Building Guidelines for UNESCO World Heritage Sites' Apps

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Abstract—**Technological improvements and access provide a fertile scenario for the creation and development of mobile applications. This high app production scenario results in a myriad of apps providing information about almost all the cultural segments, including those dedicated to UNESCO World Heritage Sites (WHS). In order to have a successful app, its development should consider usability aspects aligned with reliable content. Despite being possible to find previous guidelines for mobile usability, this paper aims to discuss how to find other ways to build guidelines for a better WHS experience, empirically applied to an open-air WHS city: Weimar and its Bauhaus and Classical Weimar sites. This research compared literature-based guidelines against industry-based ones, created by a compendium of available apps dedicated to WHS, through the implementation and test of two prototypes using these distinctive guidelines.**

Keywords: Interface design; world heritage sites; usability; app; mobile devices.

I. INTRODUCTION

It is far behind the time when, in order to enjoy a historical and cultural experience, it was necessary to visit a museum or to buy a guide to check the information about the monuments and historical buildings in a city. Despite the importance of these institutions and options, the technology allows the expansion of the concept one step further, and the cities itself can be considered open-air museums, especially using mobile apps accessible through smartphones that most people carry on their pockets.

But just offering apps without proper care in its development, can influence negatively the tourism experience, regarding getting the desired information. For this, it is advised to seek for guidelines and good practices during the development of an app for touristic purposes. This study did not just overlook on usability studies, but also took in consideration the interaction with the urban spaces, learning outcomes and took in consideration also designing for elderly people, an important target group for tourism in Germany.

The methodology applied was developing and comparing two different models for app development: one based in the industry, through dedicated apps available in the market, and other one based on literature-review on touristic apps.

As content, working with UNESCO WHS may deal with institutions that might implement the proposed guidelines into real apps, cultural heritage, in general, does not have the same background support. The UNESCO WHS also provides specific content related to cultural heritage, making it easier to be worked on, in terms of content production and localization.

In Section II, an explanation about the target content if offered, showing why Germany is relevant for a practical base for WHS apps. In Section III, the process of getting industry-based guidelines for WHS apps is explained and how the selection of apps was made. Section IV covers how the literature-review based guidelines were acquired, and how other features were used to build the prototypes. In Section V, the implementation of two prototypes is explained, along with the evaluation process, comparing the results from both developed prototypes. In Section VI, the evaluation implementation and results were described. In Section VII, the recommended guidelines are displayed, taking in consideration the evaluation results, along with further considerations regarding the found guidelines.

II. TARGET CONTENT

The focus of this research is on apps that deal with cultural heritage content. Germany is the 5th largest country with of "World Heritage Sites" from the UNESCO's list. Germany is well known for its technological potential. This scenario reflects on services using a digital format, available for several kinds of purposes, such as information, education, entertainment, just to mention a few, applied to several kinds of devices, such as mobile devices, web-based services, and interactive screens.

Taking Germany as a scenario for the covered area is the best way to gain experience and access for innovative projects using mobile devices for cultural heritage. Those 43 cultural sites are spread along Germany, however, two of the sites (Bauhaus and its Sites in Weimar and Dessau; and Classical Weimar) are situated in Weimar - a place where this research is based. Those sites are easily accessible, being a perfect sample opportunity for in loco use.

III. INDUSTRY BASED GUIDELINES

There are several models of smartphones and tablets available on the market, with different features and constraints: that situation made the choice for just one model a tricky question. However, once the market is

observed under the lens of the operating system running into several models and brands of mobiles, the choosing criteria are clearer.

The iOS or Android OS together have more than 3 million published Apps, embracing 80% or the German mobile market share. For that reason, the apps that are going to be evaluated are developed for both: iOS and Android operational systems, with assures a better stratification of the sample.

The app selection word criteria on each market were:
1. UNESCO WHS in Germany
2. Official app market
3. Word search options:
   - UNESCO Germany
   - UNESCO Deutschland
   - World Heritage
   - Welterbe (World Heritage in German)
   - The name of the WHS for Germany, in English and German versions

4. When the WHS refers to "Old Town" or "Parks" of a city, the used search term is "City Name" + UNESCO
5. Dedicated WHS apps

By "dedicated WHS App", it is understood as an app specially made for the WHS attraction. Generic touristic apps are not considered as "dedicated" one; the only exception is when the city centre (usually called an old town) is considered a WHS, in this case, a generic city touristic app may enter in the list if in its home screen there is an indication of UNESCO or WHS.

