EXARC JOURNAL 2022/3
15 Articles | Open Access

The content is published under Creative Commons Attribution 4.0 International license (CC BY 4.0).

Reviewed Article:

RETOLD: Open-air Museum Mobile Applications UX Report - Looking for Inspiration

Persistent Identifier: https://exarc.net/ark:/88735/10650

EXARC Journal Issue 2022/3 | **Publication Date:** 2022-09-15

Author(s): Pau Sanchis Rota [1] ✉

[1] Universitat Autònoma de Barcelona, Plaça Cívica, 08193 Bellaterra, Barcelona, Spain.

This article presents the methodology and results of the report on Open-air Museums Mobile Apps, developed by the RETOLD Project in October 2021. From the analysis of a sample composed by 15 Open-air Museums mobile applications, three models for Open-air museums mobile apps are proposed according to different visit experiences. Model A, 'The Guide Model' distinguishes itself by the use of narrow and linear video tours, being the one that resembles traditional visitor guides. On the other hand, Models B and C incorporate new

features that broaden the user experience and provide tools to personalise the visit. The study approach is based on the User Experience framework which has been increasingly adopted by the Tech and App industries over the past two decades. The main focus is on the analysis of the information architecture and the usability of the sample, highlighting the market trends. Furthermore, a selection of model examples and good practices is offered to input into other Open-air Museums' app development ideas.

> The 'user journey' is a method widely adopted by the UX community to map the interaction of the end-user with the product and define its interaction design. It is a visualisation method that is also being exported to the museum sector since it provides a holistic view of a particular user in a given scenario. It shows the movement from point A to point B and documents the feelings, thoughts, and obstacles...

Introduction

The RETOLD Project (2020-2024), launched by EXARC and funded by Creative Europe, aims to develop a standardised workflow to freely document, digitise and share the heritage of Open-air museums. One of its key features will be the release of a unified digital platform which will improve research capacity and the preservation of digitised heritage data. In addition, it will offer tools that will enable future museum professionals to achieve an active digital presence and enhance participation with communities, thus ensuring the long-term sustainability of these spaces. The main agents involved are: The Universitat Autònoma de Barcelona (UAB), Complexul National Muzeal ASTRA (RO), Steinzeitpark Dithmarschen (DE), Museumsdorf Düppel (DE) with the advice of Nüwa Digital Media Content Production Studios Ltd. (IE) (EXARC, 2021).

Regarding the methodology, the report was commissioned in September 2021 following the development of a benchmark on mobile applications associated with outdoor heritage centres (See Figure 1). Currently, the platform is in the early stages of the strategy phase and the main requirement was to evaluate the current offer on the market. The main goal was to observe how the applications' different information structures responded to the visitors' needs. The report was presented on 6 October 2021, via video-conference with the participation of the different partners.

Approach

The suitability of mobile applications in the interpretation of open-air heritage has been a topic treated and discussed for several years (Grevtsova, 2015). However, it was not until the digital adoption forced by the outbreak of COVID-19 that many museums began to include apps as part of an expanded visitor experience (Özdil, 2020). Ever since, institutions are increasingly opting for the *'Bring Your Own Device'* (BYOD) philosophy, producing interactive guides accessible online which lead visitors autonomously through the tour.

What benefits does the BYOD philosophy bring? In the first place, the possibility of presenting different levels of explanation with distinctive points of view. Second, the opportunity to offer personalised experiences for different user groups. BYOD also assists institutions in the adherence to health and safety measures, and also in reducing costs (no need to spend more on hardware) and innovating with technologies such as Augmented Reality (AR) (Deakin, 2021; Hardy, 2022). Nonetheless, it is necessary to provide a physical alternative to the BYOD visit that includes those who prefer another type of experience or have little-to-no access to technology (low incomes, low technology literacy, etc). In addition, Open-air Museum apps encounter several obstacles in terms of lack of clarity in the purpose leading to a lack of appreciation of the visit, and also in terms of issues arising from lack of connectivity, such as poor network access, tedious downloads, et cetera. The market is full of stale 'ghost apps' that do not work properly and take too long to load. Therefore, it is always a good idea to think about the project purposes and goals beforehand, considering that in some cases an app might not be the best option.

