Themed Subway Cars
Self-Sorting Underground

Themed Subway Cars

HARVARD Summer School

Team 3

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Abstract

Despite the large concentration of commuters using the Paris metro everyday, interaction between strangers on trains is seen as something one should avoid. Our project goal is to change this unfortunate tradition through the introduction of themed subway cars in hopes of creating an atmosphere of interaction, connection, and creativity among individuals with shared interests.

By looking at the city of Paris as a living system, we have drawn our inspiration from the compartmentalization and signaling present in the biological principle of vesicle transport. Capitalizing on the modernization of the subway by metro2030 and the availability of real-time information for passengers, we plan to provide commuters with enough underground signaling, similar to that of vesicles, to cluster into their desired train cars. As an initial model, we want to begin installing this system in the RER and later expand it to the metro lines. Using on-train cameras and online feedback, we hope to ascertain how our initial model fostered social interaction by creating a shared experience among commuters.

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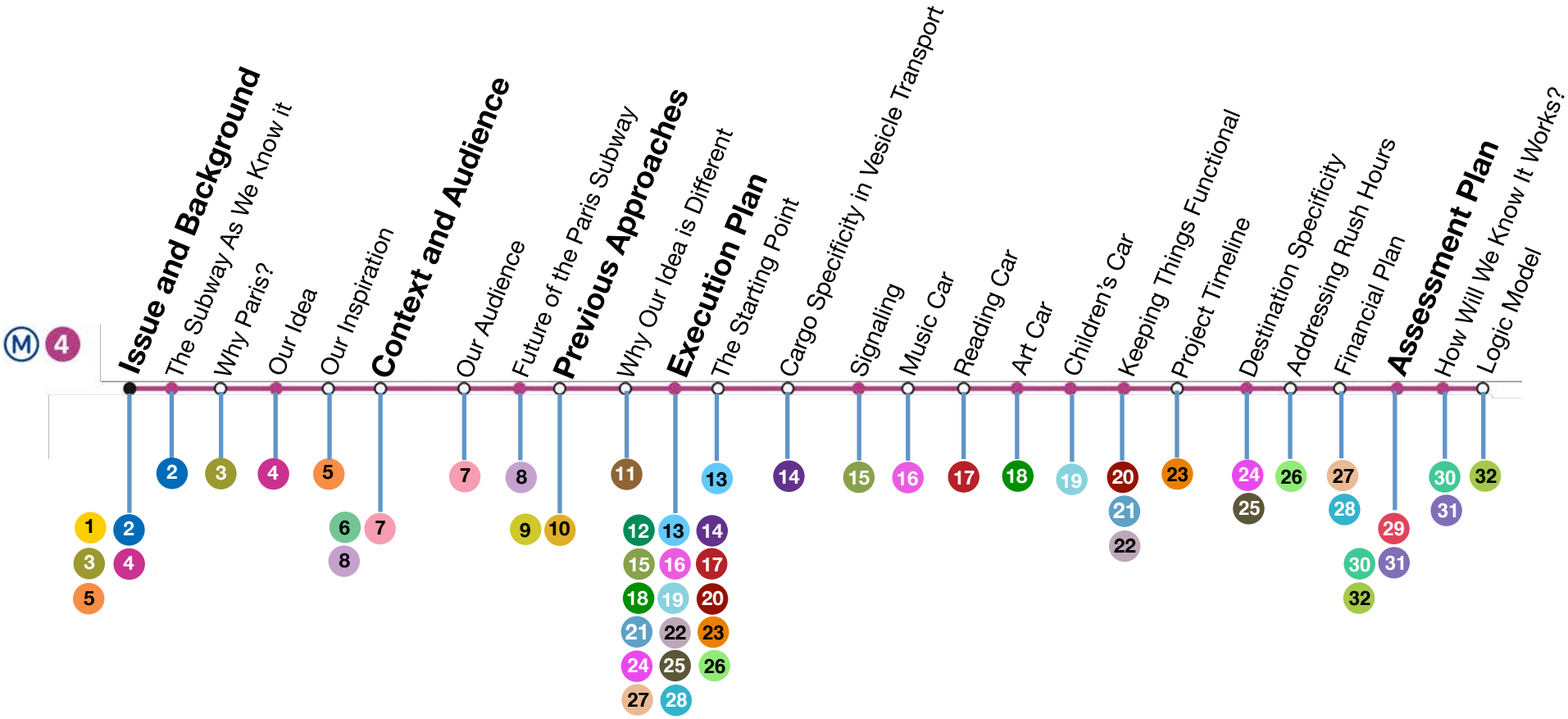
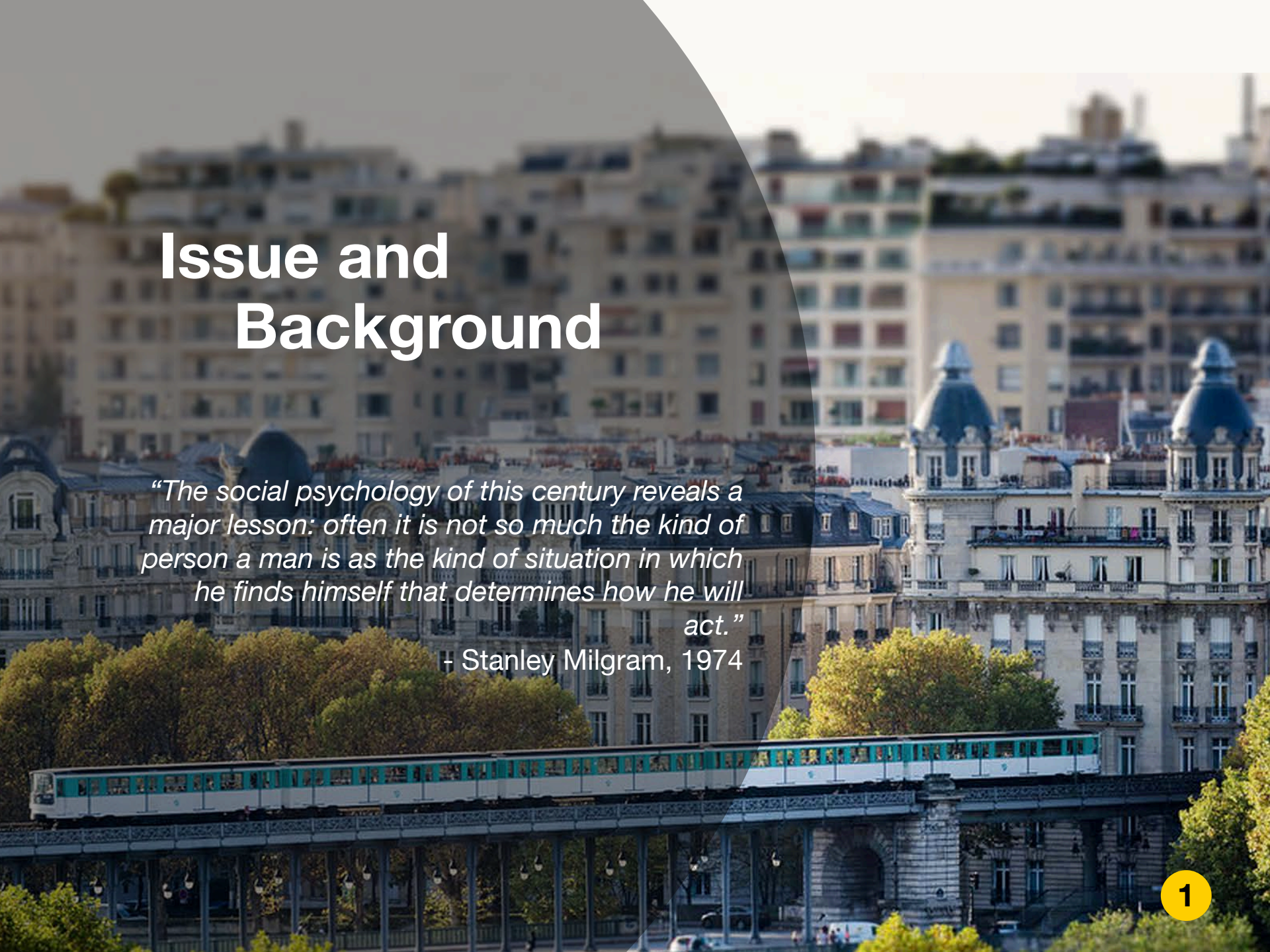




