REMEMBER: an Adriatic network of Virtual Museums to highlight ports culture, traditions and history

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Abstract. The paper presents an on-going Interreg Italy-Croatia project, funded in the period 2019-2021 under the specific objective “Make natural and cultural heritage a leverage for sustainable and more balanced territorial development (3.1)”. The project REMEMBER (REstoring the MEemory of Adriatic ports sites. Maritime culture to foster Balanced tERRitorial growth) has the overall objective to promote the shift toward sustainable tourism and blue growth in the Programme area through the valorization of the important maritime cultural tangible and intangible heritage of 8 Adriatic Italian and Croatian ports sites. The joint valorization will be carried out by the 10 project partners, with cross-cutting competences and multidisciplinary experience. Mainly REMEMBER project aims at increasing the attractiveness of local economies through the use of ICT for the digitalization of cultural contents and to differentiate the tourist offer reducing the tourism seasonality. At the current stage, the project has set up the methodological and theoretical framework in order to instantiate the Virtual Museums for the 8 ports. This common concept envisaged the development of a cloud based tool as first gate of the Virtual Museum project and provided all Project Partners with a baseline for setting up cultural and technological virtual museums, for the enhancement and promotion of ports cultural elements during the project implementation. The technical work packages, presented in the paper, establish also a common set of information as basis to reach the same digital outputs, compliant with the project goals: these outputs are called Digital Experiences and are connected to state of art technologies, enabling the dissemination of the tangible and intangible heritage related to eight port cities.

1. Introduction

The paper presents an on-going Interreg Italy-Croatia project, funded in the period 2019-2021 under the specific objective “Make natural and cultural heritage a leverage for sustainable and more balanced territorial development (3.1)”. The project title is “REstoring the MEemory of Adriatic ports sites. Maritime culture to foster Balanced tERRitorial growth (REMEMBER)”. The overall objective is to promote the shift toward sustainable tourism and blue growth in the Programme area through the valorization of the important maritime cultural heritage of 8 Adriatic Italian and Croatian ports sites - Ancona, Venice, Trieste, Ravenna, Rijeka, Zadar, Dubrovnik, Split – four of which are Unesco sites. The joint valorization will be carried out by the 10 project partners, with cross-cutting competences and multidisciplinary experiences: 6 port authorities, 1 public agency, 1 transport cluster, 1 Museum and 1 University, the last two serving as scientific and technological advisors. REMEMBER project aims also at increasing the attractiveness of local economies through the use of ICT for the digitalization of cultural contents, differentiate the tourist offer to reduce the tourism seasonality, and create new and qualified jobs linking digital and cultural competences. Currently, the project set up the methodological and theoretical framework in order to instantiate the Virtual Museums for the 8 ports. This common concept envisaged the development of a cloud based tool as first gate of the Virtual Museum project and provided all the Project Partners with a baseline for setting up cultural and technological virtual museums, for the enhancement and promotion of ports cultural elements during the project implementation. A main achievement will be to outline a long-term strategy, jointly agreed upon and pursued by all the Project Partners, highlighting the role of the involved ports as "cultural hubs" able to constantly generate...
connections, exchanges of cultures, traditions, jobs linked with their maritime relations and heritage. The technical work package establishes also a common set of information as basis to reach the same digital outputs, compliant with the project goals: these outputs are called Digital Experiences and are connected to state of art technologies, enabling dissemination of tangible and intangible heritage.

Figure 1. Digital Experiences (DEs) definition as sum of contents, equipment and development: the technical work package ensures to have set of information in order to reach the same digital outputs in the network.

2. The REMEMBER Virtual Museum
The REMEMBER Virtual Museum (hereafter REMEMBER VM) aims at fully exploiting the potential of cultural, social and economic valorization of the ports’ intangible and tangible heritage focusing on the Adriatic macro-region.