The first part of the analysis is the ‘User Experience’ (UX) or ‘User-centred Design’ paradigm. Don Norman defined ‘User-centred design’ as "a design philosophy based on the needs and interests of users, with an emphasis on making products understandable and easy to use" (Norman, 2002, p.188). Even though many trends have emerged in recent years that criticise the submission of UX to the demands of corporations and the market (Dunne and Raby, 2013), UX has taken the digital sector by storm, becoming the industry standard. This approach has benefited the research to the extent that it has made it possible to optimise resources by knowing in advance the context and the motivations that guide potential end-users. Paraphrasing Hall (2019, p.3), UX Research[1] is a “periscope” (*ibid.*) that offers a better view of the surroundings.

Study Goal

According to Garrett's scheme (2011, pp.19-24), each digital project is composed by five levels or design phases that are co-dependent on each other: Strategy, Scope, Structure, Skeleton, and Surface (See Figure 2). At the time the study was commissioned, the platform was in the first phase (Strategy), which was designed to explore the market in search of ideas and trends that would help guide the scope. Therefore, the study pursued the goal of identifying and evaluating the ‘usability and information architecture’ of a group of ‘Open-air Museums’ mobile applications. To achieve this, two UX methods were combined to find patterns that provide information and inspire the design of the RETOLD Project platform.

Sample

The selection criteria of the apps that make up the sample followed a hierarchical order. First, EXARC members applications were considered, followed by those from other Open-air Museums not related to archaeology, archaeological museums, and finally a few related to

historical monuments or sites. The *Google Play Store* (Google Ireland Limited, 2022) was used as the main search engine, taking into account different significant criteria such as the developer agent, the total number of downloads, the category, the location, or the user rating.

In the end, the sample was composed of 15 applications[2] , 67% of which belonged to archaeological sites (See Figure 3), 40% to EXARC member museums and 50% were developed by the same institution. It should be noted that almost 40% of the total amount of downloads correspond to the application of the Palace of Versailles (Chateâu de Versailles, 2021). When focusing on topics and features, almost 50% are labelled as 'Travel and Guides' by the *Google Play Store,* with an average score of 3.7 out of five, and 15% have 'Tours' listed as their main functionality.

Evaluation Methods

In UX Research it is hardly useful to use a single analysis method. The optimum is using triangulation, that is, to combine different data from different sources of information (Salkind, 2010, pp. 1538-1540). Taking into account the requirements and resources of the assignment, it was considered that the methods that best fit are: 'heuristic evaluation' and the analysis of 'information architecture' (IA) and 'interaction design' (ID).

The 'heuristic evaluation' is a method which consists of inspecting and evaluating the usability of a website, app, or product (Nielsen, 2020). It evaluates how well a product, website, or app complies with these heuristics to define its usability. Jakob Nielsen (1994a; 1994b) was the first theorist to speak about heuristics and to propose a 'Heuristic Evaluation Model'. The results are expressed in numerical-based scoring (weighted to the impact on usability) for each heuristic[3] until an overall coefficient is obtained (See Figure 4).

The information architecture of the sample was analysed using the 'sitemap' or 'application map' methodology (See Figure 5). A 'sitemap' is a bird's-eye view showing the hierarchy of different pages within an app. It is a diagram that does not have to document every link on every page on the site. In fact, in most cases, that level of detail only confuses and obscures the relevant information. It is crucial to document the conceptual relationships: Which categories go together, and which remain separate? How do the steps in a given interaction sequence fit together? The 'sitemap' allows the designer to obtain the right blueprints from the analysed apps to map out all the possibilities.

