Design Report for the Immersion Display Project

The ‘Immersion Display’ is an interactive touchscreen display that aims to immerse and engage museum visitors with a historic fact file, supported by imagery, and a sound simulation so that while visitors cannot physically go inside the vehicle, they can be transported right into the centre of it as it is being used in its era. To access these features easily, the digital screen would be mounted on a 1.5-metre tall display kiosk with a display screen on either side of it for maximum efficiency of use. Two pairs of headphones would be connected to the display so that visitors can walk up to the display, choose what engaging feature they want to explore and if needed, put the headphones on to experience the sound simulation. This display would be situated just in front of the train car so that it can be easily identified by visitors and used with ease.

Design Approach

In order to create this product, I decided to use desk-based research (full research notes available in the appendix) in order to set out basic design requirements such as: how long the design should take to access, what features it should have to make it accessible to all museum visitors and figure out what kind of interaction would be easy yet engaging for all visitor types to use (full set of design requirements available in the appendix). I then used this data to create a persona that I would use to base my user experience design. As well as this, in my product development I usability tested my product with three volunteers. To ensure that I did this ethically, I verified that they were over 18 years of age and were willing to test the design prototype for no more than five minutes which are both points that were included in the ethics checklist and consent form (full ethics documents can be viewed in the appendix). Below you can view the Persona made from my desk-based user research.

Persona - Derrick Jones

Profile:

Derrick is a 40-year old father of two boys. He enjoys railway history and culture as his father was a trainspotter and used to take him out trainspotting in his youth.

He is visiting York with his family for a short holiday and is taking them to the Railway Museum out of his own interest and also wanting to get his children engaged with the railway.

He is not well versed in advanced technologies such as VR, so he would want to interact with a product that doesn’t require too much technologic skill or understanding. His two children are 6 & 7 so he doesn’t want to overwhelm them with a product that takes away from the physical trains in front of them. He wants to be able to share the experience with his family and learn about specific trains that his father enthused about.

Design Statement

The National Railway Museum in York, as well as railway museums across the United Kingdom, face the problem of engaging their visitors with vehicles that are unable to be directly accessed by visitors. On average, the NRM (National Railway Museum) sees nearly 800,000 visitors in recent years (Wikipedia, 2023) and attracts people of all backgrounds such as railway fans, tourists, families and students. In order to enable these visitors to immerse themselves in the history of the inaccessible vehicles at the NRM, one must create an interactive product that not only educates but also makes up for the fact that visitors cannot experience the vehicle with their own senses. To solve this problem, I chose to create a product for the Dynamometer Car because of its rich history, and unique purpose of recording the power of a locomotive in a time when doing so was extremely beneficial to railcar companies and innovation.

Design Context - Research Examples

<u>The Natural History Museum Exhibit - Volcanoes and Earthquakes:</u>

The Natural History Museum in London has an exhibit called 'Volcanos and Earthquakes' that uses many different mediums to give the visitor a fulfilled experience. The atmospheric use of sound, including rumbling and volcano explosions, that is heard all over the exhibition gives the exhibit a deeply immersive effect which is passed to a wide range of visitors because of its simple function of listening. As well as this feature, at the end of the exhibition, there is an Earthquake simulation that features the set of a Japanese convenience store, with the real footage from the original store's CCTV camera being located on a screen. This enables the visitors to associate the simulation with the real historical event and become even more immersed in the exhibition as a result. This sense of realism is beneficial in immersing the visitor and should be a key point for me to focus on when creating my prototype.

<u>The Tate Museum Exhibit - Susan Philipsz 'War Damaged Musical Instruments':</u>

According to the Tate Museum's article on this exhibition: "War Damaged Musical Instruments features fourteen recordings of British and German brass and wind instruments damaged in conflicts over the last 200 years. The notes recorded are based on the tones of the military bugle call 'The Last Post', but the tune is fragmented to such an extent that it is almost unrecognisable. The tune signalled to lost and wounded soldiers that it was safe to return to base and is used today as a final farewell in military funerals and Remembrance ceremonies." (Tate, 2023). This exhibit by Susan Philipsz also uses sound to immerse visitors in the historical memory of these musical instruments, providing a powerful stimulus of emotion because of how fragmented the notes are. The use of sound to provide historical and artistic context is quite powerful in terms of immersion, and could be a key point that I could use in my prototype to give the visitors of the NRM a lasting experience.