On the one side, the concept of Tangible Cultural Heritage refers to physical artefacts produced, maintained and transmitted into a society from one generation to another. It includes artistic creations, built heritage such as buildings and monuments, and any other physical or tangible creative products significant for a society. On the other side, the concept of Intangible Cultural Heritage indicates ‘the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their Cultural Heritage’ [1]. Examples of intangible heritage are oral traditions, performing arts, local knowledge, and traditional skills in fishing, ship building and other “blue economy” related domains.

Ancona, Venice, Trieste, Ravenna, Rijeka, Zadar, Dubrovnik, and Split, namely the port-cities constituting the core of the partnership, have demonstrated to share a high value tangible and intangible cultural heritage based on their maritime history and evolution from a spatial, economic and mind-setting point of view.

REMEMBER VM overall objective is promoting the shift of traditional tourism-based business models towards sustainable tourism and blue growth paths in the Programme area.

The creation of a VM should result from the conjunction of the traditional museum concept experience with the advantages offered by multimedia and communication Internet technology [2][3][4][5]. The REMEMBER VM aims at offering a maritime and port based heritage “remote immersive experience”, overcoming the lack of time or resources to travel, the lack of exhibition space, affording easy transfer of common knowledge to remote sites and circular exploitation of common heritage.

REMEMBER VM should increase the attractiveness of local economies using ICT for the digitalization of cultural contents, increasing the touristic offers to reduce tourism seasonality and create new and qualified jobs linking digital and cultural competences.
Using information and communication technologies, REMEMBER VM will leverage the generation of added value from the full exploitation of the eight Adriatic Italian and Croatian ports sites – namely Ancona, Venice, Trieste, Ravenna, Rijeka, Zadar, Dubrovnik and Split.

REMEMBER innovative approach supports sustainable tourism starting from the common need to ensure preservation and management of cultural heritage in the port areas. The cross-border cooperation enhances the efficacy of project activities allowing the exploitation of the multiple effects of institutional cooperation among partners. The joint valorization of tangible and intangible port cultural heritage is expected to enhance the capacity of involved territories to generate added value from the full exploitation of the cultural asset and from its integration in the cultural, touristic and social policies.

2.1. The conceptual framework.
REMEMBER VM will result from the conjunction of a platform and 8 local sections of Virtual or Digital exhibitions. REMEMBER VM, conceived as a whole, aims at providing an immersive experience of the City Port heritage. With the REMEMBER VM a “remote visit” became possible, it can virtually connect cities and ports that are distant thousands of kilometers from each other, linked by common cultural backgrounds.

Educational techniques, which keep the “traditional museum experience” and provide entertainment for target groups using new technologies at the same time, could be developed in our VM. Each REMEMBER VM should be an Experience focused on “The Common Cultural Heritage of the Italian and Croatian City-Ports”. REMEMBER VM will use the great power of modern media, and visual-interactive technologies, to spread the Adriatic cultural patrimony to the widest possible public. According to the International Council of Museums [6] “sustainability is the dynamic process of the museum based on the recognition and preservation of tangible and intangible heritage with the museums responding to the needs of the community. To be sustainable, museums, through their mission, must be an active and attractive part of the community by adding value to the heritage and social memory”. REMEMBER VM should offer a cultural proposal available all year long and accessible by a large typology of visitors, an economic opportunity for the territories, not limited only to coastal/summer tourist activity. The City-ports involved in REMEMBER project – spreading across the two shores of the Adriatic Sea - share a thousand-years old port-maritime cultural heritage, a common background and sense of belonging resulting from the intense commercial and social relations, that made the Adriatic Sea “the sea of intimacy”, quoting the Croatian writer Predrag Matvejević [7]. The digitalization of both tangible and intangible cultural heritage have to be considered as a means of preservation of the identity of the involved ports. In addition, preservation means valorisation. The port-maritime intangible cultural heritage is continuously recreated by the community. Fixing this aspect means to recover and valorise the relation between ports and cities, by linking the present with the past. This parallel valorisation will show how the past is the origin of today’s port-cities identity and its richness in terms of culture, works, productions, investments and how the port system is still operating as an engine for the local community.

REMEMBER VM will count on a common platform and a cloud-based tool providing common contents to be shared by all the users and able to allow the uploading of different kinds of digital contents.

