Digital Tools for Critical Cultural Heritage

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ABSTRACT

In the cultural heritage field, the absence of representative and diverse perspectives has fueled a new wave in heritage studies that defies the dominant theoretical and practical discourse. This dominant 'authorized' discourse defines heritage as non-negotiable, forcing a global perspective of its value, perpetuating the social exclusion of certain communities. Several initiatives have emerged to amplify the 'unauthorized' heritage discourse. One example is *Migrantour*, a counter-mapping initiative of intercultural guided urban walking tours designed and conducted by migrant community members to promote intercultural dialogues, exploration of cultural heritage sites, and discussion of critical cultural heritage. However, there are still issues regarding accessibility, inclusivity, and preparation for the tours. Aligned with the values of Human-Computer Interaction, this work embraces a user-centered approach to understand how digital tools can support these alternative tours in enticing and preparing possible visitors to interact and reflect on cultural heritage. To achieve this, qualitative user research was conducted in the form of semi-structured interviews and a co-design workshop to guide the design and implementation of "Tell a Story" - a digital tool that expands the authorized discourse to include inclusive heritage, allowing users to explore and reflect on both heritage discourses, as well as prepare to engage with critical cultural heritage activities.

Author Keywords

Human-Computer Interaction; User Experience; Cultural Heritage; Critical Heritage; Intercultural Dialogues; Authorized Heritage Discourse

INTRODUCTION

Cultural diversity has been present in European history as a product of people's interactions and intercultural exchanges [7]. However, the recent rise in migration has led to an increase in tensions and xenophobia discourse in society [7]. To counteract this, European countries have proposed frameworks [6, 7] that aspire to promote intercultural dialogues, respect and acknowledgment of the influence of multiple different cultures on society as we know it.

As many approaches for intercultural dialogues (ID) head toward digital technologies, a critique emerging on heritage studies reflects on the issue of using these tools without concern for who is participating in this discussion [20], propagating the normalization of the idea of a consensual definition of heritage defined by those with power, ignoring and silencing the existence of multiple alternative interpretations [20, 24]. Smith [20] has defined this western dominant discourse as authorized heritage discourse (AHD) and as inherently problematic since it privileges western conceptualizations of heritage and perpetuates an idea that heritage is something non-negotiable [20]. However, counter-mapping initiatives such as *Migrantour*[1] were created to challenge the AHD [13]. This initiative provides alternative guided tours designed and conducted by migrant community members who guide visitors around cultural heritage sites while exposing their personal views, contributing to a more inclusive discourse [13].

The author joined a team of researchers conducting qualitative research under the project *MEMEX* [2] to explore ID and understand how to design new interactive digital technologies to support it alongside *Migrantour* and *African Lisbon Tour*[3], who provided intercultural guided urban walking tours in the middle of the city of Lisbon concerning multiple distinct heritage sites. The individual experiences of engaging with the physical and discursive context of the sites were documented using auto-ethnography, a qualitative research method that uses the personal experience to reflect on an occurrence [1]. After, they were analyzed using a diffractive analysis allowing us to explore how the researchers' experiences differed. Its findings identified needs and challenges in the act of 'visiting', focusing on the physical discomfort of performing the tour and the need to physically self-prepare for the experience of heritage, underlying the topics of accessibility and inclusivity and highlighting the importance to accommodate the users' needs and concerns as possible participants of the tours. The work described in this document is the continuity and development of this research, focusing on how digital tools can support alternative guided tours in creating interactions that help the visitors prepare, engage, and reflect on heritage.

Objectives

This work follows a user-centered approach, focusing on the users' needs and requirements throughout the design process of the digital tool. By incorporating the users' voices and critical discourses, aligned with Human-Computer Interaction (HCI), we can open the current heritage discourse to other narratives, contributing to a more inclusive discourse. To assist our design process, user research was conducted with possible visitors of the *Migrantour*'s alternative guided tours with migratory backgrounds to help us answer the main research question of **how can digital tool support these alternative**

[1] http://www.mygrantour.org/

[2] EU project for storytelling and cultural heritage for communities at risk of social exclusion

[3] https://africanlisbontour.com/

guided tours in enticing and preparing its visitors to interact and reflect on cultural heritage.

RELATED WORK

Heritage is the legacy inherited between generations and can be categorized accordingly to its cultural, natural, or historic value [8, 11]. However, heritage is not merely a passive preservation process of elements from the past, but instead is an active collection process of elements that carry a particular set of values that we still identify with, and wish to keep engaging with in the future [8].

Cultural heritage (CH) can be categorized into tangible - holding the ability to be seen or touched, such as physical artifacts or buildings - or intangible - the abstract form that may only exist in memories of community members - such as traditions or values [9, 8, 25], and both are inextricably connected and must be protected [23] as both define the cultural identity of individuals and communities [2, 8, 25]. HCI has been supporting its preservation, dissemination, and engagement with the public audience through the design and use of digital tools [14, 19, 22] as well as the creation of new opportunities to enrich the cultural experience.

