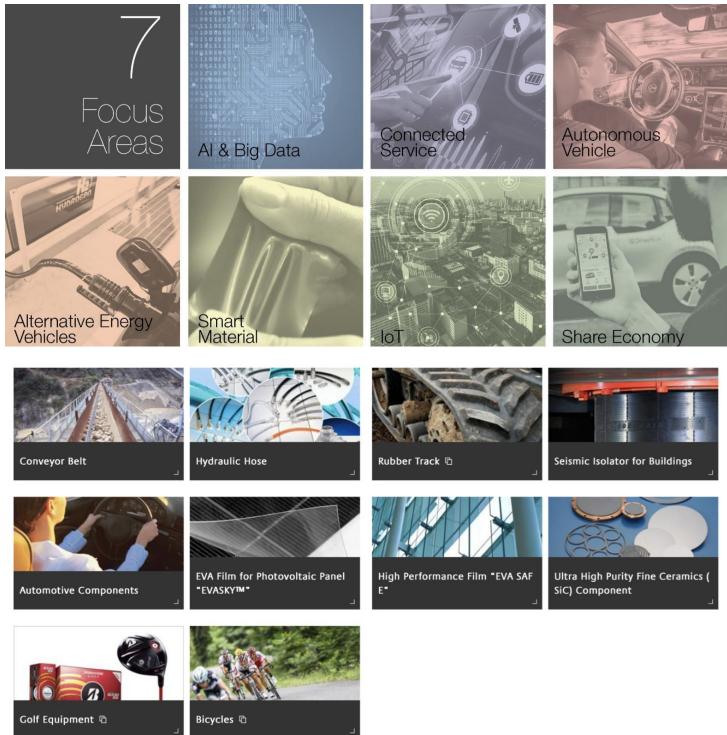
# Research · Domain Research

We began our research by doing literature review, trying to understand the domain of mobility and trends in future mobility

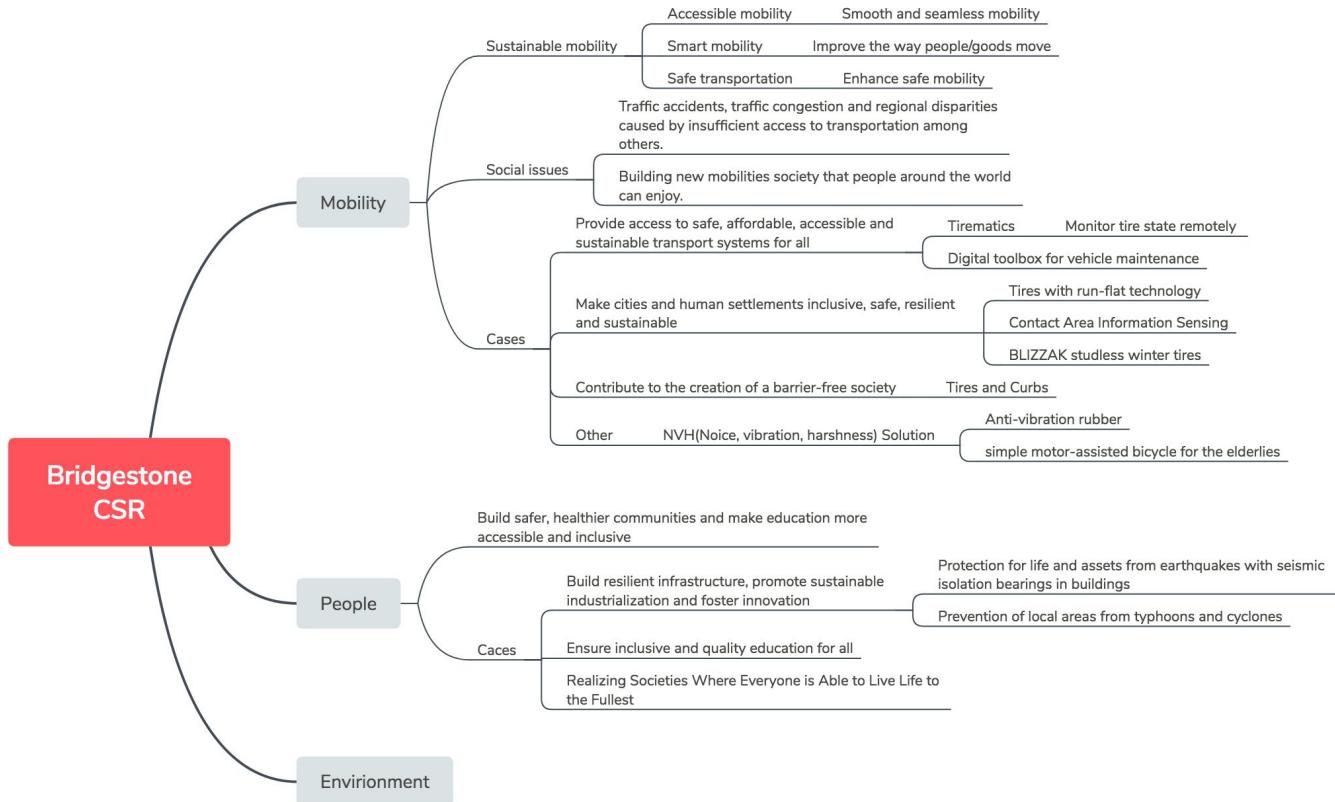
# Research · Bridgestone

We also wanted to understand Bridgestone's competence and focus areas. From our research, we defined them as:

- Material innovation
- Mobility solutions
- From product to service



# Research · Bridgestone



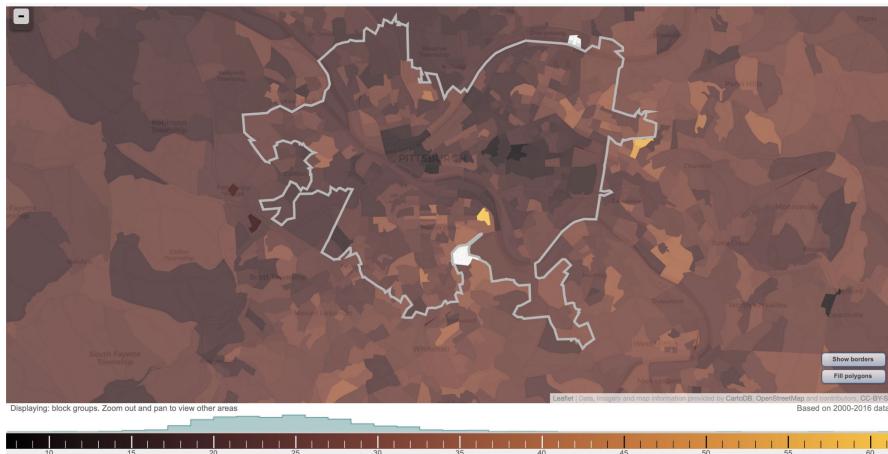
# Research · OnePGH

OnePGH is the strategy for Pittsburgh to thrive in the 21st century as a city of engaged, empowered and coordinated neighbors. In the development vision of the city, resilience, sustainability and inclusivity of communities are fueling our mobility innovation.

