Abstract— One of the largest railway museums on the continent is located in the city of Vilanova i la Geltrú, Spain. The Catalonia Railway Museum has cooperated with EPS students from UPC Vilanova for a third consecutive year this semester. Previously, the collaboration between the museum and the students has resulted in improvements to the visitor’s experience and the museum’s visibility both inside the museum’s locals and on the web. This year’s objective was to design, develop and launch a web tool. The web tool will function as a forum and allow for a fast, private and easy communication. It will stand as the largest meeting spot for railway museum personnel in the world. The main requirement was to make it as user friendly as possible. To meet this requirement, questionnaires and testing of prototypes were completed by different railway museum employees and professionals within different fields. The web tool was developed and launched under the name ‘Elephorum’. (Keywords- Railway museum, Web tool, user friendly, railway museum personnel, Elephorum)

I. INTRODUCTION

Within the European Project Semester (EPS) program at Escola Politècnica Superior d'Enginyeria de Vilanova i la Geltrú (EPSEVG), a team of students was working together with the Catalonia Railway Museum to create a web tool for communication between railway museums all over the world.

A. Background

The Catalonia Railway Museum, located in the City of Vilanova i la Geltrú, is one of the biggest railway museums in Europe. The museum opened in August 1990 as a result of a project initially developed by RENFE and la Generalitat de Catalunya, and later joined by the town council of Vilanova. Today, the museum is managed by the Fundación de los Ferrocarriles Españoles and is part of the Catalan Science and Technology Museum System.

In the museum, 160 years of railway history is on display and the chance to explore over 50 vehicles including a collection of 28 steam locomotives is on offer to visitors [2]. This is the third consecutive year that the museum has cooperated with EPS-students from EPSEVG. Earlier, a smartphone application and a website was developed to make the guests’ museum experience as exciting as possible. This included the experience before entering the museum, while staying and after the visit.

B. Project aims

This year the museum wishes to reach out to their colleagues both nationally and internationally. The reason for this is that currently, railway museums around the world have no common platform for communication. They run independently, with none or minimal interaction with one another. There are existing sites on the web where museum personnel can meet, but those sites are open for everyone interested. The idea behind this project is to find a meeting spot on the web for railway museum personnel only; this to filter out unwanted guests and keep the topics on the web tool relevant to the daily drift of a railway museum. The lack of a common communication platform is unfortunate because, on a global level, there is always something to learn from your colleagues. This may include how to run the business, how to organize exhibitions, creating fun and interesting activities for the visitors, and other things.

In cooperation with the Catalonia Railway Museum, the main objective for this project was to create a web tool to give railway museums an opportunity to share ideas, knowledge, and experience with colleagues across borders. The web tool will function like a forum, it will give the opportunity to open discussions regarding different topics, share pictures, and other things of interest. The forum will be private and only accessible for railway museum personnel. Employees can join by sending a request and receiving an acceptance by the admin or by being invited by an admin.

There will be many who will benefit from this project, first of all, the communication director and the main director of the railroad museum in Vilanova, because they are getting a communication forum of which they are the admins from the beginning. After that, the people who will benefit the most are the communications directors and the main directors of railroad museums all over the world, because all of them are then able to communicate easily with other museums and because of that, improve their own museums.
II. METHODS

A. Prototyping

Prototypes, based on different heuristics and best practices, were made to obtain the best result. As Jakob Nielsen explained in his book “Usability Engineering”; prototypes save time for the next stages at the developing. The prototype is focused on functionality, order and position of the elements and the usability.

![Figure 1. The home page of the web tool [1]](image1)

The prototype was an interactive horizontal prototype, realized with a program called Axure. This kind of prototype made it possible to create surveys and receive feedback to improve the final product. Horizontal prototypes are prototypes with the features but without the depth of every functionality [2], [3].

![Figure 2. The admin panel of Elephorum [1]](image2)

B. Design

The second and most important part for the recognition is the design. The design is based on the final prototype. All shapes, colors, and single elements were changed at this stage. The only thing that stays the same as in the prototype is the order of the single elements. The chosen primary color is the same color as the background color of the logo of the Catalunya Railway Museum, “Pantone 123C”.

![Figure 3. Pantone 123 C](image3)

In order to help the programmers to implement the design into the code, a grid system by 960gs was used. The dimensions of the grid system is a 12-column grid [4].

![Figure 4. Design with the 960 grid system](image4)

1) Color blindness

Due to the vast amount of people that will use web tool the possibility exists that several people might have a visual handicap. Paleton is a web page to simulate different visual handicaps and check if the colors might be bad for a number of people [5].

![Figure 5. Users with full Achromatopsia (unable to see color) [5]](image5)

C. Technical aspects

The largest part within the project was to implement the design and all the usability from the prototype into code.

1) Backend

The backend or server-side is the part that the user is not allowed to directly interact with. Sensitive data is stored on the database and could be a security issue if the user in direct communication with it [6]. In order to make the backend secure and send the right data to the end user, an interface was implemented. The interface is a so called representational state transfer application programming interface (REST API). The main function of a REST API is to send data between the
frontend and the backend and to ensure that the right data is transferred. Lumen, a micro framework powered by Laravel, is optimized for REST APIs and has therefore been used for the web tool. A comparison with other frameworks showed that Lumen is the fastest of them all [7]. The hypertext transfer protocol (HTTP) makes it possible to send requests to the REST API with different HTTP Headers or HTTP Methods [8].

Figure 6. JWT encoded and decoded [9]

In this case HTTP Headers are used to check if the logged in user is able to see the requested content. The JSON Web Token (JWT) is used for the authorization. With JWTs it is possible to send encrypted data in the payload, as displayed on the right side in Figure 6 [9].

