

PUBLIC SUMMARY

User Centered Design for a Flexible Train Interior

There is a large difference between peak and off-peak hours, both in type and amount of users. At the moment there's a structural shortage in capacity during peak hours. New trains are a big investment and the development requires a long process. The shortage in capacity results in a bad travel experience and causes a negative emotion and reputation for Nederlandse Spoorwegen (NS). On the other hand, more comfort should be offered when possible. This is why NS is interested in making the interior more flexible in capacity and comfort. Therefore, the goal of the assignment is to design a flexible interior for the intercity trains of NS, which is able to adapt on short term (peak and off-peak times) to changing needs, provide more capacity when it's busy and more comfort when it's not.

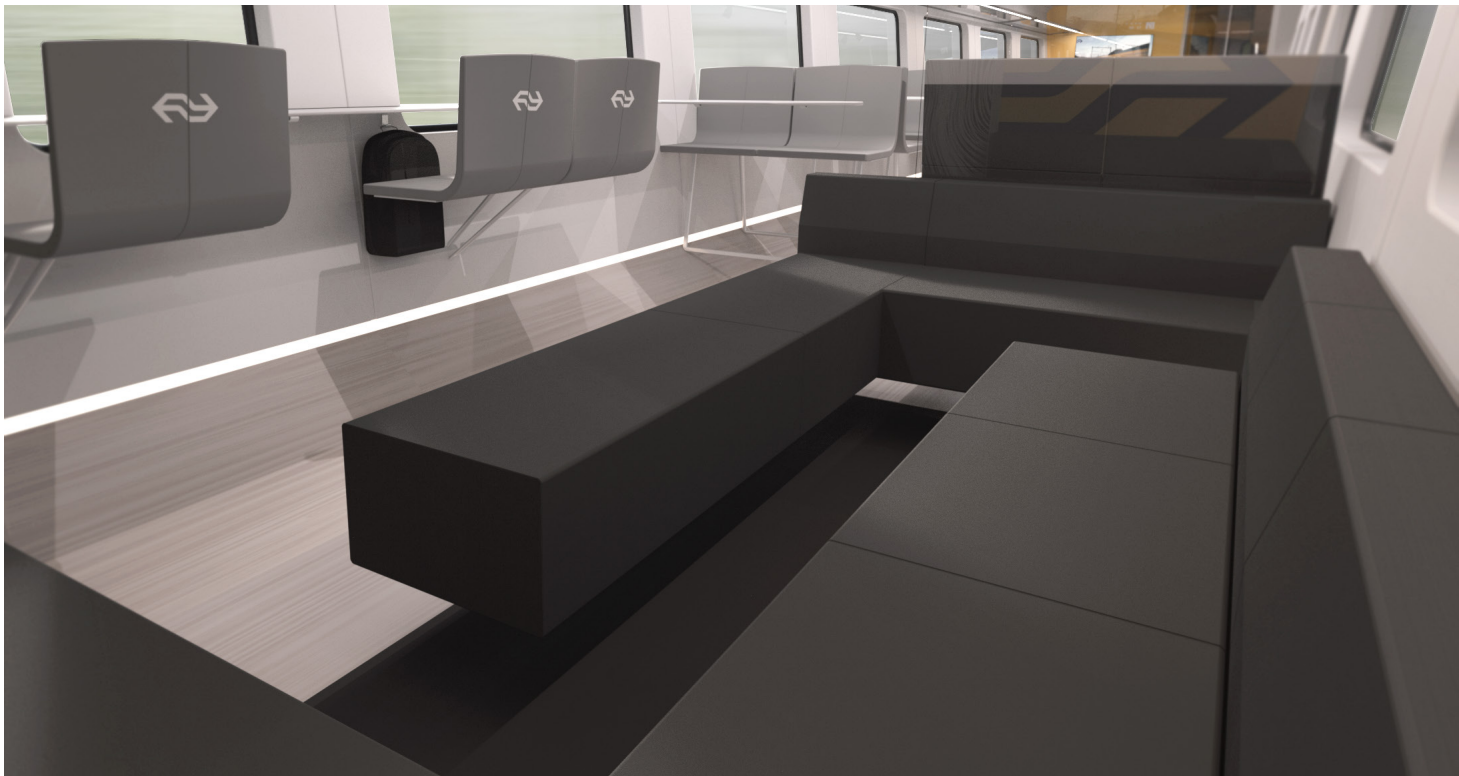


It's also important to connect better with the needs and experience of travelers. The target group can be categorized by character or reason for traveling. By categorizing by character it becomes clear that people travel in different ways and therefore have different priorities in their needs with regard to the journey. Besides character, travelers can be split in the categories lust and must. Must travelers are often required to use the train to get to school or work. Lust travelers use the train as means of transportation for recreational or social goals. The main activities which are being done in the train can be summarized in three groups: work, relaxation and social. There can be conflicting needs within the different types of travelers, which can cause displeasure and dissatisfaction. Seeing as the portion of the types of traveler fluctuates strongly during the day, it's a necessity to make places and surroundings flexible in activity.

Flexibility is doing more with less and can be defined as *(time x costs)* according to (Hashemian, 2005). This means the less time and costs there are to adapt, the more flexible something is. So something is most flexible if there are no

time and costs to adjust, which is called versatility. However, after research it has been concluded this only holds up when the satisfaction of the needs is equal. This is best illustrated using a sofa bed as an example. A sofa bed is regarded as more flexible than a regular sofa, because it allows for physical adaptation to provide more comfort while sleeping. This adaptation, however, requires time and effort, while a regular sofa can also be used for sleeping without adaptation. This shows something is more flexible when it takes more time and higher costs, but satisfies the needs better after adaptation. Therefore the satisfaction of needs has a positive impact on the flexibility. The