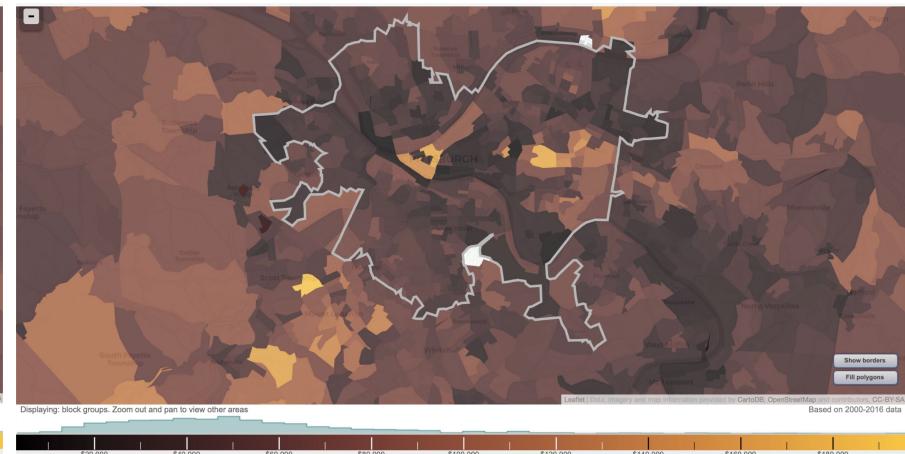


# Research · The City of Pittsburgh

As we further investigated into regional development of Pittsburgh, marginalization and inequity revealed as significant issues of the city.



Mean travel time to work (min)



Medium household income (\$)

# Research · Transportation in Pittsburgh



*Average 8.7%  
(2016)*



*"But seems none"*



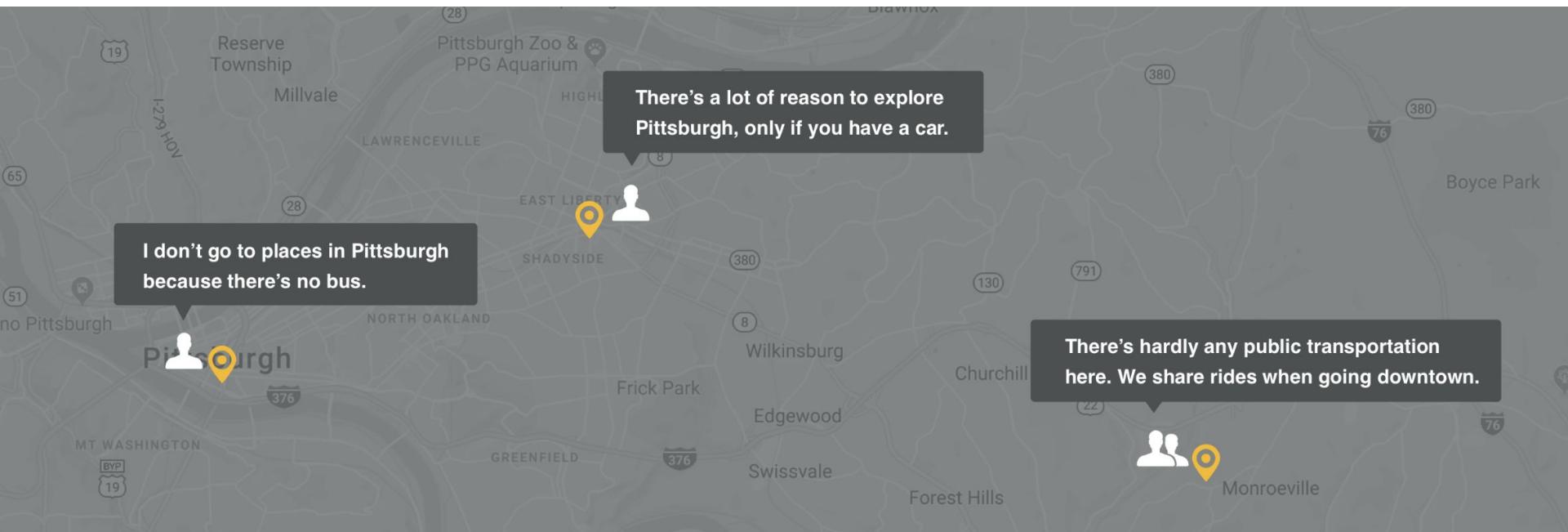
*Only behind Boston  
and DC  
(2015)*



*More than any other  
city in the U.S.*

# Research · Interviews

After literature reviews, we interviewed 4 local residents in Pittsburgh, one from downtown, one from Shadyside and two from Monroeville. We tried to uncover how people travel in Pittsburgh, and what areas we should focus on.



# Research · Initial Focus Area

We are motivated by the curiosity of understanding the different neighborhoods in Pittsburgh, and how people and communities can be connected through emerging technologies in mobility. We want to answer the following questions:

- **How might we utilize existing infrastructure?**

Individuals find there to be a barrier between exploring new places in Pittsburgh without the convenience of a personal vehicle. GPS navigation is also a challenge to those driving a personal vehicle.

- **How might we encourage newcomers to explore the city?**

Pittsburgh is a city rooted in its history and culture. Each neighborhood highlights a different aspect to the city, bringing value to the overall experience of this place.

- **How might we blend the divide between a newcomer and the neighborhoods of Pittsburgh?**

As urbanization increases in the city, areas of lower traffic suffer from the change leading to a bigger gap between the rich and the lower income.

- **How might we align with onePGH + Bridgestone?**

Pittsburgh's vision for the future entails resilience and sustainability, and they are the city's personal goals for near and far future.

# Research · Interactive Booklet

Now that we have targeted our focus on bridging “the old” and “the new” of Pittsburgh, we plan to do further interviews with newcomers and local residents to understand their life, thoughts, and concerns in order to identify their core demands.

We designed an interactive booklet with the following questions:

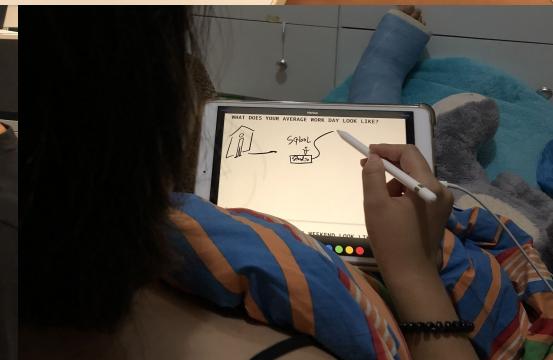
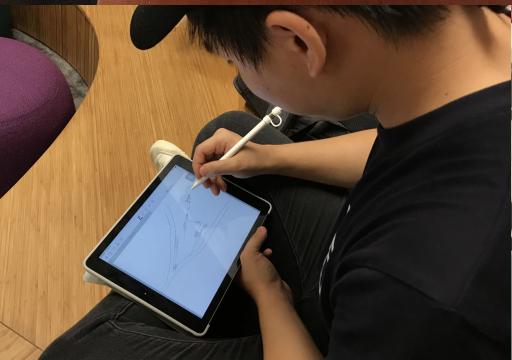
## For newcomers

- Draw a map of pittsburgh
- Draw a map of neighborhood
- Where did you live before?
- What does your average work day look like?
- What does your average weekend look like?
- How do you normally travel in Pittsburgh?
- How do you affect your neighborhood?
- Draw your journey as newcomer to Pittsburgh

## For locals

- Draw a map of pittsburgh
- Draw a map of neighborhood
- Where did you live before?
- Compare your neighborhood with others
- Describe your neighborhood with 3 words or a drawing
- What do you usually do around this neighborhood?
- What has your neighborhood changed over time?
- How do you affect your neighborhood?
- How did you transition into here?