GET, POST and DELETE HTTP Methods are used to handle different kinds of interaction at the backend. Each of the methods has its own feature:

a) GET
GET Methods are used to receive the modified data from the database.

b) POST
POST Methods will create new or update already active content to the database.

c) DELETE
DELETE Methods are for deleting already stored content in the database [8].

Figure 7. HTTP Methods from the API documentation made by Swagger

In order to get an overview of all HTTP Methods and API requests a documentation was made using Swagger. Swagger is a tool to document and test the API and the requests. The documentation on Swagger is fully written in “YAML Ain’t Markup Language” (YAML). In Figure 7 a short insight into the Swagger API documentation is displayed [10], [11].

2) Frontend
The frontend is the part where the user is allowed to interact with the content and manipulate data, if the user has permission to do so [6].

a) The chosen framework
For the frontend AngularJS is used, which is a JavaScript framework developed by Google Inc. (“Google”). AngularJS was chosen due to the fact that it has a big online community and add-ons to achieve a good result in little time. Speed and components are a plus for AngularJS.

b) Error messages
There are two different types of error messages in the entire web tool. On the one hand there are forgotten input fields or wrong emails, which are displayed as red highlighted text and on the other hand there are 404 pages, if the requested page is either not found or does not exist anymore.

c) Responsive design
The responsive design means that the web tool will adjust to all kinds of devices, such as smartphones, tablets or computers, and will work on all of them. To make this possible in the frontend, Foundation 6, a framework from ZURB, has been used. A special grid system made it possible to adapt it to every device [12].

3) Translation
First the translations were made with internationalization (i18n) to translate the static words and descriptions into different languages. In order to offer every language, it requires a lot of effort to translate it to every language manually. Since we don’t possess the means to manually translate the content to every language, the web tool is using the Google Translate Widget instead. It is able to translate the entire page, including different languages and the same time, in over 100 different languages [13], [14].

D. Brand

1) Name
The goal of this web tool is to become a well-known global communication platform that connects railway museums across the world. In order to do this, a memorable and unique name had to be invented to represent the brand.

The chosen name “Elephorum” is a composed of the two words “elephant” and “forum”. The word “elephant” refers to a steam locomotive designed by George Stephenson. This locomotive represents an important day in the history of railways as it was used to transport the first passengers of the first steam passenger railway in continental Europe on the fifth of May 1835 [15]–[17].
2) Logo
To complement the new name and to promote instant public recognition, a new logo was designed. The logo consists of two parts: the isotype, which refers to the graphic, and the logotype, which refers to the text.

a) Isotype
This consists of two overlapping speech bubbles with the larger one containing the silhouette of a locomotive. The speech bubbles were chosen to indicate that the web tool is a platform for conversations. Their shape and proximity represent the closeness created by communication. The silhouette of a locomotive was added to show that the web tool is created for railway museums and the content of the forum will be related to this theme.

b) Logotype
This part of the logo consists of the name of the web tool “Elephorum”. The font family used for the text is called “Raleway”. This is a sans-serif font, to denote the seriousness of the institution, with a semi bold italic format to give an aspect speed. This typography is distinguished by its simplicity, sobriety and professionalism, which allows the costumer to read it easily.

To combine the isotype and the logotype, the “o” in “Elephorum” can be replaced with the isotype. It is possible to use the logo horizontally instead of vertically, which was impossible with the Catalunya Railway Museum logo.

III. RESULT
The new logo and name gave the web tool a different look and feel. Over 100 languages are supported, using the Google Translate Widget to make sure that more people can use the web tool across the globe.

On the landing page, the user can choose to log in if they already have an account and have been accepted, or they can navigate to the signup page to register. After the user registers, the admins will be able to accept or deny his request to join the web tool. When accepted, the user will receive an email and from that moment he will be able to enter the web tool.

The home page is always showing the latest missed comments and topics, so the user is able to follow up what is missed by the last login. When clicking on the magnifying glass icon a search bar will appear where the user can find people and companies, and go to their profile page.

The forum is accessible from the “Forum” button in the navigation bar in the header of the page. Here, the user is able to browse through the different categories and subcategories. In each subcategory, a normal user will only see the topics visible for everyone or the ones for his job or company. Admins on the other hand are always able to view all the topics. The user can also add a new topic and choose whether they want the topic to be visible for everyone or select jobs and/or companies they want the topic to be visible for. When commenting on a topic, it is possible to add images or documents, although the amount and size of the attachments is limited.

By clicking on their profile picture in the header, admins can navigate to the admin control panel where they can manage and add new jobs, companies, and users. Company admins are only able to invite people to their company, while admins and superadmins are able to invite anyone regardless of their company. Superadmins also have the possibility to change the user roles and make other people admins.

IV. CONCLUSION
The aim of this project was to create an online platform to facilitate communication between railways museums around the world. To develop this web tool, various prototypes were made of which the final one was converted to a graphic design. A questionnaire was conducted to evaluate the user interface and to identify any unclear aspects of the functionality of the prototype. The survey was completed by different railway museum personnel, since they are our target group. Using these results, the frontend was modified to optimize the user experience.

A new logo and name have been created to promote instant public recognition and to emphasize the global aspect of the web tool. In addition, google translate was used to transform the web tool into a multilingual platform that can be used by people regardless of their native language. This enables people from different parts of the world to communicate with each other without the need of a shared language.

The objectives of the project, namely creating a private and professional online platform were users can open private and public topics to have discussions, and share ideas, pictures and documents have been met. With the help of this tool, the Catalonia Railway Museum can start their journey to unite railway museums across the globe.

Figure 8. The home page including the new logo
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VI. REFERENCES

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