Modern heritage approaches

Schofield et al. [19] examined the new wave in heritage studies that looks at it through a critical lens, focusing on issues that affect the present, and introduces three main approaches in modern heritage research: **critical heritage**, **plural heritage**, and **future heritage** [19]. **Critical heritage** addresses a critical perspective that provokes reflection and exposes the issues regarding the social, political, and cultural complexities around heritage [19, 4, 26], questioning the idea of a consensual heritage thus challenging the AHD [4]. It has been used as a participatory approach to improve the design of CH experiences and Claisse et al. [4] reiterates the importance of reconsidering how the cultural experiences are conducted and who is involved in this dialogue. **Plural heritage** acknowledges the existence of alternative points of view on the same heritage and accepts multiple and contrasting interpretations contributing to a more polyvocal narrative [4, 24, 22], while **Future heritage** embraces a future-oriented design practice that critiques present issues theorizing ways to anticipate and work through inevitable changes to ensure the continuity of heritage [19].

Heritage for Intercultural Dialogues

The current discourse in CH has adopted a modern heritage approach when discussing ID. ID respect plural and critical heritages, representing an example of unauthorized heritage discourse (or inclusive heritage discourse), as opposed to the AHD. Some initiatives have emerged seeking to stimulate ID with members of communities at risk of social exclusion by providing alternative guided tours designed and conducted by these members, with the goal to educate people and fight the growing social stigmas [13], bridging a new form of tourism [5] with an inclusive discourse. Such examples are ***Migrantour***, with focus on the migrant community; ***African Lisbon Tour*** with focus on the African community in the city of Lisbon; ***Unseen Tours***[4] with focus on homelessness in the city of London; ***Querstadtein*** [5] with focus on homelessness and refugees; and ***Shade Tours*** [6] with focus on homelessness, refugees, and drug addicts.

Digital tools for CH

As emerging technologies are transforming how we interact with CH, HCI has supported its research and design. Several works intersecting these fields have revealed interest in raising awareness on **accessibility** - the character of a system to be easily understood and reachable to everyone, despite their background [12] - and **inclusiveness** - understanding user diversity and the ability to make everyone feel welcome, embracing people who are constantly socially excluded or marginalized such as those who are members of minority groups [16] -, seeking to meet the needs and concerns of their possible users and urges of a more diverse audience.

As we witness the new wave in heritage studies that examines heritage with a critical lens to provoke reflection and expose issues with AHD, the need for digital technologies that support critical heritage has grown as well. Digital storytelling allows people to share their own stories and experiences through the use of new emerging interactive digital technologies [17], creating immersive experiences with which the public may create emotional connections [4].

Overview

Although the recent years have brought a growing body of work in the fields of CH to HCI, few have encompassed a critical approach for CH. Digital tools play a critical role in the documentation, interpretation, management, and dissemination of CH but when developing them for critical CH, it's crucial to consider the needs of all stakeholders, otherwise there might exist the risk of inaccessibility, undermine the authenticity, or even impact the understanding of history. By creating a digital tool that supports an inclusive heritage discourse, promotes ID, accessible and inclusive, as well as interactive, and allows the exploration of heritage resources and plural heritages, it's possible to counteract this effect and help create a more just and equitable world for all.

METHODOLOGY

In collaboration with *MEMEX* and *Migrantour*, our research focuses on **how can digital tools support *Migrantour*'s alternative guided tours enticing and preparing its visitors to interact and reflect on cultural heritage**. *Migrantour* requires a digital solution that must: (1) create an opportunity based on a critical heritage approach to assist and contribute to a more inclusive heritage discourse; (2) promote the interactive exploration of CH resources; (3) be expandable to other European cities. In the light of this context, the stakeholders [21] are defined as: (1) the primary stakeholders (people who would interact directly with the system) are the possible participants of the tours; (2) the secondary stakeholders (people

[4] https://unseentours.org.uk/

[5] https://querstadtein.org/en/

[6] https://shades-tours.com/en/home/

who would use the system occasionally) are the intercultural guides of the tours; (3) the tertiary stakeholders (affected by the system but do not interact directly with it) are defined as *Migrantour* and *MEMEX*.

The following steps were conducted using a user-centered design process to better understand the users and guarantee that the developed digital tool meets the users' needs and requirements. The goal is to explore the accessibility and inclusivity regarding CH by understanding (1) **how young adults with migratory and non-migratory backgrounds individually and collectively interact with and experience the cultural heritage**, and (2) **how could we support and enhance the educational encounters through the usage of digital tools**. To accomplish this, user research explores qualitative methods (individual semi-structured interviews) and co-design methods, throughout two separate study sessions.

User research - Initial Interviews

The first qualitative research study was conducted in the form of individual semi-structured interviews with directed storytelling [21], followed by an exploratory website activity affiliated with the migrant community [7]. Mentioned above as the research goals, the following exploratory research questions were posited:

RQ1 - What do participants identify as CH and how do they get access to it?

RQ2 - How do individuals and communities value heritage?

RQ3 - Which factors drive the possible users' interest for or connection with cultural heritage?

RQ4 - What type of digital technologies are the participants familiar with?