<u>Grand View Research - Interactive Kiosk Analysis:</u>

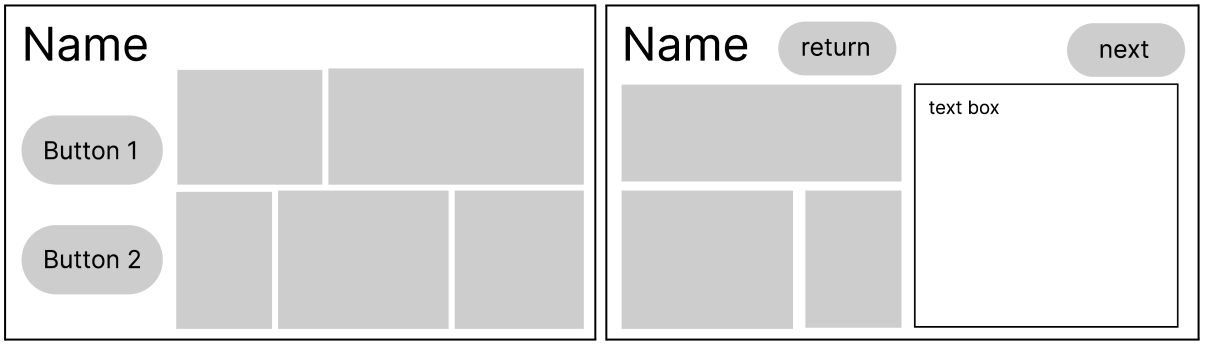
This research example relates to the prototype's physical installation: the research report by Grand View Research infers that interactive kiosks are at the forefront of customer interaction in the 21st century. In 2021 the global interactive kiosk market size was valued at USD 28.45 billion and is projected to expand at a compound annual growth rate of 7.1% from 2022 to 2030 (Grand View Research, 2023). This growth is due to the benefits of interactive kiosks providing a much quicker and digitised customer experience, lessening the amount of human interaction needed for hospitality experiences. The report highlights that in

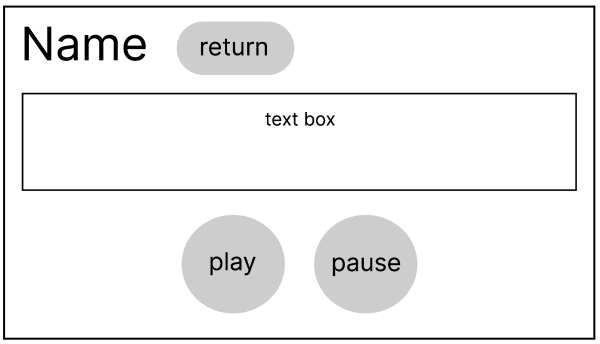
this current age, kiosks are easy for a wide range of the public to use because of their limited functionality and therefore easy to understand interface, as well as their ability to be implemented in many industries. This research has helped to inform my choice of physical prototype installation within the museum, as using a product such as an interactive kiosk allows the prototype to be easily accessed and installed.

Development Process

Wireframes

After conducting product and user research, I started my development process by creating wireframes of what the product screen would look like, incorporating the three main areas that the user would interact with: the home screen, history section and simulation screen. These wireframes were made with the software Figma and they can be viewed below.

