A study of interaction in the Catalunya Railway Museum of Vilanova I la Geltrú

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Abstract— El Museu del Ferrocarril de Catalunya has one of the most renowned and largest train collections in Europe. In order to improve visitor experience, the museum wants to offer new initiatives and services that would make the visit to the Museum a more interactive and educational resource. The aim of this project was to improve the experience, through the application of user centred design and embracing contemporary technology. In order to develop the project, various research methods were used, including questionnaires, focus groups, expert reviews, and creative sessions. Based on the outcomes of this research new interactive technologies were investigated to decide on the most suitable solutions for visitor experience enhancement. The research lead to two separated results and advises for the museum.

Keywords— Creative session, Smartphone application, User experience, Interaction technology.

I. Introduction

CHONTINIOUSLY improving the user experience" is a sentence one could hear in every type of museum around the world. There is a global need of continuously improving user experience based on the feedback of the customers. Since the popularity of visiting museums under the current generation is decreasing, the user experience becomes more important.

To improve the user experience the current problems had to be defined. The majority of the museums choose to be informative in an interactive way. Many museums launched their own applications to provide practical information but also interactive ways to make the visits more interesting. An example of implementing interactive technology into a museum is also leap motion and Kinect. Leap motion and Kinect are gesture-based technologies. Using these technologies will improve the experience for the users because it allows them to experience a different way of visiting a museum.

The Museums Association (MA): "Museums enable people to explore collections for inspiration, learning and enjoyment. They are institutions that collect, safeguard and make accessible artefacts and specimens, which they hold in trust for society.
Museums are stepping up to the mark by installing new ways of improving the customer experience. They are installing new state of the art interactive technology such as augmented reality, multimedia installation and image recognition."

The research has been done for 'El Museu del Ferrocarril de Catalunya' which is located in Vilanova i la Geltrú. It is the most important railway museum of Catalunya and one of the biggest in Europe. The museum is located next to the train station of Vilanova i la Geltrú and it is a former station depot, well known for their roundhouses, the museum is famous for their unique and historical collection of 160 years railway history.

Since 1848, the year in which the first railway was introduced, train transport has transformed the country, revolutionizing the customs and traditions of individuals and towns, alongside the urban structure, the landscape and the economy.
The museum's main aim is to open up the fascinating world of the railway and its main attractions to all. To do This, the museum acts as the guardian of an exceptional heritage, documenting it, raising awareness and building a space that actively conveys the values embodied by the railway.

The museum wants to be the benchmark cultural Centre for railways in Catalonia, and offer a unique experience that can be adapted to different types of visitors. To make this possible, they include activities for families. These include audio-visuals, exhibitions, fun areas for kids, shop, library, and the chance to explore the more than fifty-two vehicles on display, including a collection of some twenty-eight steam locomotives, the biggest collection in Europe, and so to discover what travelling was like from the second half of the 19th through to the 20th century.

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II. GOAL AND OBJECTIVES

The museum wanted to offer its visitors new initiatives and services that make the visit and the Museum itself as a cultural and educational resource. One of the main functions of the Museum is to preserve the guarded heritage, but also to encourage diffusion of this heritage among present and future generations.

It was important to find out if there is a need for "smart technologies" like smart phone application, leap motion and Kinect or if it would be a waste of investment. The main goal of the research was to find out the best way to improve the user experience and the interaction of the railway museum.

III. HYPOTHESIS

Visitor's experience could be improved by the use of a smartphone application; this application would replace the audio-guide and give the visitors further information, allowing them to follow specific areas that suit their interests. This application would also make the experience an interactive one. Another way was enhancing the way finding. Currently there is no clear way finding and visitors find it difficult to find their way through the museum and even walk past the reception at the entrance. With the help of guidelines this problem could be solved.

IV. METHODS AND OUTCOMES

The main research question of the research is as follows: '' *how can the user experience and interaction of the museum visitors be improved*'' the main research question is divided into several sub- research questions. By answering these sub-questions it allows the researchers to answer the main question and the predetermined hypothesis can be checked if they can be accepted or rejected. For this research four methods were used.