RQ5 - How do the participants imagine the scenario of producing and consuming digital storytelling, and what would it entail?

RQ6 - What do young people need in the pre-tour context to feel enticed to participate in *Migrantour*'s intercultural guided tours in the city of Lisbon?

Participants

A total of 15 participants between the ages of 18 and 30 were recruited for this study session through standard convenience procedures including direct contact and snowball sampling. 5 participants had a migratory background and the remaining 10 had a non-migratory background (see table 1).

[7] http://www.mygrantour.org/pt-pt/migrantour-lisboa/

Migratory Background	**1st generation**	Women: 2	P1, P2
		Men: 1	P3
	2nd generation	Woman: 1	P4
		Men: 1	P5
Non-Migratory Background		Woman: 3	P6, P7, P8
		Men: 7	P9, P10, P11, P12, P13, P14, P15

Table 1. Synthesized description of participants (n=15) from the interviews. Participants were anonymized and identified by a number (e.g., P4 is participant 4).

Procedure

The interviews were held in a hybrid form according to each participant's preference, with 13 interviews held in-person and 2 were conducted through an online video conference platform [8] as the participants were currently not living in the country where the research was being performed. Participants were presented with a session divided into three parts. Initially, they were met an initial ice-breaker with demographic questions. Secondly, the semi-structured interview with directed storytelling (see table 2 for pre-determined questions). And lastly, the exploration of a website while performing a think-aloud protocol [18] to verbalize their thoughts.

All data gathered from sessions was documented with audio and screen recordings, transcribed into anonymized documents for subsequent qualitative thematic analysis using software Nvivo 3 [9] resulting in a codebook [10] that was used to answer our RQs.

	Applicable to		
# order	**Non-migratory background**	**Migratory background**	**Question**
1	X	X	Tell me a story of a memorable moment interacting with the cultural heritage of the country you were born in.
1.1		1st gen	Tell me a story of a memorable moment interacting with the cultural heritage of the country you currently live in.
2	X	X	When was the last time you interacted with the cultural heritage of the country you were born in?
2.1		X	When was the last time you interacted with the cultural heritage of the country you currently live in?
3	X	X	If you wanted to interact with the cultural heritage of the country you were born in, how would you do it?
3.1		1st gen	If you wanted to interact with the cultural heritage of the country you currently live in, how would you do it?
3.2		2nd gen	If you wanted to interact with the cultural heritage of [parents' heritage], how would you do it?
4	X	X	If you wanted to share a story regarding your cultural heritage, how do you imagine doing so?
5	X	X	How would you do if you wanted to find similar or even different stories related to cultural heritage?
6	X	X	Would you use any type of digital tools? Which ones?

Table 2. Predetermined questions prepared for the interviews.

Findings & Discussion

Regarding **RQ1**, participants have identified several elements of what they considered to be cultural heritage concerning both tangible and intangible forms, such as **beliefs**, **events**, **gastronomy**, **language**, **music**, **politics**, **traditions**, **buildings or structures**, **monuments**, **museums**, **objects**, and **physical sites**, verifying that the participants are drawn to both physical and abstract forms of cultural heritage resources. To access CH, they favored learning with **family**, **friends**, and knowledgeable individuals in the area. P5 stated to be currently learning their parent's (who is a first-generation migrant) native tongue with knowledgeable people in the area to get in touch with their CH, and connect with the parent and their side of the family. In this educational environment, P5 found a community with relatable people and extended his limited and parent-dependent access to said heritage. P12 favored their first-generation migrant sibling to tour P12 around the city when visiting, as despite not being a professional tour guide, they had lived as a local thus carrying knowledge to

[8] https://zoom.us/

[9] https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home

pass down to P12. P9 favored engaging with CH activities if their friends were involved. Thus, friends, family, first-person heritage experiences, and a sense of community hold a great weight in the participants' confidence in the authenticity of heritage and history, and in increasing the desire to explore and exchange CH resources.

Concerning **RQ2**, participants found in CH a way to connect with the past and the present as P5 stated to feel a deeper connection with their migrant parent after learning the parent's native language, or to invigorate their personal cultural identity as P5 stated to feel ashamed of their very distinct name throughout their childhood until they started to learn more about their heritage, increasing their confidence in their identity. Others found in CH a way to connect people (P1 stated to witness a major cultural event that joined thousands of people and embraced people external to the culture as one of the community). Additionally, participants also highlighted the importance of plural heritages as P5 and P3 believe that individuals and communities have the right to learn about all existing perspectives on heritage to form a solid opinion. P9 added that plural perspectives can co-exist in our world. Overall, participants shared multiple different ways through which they value heritage individually or as a community, ranging from being a source of personal identity to connecting members (from internal or external communities), this sense of understanding and feeling understood crucially drives people's lives.