Following these search criteria, there were found 29 Apps, by 25 July 2018.

Some apps were found following the search criteria, but they were not proper WHS content related, being excluded from the research list. In some cases, they were "clickbait" Apps, to promote other content apart from the WHS, such as touristic tours or purchase-in features, using the UNESCO attraction to attract the user to download the App. In other cases, some app is web-based content, present problems to load the pages, not make them proper functional, being deleted from the list of analysis as well.

This list includes as well generic touristic apps where it was possible to find WHS information, but not in evidence in its home screen. Usually, the one needs to go further into the app to discover if there is, or not, a WHS addressed.

A. WHS App Analysis

An overview of the selected WHS apps can provide information about what is been offered to their users, from content and features perspectives. This overview can help to trace the common tools used for the promotion of a WHS and which features could be used as inspiration for building the prototype. The analysis will cover possible guidelines from layout, navigation, design, content perspectives. The analysis will serve to mimic a WHS prototype app, based on the state of the art market, to be tested with another version based on literature review.

B. Industry Overview Results

On the overview of the selected apps, common features and content structure were analysed to serve as a guideline for a market-based prototype, to be compared later with an academic-literature-review-based prototype (Table I).

Each selected app was analysed under the individual expert review technique, where "an individual expert review involves a single practitioner who is asked to provide feedback on the usability of a UI." [1, p. 37]. Once mapped, the content was distributed under subcategories, adapted from a study about usability guidelines for mobile websites and applications [2], taking in consideration just the app considerations. This approach aimed to facilitate to identify the usability guidelines, plus mapping the visual and content structure from the official apps for WHS in Germany.

TABLE I. INDUSTRY BASED GUIDELINES

		Total %
Layout		
L1	Place Content in one screen	41.38 %
L2	Vertical Scrolling	89.66 %
L3	Horizontal Scrolling	17.24 %
L4	Consistency between different sections	79.31 %
Navigation		
N1	Number of Taps to WHS Information	2 (average)
N2	Number of items on main navigation	6 (average)
N3	Navigation Menu visible	75.86 %
N4	One Level Navigation Menu	48.28 %
N5	More Levels	51.72 %
N6	Self-explanatory menu	55.17 %
N7	Enable gestures	48.28 %
N8	Presence of the Back button	72.41%
Design		
D1	Limited use of colours	68.97 %
D2	Wide range of use of colours	31.03 %
D3	Simple design	75.86 %
D4	Polluted design	31.03 %
D5	Use of icons	86.21 %
Content		
C1	Long text	86.21 %
C2	Short text	24.14 %
C3	Info at start screen	24.14 %
C4	No info at start screen	68.97 %
C5	Prevent information loss (when back)	89.66 %
C6	Provides action feedback	41.38 %
C7	Provides share options	20.69 %
C8	Nearby	3.45 %
C9	Tours	41.38 %
C10	Links to external content	41.38 %
Features and Media		
F1	Photo	96.55 %
F2	Photo 360°	6.90 %
F3	Map GPS	68.97 %
F4	Map Static	55.17 %
F5	Video	13.79 %
F6	Audio	44.83 %
F7	Animation Film	6.90 %
F8	AR	10.34 %
F9	VR	3.45 %
F10	Game	3.45 %

C. Industry Overview Guidelines

The industry/market overview served to collect impressions and analysis from the available apps for WHS in Germany to build a market-based prototype with the most common features and layout, creating an average model to be tested against a literature-review-based one (Figure 1).
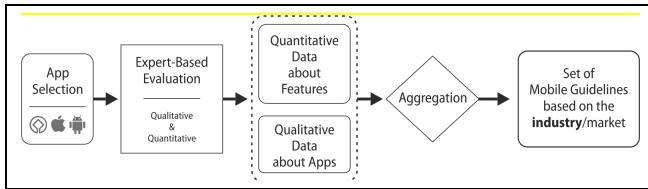

Figure 1. Schematics on the creation of the industry-based guidelines

This average model is based on the most popular elements presented on the evaluated Apps, taking in consideration Layout, Navigation, Design, Content Style, Features and Media. For this selection of market-based guidelines for building a prototype, were selected just those elements that scored more than 50% on the qualitative evaluation, and the average number in case of the quantitative collection.