Issue and Background

"The social psychology of this century reveals a major lesson: often it is not so much the kind of person a man is as the kind of situation in which he finds himself that determines how he will act."

- Stanley Milgram, 1974

The Subway As We Know It

Our project revolves around the very idea laid out by Stanley Milgram and the kind of situation we hope to create is one in which commuters using the Paris subway share a sense of identity and experience with the people around them in order to make them more likely to share knowledge and ideas. It is no news to us that most people around the world view the use of the subway underground as nothing more than practical for transport. After all, it is hard to imagine that people would be willing to expose themselves to the bad smells and large crowds present in these underground tunnels unless they really have somewhere to be. But what if, along with the heightened functionality of this form of transportation, the subway could become a complex social ground that fosters interaction and collaboration no different from the streets above? As exemplified by the quote on the previous page, it is not such that humans are unwilling to interact with others during their functionality-oriented commutes, but rather that the diverse and intimidating public spaces do not give them the means to do so.

Why Paris?

The Paris subway is one that especially constitutes this dull sort of commute. The many Parisians who take advantage of the metro were characterized to be so grumpy that the Paris transport authority released an etiquette manual that seeks to bring more joy to these underground cars by enforcing courtesy and politeness upon the subway's many regulars.

However, by fostering an environment in which people's' greatest concerns when they commute are to apply enough anti-perspirant so as to not create a bad smell for others or to make sure they are not playing their music too loudly, people will undoubtedly be less likely to initiate social interaction with strangers so as to not cause any disrespect. This will therefore simply perpetuate this grumpy Parisian commute instead of remedying it.

In the center is a drawing from the etiquette manual, showing what not to do on the subway.

Creating a Shared Experience

Our Idea

That's why our idea serves to initiate underground social connections by giving commuters the option of boarding a themed subway car, serving to minimize the fear of causing disrespect by giving citizens a shared experience. After all, it won't cause disrespect to play your music too loudly if everyone in that car wants to hear it. Through this shared experience, citizens will benefit by being able to better relate to the individuals around them which will lead to a greater likelihood of social interaction and a more pleasant commute.

Our Inspiration

This idea of compartmentalization and self-sorting draws many parallels with the crucial biological principle of vesicle transport, which might be slightly more difficult to observe on an everyday basis. Vesicle transport is a system through which exchange is made possible between different cellular compartments through very specific membrane signaling. These vesicles, or compartments, form as the membranes of existing cellular organelles pinch off at coated regions and proceed to travel to their destination, where they recognize a certain combination of marker molecules. In a similar way, we hope to create a system in the tunnels beneath Paris that provides citizens with the necessary platform signaling to sort themselves in different themed subway cars (or enter a normal car if they choose to) in order to create a shared experience among them.