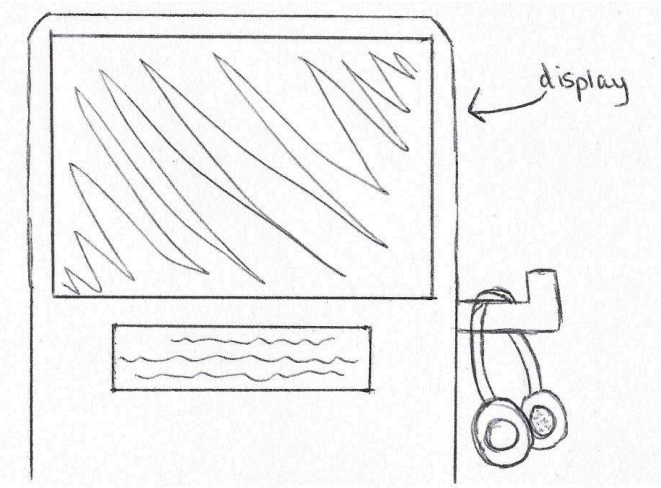




The first wireframe structures the home screen, with two buttons leading to the historical fact file and sound simulation. Beside the buttons, there are images of the Dynamometer car for the user to view before they choose what function they want to experience. The second wireframe structures the historical fact file; having information about a specific area of the dynamometer in the text box on the right and accompanying images to the left. There is a ‘next page’ button for the users to easily navigate and a ‘back to home’ button that is quickly accessible. The third wireframe structures the screen for the sound simulation, featuring a short description of what the simulation is along with ‘play’ and ‘pause’ buttons for the user to interact with.

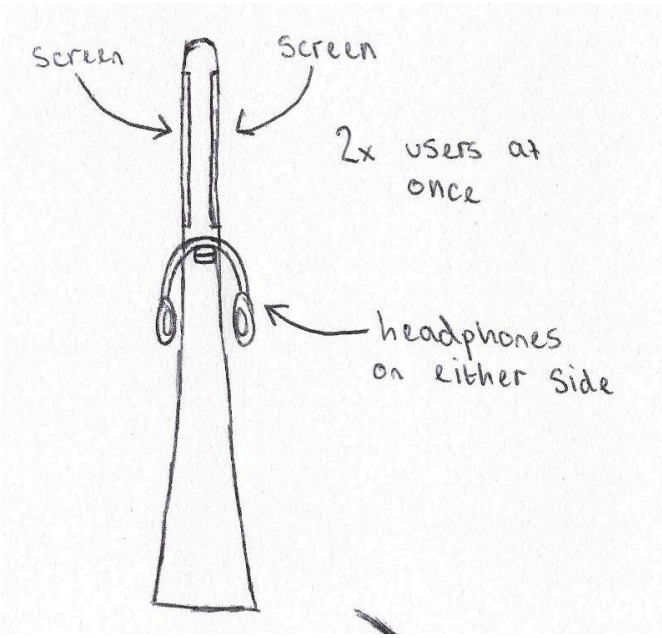
Storyboarding

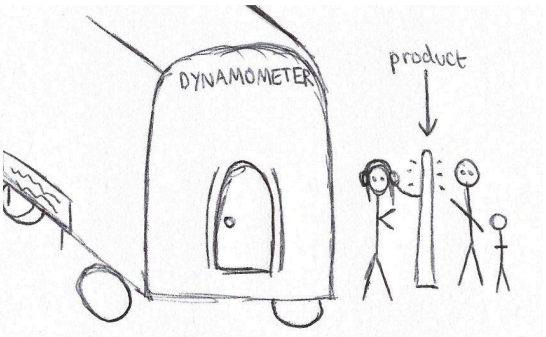
Along with these wireframes, I also storyboarded and created sketches of how the user would interact with the product and not just the screen display alone, as this product needs to be physically installed in the museum. Below you can see sketches and explanations of why I decided to model the product the way it has been imagined.



Firstly, this sketch depicts the screen display mounted on a standing obelisk that also has a small stand on the side for headphones to sit on. The screen will be accessed by touch interaction such as tapping so that no external technology is needed apart from the screen itself.