It is possible to point that, based on the available apps dealing with World Heritage Sites in Germany, an average app would have the following aspects:

1) *Layout*
   - The content is spread beyond the initial screen, creating vertical scrolling. (L2).
   - The layout structure will be maintained among the sections (L4).
2) *Navigation*
   - The number of taps to achieve a WHS content from the initial screen is two. (N1).
   - The number of items in the main menu would go from four to six (N2).
   - The navigation menu is always visible among the sections (N3).
   - The content will be spread in different levels, leaving the user to explore further in each section (N5)
   - The main menu is self-explanatory, with direct meaning sections (N6).
3) *Design*
   - The use of colours is limited up to three (D1).
   - The design should be clean and not polluted (D2).
   - The use of an icon to reinforce the menu and content should be present (D5).
4) *Content*
   - The content should utilize long text, usually more than two paragraphs (C1).
   - No need for introductory or explanation text on the initial screen (C4).

   - The prevention of content loss when backing from a section should be ensured (C5).
5) *Features and Media*
   - Use photo/illustration along with the text, to reinforce the content (F1)
   - Providing map in GPS and static versions (F3, F4)

These guidelines will shape the structure and layout of the market-based prototype, and how the content will be divided into it. The content will be elaborated addressing the WHS in Weimar, using the information available at the official touristic site of the city [3].

IV. GUIDELINES FROM LITERATURE-REVIEW

This section covers the creation of the second guidelines for WHS app, based on the literature review, to be compared with the app guidelines extracted from the market overview.

While the guidelines from the app market overview took an observational approach, aiming to generate a model that could represent the average content style and features based on the available WHS apps for Germany, the guidelines acquired from the literature review will take in consideration the empirical academic publications on mobile app usability (available on research frameworks, such as ACM, IEEE, SAGE, JSTOR and Google Scholar), existing usability models (Nielsen, Schneiderman, Weinschenk and Barker, ISO 9241-11, and PACMAD) and also the official industry guidelines for mobile development from the main mobile OS companies (Apple and Android).

The generated guidelines took in consideration studies from the academia and the industry recommendations, connecting and combining different views and approaches into mobile interface design guidelines applied for WHS (Figure 2).

The literature review took in consideration the guidelines from the mobile industry, added a layer of confirmed guidelines on studies of mobile apps, collected on academic publications, on platforms, such as: ACM [4], IEEE [5], JSTOR [6], SAGE [7], and Google Scholar [8].
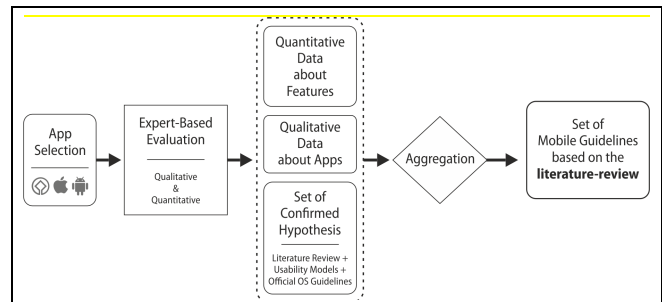

Figure 2. Schematics on the creation of the literature-based guidelines

In order to find studies and research outcomes that can contribute to the formation of literature-review guidelines

for mobile apps dealing with cultural places, a set of search parameters were applied:

Search Strings:

- "Mobile usability" AND "Guidelines"
- "Mobile usability" AND "App"
- "Mobile usability" AND "Heritage"
- "Mobile usability" AND "Travel Guide"
- "Mobile usability" AND "City Guide"
- "App guidelines"
- "Mobile interface guidelines"
- Since 2013, covering five years of publication, considered enough for a literature review DePoy and Gitlin apud [9, p. 53]

The first 50 results sorted by relevance were analysed in each platform and based on their abstract/description were selected or discarded for content analysis.

A. Selected papers

The aim of the reading selection for the literature review is to find guidelines and interface recommendations for mobile devices, to build a literature-based prototype to be tested with a market-based one. For this intent, studies made on web mobile sites were included, as they address the interface design on mobile screens. Medical and health studies were included just when they addressed to mobile interface design and usability, and not the therapeutic issues.