It should be accessible:

- From everywhere in the world: toward a basic set of contents and functionalities, with an Internet connection on personal devices as pc, smatphone and tablets
- By the eight port sites: with a full and sophisticated set of contents and functions in Ancona, Trieste, Venice, Ravenna, Rijeka, Duvrovnik, Zadar and Split. Through tablets, smartphones, touchscreens and other digital devices and tools in permanent locations.
The content structure of REMEMBER VM will be as it follows:

- an introductory/common section, hosted by a shared platform provided by an website. The basic common contents will be: presentation of REMEMBER and APCN; Introduction to the 8 city ports; presentation of some new touristic routes involving city ports; introduction to the 8 VMs. Each partner will contribute to this part following a common structure and methodology;

- eight local sections, developed by each partner, according to a common storytelling methodology, conceived as a net of contents with a common taxonomy and logic. Local sections contribute to improve the accessibility to the eight cultural heritage ports sites (Ancona, Ravenna, Trieste, Venice, Rijeka, Dubrovnik, Zadar, Split). The Local sections will be realized with selection, editing and uploading by each Project Partner, in the framework of a common approach that includes links referring to each other’s contents.

The common introduction should provide several «fil rouges» - based on the Adriatic strong identity - connecting the different storytelling made by the eight city ports involved. These related histories and experiences have to be presented throughout three main content categories: these categories allow each partner to vertically decline their contents in subthemes (Table 1).

**Table 1.** Table highlighting the tree main categories of the virtual museums and their subthemes. The table instantiates also the taxonomy for contents of the platform.

| Category                | Sub-theme                                                                 |
|-------------------------|---------------------------------------------------------------------------|
| TRADITIONS & CULTURE    | competences, job profiles, visual art                                      |
| Intangible heritage     | crafting, tools                                                           |
|                         | literature, proverbs, languages                                            |
|                         | religions, gods, sea mythology, fairy tales                                |
|                         | sustainable behaviors / greening food and recipes.                         |
| SOCIO-ECONOMIC RELATIONS| inland /City port relations, import/export of goods, traffics             |
| Intangible heritage     | routes, maps                                                               |
|                         | immigration/emigration of people                                          |
|                         | sailing activities, cruises                                                 |
|                         | Tourism                                                                    |
|                         | sailing techniques, winds, on board tools and technologies                 |
|                         | fishing.                                                                   |
| PHYSICAL HERITAGE       | Port authorities headquarter and premises architecture                    |
| Tangible heritage       | lighthouses,                                                               |
|                         | dams                                                                       |
|                         | ship design, shipbuilding, ship maintenance                               |
|                         | relicts                                                                    |
|                         | sustainable power and environmental solutions                             |
|                         | other monuments                                                            |

With the aim of valorising and strengthening the link between the cities and their communities, paying specific attention to create experiences and fix common meanings, we organize them around uses and purposes that could be immediately understood by the different target groups.
2.2. The technological approach: the cloud based service

The main objective of this part of the paper is to describe the innovative ICT architecture, specifically developed for the REMEMBER project. The services, depicted in the following paragraphs, are customized to the guidelines of the VMs and the graphics and contents structure will be defined in the partnership, according to the WP responsible roles. The ICT infrastructure, modular and scalable, represents an important communication system that facilitates all the stakeholders involved in the project to exploit many kinds of information at different system levels of detail and fruition. It allows to manage multiple information with an interoperable and multi-channel approach. Given its flexibility, contents can be conveniently displayed in different ways: Web portals, fixed installations (totems, digital signage), mobile devices (smartphones and tablets) etc.