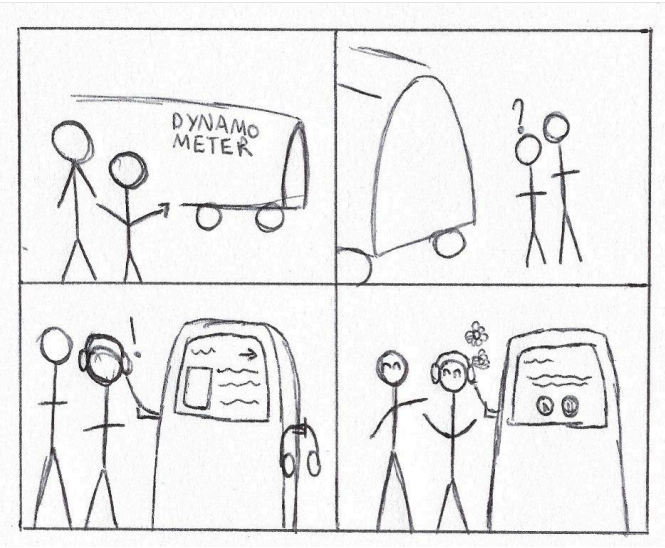
The next sketches depict how the user would interact with the product, as well as the key features of the product such as; the obelisk having a screen on either side of it so that 2x users can





access the product at once and the headphones being accessed via a small stand that is either side of the obelisk.

I also storyboarded how the user would find the product useful, which you can see to the left, of how they would spot the dynamometer and wonder what it was used, finding the product in order to learn about the dynamometer's history and listen to the sound simulation to build a well-rounded picture of how the dynamometer was used and why it is an important piece of history.

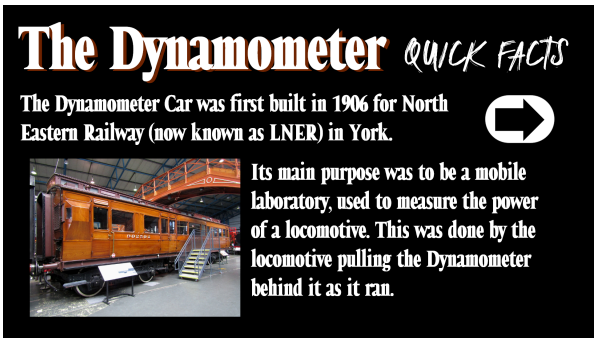


Prototyping

Once I had finished sketching how the user would interact with the product, I used these sketches and the previous wireframes to make the first iteration of the design for the display. Below you will find screenshots of this first design along with an explanation of why some design choices were made.

The screenshot to the left shows the first design iteration of the home screen. It features the name of the train car that the product is about as well as the buttons for the 'quick facts' section and the 'sound simulation'. Two images are also featured, however, more will be added to give the user plenty of imagery to look at.

Below are the first design iterations for each feature section, following the wireframes as closely as possible. The fact file section used research that was made accessible by the NRM, making sure to include the key information that was provided which would be the most useful for a large number of users to enjoy reading (ie. nothing too technical).



Usability Testing

In order to consider changes and also identify any issues with the prototype design, I decided to user test with three volunteers that spent no longer than five minutes analysing the design and providing user feedback. I made notes of the feedback from each volunteer which you can see below. (full ethics documents are available in the appendix).

Volunteer 1

- I appreciated the design style, but I think it is too flashy for all types of people to enjoy, so a simpler design may be better
- some of the transitions weren't the same
- there are no home buttons on the fact file slides so if someone didn't want to read anymore they couldn't go back to the home page without going through all the slides.