Also, studies tackling mobile interaction with public spaces were included, as the prototype app will deal with interaction in the city centre of Weimar. The same applies for context-aware and location-based mobile interactions.

Taking into consideration the wide range of visitors' profile in Weimar, the selection also included studies on interface mobile for elderly users. Despite the prototype is not a proper learning tool, studies on mobile learning were also included, as far the interface was the research target, as the city of Weimar also deals with teenager students visiting and learning about the heritage attractions of the city.

Overall, were selected findings that could be translated into guidelines. Vague recommendations, such as "create an appealing design" were not considered for being too open for different interpretations.

Based on their titles and abstract, were selected 249 academic publications readings on mobile usability and mobile cultural heritage, where only thirteen were not accessible due subscription and/or accessibility issues (despite five of them providing a two-pages preview), totalizing a 5.2% rate of waste in the original selection, making the final number of selected academic works for reading equals to 236 publications.

The selected readings, beyond dealing with app interface and usability, dealt with topics, such as cultural heritage, mobile tourism, mobile health, mobile learning, elderly people, just to mention a few examples. Based on the readings' keywords (when available), a word cloud was generated to illustrate the wide range of selected topics (Figure 3).

Figure 3. Word cloud generated from the used keywords from the reading selection.

It can be seen in the word-cloud that the word "cultural heritage" has not the same weight as "usability", or even "app" for instance. It was based on the keywords defined by the authors, and it also reflects the fact that there are not so many studies that are specifically dedicated to the relation apps and WHS, as for those which are related to "regular" apps.

Each one of the selected publications was read and analysed to find and extract guidelines that could be used for cultural heritage apps. This analysis was not restrained to the selection list, taking in consideration also references inside the publications.

Once a guideline or recommendation was found, it was placed in a table following a similar structure from the guidelines extracted from the app-market-overview, adding new categories to correspond on the literature review findings.

This literature-review based guidelines served to reinforce and confront some guidelines found on the industry-oriented overview, creating a new set of guidelines to be tested against the market one.

When a confrontation of guidelines was found (for instance: one author claiming that texts should be long, and another that should be short), the one with the majority of supports (more than one author endorsing it) would be selected; in case of a tie (equal sum of authors endorsing opposite views), an expert-based overview technique was implemented to select which one would be selected for the literature-review guidelines list, based on the proximity with the research topic.

The found guidelines were fit in the following table (Table II), using the common ones with the market-based selection with the addition of new literature-based guidelines, distinguished with an asterisk (*) mark.

The literature-based guidelines have some items in common with the market-based one, but with more new orientations regarding the content.

When comparing both guidelines, it is possible to find those exclusive for each model, making a comparison viable for the prototypes.

One of the features, that was not detailed on the literature-based, is regarding the maps. On market-based, it is suggested to offer an offline map along with the GPS one, but such orientation was not found on the literature-based, making this specific feature open to new test possibilities.

For the AR feature, the selected studies normally addressed on issues using this technology, but just a few of them recommended it for a mobile application. Here it is believed that AR it is indeed an interesting feature for a mobile app, but using such environment demands an exclusive development about using augmented reality navigation by dealing with camera-based navigation and interaction – which is not the purpose of this research.

TABLE II. SELECTED LITERATURE-REVIEW GUIDELINES

Code	Guidelines	Authors
	Layout	
L1	Place Content on one screen / minimizing-avoiding scrolling	[10] [11] [12] [13] [14] [15] [16] [17] [18] [19]
L4	Consistency between different sections (it may include the way the tasks are performed in different sections)	[11] [12] [20] [13] [21] [15] [22] [23] [17] [24] [18] [25]
L5 *	Orientation: provide session title	[23] [18]
L6 *	Providing search bar	[22] [23] [18]
	Navigation	
N1	Number of Taps to WHS Information	[23]
N3	Navigation Menu visible	[26] [24] [18] [25]
N4	One Level Navigation Menu	[10] [21] [16]
N6	Self-explanatory menu	[10] [27] [20] [13] [16] [23]
N8 *	Presence of Back button	[18] [19] [25]
	Design	
D1	Limited use of colours	[28] [20] [13] [29] [14] [15] [22] [23] [18] [19]
D3	Simple design	[10] [12] [13] [29] [21] [15] [22]
D5	Use of icons	[10] [26] [13] [29] [30] [21] [14] [15] [31] [32] [22] [33] [16] [17] [34] [19] [25]
D6 *	Space between buttons or other clickable items	[26] [35] [12] [28] [20] [14] [32] [16] [17] [18] [19]
	Content	
C2	Short text	[10] [11] [13] [21] [15] [17] [24] [18] [19] [25]
C3	Info at start screen	[36] [27] [31] [33] [23] [37]
C5	Prevent information loss (when back)	[10] [21] [22] [23] [37] [24]
C6	Provides action feedback (in some cases, confirmation before deleting/uploading)	[10] [26] [21] [22] [33] [34] [18]
C9	Tours / Routes	[38] [39]