# Research · Interactive Booklet



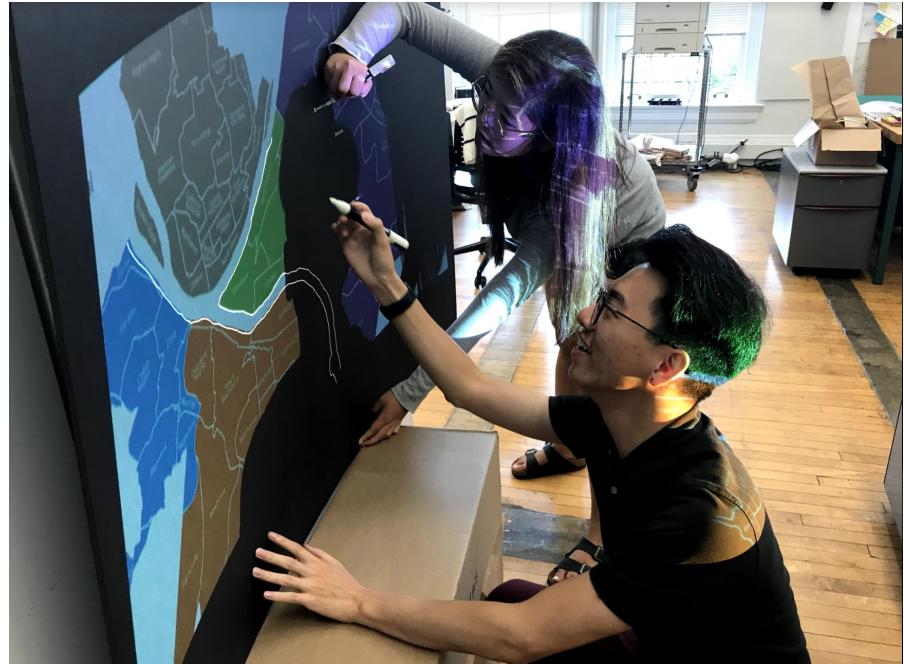
# Research · Interactive Poster

In order to get to a wider range of stakeholders, we also conducted an open-space user study with an interactive poster to see how people go out in Pittsburgh.

We asked the following questions:

- Where do you live? Work? Frequently hang out?  
Want to explore?
- What stops you from exploring Pittsburgh?

We put it in the lobby of Cohort University Center in CMU from Oct 11-15 including a Family Weekends where a lot of parents from all around the city participated in the study.



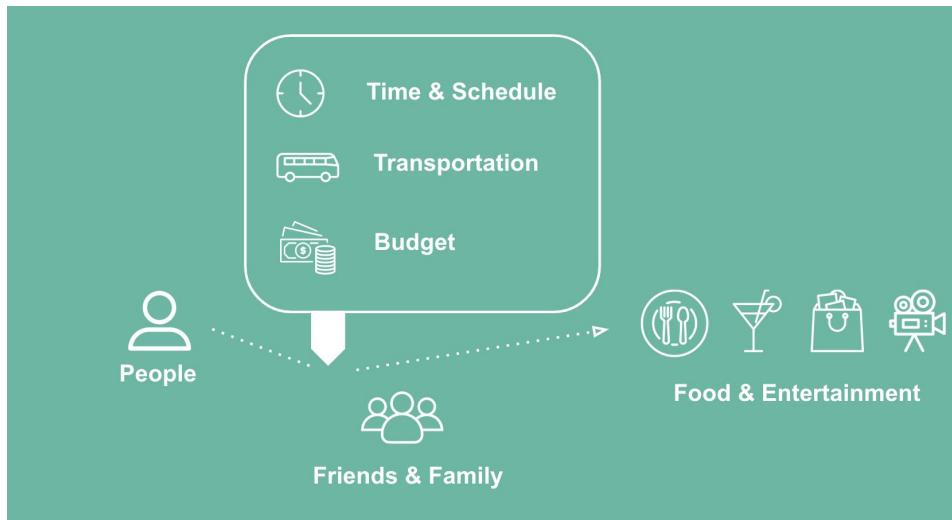
# Research · Interactive Poster



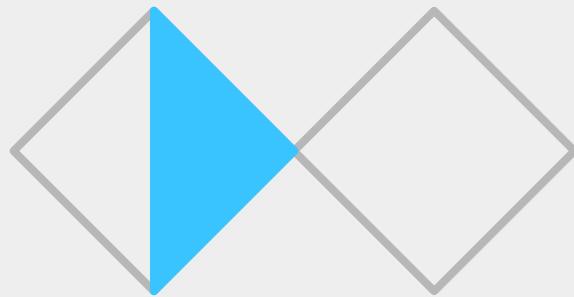
# Research · Insights

From the research, we found out that:

1. People have inclination to go out in their spare time.
2. They prefer to go out with people close to them.
3. Their main motivations are food and entertainment.
4. Their experiences are impeded by time & schedule, transportation constraints, and budget.

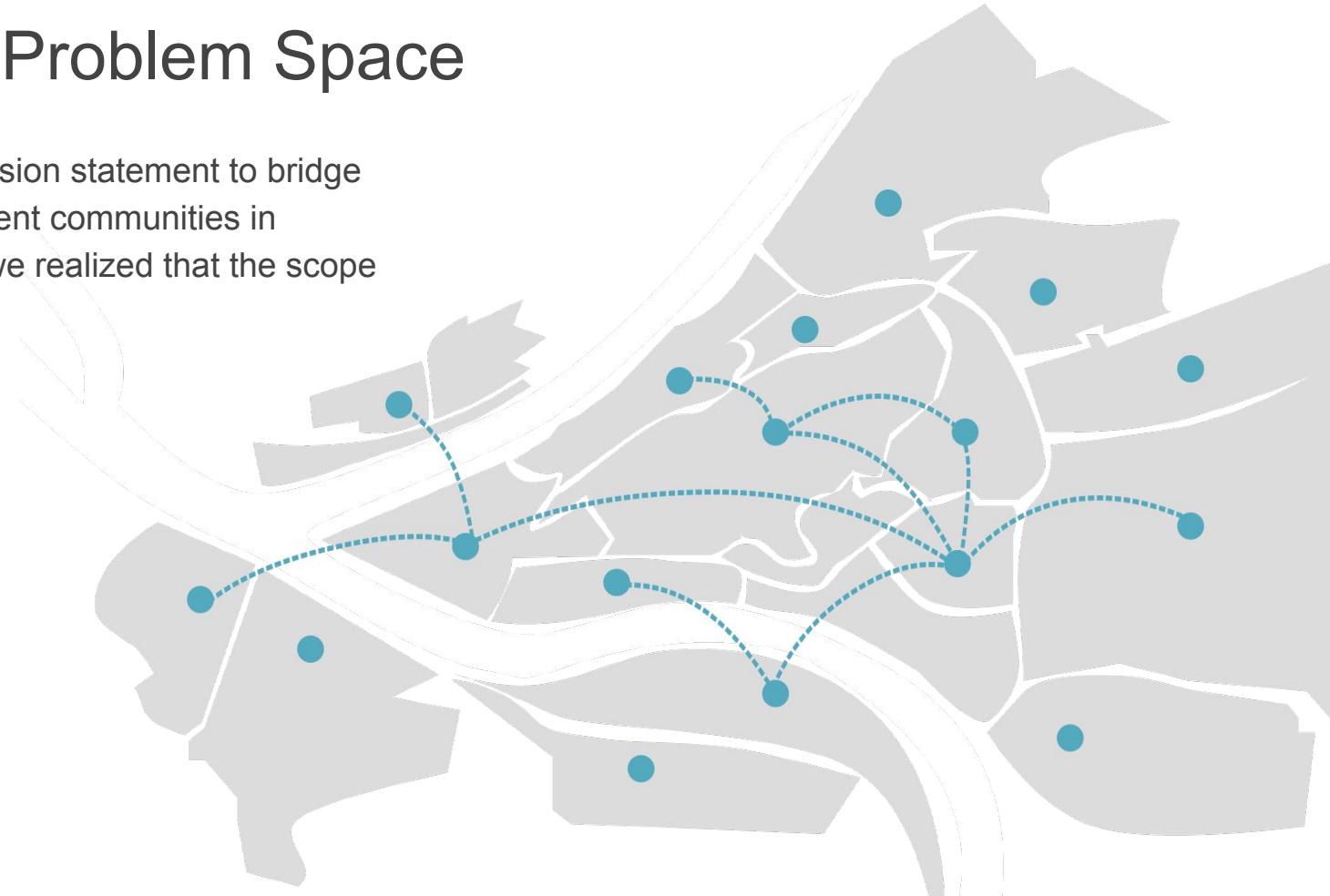


# Problem space



# Redefining Problem Space

Initially, we set our mission statement to bridge the gap between different communities in Pittsburgh. However, we realized that the scope is too big and broad.