As stated by EU MEMO/11/745: “Through digital libraries people can visit the past in a virtual way to experience Europe's cultural wealth and history. Once digitized, cultural material is a valuable resource for creators and businesses, who can reuse it to develop innovative products and services, for example for education and tourism or games and animations” [8]. According to this assumption, the architecture is developed following the cloud-based services paradigm, with the aim of creating a long-term and linked open data platform, designed for CH-related repositories. This approach allows interoperability between different platforms (on site, online, mobile) and between different users (augmented usability of metadata for both experts/non-experts). Moreover, the architecture allows different kind of users to manage and maintain it in a simple, fast and secure way. Particular attention is paid to the integration of the information. In fact, while populating the data base, different stakeholders, as well as heterogeneous data, can be involved. The key value of the whole project is that the ICT system is able to convey information at different scales, providing the users with updated contents; at the same time, administrators can constantly monitor its performances, being able to infer useful information about tourists’ needs, habits and preferences. The main features of the system can be summarized as follows:

- creation of the single cloud-based architecture that allows the management of multiple multimedia contents, to be exploited in various platforms;
- development of the unique content management system for all stakeholders to share cultural information;
- monitoring user’s behaviours, preferences and needs by collecting users’ generated data

The technological infrastructure will hold and manage data and services. The architecture assures efficiency in the management of context-aware services, analysing data arising from different experiences. The cloud platform will be able to offer a great number of IT services, however, services will be designed according to the needs of users and the needs of each participant to the project.

The Cloud infrastructure is based on protocols (for the standardization of data flows) and multi-level aggregations; a joint control interface serves to merge information, using a Multisensor Information Fusion (MIF) approach.

The architecture has two mutual task: from the one hand, the managing of information about Heritage and, from the other, allows the single instruments to exchange data in a smart way, based on ontology and will use OWL language (if required). The main advantage of cloud computing is that, such architecture, resources are always available for the user. A detailed description about the back-end platform (for both data loading and management) is provided in the following paragraph. The main tasks are the following:

- Integrated management of data and resources to ensure the integration and cooperation of the technologies used in the platform
- Management of levels of interoperability between applications and services present at different levels of the platform;
- Management of rules according to the context of application and user typology
Through the administration back office it is possible to manage and insert structured contents in a simple way. The administration platform is designed to have a generalized data structure; in this way, the partners and the collaborators will be able to arrange the entities of the data structures even in future steps, based on the needs of the project. The data structure makes use of an object–based logic, where an object can be a point of interest, an event, a product page, etc.

Each object is composed of different parameters such as, for example:

- First name
- GPS coordinates
- Subtitle
- Description
- Address, Country, City, etc.
- Media (Images, video, audio)
- Other parameters ...

The above-mentioned structure is meant to generalize the cloud-based content management platform, useful for dealing with any type of need. In addition, the administration platform is designed to manage accesses by structuring a user hierarchy; the reason is to have an administrator user and multiple users with different permissions and roles. The administrator user will be able to manage the entire platform in complete autonomy, through a simple and intuitive interface. One can create users, points of interest, contents, etc.

The cloud platform displays API calls that will be used to populate the various frontends (website, app, totems, etc.). Backend APIs are offered as a service to 3rd parties, allowing partners to edit data in their own system. Standards, such as JSON, REST/HTTP, OAuth will help internal and external people to exploit such APIs. The contents uploading will be easy even for not expert users, as showed in the following step by step guide through. Within the platform it will be possible to create the new “Point Of Interest (POI)” object; a new window will be opened containing all the configuration parameters.

2.3. Special need user

Disabled people are a wide target. We should plan different ways of showing our contents with a careful use of sounds, pictures, videos, and words. Main items or stories that we are going to show in the VM should use a mix of all four media languages.

In this way, for example, blind and deaf people will both be able to visit the REMEMBER VM.

For the VM that is going to be situated in a physical location within the port site we must ensure that the site is suitable for the use of both disabled and senior people. We need to provide all levels of access where possible, hand trails near steps, ramps, easily operated doors, textured surfaces, and easy to use taps and toilets.

One of the tasks of the REMEMBER project is also to guarantee the accessibility of digital experiences to audiences who differ in perceptual, physical and cognitive abilities. In fact, it is important to design experiences of fruition and enhancement of cultural heritage able to expand the public, responding to the needs of a plurality of categories of visitors.