Code	Guidelines	Authors
C11 *	Focus / Only display essential information, no more than needed	[24] [34] [18]
C12 *	Clickable buttons with tactile feedback or sound (for Elderly)	[26] [20] [16] [19]
C13 *	Considering surrounding environment	[36] [31] [33]
C14 *	Provide notification of location-based (incorporated into the C17 guideline)	[36] [40] [41] [42]
C15 *	Use of visual clues for visited POI	[18][41] [18]
C16 *	Screen font large (for Elderly) / optimal size (incorporated into the C17 guideline)	[26] [35] [11] [12] [20] [18] [19] [14]
C17 *	Allowing personalization / configuration	[21] [43] [22] [24] [19]
	Features and Media	
F1	Use of Aesthetics graphics (related to "Photos" of market-based guidelines)	[28] [13] [29] [30] [43] [15] [32] [16] [17] [34] [18] [19] [25]
F9	Use of AR (if the app idea allows it)	[30] [44] [45]

Despite some similarities, both extracted guidelines (market vs literature-review) present more differences, in terms of quantity, creating a proper scenario for prototype comparison.

Some other elements that were not traced or suggested on the extracted guidelines can be implemented to be compared in the prototypes, such as:

- **Content: List vs Grid content**
  "List" is normally when the options are listed in a vertical sequence. "Grid" presents the content in a "tile" format, normally in square shape.
- **Map: icons**
  Displaying one map with generic "map – pin" icon, and others with personalized icons (according to content categories)
- **Map: marker information**
  When tapping/clicking in a pin on a map, the information may be displayed in the bottom of the screen, or as a "floating" banner.

Some of the found guidelines were similar in both scenarios (Industry/Market based vs. Literature-based), but some were quite distinctive. On table 3 it is signalized the differences and common guidelines found in this comparison.

As the guidelines were found by literature-review from other usability studies and from what is currently being presented in the app market, they can provide enough, but

subtle, contrast to be developed into prototypes and tested with users.

V. GUIDELINES INTO PROTOTYPES

After having two different sets of guidelines, industry and literature-review based, comes a more practical approach: creating mobile prototypes using each set of guidelines, and testing them against each other.

The decision of not using a user-centred design approach, involving users during the design process, was relied on an expert review approach [1, p. 37], leaving the involvement of users for the comparison of the found guidelines.

For implementing this comparison, and evaluation, there were developed two versions:

- Prototype Red (Figure 4): industry-based, available at: http://tiny.cc/Prototype-Red
- Prototype Blue (Figure 5): literature-review based, available at: http://tiny.cc/Prototype-Blue

Figure 4.   Prototype Red, with less content on the main menu, bigger tiles for pages and standard map icons.

Figure 5.   Prototype Blue, with more items on the main menu, detailed tiles for pages and customised icons for the map.

The reason of calling "Red" and "Blue" was to set a neutral impression for the users/testers, not revealing their nature (industry or literature-review), neither their chronological development using letters, such as "A" and "B" – which could lead to the impression of "A" being the first version, and "B" a second-and-updated version. The chosen set of colours (red and blue) also was implemented for avoiding conflict for possible colour-blind testers.

VI. EVALUATION

To compare the two found guidelines, a task-based test and a comparative evaluation survey were implemented. The idea behind it is to have different individuals performing a series of pre-defined tasks in both prototypes and answering a series of questions comparing features and formats presented in both versions.

Questionnaires are a well-known method to collect and summarizing evidences [46] [47, p. 100], helping also to collect opinions and input from the users being used to a wide range of data collection, such as usability, user satisfaction and interface design [48, p. 30]. This method is crucial to compare and analyze both sets of guidelines (industry vs literature-review) against each other, to extract an ideal set of guidelines for app dealing with open-air world heritage sites, inside the context of the present research.