Regarding **RQ3**, P10 finds interest in CH activities if they stimulate *"friends and family to get together and interact outside of the home"*. Other participants are driven by their upbringing and family values as P11 stated to create connections with CH by asking elders of the community about disregarded heritage to later explore with the family. Surrounding the topic of **discomfort**, P7 avoids activities that limit them to themselves and favors activities that allow them to go with friends, especially to unfamiliar places; meanwhile, P5 mentioned the restricted access to their CH complicated their journey of self-acceptance and further connection with the CH. Additionally, **intercultural contrasts** also affect the participants' connection with CH as P5 states how people sometimes are unaware of their own culture and habits, and how different they are from the rest of the world until they witness an **intercultural contrast** that may originate a reflective moment and impact on how they interact with or perceive other cultures. In general, the participants' interest or connection with CH is driven by personal motives (such as their cultural identity), the influence of family/friends/first-person heritage experiences, and intercultural contrasts. Additionally, participants lean towards the sense of community, by favoring activities in which they are accompanied instead of unchaperoned ones.

To aid the design of a digital tool that is available to as many users as possible, the answers to **RQ4** elucidate us as the majority of the participants prefer web devices, websites, quiet consumption of social media content, and blogs.

Referring to **RQ5**, participants don't expect a new technology to substitute the visiting experience but instead one that allows them to search for authentic heritage resources from any place in the world as preparation for the visiting experience. P11 stated feeling restricted in their current process of interacting with CH as its dependent on meeting people with CH stories to share. P7 stated to have an interest in exploring intercultural contrasts and uncovering the motives behind their CH for following certain behaviors that other cultures do not follow. Thus, the challenge for the heritage resources' explorers lies in the pursuit of authentic heritage resources. Both statements, from P11 and P7, reflect their search limitation as they depend on traditional methods such as directly finding people who want to share their CH or have interacted with it. To solve both issues, digital storytelling holds the advantage to present an authentic 'inviting' story of someone who has witnessed the heritage as well as being widely accessible.

The answer to **RQ6** exposes the participants' needs to own specific information before joining one of the tours, namely the **duration time**, **resting points** throughout the tour for a break (if existent), **price**, **route** of the tour, **start** and **end** points of the tour, **starting hours** or **availability** of the tour, if the tour is prepared to accommodate people with **mobility issues** such as old age or wheelchair accessibility and lastly **advice** from the tour guides to take into consideration when participating in their tours (e.g., an appropriate type of shoes, necessity for a bottle of water, etc). To feel enticed to engage *Migrantour*'s intercultural guided tours in the city of Lisbon, participants need to feel clarified and prepared to do so. To achieve this, an information layer regarding the details of the tour and an advice layer concerning orientations from the guides to optimize the overall experience should be provided to the possible visitors of the tours.

As our sample size of participants is small for generalization, the findings from this study are meant to inform the profile of possible users of the digital tool. The findings reflect the necessity of these users for a web-based digital technology that does not replace the in-person experience but instead allows users to explore and prepare for the interaction with both types of CH using first-person heritage experiences. To better define the details for the development of this digital tool, the user research proceeded to a second study with co-design techniques.

User research - Co-design workshop

A co-design workshop was conducted to explore the solution space obtained above and define it into feasible features. The workshop discussed how can the participants' exploration and preparation to interact with heritage resources be embodied into a digital tool, using a card-sorting activity along with a MoSCow prioritization technique [10] to understand the co-designers' mental models as well as manage the requirements for the solution by categorizing them through levels of priority (will have, should have, could have, won't have).

Participants

A total of 2 participants (1 first-generation migrant woman unfamiliar with the theme identified as P16, and 1 man identi-

[10]The author had previous experience working with this methodology in the context of uncovering design opportunities for digital tools based on challenges faced by members of communities at risk of social exclusion [15].

fied as P3 who participated in the prior study) were recruited for this study session through direct contact, with the inclusion criteria of being between 18 and 30 years old, as well as having a migratory background.

Procedure

The co-design session was held over an online video conference platform using a digital whiteboard [11] that allowed the participants to write on the cards, and interact the MoSCow matrix. The session was divided into two parts. First, an initial small talk to make participants more comfortable. Then they were presented with prompts exploring the solution space and were asked to discuss as well as write in the cards the features needed to embody their requirements. Afterward, they sorted each one of the cards into the several categories of the MoSCow Matrix displayed on the digital whiteboard comprising the four following options: "must have", "should have", "could have", and "won't have".

Findings & Discussion

The co-design workshop was an effective experience in translating the solution space into feasible features as well as incorporating the primary users' input in the design of the digital solution. This resulted in the following implications for the design of the digital tool:

I1 - Critical heritage content - The system must allow the upload of heritage resources based on a critical heritage approach to assist and contribute to a more inclusive heritage discourse.

I2 - Critical heritage content management - The system must allow the creation, editing, and deletion of the critical heritage content uploaded into the system.

I3 - Integration in *Migrantour*'s website - In the context of the collaboration between *MEMEX* and *Migrantour*, the designed solution will be afterward integrated into the website of the initiative *Migrantour*.

I4 - Layers - To entice and self-prepare the future visitors of the alternative guided tours, the system should provide layers of information concerning the critical cultural heritage activities provided by *Migrantour*.

I5 - Relevant assets - By interacting with a certain heritage resource, the system shall provide other relevant nearby heritage assets based on the geolocation.