A questionnaire is a (digital) research instrument that can be answered fast (and remotely) by its respondents. It consists of a series of questions, often with multiple-choice, propositions and Likert scales[i], for the purpose of gathering information. The data from the questionnaire is quantitative and is often used to support other research methods.

The conclusion from this research method is that the main attraction of the museum is the locomotive collection and the possibility to have access of all the individual trains, the visitors would like to experience the different timeframes of the trains and it would feel like as if they were stepping back in time of the era of the locomotive.

There is a need of a better layout or signage to guide the visitor's trough the museum and the main exhibition areas.
The entrance and the children area has a regular impact on the visitors, it's the first thing they see when they enter. It's a blast of colour from the playground. Most of them would prefer to have a setting more oriented to the era when the building was used originally.

A focus group is a form of qualitative research wherein a homogeneous composite group consisting of 5 to 10 participants. The group will perform a carefully planned discussion about their ideas, motives, attitudes, believes, interests and way of thinking about a defined area of interest such as a product, concept or service in an interactive environment. The participants are allowed to interact freely with the other members; the discussion is guided with the help of a topic list and a facilitator.

The focus group was held on Thursday, April 10th at the library of the Railroad Museum. The facilitators led a group of six respondents in the content of the research. To give respondents a visual support a mood-film (film about the team to set on the mood) was shown. This film consisted of the history of the railroad in Catalonia. After seeing the film the group was asked to create a mind-map on an A4 size paper about how their perfect museum would look like and all its requirements. When everyone had finished each of them were asked to discuss what they had written down and why it was important to them.

With this previous research it is determined that the most significant and enjoyable part of the museum are the trains and the possibility to inter the carriages and interact within them. Taking this in account several solutions would be proposed with the aim to improve this experience and create new experiences that are now not possible, for example the ability to drive a train, or to implement more characterization of each train.

The solutions will be discussed in creative sessions and implemented to know the strengths and weakness of them with the help of prototypes so that at the end a suitable option to implement in the museum can be given.

On the other hand for the usability problems or weaknesses (layout, atmosphere and graphic information) prototypes will also be made and tested to improve the missing experiences and to recreate a more fulfilling experience in overall.

Observation is a method for collecting data about processes, people in qualitative research. Observing is watching how something happens or how someone is behaving. The observations can be done by observing and participating or observing alone. Observations can have several forms; in this research a participating observation will be conducted. This means that the researchers are involved within the situation of the observation.

An expert review is a flexible method to research the usability and user experience. Evaluators that are familiar with heuristic evaluation do this review. A heuristic evaluation is a usability inspection method that helps to identify usability problems. For this research the heuristics principles by Molich and Nielsen (1990) were used.

V. New ways to interact

Leap motion is a new technology designed by an American company that supports hand and finger motions. There is no physical mouse used, just hand gestures in front of the computer screen without no hand contact or touching. All control is in in the movement of the hands and fingers. This technology is been used in some museums to improve the victors experience and allowing interacting with the exhibits. The Allard Pierson museum in the Netherlands uses this technology. Leap motion was used in the exhibition Eternal Egypt experience

The leap motion Technique has made it possible to see the colours that once were used visible on Egyptian reliefs. With this technology you can use your hands by pointing at an object, the sensor makes it possible that a projection is shown the original painting on the relief. This is a way for the visitors to interact with the museum.

Kinect is a new technology that some museums are using to make their exhibitions more interactive. This is a motion sensing input device that allows the user to control and interact with their console/computer without the need of a joystick or any game controller. The user moves their hands to control to activate whatever they want on the screen without any contact. Microsoft used this for Xbox 360. With this technology visitors can interact with a screen that is placed in the museum that out of physical reach, but still can operate and control what they can see with the movement of their hands.

VI. Translating to the museum

To solve some of the needs and requirements the use of interactive technology is required by the project, and to choose between a smartphone application, the use of Kinect and the use of leap motion, some research had been conducted and the use of a smartphone application is defined because it is at the moment the best choice. Looking at the number of users, Kinect; 24 million users, Leap motion; 25.000 users and the smartphone; 1.75 billion users, we can conclude the smartphone is well accepted.