The questionnaire has a set of pre-defined answers to be chosen by the users, ideal to statistics, especially on user satisfaction [49], opening also the possibility for the testers to give inputs on the questions.

A.   Evaluation Development

A questionnaire can be divided into four parts: introduction, participant information, information section

and epilogue [48]. At the introduction, it is important to give the information about the test, without providing information that may produce a biased result. For this was enough to illustrate that the test was meant to compare two different models of interface design. Within this context, the testes got the idea about what the test/questionnaire was about, without saying what exactly were the differences or origins of both prototypes.

As participant information, the gender role was discarded on purpose as it was irrelevant for this study. The relevant information to understand the profiles were: age, which can bring details about a different group of visitors; familiarity (or not) with the city of Weimar, showing if the results would change if a tester knows the locations or not; and the behaviour related to the use of apps, especially for travel and touristic activities, and how are the expertise in using them.

The selection of testers/participants aimed to find two different groups: people who know the city of Weimar, and people who never been in the city. The age groups also had a wide range, going from the early '20s to late '40s. Those differences may bring an interesting data analysis based on how familiar the users are with the locations, and which features may be in preference of certain group age. For this were invited academics, students and professionals, from a diverse set of areas of expertise.

It is argued that even a modest number of 5 participants is enough to perform a usability test [50] [51], getting the necessary feedback to find usability problems when compared with a setting using a larger amount of testers. For the performed test, 35 participants confirmed the interest in performing the evaluation, with a final attendance of 30 participants.

B. Evaluation Implementation

After designing the evaluation, it was chosen as an unmonitored/unmoderated setting for the user tasks and online evaluation. The unmonitored setting for evaluations is not new on computer sciences [52], such as online surveys and questionnaires.

Unmoderated tests can be perfectly applied for testing prototypes [53], and brings a series of advantages by increasing the measurement precision [54]; no restriction of time [55] [56]; and simultaneous participation [52].

Unmonitored tests have a set of advantages in comparison to the monitored ones, which may be intrusive to the task performance, time-consuming in terms of one tester per time in the observational setting [48, p. 44].

The evaluation was implemented using *Google Forms*, as it is a free tool and covering all the needs relating to the type of questions. The Google Forms also offers the possibility to export the collected data to Microsoft Office Excel format, creating the possibility of generating different data graphics for the analysis.

For the evaluation was implemented different types of questions, changing according to the desired data. Most of the questions were a multi-choice option, with the possibility to add their own answer.

C. Type of questions

Surveys commonly present two types of questions: open or close-ended. Normally open-ended questions give more freedom to the participants in answering without any influence, but they consume more time and effort from them in creating their own answers and demanding interpretation from collected data [57]. Close-ended questions are more suitable for quantitative usability data [58].

As the questionnaire has 69 questions in total, an open-ended approach would create wear on the testers' participation, the questionnaire was developed using close-ended questions, but with a possibility to an open-ended answer. In this way, the participant could always give his own input, without overwhelming them. Almost all the questions had a screenshot to help.

D. Structure

The evaluation was divided into sessions: About you, About the attractions, About the Red Prototype, About the Blue Prototype, Comparing the two versions (Red/Blue), About Weimar, and Final opinion.

The "About You" session was designed to collect the demographics from the participants, such as age, gender and occupation, but also to get information regarding their behaviour on using apps for travel purposes.

The "About the attractions" was designed to check if the participants could recognize the UNESCO's WHS logo after using the prototypes, confirming if they acquired this information by using the prototypes or if they already knew this information.

"About the Red Prototype" and "About the Blue Prototype" investigates the impressions on the interface elements and features from each version, with the "About the Blue Prototype" also inquiring about exclusive features/pages, such as Routes, Settings and Right-Top-Menu.

After collecting the information regarding each prototype, the next session "Comparing the two versions (Red/Blue)", creates a direct comparison between the prototypes, making the participants choose between them, and justifying their choices.

The "About Weimar" session was designed to separate the analysis on two different groups: those who know Weimar, and those who don't know the city, to see if the relation of physical familiarity with the locations could affect the answers. Also, checking if the prototypes could serve as an incentive for people to travel to Weimar.

In the end, it was offered the possibility to add any comment or suggestions, as optional participation, and checking how easy was to fill the questionnaire.