Context and Background

Future of the Paris Subway

Currently, the RATP is in the process of modernizing the Paris metro under a program it calls Métro2030. One of the primary aims of this project is to update the stations and trains of the metro so that they become more pleasant and functional. The Paris metro is already undergoing renovations to its stations for “Un métro plus beau.” This effort also includes the modernization of information for passengers, meaning passengers are to have access to real-time information on trains to better plan their rides. The RATP aims to implement around 3,000 new passenger information screens in use by the end of the project. By the end of 2016, the RATP also intends for all lines to have 3G and even 4G coverage.

métro2030
notre nouveau métro de Paris

Our Audience

Our proposal is designed to benefit most Paris metro and RER users as our diverse themed cars underground, such as music cars and silent cars, are meant to facilitate participation and interaction of users of many ages and origins. This is not to mean that everybody using the subway will benefit, as people still have the option of boarding a normal car. Just as vesicles are very specific as far as the material they contain, we want to be very specific and make sure people who want to look at art or finish some work, for instance, are in the art car and the reading car respectively.

Not only will various users of the Paris metro benefit by gaining a shared experience with the people around them, but local aspiring artists and DJs might find it easier to get their name out using these various themes. For instance, our music car will consist of ordinary citizens being able to play their music in the metro and our art car will consist of local artists submitting their works to the RATP to be placed on the walls of the art subway car.

Previous Approaches

Moscow, Russia

In celebration of the Moscow Metro's 75th anniversary, copies of art from the Pushkin Museum of Fine Art were exhibited in subway cars on the Arbaysko – Poprovskaya line. This marks the third exhibition of art in the Moscow Metro system and is an example of a top-down approach to Smart City innovations, as the citizens had no involvement in its development.

Ningbo City, China

This themed car, which began operating on May 20, 2015 includes wall drawings and decorations that depict the ancient Silk Roads that were used to connect the Chinese port city of Ningbo with the rest of the world. In implementing such a car, the city of Ningbo has helped create a shared experience among the metro's commuters, who are likely entering this car to learn more about the city's history.

Chicago, United States

Lasting only about 5 hours, this project was created by nonprofit group *Noisivelvet* and consisted of turning this Chicago subway car into a Mobile Garden for the world's largest mobile art exhibit, Art on Track. As can be seen here, much of the car's functionality has been reduce due to the many plants' presence.

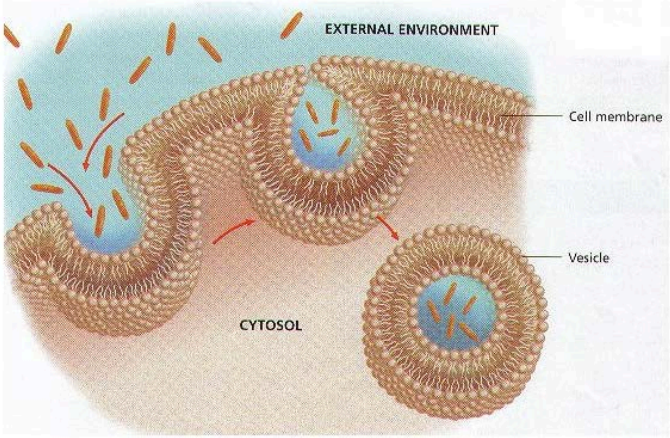
Why Our Idea Is Different

Our idea seeks to bring together concepts from all these previous approaches that have been laid out. More specifically, we plan to create a system of themed cars that resembles in practice the art car in Moscow's Metro but contains bottom-up characteristics such as the ability for citizens to play their own music peacefully under the Concorde Bridge in Paris. This results in ideas such as our art car, which would be composed of exhibits made by the citizens. Also, we seek to apply similar designs such as those form Ningbo City to our themed cars but without neglecting to make them more interactive for the commuters. Lastly, while the Chicago garden car seemed like a very unique experience among commuters, we want to make sure that the functionality of the subway cars is not lost by adding our themes to them.

Execution Plan

The Starting Point

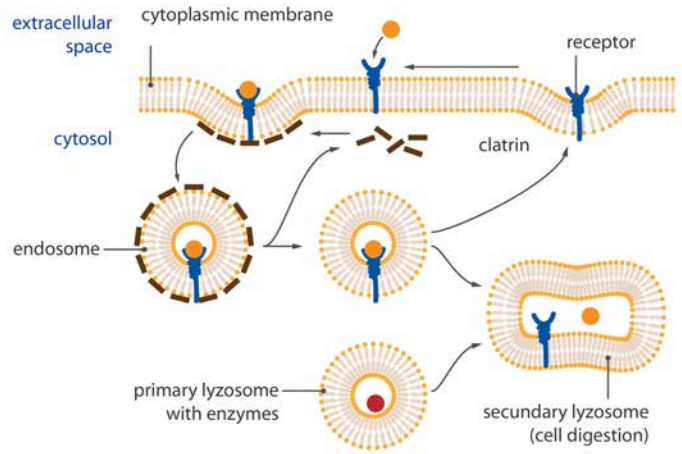
The idea of setting up different themed cars in the subway may initially seem difficult to execute in Paris; however, we think the RER would be the optimal test line for our proposal. We will first focus on implementation in the RER for some simple reasons which are: longer waiting time between trains so people have more time to get to where they need to be for their desired car, longer individual commuting time which increases the commuters' interest as far as which car to board, and more compartments on each trains so that creating a few themed cars will not have such an impact on those who want a regular commute. We propose implementing 2 themed cars on one RER B train as a first step by the end of 2016, using the passenger information screens present today and platform signaling to introduce this concept to commuters. We chose the RER B line specifically because it only has one floor, which would make it easier to change the interior layout.