I6 - Interactive Map - The interactive map is meant to provide an overview of the uploaded cultural heritage resources, allowing an in-depth understanding of where they are located, as well as promoting the interactive exploration of spacial structure and research for heritage resources.

I7 - Colored and shaped icons - The interactive map must include different colors and icons to identify the different types of heritage resources.

Additionally, we also defined the main design goals as the following:

[11] https://miro.com/pt/

G1 - Usability - Stakeholders expect to be provided with an easy-to-use interface of the system. The level of ease must be within reach of regular people with a low range of technological skills.

G2 - Costless - Stakeholders expect the system to be free of charge to use and sustain.

G3 - Maintainability - Stakeholders expect the system to be low maintenance.

G4 - Discoverability - Stakeholders expect the system to allow users to easily find what they are seeking.

G5 - Accessibility - Stakeholders expect the system to be accessible to a wide range of ages. By facilitating its access and making it available to a larger audience, it is possible to ensure that the information will reach as many people as possible.

G6 - Scalability - Stakeholders expect the system to allow the increase or decrease of resources in the system.

DESIGN

The digital tool is a system that expands the authorized heritage to include inclusive heritage, allowing users to explore both discourses to learn, de-construct their views and continuously form new opinions, as well as prepare to engage in critical heritage activities such as alternative guided tours provided by *Migrantour* (see fig. 1). Furthermore, the system encompasses two types of users: **writers** and **visitors**.

The visitors can interact with the user interface (UI) available through a web browser presenting a 3-Dimensional (3D) globe visualization that allows the interaction with heritage resources. Users can rotate, zoom in/out, and select the different colored and shaped pins on the globe. By selecting a pin, users can learn more about the heritage resources that have been authorized by *UNESCO* as well as unauthorized ones provided by *Migrantour*. Furthermore, users are also shown the nearby heritage resources based on the geographic coordinates of the selected pin existent in *Wikipedia*. If they wish to explore more of a certain heritage resource, users are presented with the option to be redirected to the resource's page in another tab.

Writers are responsible for introducing critical heritage content in the system, through a Content Management System (CMS). The tour guides can use the digital tool to display multiple layers of information about the tour, which can help visitors plan and prepare for their trip. For example, there can be a layer for the location of the tours around Europe, a layer for the information regarding the logistics of the tour, and a layer of advice each guide or city may have for future visitors and participants of the tours. There can also be a layer of accessibility to provide orientations regarding if the tour is physically demanding or if it requires certain physical abilities that may be impaired or restricted.

Low-fidelity prototype

A low-fidelity prototype (LFP) was sketched on paper and pencil. At this level, the prototype (see fig. 2) embodied the critical tasks for (1) visualization and interaction with the

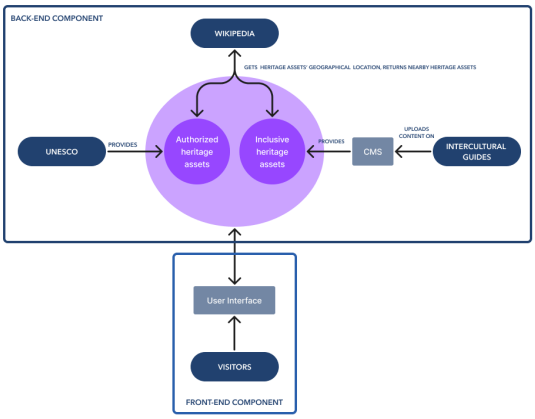

Figure 1. Diagram of the entities involved.

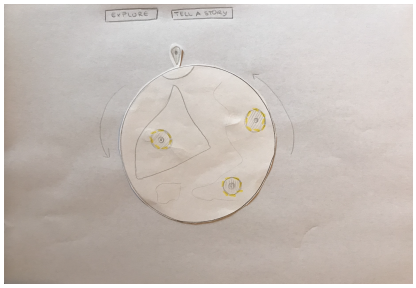

Figure 2. Low-fidelity prototype - A 3D globe map with user entries represented by pins. The 3D globe can be manipulated by rotating, zooming in/out and pins can be selected.

globe and (2) creation and management of critical heritage content that would be uploaded through the CMS and represented on the 3D globe.

A total of 5 participants tested the LFP using wizard-of-oz and a think-aloud protocol, complemented with A/B testing. The participants performed the required tasks with ease and provided feedback for the next iteration.

High-fidelity prototype

A high-fidelity prototype (HFP) was created using Figma [12] and incorporating the feedback from the previous session. Additionally, several details were conceived and integrated into the prototype (see fig. 3) to offer the users a more fluid experience when handling it.

To test "Tell a Story", 5 participants performed user testing making use of the HFP and a think-aloud protocol. Users performed the requested tasks with success, and their feedback was incorporated into the next stage.

IMPLEMENTATION AND EVALUATION

The design of the system's architecture consists of two layers: the presentation layer, through which users interact with the application, and the application layer which receives requests and presents the user with the requested information.