After evaluating each implemented feature, the testers answered a final question about which version they liked

more, resulting in 83,3% in favour of Blue Prototype, and 16,7% for the Red Prototype.

VII. CONCLUSION AND FUTURE WORK

The results were largely favourable to the literature-based prototype (blue version), confirming the found guidelines. Creating guidelines is not a closed formula, adding new parameters and sources can create an impact on the results.

Some other features were tested and included in the guidelines, which were not found either in the industry based guidelines nor in the literature-based one, such as N2, N9, C20 and C21. But from the evaluation, most of the proposed guidelines were based on the literature review.

In the following table (Table III), it is possible to see the origin of each suggested guidelines, divided into 'industry-based', 'literature-based', 'common on both' and in case of absence – they came from the test and not from the reviews.

In this study, comparing a different set of guidelines, based on different sources brought interesting dynamics and analysis. Also, adding tailored outcomes for specific target groups, such as elderly people and studies on open-air media urban integration using apps, created a more inclusive set of guidelines.

TABLE III.   SUGGESTED GUIDELINES

Guidelines		Industry-Based	Lit.-Based	Common on both
Layout				
L1	Place Content in one screen / minimizing-avoiding scrolling		X	
L4	Consistency between different sections			X
L5	Orientation: provide session title		X	
L6	Providing a search bar		X	
Navigation				
N1	Number of Taps to WHS Information		(up to) 3	
N2	Number of items in the main navigation (up to 5)			
N3	Navigation Menu visible			X
N4	One Level Navigation Menu		X	
N6	Self-explanatory menu			X
N8	Presence of the Back button		X	
N9	Offering visible (tabs) sub-menu navigation			
Design				
D1	Limited use of colours			X
D3	Simple design			X
D5	Use of icons			X
D6	Space between buttons or other clickable items		X	
Content				

Guidelines		Industry-Based	Lit.-Based	Common on both
C2	Short text		X	
C3	Info at start screen		X	
C5	Prevent information loss (when back)			X
C6	Provides action feedback (in some cases, confirmation before deleting/uploading)		X	
C9	Tours / Routes		X	
C11	Focus / Only display essential information, no more than needed		X	
C12	Use of Aesthetics graphics		X	
C13	Clickable buttons with tactile feedback or sound (for Elderly)		X	
C14	Considering the surrounding environment		X	
C15	Provide notification of location-based		X	
C16	Use of visual clues for visited POI		X	
C18	Screen font large (for Elderly) / optimal size		X	
C19	Allowing personalization / configuration		X	
C20	Displaying more details on the available locations			
C21	On maps, displaying further information floating on the centre of the screen (not on the bottom)			
Media and Features				
F1	Photos / Aesthetic graphics			X
F3	Map GPS	X		
F10	Photo Gallery available			

Beyond the found guidelines, from the evaluation analysis, it was suggested that using the UNESCO's WHS logo helps to reinforce its branding, with 59% of people who recognised this symbol claiming they learnt if from the prototypes.

Another positive aspect of developing dedicated apps is city promotion. The evaluation analysis also suggested that the users who never been in the location (in this case, the city of Weimar), were considering to visit the city.

It can be argued that the found guidelines could be applied not just to dedicated open-air WHS apps, but also to other touristic apps. This is partially true, as touristic locations also require wayfinding and POI descriptions, along with all the navigation, design, layout and content recommendations described in this research.

What makes the guidelines focused on WHS are subtle recommendations, such as, the best approach regarding the use of a large amount of text to describe each POI (in this case, offering a short version, with the possibility to read further/expand); no use of audio or video, considering the

surrounding noises while walking through the city; the recommendation of implementing thematic routes; and offering the possibility to change interface features such as text-size (especially for elderly groups) and POI warnings based on GPS.

As future work, it would be suggested to implement a real app based on the guidelines that got a high positive evaluation from the developed prototypes and carry on more tests, using different techniques to check if the success threshold would be maintained in a satisfactory level. Also, further tests could be done with a wider set of different group profiles, especially regarding age and familiarity with the topic, to check in what extension the elderly-friendly features could affect users from different age groups, and how the empathic relation to the topic could affect the results.

But if time and budget would make not feasible such tests, it would be recommended to use a more inclusive approach, when developing the interface design and content features for app dealing with touristic destinations.

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