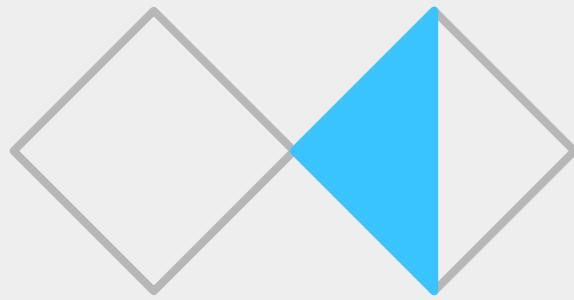


# Redefining Problem Space

We went back to our research findings, and redefine our mission statement to something that is more human-centered:

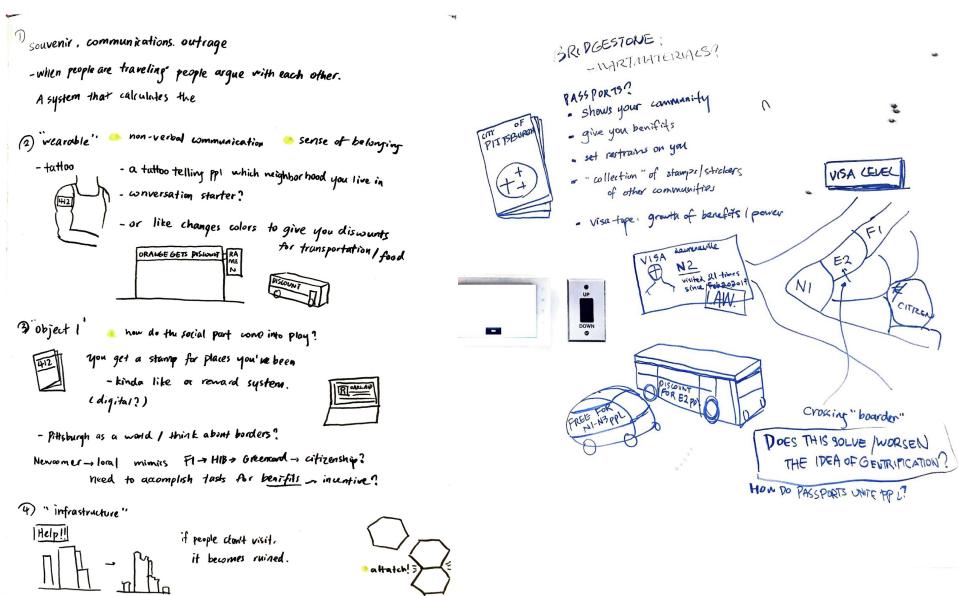
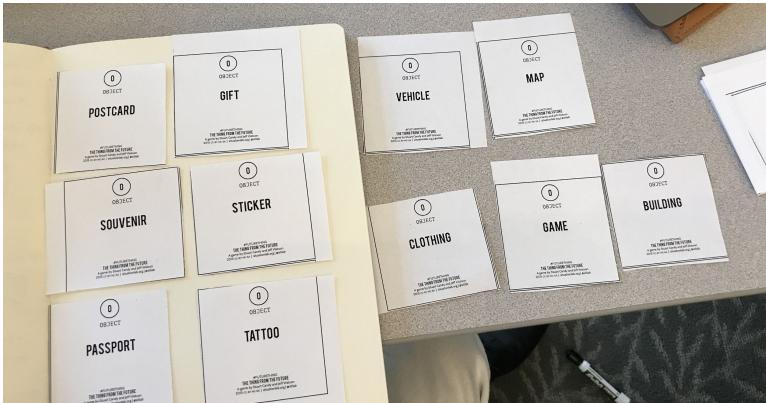
We want to expand newcomers' social and physical radii by designing a system that will facilitate their connection to communities.

# Ideation



# Ideation · Brainstorming

In order to solve the problem we identified from user research, we brainstormed multiple ideas using tools such as S. Candy's "Things from the Future" exercise. These ideas include a digital solution called "Pittsburgh Passport", an individual vehicle that can be assembled into groups, etc.

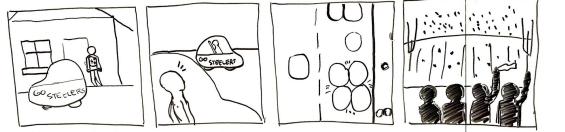


# Ideation · Brainstorming

## ONE PITTSBURGH PASSPORT

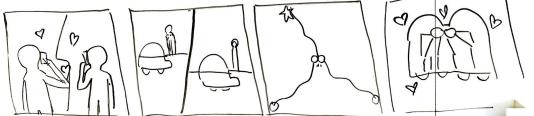


## Scenario: Steelers' Game Night



Wayne forms a squad with other connectables and talked along the way about Steelers. They gained a sense of community!

## Scenario: Dinner Date

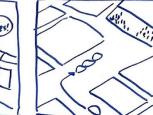
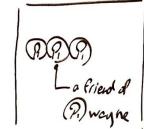


Mia & Sebastian are going on a date tonight.

They board the convertible at their own (W)NDSOS.

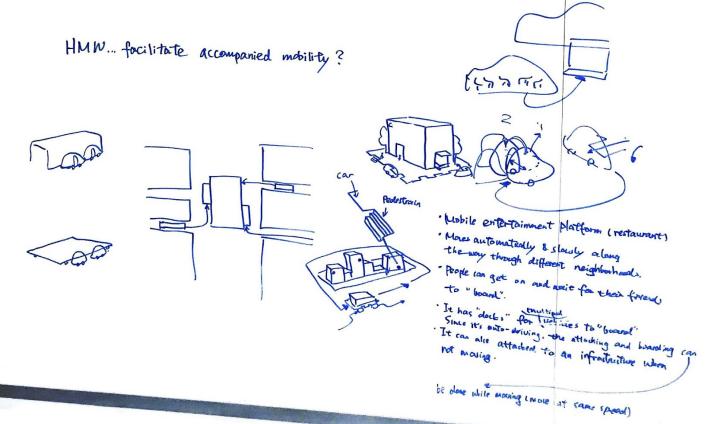
They correct mid-way which serves first.

## social network



Your smart home device receives the "broadcast" and asks you if you want to go. You said yes and a car is waiting for you at your door.

HMW... facilitate accompanied mobility?



· ppl

· ppl

[IDE]

Hexagonal  
I'm with  
Jordan and  
Cameron  
Taste  
Sweet  
Sour

May 16th  
Mark, Kristie,  
He and John

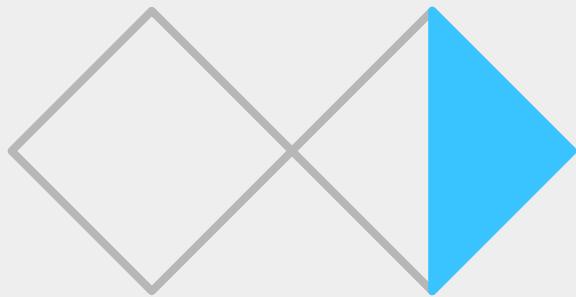
# Ideation · Changing Perspective

After reviewing our designs, we realized that, though the concepts are interesting, our designs lack innovation and it wouldn't solve the problem we identified.

Inspired by feedback from Prof. Chung and Bridgestone, we altered our perspective and changed our goal from “motivating and bringing people to places” to “bringing experiences to people”.