A smart phone application could resolve the problem of different languages having the possibility to change the language depending on the visitor. All the information would be available in the app without the need to put large signs with all the information in different languages and affecting the aspect of the exhibition. A smartphone application is also an interactive device, which the users from different ages could use to make their visit more pleasant. The problem of the way finding could be solved by the combination of a clear map that could show where to find the different exhibits and the use of corresponding numbers and info graphic's.

Furthermore, the use of a smartphone application will make it more accessible for more users compared to the other two products. Each user can download the app at home or at the museum and use it on their smartphone. Compared to the other products where only one user can use the product at the time. If more users want to use Leap Motion or Kinect then more devices have to be bought, otherwise visitors would have to wait in line to make use of the products. This will lead to the chance that visitors won't use the product at all because they don't want or can't wait. Also more space is required to place them, space that could be used for exhibits.

VII. Way finding

One of the main problems identified in the museum was the signs for the audio tour. When doing the audio tour, visitors were losing their way. For visitors who want to do the tour by themselves, they can do the audio tour. This consists of using a device that will guide you around the museum. It looks similar to a TV remote control that speaks all the information about the different exhibits. Most of the major exhibits are numbered so the visitor starts at number 1 and moves through the museum following the numbers. When the visitor arrives at an exhibit that has a number, the visitor presses the corresponding number on the audio device. The audio device speaks the information about the relevant exhibit.

While this is a good system the problems that were identified were the numbers were very small and in certain parts of the museum not in the right location. This was very frustrating for the visitor. At the beginning of the tour the visitor was given a map and the audio guide. For visitor who wishes to take pictures, carrying a camera, a map, and an audio device had their hands full, this made the tour difficult and from observation the visitor had put the map or the audio device down to take a picture. In most cases the visitor uses the phone to take pictures.

This is where the smartphone app is very convenient. The app has a search by numbers application. This will replace the audio tour device. The visitor who wants to do an independent tour will search by numbers. When the visitor views an exhibit there will be a number on it. The visitors select the number and information will be given, either it will be written or oral. But this can only be achieved if the numbers are made clear and it the right place. This will have to be solved before both works well together.

The signs that are used at the moment are a mix of plastic signs place on a vertical post. These work relatively well. These signs provide information about the exhibit. There is a number place on the signs but it's very small. This is where

the problem lies. The numbers are too small and not easily seen.

VIII. CONCLUSION

The railroad museum of Vilanova I la Geltrú has been in existence since the building closed as a depot in 1990 this museum hosts a large selection of exhibits that date back to the introduction of the first trains in Spain. The museum takes you on a journey back to the beginning when the industrial revolution was in its infancy. This study looks at merging both old and new technologies to give the visitor a better and more interactive experience. To improve visitor experience an in-depth study of the museum was done by a user centered design approach. The research involved and identified user requirements. Solutions were obtained using questionnaires, expert review focus groups, concept design, user testing of prototypes, and field trials. From this research, problems were identified such as signage and way finding. There was also a need for more interaction within the museum. People are also so used to getting information at the swipe of a finger and visitors to museums are no different, they want more than just static exhibits. The first step to introducing technology to this museum is a smart phone application. This application allows the visitor to move through the museum effortlessly. It will replace the out dated audio guide. The app and the way finding will merge to give the visitor a more relaxing visit by eliminating frustrating lack of clarity in moving around and viewing exhibits. The app will cater for all levels of interest from the first time casual visitor to the train enthusiasts. The introduction of a smart phone application will be the first step in nudging the railroad museum into and embracing 21st technology. This is only the beginning of the journey of introduction of new interaction technology, both old and new technology will work side by side to give the visitor an informative and enjoyable experience.

The Visitor's interaction and experience can be improved by the use of a smartphone application. This application will replace the audio-guide and will provide the visitors more information in their own language besides the current audio files on the audio tape. This also allows the visitor to control how much time they want to spend in the museum and to follow his or her own path. By giving the visitor more freedom the visitor can go to specific areas that suit their interests in an interactive way.

The visitors experience can be improved by enhancing the way finding. Currently there is no clear way finding and visitors find it difficult to find their way through the museum and even walk past by the reception at the entrance and possible exhibits or waste time on searching the right direction or having to ask for it. With the help of guidelines on the floor and improved signage to guide the visitors in the right direction it makes sure that the visitors won't have those problems anymore.

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