The 'user journey' (See Figure 6) is a method widely adopted by the UX community to map the interaction of the end-user with the product and define its interaction design (Salazar, 2021). It is a visualisation method that is also being exported to the museum sector (Moffat and Scott-Songin, 2020) since it provides a holistic view of a particular user in a given scenario. It shows the movement from point A to point B and documents the feelings, thoughts, and

obstacles that could be experienced throughout the process. ‘User journeys’ help determine how many screens are needed, what order they should appear, and what components should to be present.

Results

In terms of functionalities[4] , most of the appraised apps offer heritage tours which can be accessed from a navigation menu that eases the search. The aid and information features along with the accessibility parameters are also among the most common functionalities (see Figure 7). The most frequent features are the main menu (14 times), tours guides (13 times), and onboarding (10 times). Video/audio-player features are usual (nine times) along with info/help section (nine times) and search functionalities (six times).

Three structure typologies have been found from the information architecture and interaction design analyses. Model A[5] , ‘The Guide Model’ (Figure 8) predominates a hierarchical structure of the information combined with a global navigation design. However, in the specific stages the local navigation and sequential architecture take control. A hypothetical user journey could be:

1. The user meets the brand elements and partners.
2. The user navigates and explores using the ‘navigation bar’.
3. The user gets an overall idea of the content and functionalities.
4. The user is introduced to the topic and prepares for the experience.
5. The user starts a tour and chooses one stop.
6. The user plays, stops, reads, and listens/watches the media of the tour.
7. The user finishes the learning experience enjoying the process.

The results of the ‘heuristic evaluation’ (See Table 1) conducted on this first model show an average of seven out of ten in the final computation of all the heuristics. In this particular case, the most prominent heuristic is number six, ‘Recognition Rather Recall’, which means design makes the interface intuitive and keeps the experience simple. Another highlight is number ten, ‘Help and documentation’, which is correct in most cases. In contrast, heuristics one to three still have space for improvement. Especially, 'Visibility of system status' or how appropriate the state of the system is conveyed to users. That means, again, to reduce at the possible minimum the user's frustration and cognitive load. Below, there are heuristics number four, five, and seven. This last one, 'Flexibility and efficiency of use', is far away from the rest. This type of app allows little space for improvisation, creation, or exploration. Their concept is focused on a pre-made journey, so the visitors have to jump from one point to another. The application that stands out the most is that of the Open-air Museum *Sagnlandet Lejre* (Loby Technologies, 2021).

MODEL A APPS	Visibility of system status	Match between system and the real world	User control and freedom	Consistency and standards	Error prevention	Recognition rather than recall	Flexibility and efficiency of use	Aesthetic and minimalist design	Help users recognize, diagnose, and recover from errors	Help and documentation
Cambodunum	70	80	60	80	70	100	55	80	-	85
Carnutum App	80	70	78	73	63	90	55	70	75	70
Museo de Altamira	73	73	80	68	60	68	63	70	60	70
ArchéoParc Dame Brassempouy	60	65	70	70	70	70	40	60	-	70
Museo de la Evolución Humana	60	65	70	50	73	60	40	40	40	70
De Tijdkijker	60	60	60	53	55	65	45	60	53	65
Sagnlandet Lejre	90	90	95	90	95	90	95	95	63	93

TABLE 1. MODEL A HEURÍSTIC EVALUATION.

Model B, 'The Experience-Oriented Model' (see Figure 9) presents an architecture focused on the delivery of 'as quickly as possible' experiences to the user. Because of that, hierarchical and sequential structures and local navigation tend to predominate. A user journey could follow the following sequence:

1. The user meets the brand elements and some basic information.
2. The user sees the menu options and experience specifications.
3. The user chooses an experience when they feel secure and ready.
4. The user lays or interacts with the content and the environment.
5. The user repeats the process until finishing the experience.
6. The user learns and has fun.