Much like how export from the endoplasmic reticulum (ER) can only happen in special places, called ER exit sites (ERES), we understand that not all individuals would like to opt in to our special themed train. We also believe that these trains would be most effective in certain places, like the RER lines.

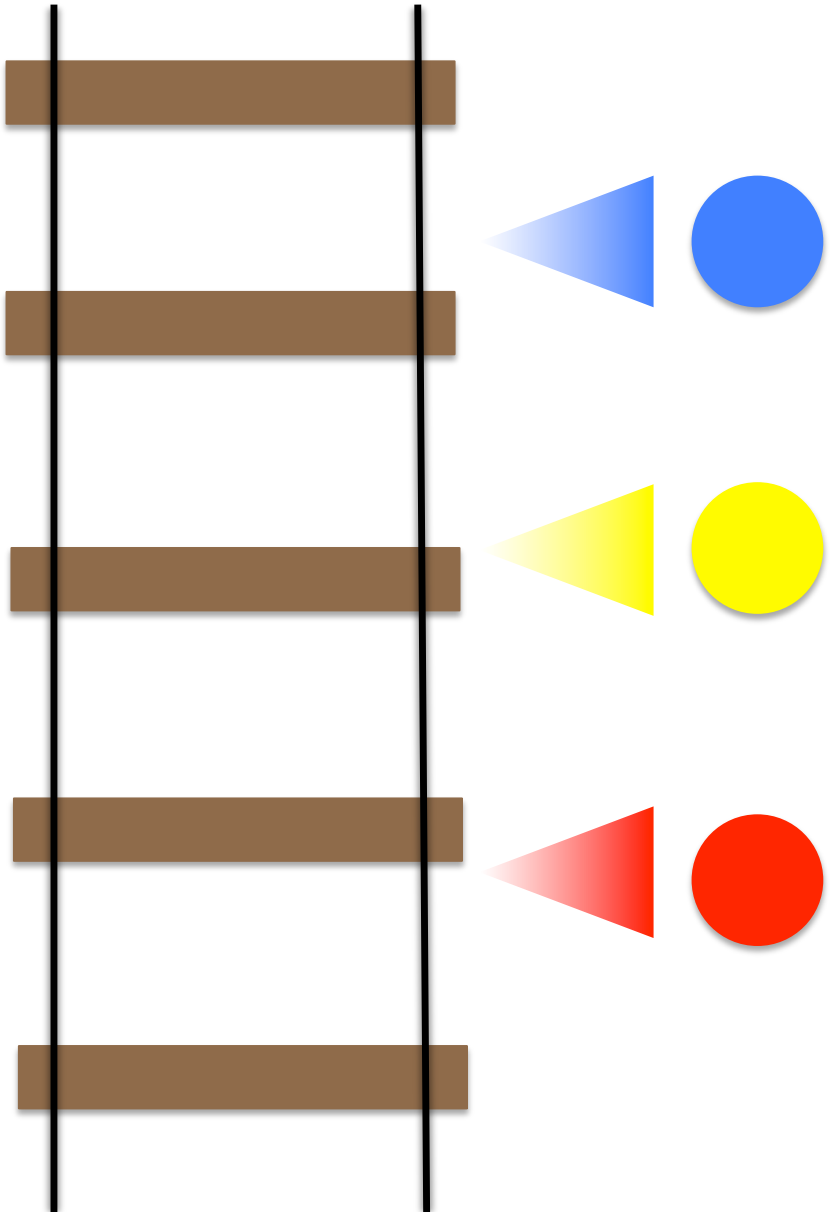
Cargo Specificity in Vesicle Transport

Self-sorting and specificity of cargo in vesicle transport is defined by coat protein complexes (CPCs). These complexes include adaptor protein (AP) complexes, and cage proteins (CPs). The AP complexes recruit the cargo while the CPs form a lattice on a flat membrane to form a scaffold to collect the AP-cargo complexes. Once the cargo is concentrated enough, the membrane curves and vesicle budding is induced.



Inspired by the function of the use of CPCs in vesicle formation, we looked at how to signal interested passengers about how to get on our themed trains.

To indicate to passengers where to align on platforms on participating lines, we could modify the already existing arrow system at the entrance of the cars by changing the color of arrows along the platform.