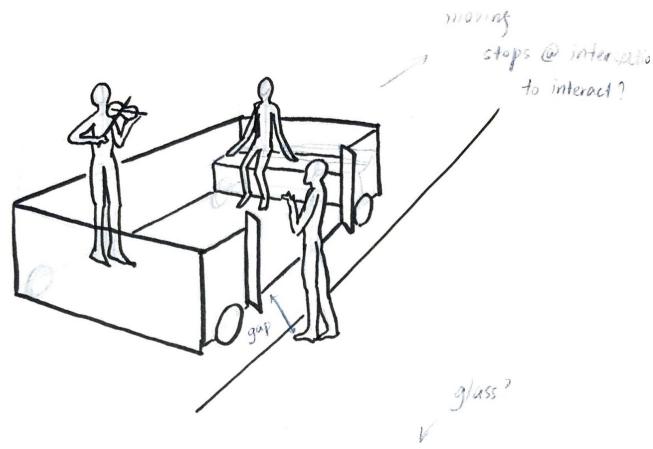
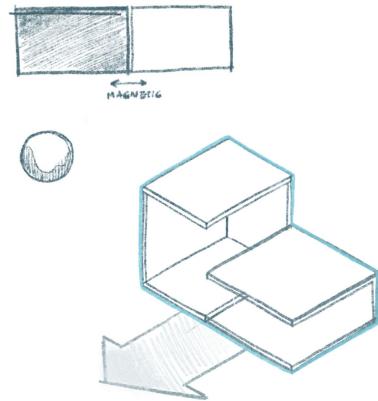
We ideated the final solution to be a vehicle that will operate in a way similar to food trucks and bring experiences from one neighborhood to another.

# Design & Prototyping

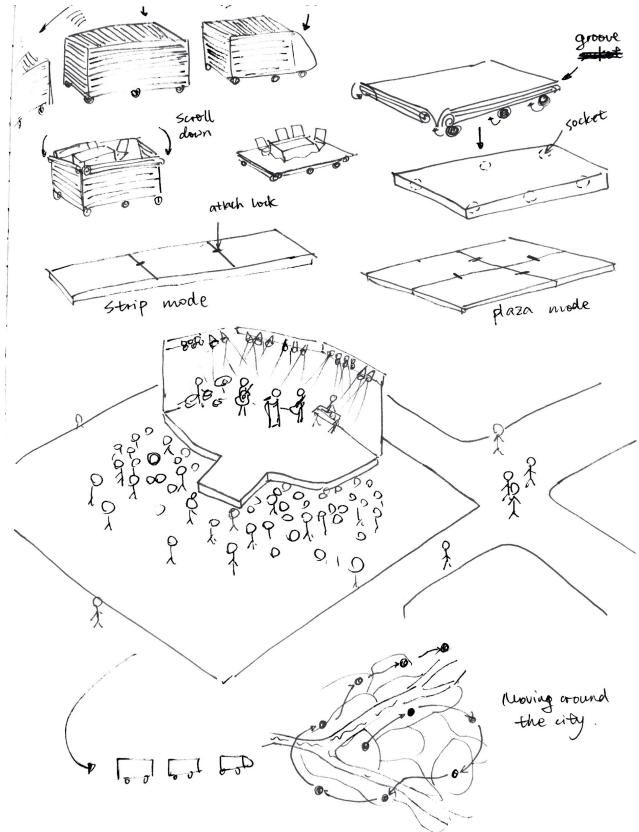


# Phase 1 · Brainstorm

We drew sketches of our visions of vehicles individually, then selected highlights of our ideas to come up with a combined design.



Dynamic combination



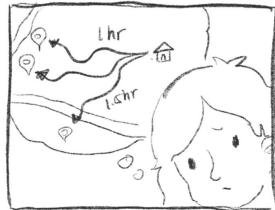
Attracting people

Community event

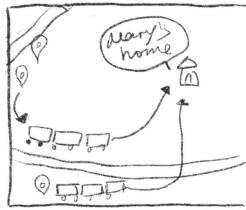
# Phase 1 · Storyboarding

We then drew storyboards to see how these vehicles can be useful in different scenarios.

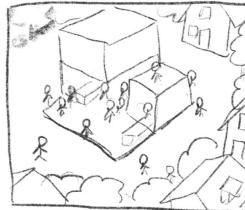
BRIDGING  
PITTSBURGH



Mary is a newcomer in Pittsburgh. She wants to explore different places but they're too far away. Her time is limited.



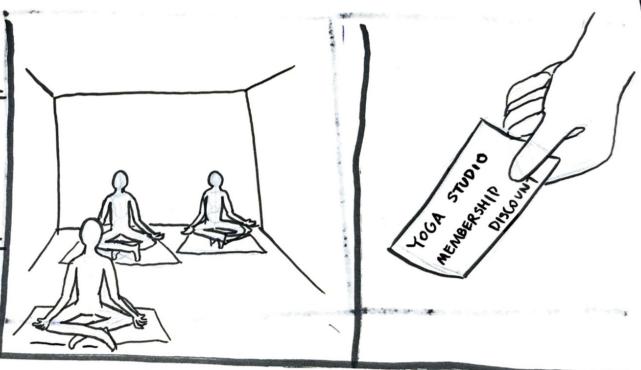
Now, the mobile platform is moving the "attractions" to Mary's home.



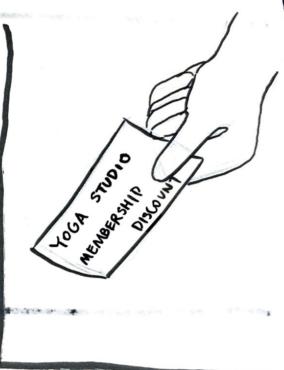
Mary can enjoy social & cultural events near her home. She feels more connected to different communities as well as Pittsburgh.



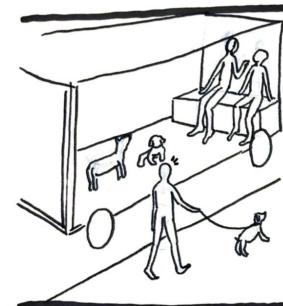
Garrett and Angela are going to Oakland and they see a "Yoga car" that goes to Oakland as well.



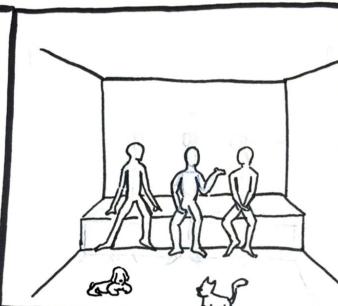
They board the car and enjoyed a small short yoga session.



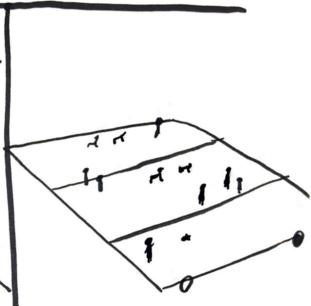
In the end, they got a discount voucher that for the yoga studio.



David is walking his dog and he sees the "pet car".



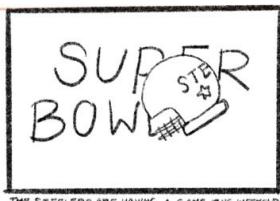
He boards the car and connects with other dog owners.



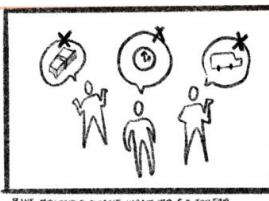
These cars eventually assemble into a large pet park/playground for the pet owners/pets to connect.