Tied with Model A, Model B also obtains a mark of seven in the heuristics (See Table 2). It also follows the trend of Model A and excels in the 'Recognition rather recall' area. But it also succeeds in keeping consistency and following industry standards. This model has a

reasonably good score in heuristic number three, 'Match between the system and the real world'. Designing experiences using long-standing conventions ensures that users have a pleasant journey through the interface. The apps that make up this group[6] should improve areas such as 'Visibility of system status' and 'Error prevention' to reduce user's confusion. It should be noted that in order to offer an interactive experience, for example using Augmented Reality, it is necessary to employ the right indications and make sure to provide 'exit doors' to users. More similarities between models A and B can be found by focusing on the lowest score, heuristic number seven or 'Flexibility, and efficiency of use'. The Experience-Oriented Model tends to have an even more limited user journey and while Model A focuses mainly on the itinerary, Model B puts the interactive experience in the spotlight. The application that stands out above the rest in this model is that of the Dutch historical park *De Hondsrug Hunzebosroutes* (VR Owl, 2021).

MODEL B APPS	Visibility of system status	Match between system and the real world	User control and freedom	Consistency and standards	Error prevention	Recognition rather than recall	Flexibility and efficiency of use	Aesthetic and minimalist design	Help users recognize, diagnose, and recover from errors	Help and documentation
MUSA Museo Arqueológico	65	70	70	70	65	75	40	70	-	63
De Hondsrug Hunzebosroutes	80	80	75	80	83	75	70	75	80	80
Industriekul TOUR Aabach	55	50	50	50	50	50	40	40	-	60

TABLE 2. MODEL B HEURÍSTIC EVALUATION.

Finally, Model C or 'The Exploration-Oriented Model' (See Figure 10) has a complex and open architecture, mostly with organic structures and a variety of navigation layouts. The three most common types are: global, supplementary (shortcuts, recommendations), and contextual (links) navigation systems. The user journey in an application with these characteristics could follow the following steps:

1. The user meets the brand elements and customises the experience.

2. The user feels secure and prepared to start.
3. The user glances at all sections of the app at once.
4. The user has immediate access to the main contents of the app.
5. The user searches for specific content (by map, filtering, or scrolling).
6. The user taps on the like icon and keeps the station for a further occasion, acquiring a deeper commitment to the app.
7. The user uses the audio guide playlist to follow the tour.
8. The user interacts with multimedia and feels in absolute control of the experience.
9. The user likes and shares the stop or tour.
10. The user learns and enjoys the process.

This model gets an average score one point higher than the previous two (eight out of ten) and stands out for its excellent use of 'Consistency and standards' and its sleek aesthetics and minimalist design (See Table 3). The list of services is diverse and focused on providing information and assistance before the visit. Not every app within this group[7] gives an entirely free and open experience, but what characterises this model is the ability to put users in control by allowing them to lead the experience. Contributing to that, there are two main heuristics: 'User control and freedom' and 'Flexibility of use'. The application that stands out by far is the one developed by the *Palace of Versailles* (Château de Versailles, 2021).

MODEL C APPS	Visibility of system status	Match between system and the real world	User control and freedom	Consistency and standards	Error prevention	Recognition rather than recall	Flexibility and efficiency of use	Aesthetic and minimalist design	Help users recognize, diagnose, and recover from errors	Help and documentation
Antwerp Museum App	85	75	80	90	80	90	80	85	75	90
Dundas West Open Air Museum	75	73	73	80	73	73	50	78	-	73
Useeum	75	80	80	90	75	80	80	85	60	80

Château de Versailles	95	95	95	100	90	95	95	95	90	95
Parco Colosseo	70	70	75	80	70	70	65	65	-	75

TABLE 3. MODEL C HEURÍSTIC EVALUATION.