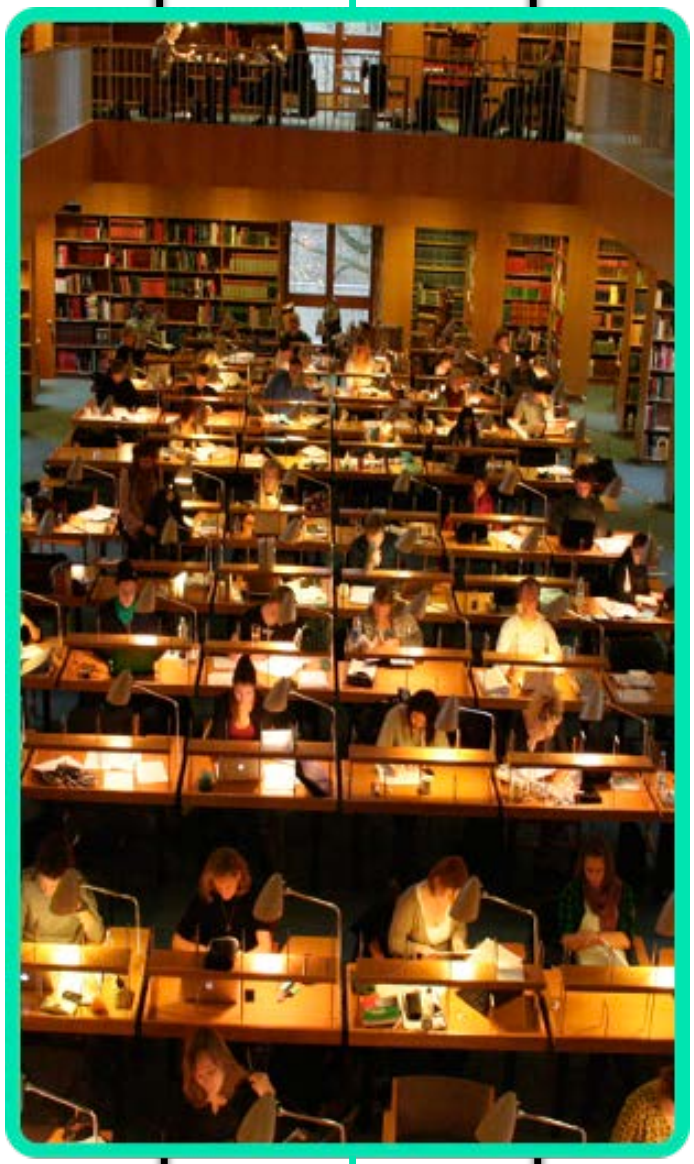


Signaling

The CP complex in our model, our scaffold to gather individuals, will be the wrapping around the themed car of the train; the themed cars would be identifiable through some sort of wrapping on the outside of the train cars that would make the particular theme obvious to any viewer. Thus, we can gather and direct the right cargo into the right themed train as in vesicle transport.

Music Car

For instance, our proposed music themed car would have speakers installed around the inside of the car that people could connect to using Bluetooth in order to play their own music, similar to what is happening under Concorde Bridge. Only one person could play music at a specific time and they must be present on the music car to do so. When nobody is playing music, we hope to have some playing as a result of potential partnerships with organizations such as Radio Nova or Spotify. Also, we propose changing the interior layout to make all the seats foldable in the car so as to create enough space for people to stand up and dance if they want to but also to seat just as many people if it is being used as a normal car.



Reading Car

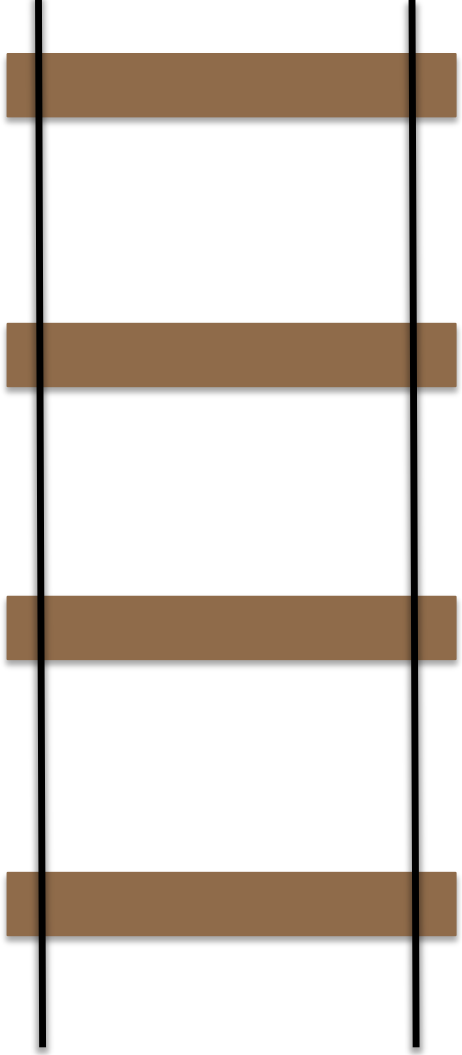
Our reading car would include the necessary environment for reading or getting work done before arriving at the destination. It would essentially have an on-train library, with shelves containing books that people can take and read during their ride (and even keep, if they leave one of their own). It would consist of the same configuration as the normal car, only with tables wherever there is a group of four seats facing each other that could be rolled up against the window when they are not being used or when the car is operating as a normal one.

Art Car

Our art car would be dedicated to local artists and would act as a gallery for commuters. Local artists would be able to submit their artwork to the RATP who would print and frame it on the interior of the subway (as long as it is appropriate) on a first come-first served basis for 2 days at a time. The interior layout of the car would have to change in order to provide a wall for the art to be posted on and we think the resulting layout will look much like the one in Moscow. However, by installing roll-up seats on the walls below the art, the subway car will be be able to seat people normally when it is functioning as a ordinary car.

Children’s Car

Another themed car that we propose is a children's’ car, the interior of which would be covered in white-board walls that kids can use markers to draw on as they are being dragged on their parents’ commute. This car would be relatively less expensive as it does not demand any significant change in the interior layout. Another added benefit of this themed subway car would be that it can lead to the isolation of kids and their parents on the train, which might create a more peaceful commute among the other metro users.



Keeping Things Functional

We want to make sure the first and last subway cars are among those to remain normal because those are the cars that most people who are running to catch the train just before the doors close will likely be entering. Thus, we don't want those people to have to opt into the themed car system just because they are running late and getting on one of the end cars.

Also, when we extend our themed car system beyond the RER to the metro, we want to make sure people still have the clear choice to opt in or out even though the trains have fewer cars. That's why we plan on having 1 or 2 themed cars maximum on the metro trains, most of which consist of 4 to 5 cars.