[12]https://www.figma.com

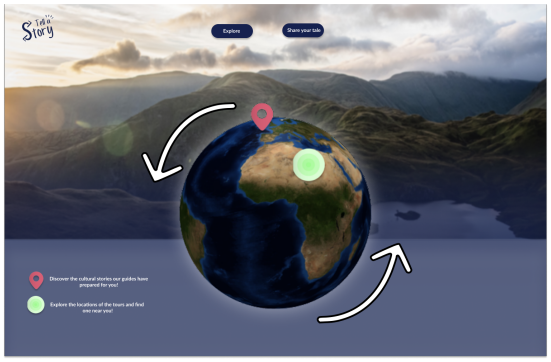

Figure 3. High-fidelity prototype - Placeholder interface with a manipulable 3D globe map with user entries represented by pins. The user can select a pin or create a new entry to add to the globe. The arrows were added as rotation indicators.

Application layer

The system's front-end and back-end components communicate with each other through Application Programming Interfaces (APIs), as the information to be shown in the presentation layer is retrieved based on Hypertext Transfer Protocol (HTTP) request/response made to external resources, namely Contentful[13], Wikipedia[14] and UNESCO[15].

API - Contentful

The chosen CMS is Contentful, a content platform with an API-first architecture that allows the management of the uploaded content and can publish it to any digital channel. This allows the users (in this case, the writers) without much technology skills to easily orchestrate their uploads of critical heritage resources onto the digital tool. To query and get the content of the CMS, it was necessary to authenticate the Space ID and the access token from the API keys. All data is retrieved using a Hyper Text Transfer Protocol Secure (HTTPS) protocol.

When uploading a resource, the writers must fill in the data required such as the title, content, category, media, and coordinates they want to be associated with their heritage resource. Based on the category of the heritage resource given by the author at the time of the upload, it will create a new layer of information or add to an existent layer and each resource will be represented with an icon representative of its category on the 3D globe in the presentation layer.

API - UNESCO

To incorporate all the authorized heritage assets, an API was created to directly access UNESCO's official heritage list data in Extensible Markup Language (XML) format through an HTTP request protocol. The retrieved data was parsed to a Document Object Model (DOM), followed by the extraction of the required data. In the presentation layer, each authorized heritage asset is represented by a circle on the respective coordinates. The colors of the circles differentiate the respective categories.

[13]https://www.contentful.com/
[14]https://www.mediawiki.org/wiki/API:Geosearch
[15]https://whc.unesco.org/en/list/

API - Wikipedia Geosearch

To present the nearby heritage assets of a selected pin, the application layer sends a GET request to search and retrieve pages from Wikipedia matching the selected asset's set of coordinates. Using the variable *gsradius*, it is possible to limit this search within a specified range in meters. Currently, the variable *gsradius* presents nearby heritage assets up to 500 meters from the selected heritage asset.

Presentation layer

The presentation layer corresponds to the front-end component through which the users visualize and interact with heritage resources on a 3D globe visualization.

3D Globe

The web component describes the visualization of informational layers on a 3D globe using spherical projection created in three.js[16], a javascript 3D library that allows the creation of 3D animated graphics in a browser. Using the data from the CMS Contentful and from UNESCO, representative pins for each source will be appended on the globe in the corresponding coordinates and when selected, the users are presented with the corresponding content regarding that heritage asset, as well as the nearby heritage assets from Wikipedia. Jquery[17] is used to manipulate the data retrieved and append the content onto the HyperText Markup Language (HTML) page. By clicking on the heritage asset's name, the users will be re-directed in a different page to the respective page on UNESCO's website (in case the heritage element is of authorized heritage discourse) or Wikipedia (in case the heritage element is one of the nearby heritage assets).

Implementation

The solution is a web application developed in HTML, Javascript, and Cascading Style Sheet (CSS). The implementation of the system as previously detailed was separated through two iterations. The first iteration tested the feasibility of the essential mechanisms between the web application and an external resource, and the second iteration considered an improved development over the first one.

First Iteration

The first iteration of the implemented prototype consisted of the development of the basic functionalities previously tested with the low and high-fidelity prototypes. This included the implementation of the 3D globe visualization as well as its connection with the CMS.

At this point, it was possible to interact with the 3D globe by rotating, zooming in or out, and selecting the pins (see fig. 4). Each pin was appended in the geographical coordinates given by the writer at the time of upload and when selected, presented the user with the respective critical heritage content, previously inserted in the system by the writers. Additionally, the pins were all in the same color and shape to any resource originated from the CMS (see fig. 5).

[16]https://threejs.org/

[17]https://api.jquery.com/

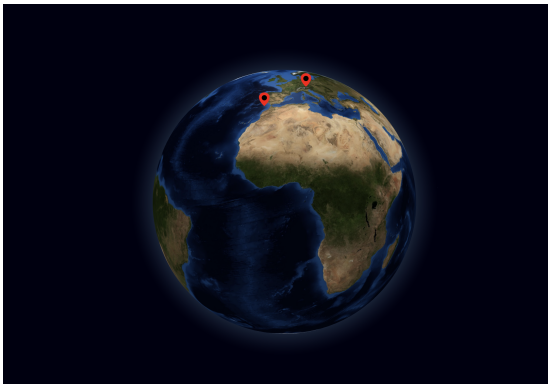

Figure 4. First iteration of "Tell a Story", a 3D globe visualization with red pins representing entries in the CMS - the users can select the pins to be presented with critical heritage content.