Conclusions

Models A, B and C have the same goal: to guide visitors through the tour in the most efficient and enjoyably way possible. Apps under the Exploration-Oriented Model (Model C) present a greater variety in their functionalities, extending their useful life more than the rest. They are also the ones that achieve the best results in the usability analysis. Model C interfaces also present greater consistency across all screens, standardised information, intuitive navigation, and flexibility in use. Nonetheless, this model may not be the most suitable if the project is budget-limited or if long-term maintenance is not planned.

The Guide Model (Model A), characterised by a hierarchical structure and sequential navigation, is by far the most successful type of structure with almost half of the analysed applications belonging to this group. Its entire design is based around the route of the visit, which can be free (for example, following points on a map), or linear, through an audio or video playlist. In addition, it is quite common to combine Augmented Reality interactive experiences with the environment itself, thus exploiting the 'sense of place'. Its main drawbacks are: 1) The little versatility of its functionalities, that is, they can only be used in one way. 2) These apps are intended to be used only once, which makes many users think that they are not worth downloading[8] . 3) Many depend on a good internet connection and the capabilities of smartphones.

The Experience-Oriented Model (Model B), the one with the least representation in the sample, is very similar. As its name suggests, Model B focuses all product decisions on delivering interactive experiences devised for learning with emotion, offering better opportunities to incorporate a 'storytelling' approach. Furthermore, it can contribute to breaking the 'isolation' of visitors, one of the main criticisms of mobile guides in museums.

Whereas its main feature is gamification, Model B apps are not the only ones incorporating this type of experience; most of the sample merge gaming elements into their user interfaces. Gamified experiences enhance learning by encouraging users to follow the tour itinerary playfully and effortlessly. Some of the most commonly used strategies are quizzes, badges, adventure games, or geolocation games. Despite this, these types of apps are not easy to develop and in most cases of study the design tends to fail, especially in the following areas: 'Visibility of system status', 'Error prevention', 'Flexibility and efficiency of use' and 'Aesthetic and minimal design'. They also require high programming and maintenance costs.

These three models illustrate the different directions in which the project can be headed. None of them are aimed at a particular type of museum, instead, the conditions of each place

must be assessed to find the best possible alternative.

1 The term 'research' referred to when talking about UX Research is not the same as that followed by Social Sciences or Pure Sciences. In UX, an applied and practical use is made of research which is goal-driven and methodologically more flexible.

2 The 15 apps are: Antwerp Museum App (https://bit.ly/3uf23FH), ArchéoParc Dame Brassempouy (https://bit.ly/3DNAQx3), Cambodunum (https://bit.ly/3LKbQtw), Carnutum App (https://bit.ly/3NSD3Mj), Château de Versailles (https://bit.ly/3r6Nmm2), De Hondsrug Hunzebosroutes (https://bit.ly/3KjJhTd), De Tijdkijker (https://bit.ly/3uWGKIh), Dundas West Open Air Museum (https://bit.ly/3x9rLNW), IndustriekulTOUR Aabach (https://bit.ly/3v3l79n), MUSA Museo Arqueológico (https://bit.ly/3KfQLH2), Museo de Altamira (https://bit.ly/3uYXGxL), Museo de la Evolución Humana (https://bit.ly/3ue5AnG), Parco Colosseo (https://bit.ly/3jd8Yco), Sagnlandet Lejre (https://bit.ly/3DU9Xru), Useeum (https://bit.ly/35KKfJc).

3 Jakob Nielsen established 10 heuristics: 1. Visibility of system status; 2. Match between system and the real world; 3. User control and freedom; 4. Consistency and standards; 5. Error prevention; 6. Recognition rather than recall; 7. Flexibility and efficiency of use; 8. Aesthetic and minimalist design; 9. Help users recognize, diagnose, and recover from errors; 10. Help and documentation.

4 In UX, the term 'functionality' is used to designate a function or group of functions that are part of what an app offers. For example, to look up for a particular term within an app, you need a 'search engine' functionality, which consists of an internal search engine and a form to introduce that term.