Fun
with
Functionality
A
A
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au public
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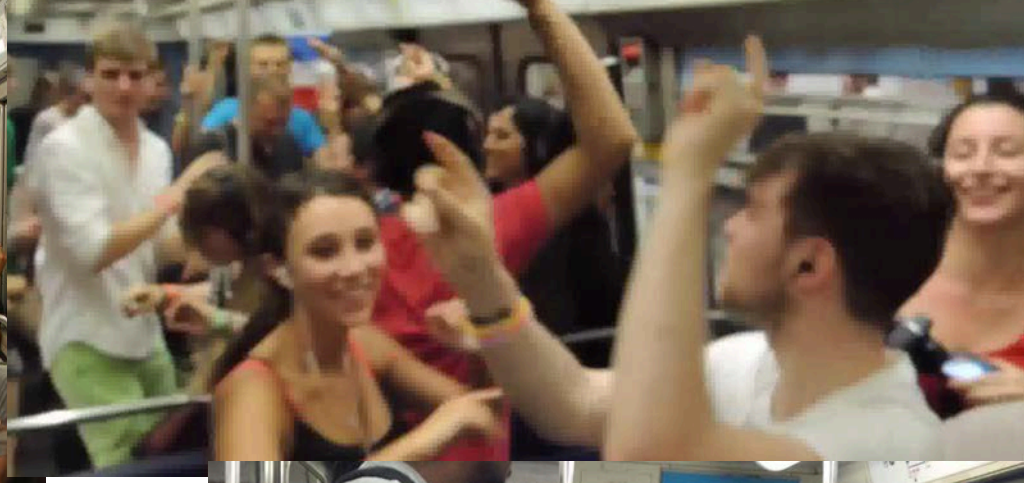
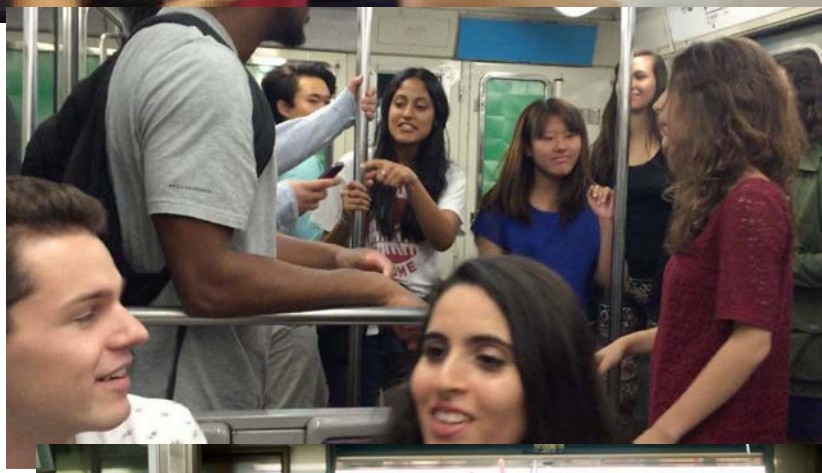
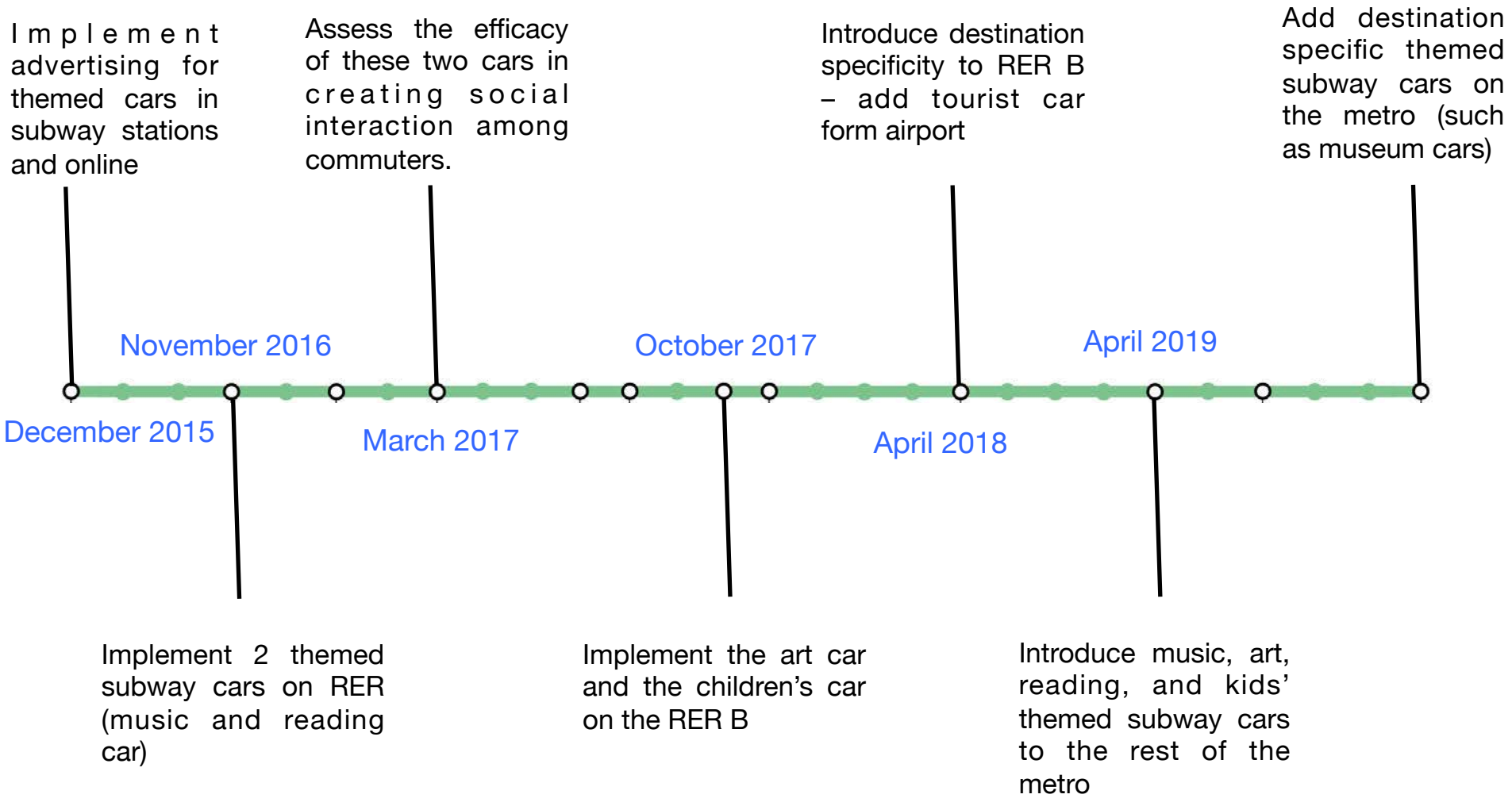