# Phase 1 · Storyboarding

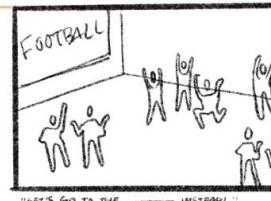
## SPORTS EVENTS



THE STEELERS ARE HAVING A GAME THIS WEEKEND



BUT FRIENDS DON'T WANT TO GO TO THE  
OR SPEND TOO MUCH MONEY



"LET'S GO TO THE \_\_\_\_\_ INSTEAD!"

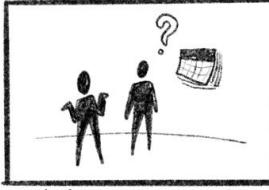


MEETS @ central place with  
many other people!

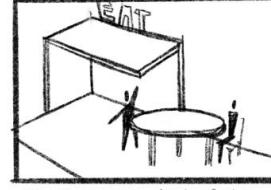
## FOOD OF PITTSBURGH



I want to try the foods in the  
Steel district!



How do we get there? Also not enough  
time to visit more than a few  
times — But so many things to see!



OH! They're coming — Yum this food is  
delish! I want to go again!

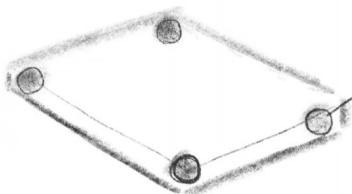


Give route recommendations or how  
to get to these resources.

# Phase 1 · Stakeholder Review

We presented our design and storyboards to Bridgestone for feedback.

They had a positive reaction to the design. They also talked about the opportunity areas Bridgestone would have in this design, with examples such as shock-resistant walls, smart materials, and wheels with sensors.



- 360° Flexibility
- Affordability → Materials
- Sustainability
- Invisibility
- Intelligence → Sensor
  - > Autonomy in making decisions based on feedback from wheels.

## Phase 2 · Paper Lo-fi Prototyping

We decided that the size of the vehicles will be similar to that of contemporary buses so that they can fit infrastructure.

After finalizing the dimension to be 9ft(W) by 18ft(L) by 10.5ft(H), we used paper to make lo-fi models of such vehicles. Inspired by miura origami folding, we also designed and prototyped foldable walls, a new feature that will significantly increase area of space the vehicles create.

These paper prototypes enabled us to think about how the vehicles will unfold and combine in dynamic ways.

## Phase 2 · Foam Board Mid-fi Prototyping

We used laser cutting to cut foam boards and glued them to make mid-fi prototypes for the video. New miura prototype was also made using translucent paper, a material that mimics the ideal material for the vehicle roofs, which will allow partial sunlight passage into the spaces that the vehicles created.



## Phase 2 · Branding

We decided that the vehicles will be named Silta, Finnish for “bridge”. A logo was also designed in a similar fashion to that of Bridgestone.



## Phase 2 · Value Analysis

To evaluate whether this design will be successful or not, we conducted a value analysis, and came to the conclusion that Silta is promising as it creates values for various stakeholders.

### Value for Individuals:

- Freed people from time and transportation constraints
- Provides more exposure to cultural diversity
- Brings new experience to familiar space

### Value for Businesses

- Helps commercial branding & promotion by increasing public exposure
- Facilitates market investigation and evaluation
- Expands business radii and brings more revenue

### Value for Society

- Reconstructs local network by sparking conversations and deepening understandings
- Improve social equity by sharing infrastructure and public services
- Other cities can use Pittsburgh as a model

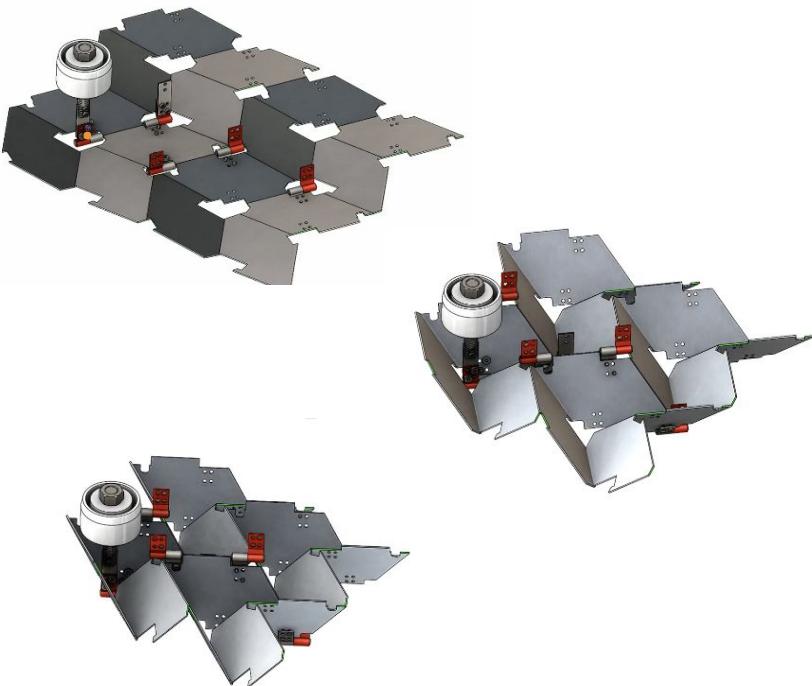
## Phase 2 · Value Analysis

For Bridgestone, we see promising opportunities as well. New R&D can be done to develop omni wheels that travels in all directions, and new material which will be shock-resistant and also have flexibility in terms of rigidity. They will also gain benefits from implementing autonomous driving. What's more important, Bridgestone increases its reputation for fulfilling its social responsibility by creating these community spaces and facilitates social interactions and conversations among people.



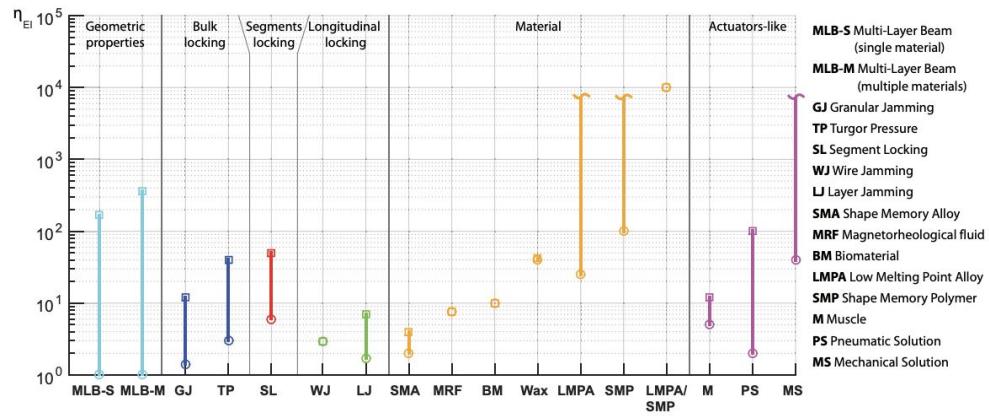
## Phase 2 · Technical Design

For the technical designs of the car, aside from miura folding, we also designed the material used to build Silta units to be shock resistant, which ensures the safety of the units both when they are traveling and when they are unfolded and forming structures. Another feature of the materials is that they have controllable stiffness. This is because the walls/floors need to be flexible to be folded in the miura form, but also need to be rigid when in the expanded form to support people and other heavy weight items that are going to be in the spaces they created.