new expression becomes *(time x costs + satisfaction)*. Flexibility is often more complex, because it allows to do more with less. This added complexity can cause a negative influence on the usability, which is called the flexibility-usability trade off. Within NS there are different layers of flexibility based on size and context, which are: strategic, renewal, seasonal and during the day. In the assignment the focus is on flexibility during the day.





New concepts for places and seats have been developed for the interior of the train with the acquired knowledge from the analysis and the goal of flexibility. Most of these have been designed to be versatile, which means they are able to adjust to multiple needs without physical adaptation. This means the staff doesn't have to be responsible for flexibility, because it doesn't require any complex operations. If travelers can be in charge of the flexibility, it means it can be applied on the smallest scale and the shortest term. The most realistic and combinable concepts have been developed in appearance and functionality. The concepts are aimed at different activities, while still allowing for the other activities, to create diversity and more comfort while not being restrictive. Besides that, other concepts have been developed to increase the capacity of a place towards the aisle to accommodate for extremely busy situations where people would otherwise have to stand in the aisle.

The developed concepts and boundary conditions for spacing and safety are the building blocks for the concept of the interior design. By changing the interior from orderly and structured to an environment with more attention and wellbeing for people and activities, the acceptance

and implementation of flexibility can be improved. More domestic, softer and friendlier for relaxation and social activities. Serious, balanced and clean for work. The designed concept is flexible in capacity and comfort due to the versatility of the interior and offers 24% more maximal capacity than the current interior in the train. This is a huge improvement considering the total amount of places this adds up to in an entire train.

The sofa offers more comfort for relaxation when it's not busy and more places when it is. The high table on the left offers more comfort in working due to its increased desk space. When it's more busy, the space in between the seats can be used to stand in and still be able to work on the table when there are no more seats available. The different kinds of places have been carefully balanced in the interior to maintain the freedom in activity while providing a more diverse offer. This proves flexibility doesn't need to cause a reduction in freedom of activity or comfort, as long as the user is put first.