Project Timeline



Destination Specificity

Inspired by the notion of destination specificity seen in vesicle transport, we want to make our themes match with popular destinations along certain lines in further stages of implementation.

For example, Line 1 of the subway is connected to a lot of museums (these include the Louvre, Pompidou, Grand Palais, and Petit Palais among others) and we hope to have a car dedicated to informing citizens of all the art exhibits they can see just a short walk from the metro stations. This museum - oriented themed car would contain brochures and pamphlets of the famous exhibits at these museums so that, for instance, if a tourist wanted to go to The Louvre, they could use the time they have in the metro to figure out which art exhibits are most worth seeing.

Another example would be installing a tourist car on the RER B with information about the city on the walls for those visitors who just landed at the airport and are trying to figure out what sites in Paris they want to see first.

Addressing Rush Hour

During rush hour congestion, from the hours of 8 - 9, 12 - 1 and 6-7, the idea of running themed subway cars seems much more difficult. However, because of our stress on maintaining functionality and creating a themed environment that has the ability to adapt to the amount of people commuting, through the use of foldable chairs and tables for example, we are confident that our cars could function during these hours. If anything, due to the presence of more foldable chairs in our art and music cars, the functionality of the metro would actually increase because more people would have the option of folding up their chair and standing up to make room for others. However, we do not plan to keep cars such as the music car operating all day, as that might become a nuisance for commuters who are traveling during rush hours and just want to find a place with the most amount of space. The music car would only play audio starting at 2pm as most commuters in the morning probably would not want to be in a loud environment. But, of course, as far as the other themes go, children can draw on the walls in the kids' car and commuters can enjoy the art gallery at any time of day.

Financial Plan

Subway cars are a major issue for smart cities. Beyond their gateway function in the metropolitan system, themed subway cars will contribute to the development of a new spirit and an increase in interaction within the subway, which will become a more emblematic place in Paris. Halfway between the “Grand Paris” project, and Metro 2030, the “Themed Subway Cars” appear like a great element of the modernization of services offered to commuters, since we know that there are 5.26 millions of commuters everyday in the Parisian subway in 2013.

1. **Identification of financial needs.**

Cost of operational work
→ Markings on the ground
→ Reconfiguration of seats in subway cars
→ Thematic facilities (setting speakers in cars, library facilities, art ...)

2. **Identification of preexisting resources.**

The resources of funding from the region Ile-de-France itself were identified as a priority: given the weight of the Capital Region in the French countryside, it is legitimate to call on national resources as a last appeal / solution.

3. **Parameters to be taken into account.**

Temporary closure of stations for the implementation of the project
Strengthening other means of transport to compensate to offset the closure

Figures

Operations	Costs for the period 2015 - 2018
Closing stations for work	8.5 Million euros
Strengthening other means of transport	9.6 Million euros
Operationnal work • Markings on the ground • Reconfiguration of seats in subway cars • Thematic facilities (setting speakers in cars, library facilities, art, equipment protection ...)	12.7 Million euros
Exploitation charges	8.1 Million euros
Network accessibility implementation	1.8 Million euros
Total	40.7 Million euros