Figure 5. First iteration of "Tell a Story" - selectable pin representing the location of a CMS entry.

Evaluation of First Iteration

A total of 5 users evaluated the usability of the system developed in this first iteration. This stage allows us to evaluate the system using real users to perform real tasks, to ensure that the system meets the users' needs.

The individual user testing sessions were conducted over an online video conference platform, through which participants were given access to control the author's screen and interact with "Tell a Story". All users confirmed to be familiarized with maps and able to pinpoint geographical locations on a map. The users were asked to perform several tasks comprising the critical tasks of the system while using a think-aloud protocol. In the end, the users were asked to fill out a System Usability Scale (SUS) questionnaire [3] to measure the usability of the system.

The users were successful in completing all tasks independently and without any issues or problems being discovered with the system during the tests, with users being able to quickly figure out how to perform the requested tasks. The SUS evaluation score gave the system an overall score of 92.5 out of 100, reflecting the high level of ease users felt when using the interface of the system. Furthermore, this result also confirms that the main design goal G1 (Usability) was achieved.

Second Iteration

The second iteration of the "Tell a Story" embodied the previously detailed system architecture (see fig. 6 and fig. 9).

From the work developed in the first iteration, the API connecting the digital tool to UNESCO's website was implemented to retrieve the authorized heritage assets. Using the same icon to represent all the authorized heritage assets, different colors were used for different authorized heritage categories: green for elements categorized as cultural heritage (see fig. 7, left), red for elements categorized as natural heritage (see fig. 7,

center), and yellow elements categorized as mixed heritage (see fig. 7, right).

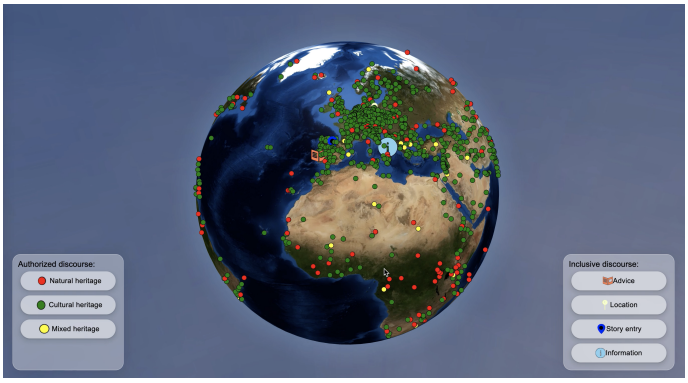

Figure 6. Second iteration of "Tell a Story" - dashboard presented to the users. They can interact with the globe by zooming in or out, rotating, filtering the icons accordingly to their category, and selecting the icons to be presented with information as well as nearby heritage.

Figure 7. Selectable pins for authorized heritage assets used in the second iteration of "Tell a Story". From left to right: green pin representing an authorized heritage asset categorized as cultural heritage; red pin representing an authorized heritage asset categorized as natural heritage; and yellow pin representing an authorized heritage asset categorized as mixed heritage.

Additionally, the Wikipedia API was implemented to retrieve the nearest heritage assets of any selected element in the 3D globe visualization.

As it was previously defined that the critical heritage content would be presented through different layers of information (such as logistics of the tour, orientations to prepare for the tour, etc.), categories for each layer were added on the CMS. By inserting to which category the heritage asset belongs, the system will append the content on the globe with a representative icon of the category in its respective coordinates.

It is important to note that these additional representative icons were not tested with the users up to the present moment, and *Migrantour* may wish to modify them (see fig. 8) but they will be tested with users in a future evaluation.

Figure 8. Additional selectable pins for inclusive heritage assets for the second iteration of "Tell a Story". From left to right: pin representing an inclusive heritage asset categorized as important information regarding the logistics of the tours; pin representing an inclusive heritage asset categorized as advice for the preparation of the tours; and a pin representing an inclusive heritage asset categorized as the precise location of the tour.

CONCLUSION

Limitations

Throughout the research and development of this work, several limitations were found. The first limitation concerns the group of secondary users as it was not possible to establish contact

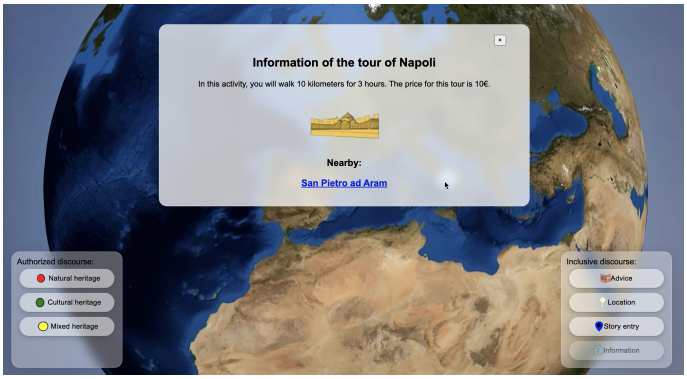

Figure 9. Second iteration of "Tell a Story" - information presented to the user in a pop-up form, portraying the content correspondent of the selected pin and its nearby heritage.

with *Migrantour*'s guides. Although the organization was keen on conducting the collaboration, it was not possible, up to the moment, to get access to the intercultural guides to include them in the process of designing the digital tool. We tried to circumvent this limitation by focusing the user-centered process on individuals with migratory backgrounds in an attempt to understand the duality of living with multiple heritages. However, the findings resulting from the studies can't be generalized as they are limited to the current sample of participants.