Volunteer 2

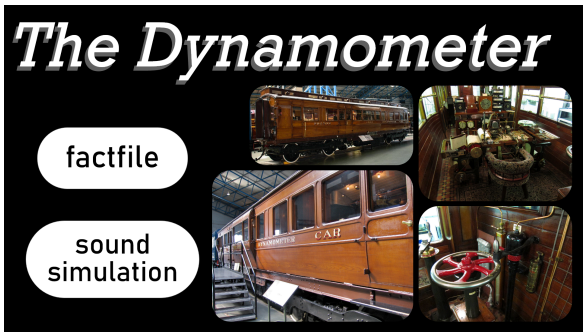
- at first, I didn't know if the words on the home page were buttons or not, so I didn't know where to click.
- I like the idea of a sound simulation, it sounds very interesting and it's a quick way to get immersed without having to put on a clunky headset or anything like using a keyboard which I wouldn't know how to use.
- the sound simulation needs a better home button with fewer words

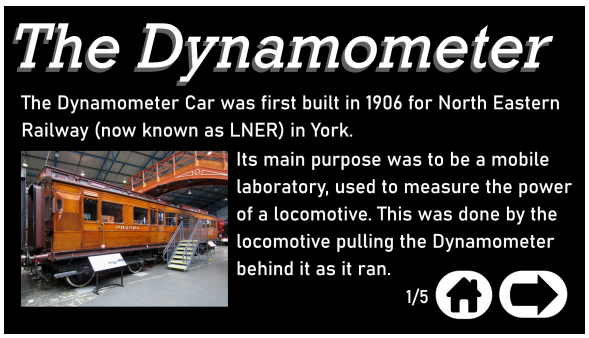
Volunteer 3

- the font in the fact file is slightly hard to read, for people with poor eyesight like me it would be better to have a more standard font than something artsy.
- the next button in the fact file moves around a bit and is in an awkward position I think so it would be better if it was in a specific place.

Second Prototype

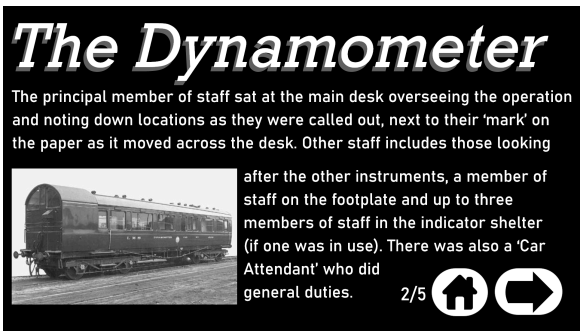
By utilising the usability testing feedback, and also making a checklist of every function that the prototype needs to serve, I created a second iteration of the design which you can see below. The design is now a lot sleeker and simple, getting rid of unnecessary fonts and giving the design a cohesive structure for the user to easily understand and navigate.