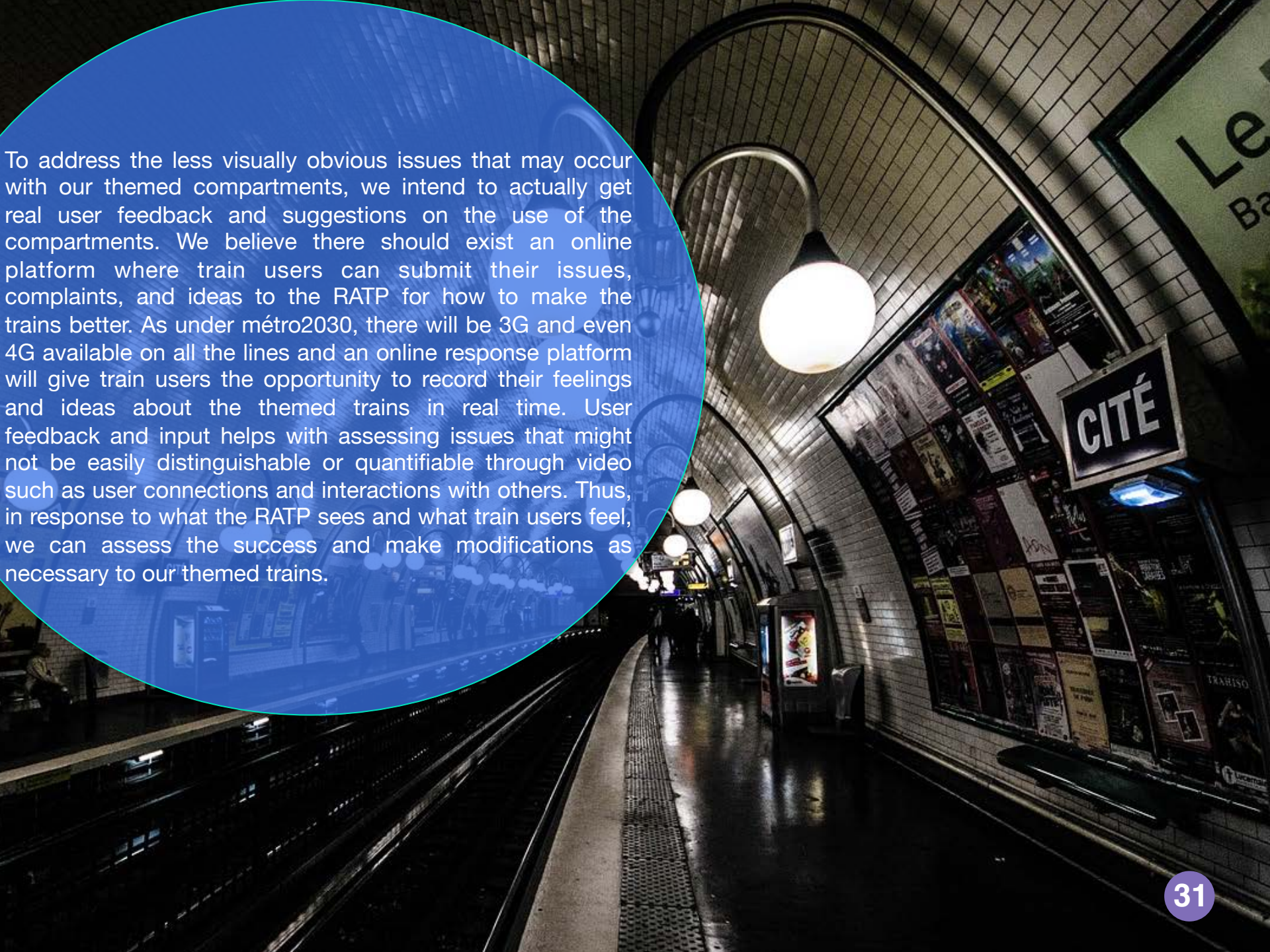
Assessment Plan

How Will We Know It Works?

At every step of the project, we will need to know if and how passengers are using our themed compartment to make any necessary modifications to the project.
To gather the necessary data on our car users, we propose that the observational data be largely collected through surveillance cameras installed on the train cars themselves. Surveillance cameras on metro trains have already been installed on several lines in Paris. However, we intend for the camera footage to be used to assess user participation and interaction.

Surveillance cameras already set up on line 2 in Paris.

Cameras would be quite useful in detecting obvious problems, such as zero ridership on themed compartments (we, however, do not foresee this as an actual problem). Cameras would, however, also be useful to inspect the proportion of riders participating and interacting with the themes, e.g. what proportion of users are playing music on our music car. Hopefully, through the cameras, we can observe if users are taking full advantage and enjoyment of the themed cars, and, if not, what appear to be the barriers preventing users from taking full enjoyment of the cars. As our goal is to foster connections in the Paris metro, we plan to observe the number of commuters engaged in social interaction in the themed cars and compare that to the normal cars. We intend for RATP officials to be in charge of monitoring as well as assessment of the surveillance footage.



To address the less visually obvious issues that may occur with our themed compartments, we intend to actually get real user feedback and suggestions on the use of the compartments. We believe there should exist an online platform where train users can submit their issues, complaints, and ideas to the RATP for how to make the trains better. As under métro2030, there will be 3G and even 4G available on all the lines and an online response platform will give train users the opportunity to record their feelings and ideas about the themed trains in real time. User feedback and input helps with assessing issues that might not be easily distinguishable or quantifiable through video such as user connections and interactions with others. Thus, in response to what the RATP sees and what train users feel, we can assess the success and make modifications as necessary to our themed trains.

Logic Plan

Actual Situation	Objective	What we want to do	How we will do it	Outcomes: Success Scale
There is a lack of interaction between people in the subway The diverse subway holds great potential for interaction The metro 2030 project is projecting to improve the metro greatly	Create clusters of interests in the subway to make social contact much more natural	Make sure that people know about the themed subway cars Make sure all the users know where the themed subway cars are Make the themed cars noticeable Change the car's interior layout to fit the theme	Start an information campaign inside subway stations and online Incorporate clear platform and on-screen signaling to indicate the location of themed cars Color or decorate the car according to the theme Make the seating and tables in the cars more flexible depending on how crowded the car is	Increased number of people using the subway A noticeably higher organization on the subway platforms because people would know where to wait for their desired car Higher number of interactions on the themed subway car compared to the normal car (as observed by on-train cameras)

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We hope that through these means we can truly live up the words of Stanley Milgram in creating a situation under the streets of Paris in which citizens will use this shared experience to create social connections that would otherwise pass them by.

FIN

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Themed Subway Cars