# Phase 2 · Technical Design

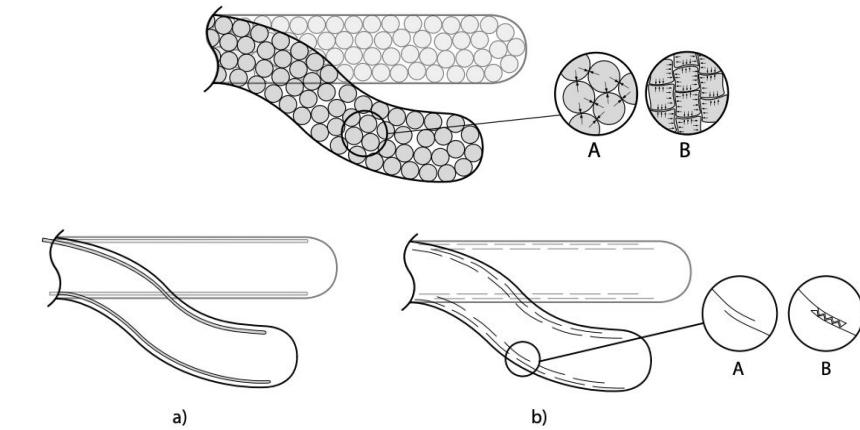
Luckily, there are numerous studies already around such kind of material. From a review paper on material's controllable flexibility, we looked at all of the materials that have been invented and their relative flexibility in terms of rigidity (represented by the length of range along the y-axis in this graph).



Blanc, L.; Delchambre, A.; Lambert, P.; Blanc, L.; Delchambre, A.; Lambert, P. Flexible Medical Devices: Review of Controllable Stiffness Solutions. *Actuators* **2017**, *6* (3), 23.

## Phase 2 · Technical Design

One specific kind of materials utilizing “jamming techniques” caught our attention. These materials contain particles or sheets inside them. Upon forces, their contacting surfaces increases, which increases frictions and interactions, thus increasing rigidity. We believed this would be a promising material for Bridgestone to look into.



Blanc, L.; Delchambre, A.; Lambert, P.; Blanc, L.; Delchambre, A.; Lambert, P. Flexible Medical Devices: Review of Controllable Stiffness Solutions. *Actuators* **2017**, *6* (3), 23.

Ou, J.; Yao, L.; Tauber, D.; Steimle, J.; Niiyama, R.; Ishii, H. JamSheets: Thin Interfaces with Tunable Stiffness Enabled by Layer Jamming; **2014**.



## Phase 2 · Technical Design

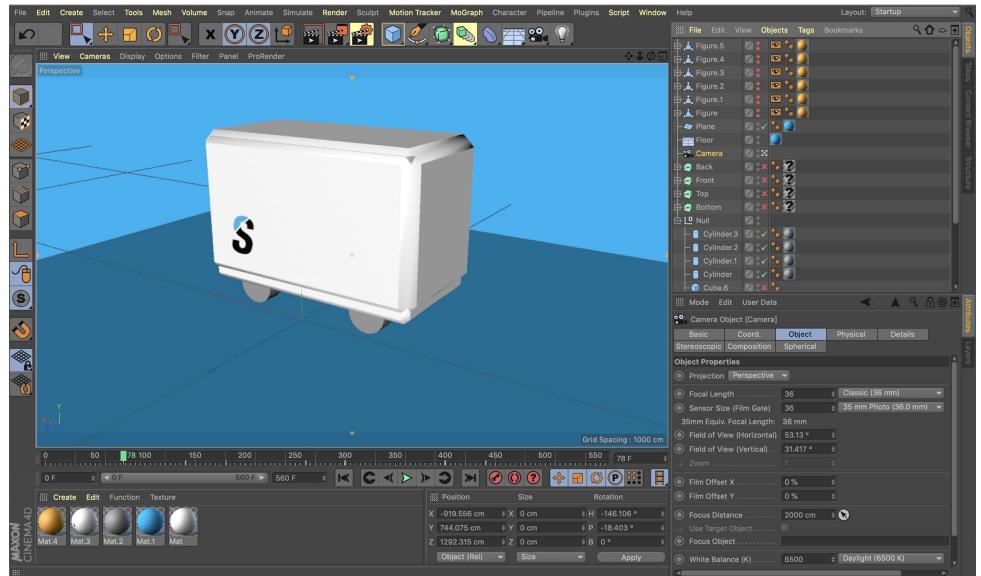
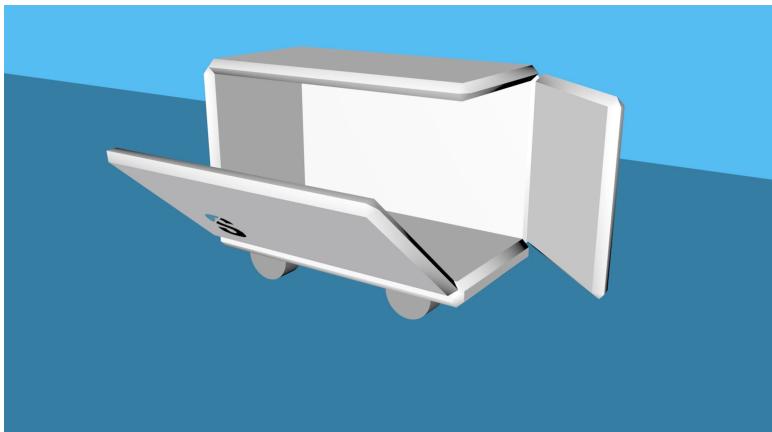
Autonomous driving is also implemented in these units, ensuring efficient transportation. In this way, human focus can be honed towards enhancing event experience over travel logistics.

The wheels are also engineered in a way that enables them to travel in all directions without turning. These wheels are called omni wheels and have sub-wheels that enables alternative traveling directions. This ensures an accurate and efficient assembly of the units.

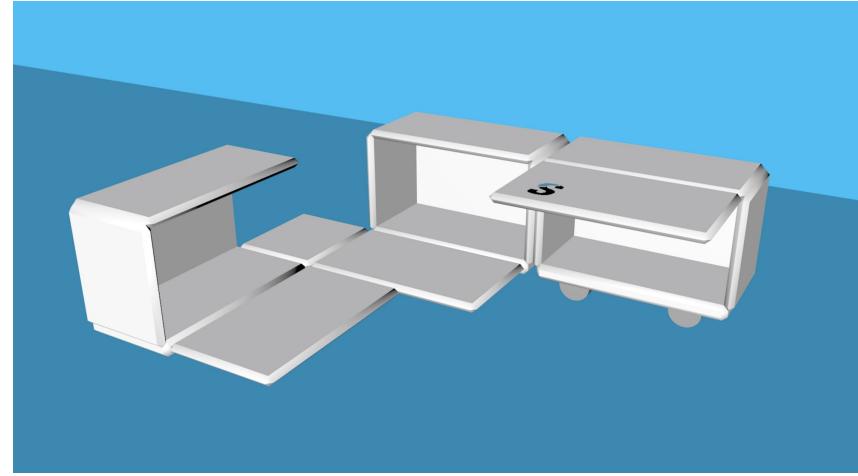
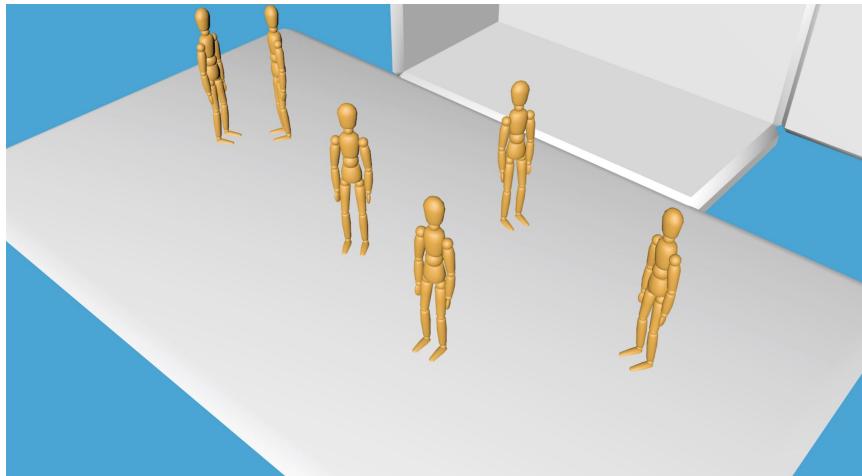


# Phase 3 · Digital Hi-fi 3D Prototyping

We used Cinema 4D to create 3D prototypes of the Silta units and also animations of them driving, unfolding, expanding, and attaching, and closing.