Immersive and entirely digital experiences are generally precluded to the public with sensory disabilities. It is therefore necessary to implement alternative communication strategies, capable of conveying in an equally effective way the contents of digital experiences. However, there are some general guidelines that are useful to ensure that digital contents, whether accessed online or on site, are inclusive and accessible. Digital experiences should be used by anyone in a fair and completely autonomous way; adapt to the different abilities of the users; allow intuitive use; stimulate as many senses as possible, providing information through different channels; minimize the risk of unintentional errors; minimize the physical effort of the visitor in the interaction/use.

A website or mobile application is accessible when it provides information that can be used by all users, including those with disabilities. Accessibility ensures that users with different types of needs or functional limitations can use the Internet without restriction and independently.
The following are the areas on which attention should be paid to make a website accessible:

- Perception. Depending on the type and degree of disability, some users may not perceive, in whole or in part, all the elements included in the site. Blind people, for example, navigate without being able to rely on visual stimuli. Nevertheless, there is a tool called “screen reader” that reads the contents of the website and transmits the readable data to the assistive technology (display for Braille, speech synthesis tool ...). Some stimuli, such as background music, can become disturbing elements.

- Understanding. Do not use acronyms and abbreviations that may be difficult to understand.

- Interaction and navigation. It strongly depends on the structure of the site, which should be as clear and intuitive as possible. Each website should be designed so that it can be navigated using supporting technologies (e.g. instruments that capture eye movements, keyboard navigation...).

A few simple instructions should be taken into account when designing and building a site. In general, the same graphic instructions provided for texts (enlarged characters, text in contrast to the background, etc.) apply to both sites and apps. Other recommendations are: a) give each image an alternative text describing its content; b) make navigation easy, possibly with a single menu; c) allow to customize the size of the characters and the contrast between text and background; d) use a simple language; e) subtitle the video contents; f) add audio descriptions where necessary. In particular the contents have to be uploaded according to W3C Web Accessibility Initiative (WAI) guidelines.

![Digital Contents Diagram]

**Figure 2.** Example of good practice in exploitation of same content at local and common level

3. Conclusions

Although the REMEMBER project is currently in the early steps of the VMs implementation, the methodological and technical work packages had already established a common set of information as basis to reach the same digital outputs, compliant with the project goals. These outputs are called Digital Experiences and are connected to state of art technologies, enabling dissemination of tangible and intangible heritage.

A good practice should be considered the use and re-use of digital contents both at the common and the local level, ensuring smoothness of the outputs as well as the high recognizability of the brand at the partnership level. As first example, the small pilot test that can be cited, in this phase, is about the Ancona’s VM and its heritage (Fig. 2). The Ancona port authority reopened up to the city a part of its own area, in which a huge heritage is included coming from Roman age till now. The Wayfinding of Ancona port was foreseen in actions by Remember. Currently the idea is to join the small scale infrastructure with the Points of Interest (POIs) and digital contents. All specific data developed at the local level will be uploaded in the common platform in order to generate on line and on site experiences, exploiting the cloud-based infrastructure [9].

The proposed partnership and the technical experts involved, already skilled in a variety of Digital Cultural projects, instantiated a workflow able to develop high quality contents and Virtual experiences referring to robust Virtual Museums guidelines and usability [10,11]. A main achievement is the cross
fertilization among different public institutions in order to enable a sort of technology transfer in the domain of Digital Cultural Heritage. In fact the Port Authorities act as players to enhance and promote the ports cultural elements, as well as to increase preservation of the maritime tangible and intangible cultural heritage through a cross border methodology for the knowledge systematization, with regard to common traditions, history and manufacturing. The enhanced awareness and accessibility of the Adriatic maritime heritage obtained through the development of a cross border network of Virtual Museums with digitalized cultural contents and the restoration of historical buildings/rooms for touristic purposes constitutes a first achievement useful to be shared with other domains experts, although the instantiation of the exhibitions is not yet running.

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Acknowledgments
The project here presented is funded under the Interreg IT-HR programme 2019-2021, Application ID 10042741. The content of this document reflects only the author's view and the Programme Authorities are not liable for any use that can be made of the information in it included