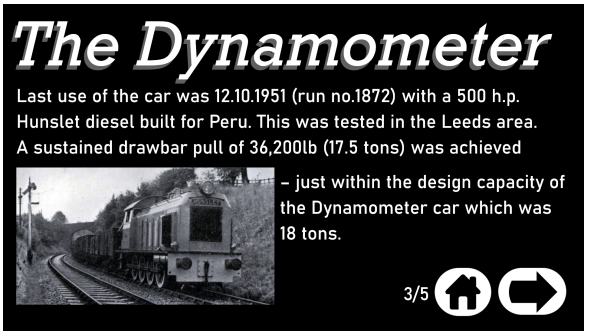


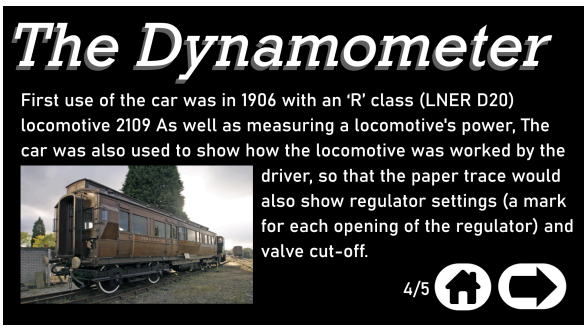


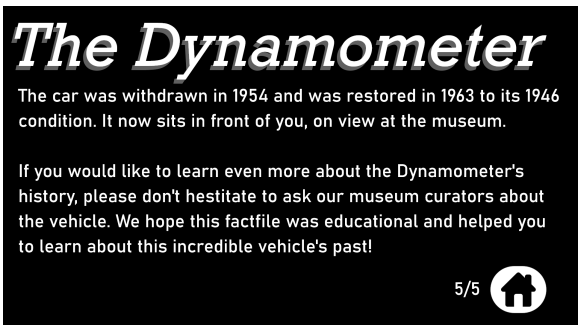
On the home screen, the buttons for each section are now clear for the user to identify, and there is a range of imagery that shows the inside of the car as well as the outside. The title has also changed to become much bolder and more recognisable. The fact file section of the product has a cohesive design and the font is now easier to read which was fixed upon it being pointed out in the usability feedback. There are also clear 'next' and 'home' buttons on the bottom right of the screen that stays in the same static position so that the user does not get confused, which was another feature that was fixed upon the usability testing feedback. On the sound simulation screen, similar changes were added including the fonts and the addition of a clearer 'home' button for the user to access better.

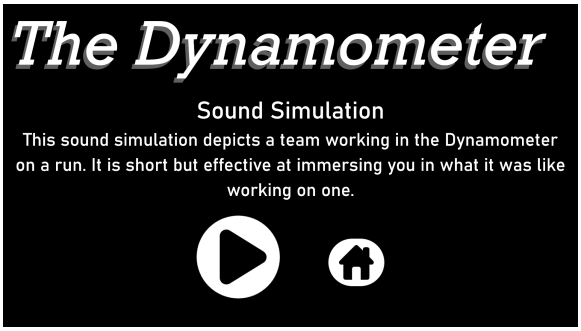
This iteration of the design was changed slightly in order to give the final iteration of the product, with changes only being made to component positioning and the colour of some elements. You can view more screenshots of the second design iteration below.







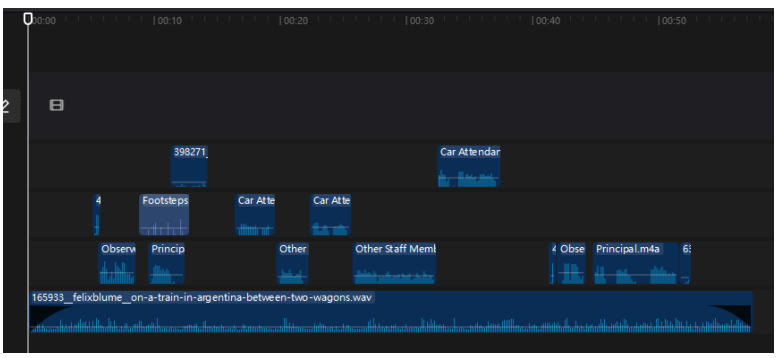




Making The Sound Simulation

In order to give the user a realistic immersion when they listen to the sound simulation, the content needed to be historically and mechanically accurate. Before anything, I devised a script of what sounds and dialogue could be included in the simulation to make it as effective as possible. I decided on portraying a short narrative between the staff on the train car as they are recording each quarter mile (view the full script in the appendix). When it came to recording the dialogue, I knew that the product had to be historically accurate which is why I asked two male family members to record the short dialogue parts for no more than two minutes of their time. The reason I could not record the dialogue myself is that it would compromise the historical accuracy of the product greatly due to the era in which the train car was most in use having different societal values than today. To record the dialogue I used a smartphone and uploaded the files to my computer in post-production.

To assemble the clips together, I used a post-production software called CapCut. Along with the dialogue, I used several sound effects and open-sourced recordings to make the simulation realistic and give environmental effects (see reference list). Furthermore, I also edited the dialogue recording so that the voices are different to the original, either in octave or speed so that the conversation flowed smoothly, and the characters can be distinguished better. Most sound effects are necessary to enhance the historical accuracy of the simulation, for example, the 'clicks' that you can hear before one of the staff members call out a quarter mile is a similar sound to that which a bulb switch makes (a bulb switch is what the observers on the train car used to call out quarter-miles to the principal).



Here you can see a screenshot of the audio composition as it has been edited in CapCut.