## Phase 3 · Digital Hi-fi 3D Prototyping



## Phase 3 · Mock-up

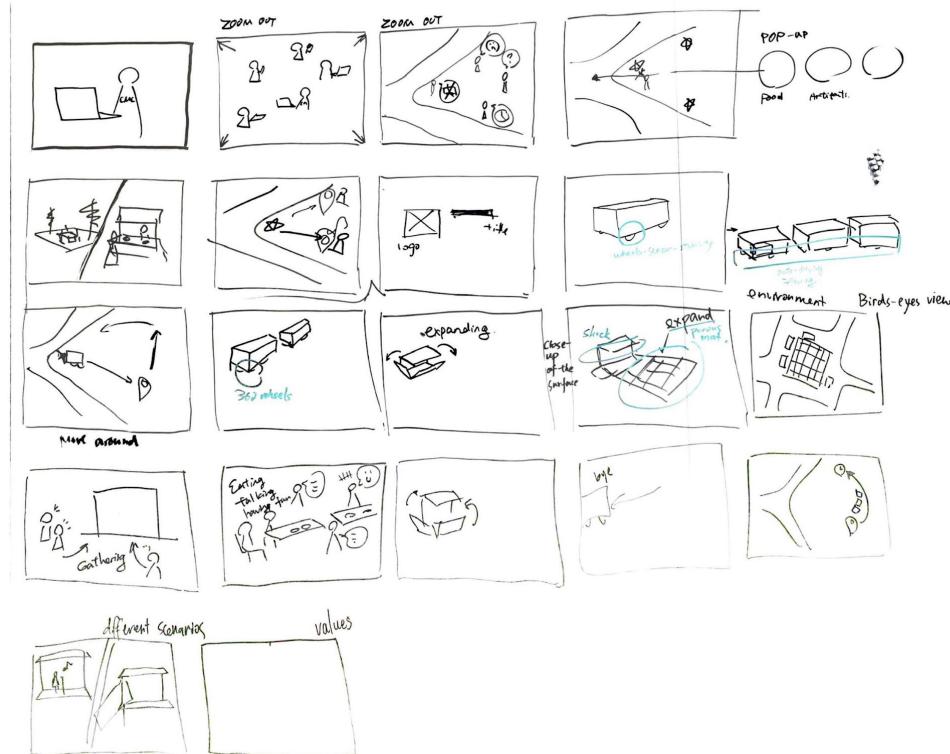
Using Vectary, we also created mock-ups of how people will interact within the spaces Silta creates in real life.



# Phase 3 · Video Prototyping

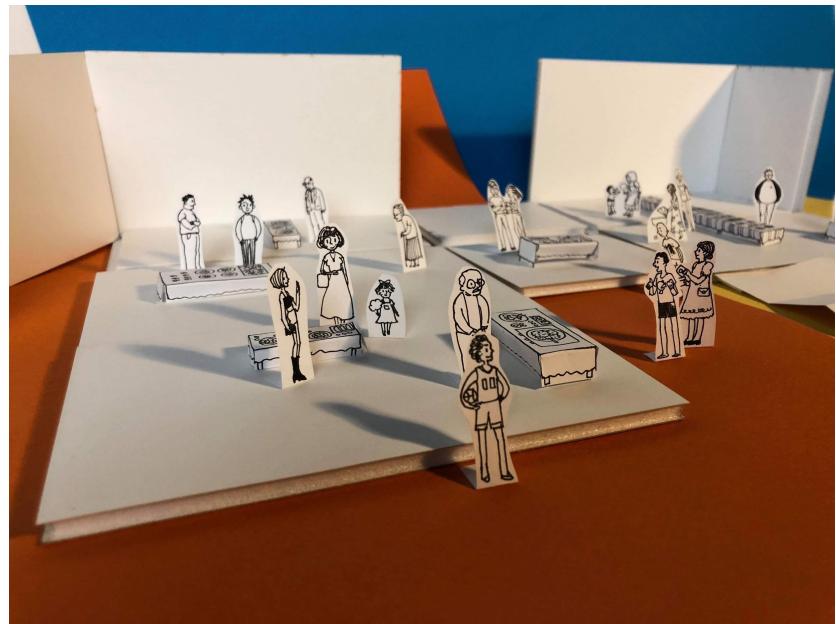
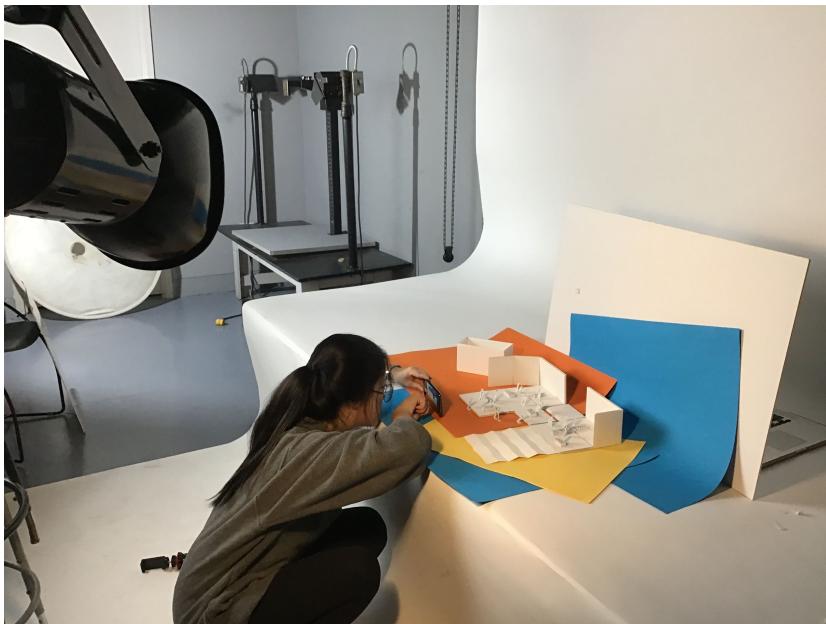
For the final video prototype, we first created a storyboard, imagining how we are going to tell the story while presenting opportunity areas for Bridgestone at the same time.

Based off the storyboard, we wrote the script for voice-over of the video.



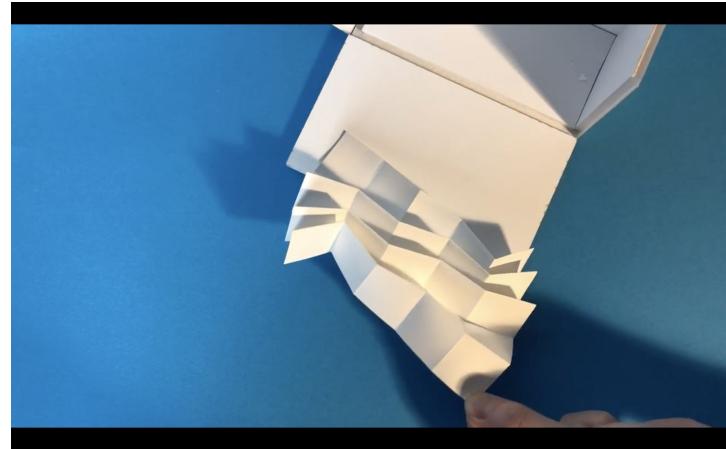
# Phase 3 · Video Prototyping

We decided to used paper models to create a stop-motion video.



# Phase 3 · Video Prototyping

Link to the video: <https://vimeo.com/304878800>



# Phase 3 · Presenting to Bridgestone