Secondly, the current sample size of participants was limited, and therefore the design of this solution may not encompass further possible needs and expectations of individuals out of our sample of participants.

Additionally, further user testing using the second iteration of "Tell a Story" is needed. It is important to survey the users regarding their user experience when interacting with the final prototype, for both the possible visitors of the tour who assume the role of consumers and for the alternative tour guides who assume the role of writers.

Future Work

Taking into consideration the overall developed work, the next steps would include the user testing of the second integration of the implementation of the digital tool with the secondary users defined as the guides for the alternative tours. Their feedback is just as crucial to this process as the primary guides, as both are considered end-users of this system. This would then be followed by possible modifications based on their feedback, as well as developing new supplementary features concerning the needs and expectations of the secondary users. Finally, the final step would encompass the integration of the final product onto the *Migrantour*'s system.

Contributions

This work documents the process of creating and developing a digital tool for critical cultural heritage using a user-centered approach. By following a user-centered design process, we were able to create a tool that meets the needs of users and expectations, as well as involving them throughout every step of this process of uncovering **how can digital tools support**

alternative guided tours from Migrantour in enticing and preparing its visitors to interact and reflect on cultural heritage.

Initial qualitative research was conducted under the project *MEMEX* with the goal to explore and understand how to design new interactive digital technologies to support intercultural dialogues. In this stage, the team of researchers engaged in alternative guided tours with *Migrantour* and *African Lisbon Tour* who provided intercultural guided urban walking tours in the city of Lisbon, facilitating the visitation and exploration of several heritage sites. The experiences were documented and analyzed using a diffractive analysis throughout several workshops. The findings focused on the need to self-prepare for the experience, reflecting underlying issues concerning accessibility and inclusivity regarding the accommodation of the needs and concerns of the possible participants of the tours.

Based on the findings of the initial qualitative research, the researcher proceeded to a qualitative research study involving the possible performers of the alternative tours using semi-structured interviews with directed storytelling allied with a practical activity. Qualitative data analysis was processed on the transcripts of each interview using the Nvivo 3 software, resulting in a codebook. Consequently, its findings answered the research questions proposed for the study and it was possible to define a solution space, although the challenge resided in defining the details for the development of the digital tool.

To complement the previous findings, a co-design workshop was conducted to craft the details of the previously defined solution space. Using a card-sorting activity along with a MoSCow prioritization technique to uncover the co-designers mental models and manage the details for the implementation. The outcome reflected the effectiveness of this methodology.

The resulting work is a system that expands the authorized heritage to include inclusive heritage, which is an important step in promoting a more critical and reflective understanding of heritage. It consists of the visualization of globally scattered authorized and unauthorized heritage resources that when selected, provide information regarding the heritage asset selected as well as its nearby heritage assets. This allows the education of the user and promotes reflection on inclusive and plural heritages. This way, possible visitors of the alternative tours are invited to explore both discourses to learn about and reflect on heritage concepts as well as plural heritages, in addition to self-prepare to engage in critical heritage activities provided by Migrantour. Furthermore, the results of the initial evaluation that tested the basic functionalities of the system allowed us to verify the high level of usability the system provides as it achieved an excellent score of 92.5 in the SUS evaluation score. Participants also expressed their interest in engaging with critical heritage concepts.

Thus, the overall work described contributes with extensive qualitative research and methodology on the heritage field aligned with the values of HCI and a user-centered approach, that shed a light on the importance of developing tools for critical cultural heritage, and stimulates further research of our findings.

Final Remarks

The work presented in this document engages in the design of critical heritage tools by adopting a user-centered approach, highlighting the users' needs and expectations when engaging with critical cultural heritage. Through user research (working with semi-structured interviews and a co-design workshop) and in collaboration with *Migrantour*, main design goals and implications for design were identified and applied to the design and implementation of "Tell a Story". Future work will involve the validation of "Tell a Story" with participants and possible refinements of its features.

The "Tell a Story" digital tool supports *Migrantour*'s alternative guided tours in enticing and preparing its visitors to interact and reflect on heritage by **(1)** supporting the tour guides (also known as writers) in creating critical heritage content concerning the alternative guided tours – this content can be used to inform about the physical locations, entice possible visitors, share personal views of heritage or highlight barriers of accessibility; and **(2)** supporting possible visitors in reflecting on cultural heritage through the juxtaposition of unauthorized heritage discourse (from the writers' content), semi-authorized (from Wikipedia) and authorized heritage discourse (from UNESCO) of the places they can visit.

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