Critical Reflection

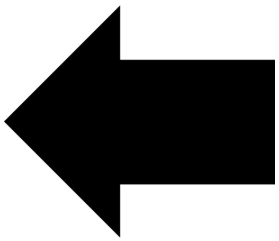
Holistically, this interactive media prototype provides a successful interactive experience that would appeal to a wide audience. It not only provides an easily accessible source of historical information about the Dynamometer car, but also provides the user with an immersive sound simulation that allows them to experience the environment that the Dynamometer car once fostered. The prototype has a modern and easy-to-navigate interface that any age group can use without obstruction, and also allows the product to be reproduced and possibly used for other train cars in the museum without much change to the design. Furthermore, the prototype's physical concept design does not take up much museum space and would be able to blend into the museum's environment well.

Despite the prototype's success, there are areas for improvement. If I had more time to develop the prototype I would add features such as a moveable 3D orientation of the train car to allow users to view all workings of the vehicle. While creating this prototype, there have also been some difficulties such as modifying what the simulation feature would offer to the user. Originally, I wanted to focus on the imagery of the simulation, however, after researching 'War Damaged Musical Instruments' I realised that the potential of sound simulations, not to mention the immersion, can be infinitely more efficient at stimulating a response from the user. This meant that I changed my intentions for the project after a week of planning and ideation, however, the end prototype is much more immersive because of it, so I do not regret this choice of development.

Word Count: 2512

Reference List
Prototype:

Image/Description	Source	Location in prototype	Licence
	https://en.wikipedia.org/wiki/Dynamometer_car	Home screen	Personal/Fair Use
	https://www.hattons.co.uk/directory/vehicledetails/3144792/lner_dynamometer_car	Home screen	Personal/Fair Use
	NRM Resources Shared File Dynamometer < Images	Home screen	Fair use
	NRM Resources Shared File Dynamometer < Images	Home screen	Fair use
	https://www.flickr.com/photos/doctor_dave/26392643915	Factfile	Personal/Fair Use
	https://www.prclt.co.uk/45050-dynamometer-car.html	Factfile	Personal/Fair use
	NRM Resources Shared File Dynamometer < Reading Resources < Vehicle Information	Factfile	Personal/Fair use

	NRM Resources Shared File Dynamometer < Reading Resources < Vehicle Information	Factfile	Personal/Fair use
	https://commons.wikimedia.org/wiki/File:Home-icon.svg	Factfile & Sound Simulation	Personal/Fair Use
	https://www.flaticon.com/free-icon/left-black-arrow_46441	Factfile & Sound Simulation	Personal/Fair Use
Train Rumble	https://freesound.org/people/felix.blume/sounds/165933/	Sound Simulation	Personal/Fair use
Light Pulley Switch	https://freesound.org/people/InspectorJ/sounds/414434/	Sound Simulation	Personal/Fair use
Pencil Writing Sounds	https://freesound.org/people/InspectorJ/sounds/398271/	Sound Simulation	Personal/Fair use
Paper Turn	https://freesound.org/people/flag2/sounds/63318/	Sound Simulation	Personal/Fair use
Footsteps	‘Footsteps stop’ sound effect in the CapCut Library	Sound Simulation	Personal/Fair use

Report:
National Railway Museum
Wikipedia, 2023
https://en.wikipedia.org/wiki/National_Railway_Museum

Susan Philipsz: War Damaged Musical Instruments
Tate Museum, 2023
https://www.tate.org.uk/whats-on/tate-britain/susan-philipsz-war-damaged-musical-instruments#:~:text=War%20Damaged%20Musical%20Instruments%20features,that%20it%20is%20almost%20unrecognisable.

Interactive Kiosk Market Size, Share & Trends Analysis Report By Type (Self-service Kiosks, ATMs), By Component (Hardware, Services), By End Use (BFSI, Healthcare), By Region (APAC, EU), And Segment Forecasts, 2022 - 2030
Grand View Research, 2023
https://www.grandviewresearch.com/industry-analysis/interactive-kiosk-market

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