5 Seven apps compose this group: Cambodunum, Carnutum App, Museo de Altamira, ArchéoParc Dame Brassempouy, Museo de la Evolución Humana, De Tijdkijker and Sagnlandet Lejre.

6 Musa Museo Arqueológico, De Hondsrug Hunzebosroutes and IndustriekulTOUR Aabach.

7 Antwerp Museum App, Dundas West Open Air Museum, Useeum, Château de Versailles and Parco Colosseo.

8 Companies such as Smartify (https://smartify.org/) or Google Arts & Culture (https://artsandculture.google.com/) have addressed this issue by creating platforms where different museums and galleries share their routes.

Keywords digitalisation
documentation

Bibliography

Chateâu de Versailles, 2021. *Palace of Versailles* (Version 5.4.7) [Mobile app]. Available at: Google Play Store [Downloaded 15 March 2022].

Deakin, T., 2021. What does the Bring Your Own Device (BYOD) revolution mean for museums?*Museum Next,* June 01. Available at: <bit.ly/3u0KQyDbit.ly/3u0KQ> [Accessed 15 March 2022].

Dunne, A. and Raby, F., 2013. *Speculative Everything: Design, Fiction and Social Dreaming.* Cambridge: The MIT Press.

EXARC, 2021. *RETOLD 2020-2024 (Creative Europe).* Available at: <https://exarc.net/eu-projects/retold> [Accessed 15 March 2022].

Freeman, J., 2021. *5 Charts and Templates for Competitor Analysis*. Available at: <bit.ly/3i7hadBbit.ly/3i7hadB> [Accessed 14 March 2022].

Garrett, J.J., 2011. *The Elements of User Experience: User-Centered Design for the Web and Beyond.* 2nd ed. Berkeley: New Riders.

Google Ireland Limited, 2022. *Google Play Store* (Version 29.5.14-21) [Mobile app]. Available at: Google Play Store [Accessed 17 March 2022].

Grevtsova, I., 2015. *Interpretación del patrimonio urbano. Una propuesta didáctica para un contexto histórico mediante las aplicaciones de telefonía móvil.* PhD thesis. Universitat de Barcelona. Available at: <bit.ly/3Iehzpgbit.ly/3Iehzpg> [Accessed15 March 2022].

Hall, E., 2019. *Just Enough Research.* 2nd ed. New York: A Book Apart.

Hardy, R., 2022. 'QR codes are experiencing a resurgence but how can they benefit museums?', *Museum Next,* February 18. Available at: <bit.ly/3u0UQI2bit.ly/3u0UQ> [Accessed 15 March 2022].

Loby Technologies, 2021. *Sagnlandet Lejre* (Version 1.95) [Mobile app]. Available at: Google Play Store [Downloaded 15 March 2022].

Moffat, K. and Scott-Songin, C., 2020. Digital journey mapping at The National Gallery: Understanding the role of digital touchpoints in a real world or online only visitor journey. *MW20: MW 2020*. Available at: <bit.ly/3KIcJIIbit.ly/3KIcJII> [Accessed 15 March 2022].

Nielsen, J., 1994a. *Enhancing the explanatory power of usability heuristics*. Proc. ACM CHI'94 Conf. (Boston, MA, April 24-28). Available at: <https://doi.org/10.1145/191666.191729> [Accessed 15 March 2022].

Nielsen, J., 1994b. Heuristic evaluation, in: J. Nielsen and R.L. Mack, eds., *1994. Usability Inspection Methods*. New York: John Wiley & Sons, pp. 25-64.

Nielsen, J., 2020. 10 Usability Heuristics for User Interface Design. *NN/g,* November 15. Available at: <bit.ly/3CMPwflbit.ly/3CMPwfl> [Accessed 15 March 2022].

Norman, D. A., 2002. *The Design of Everyday Things.* 2nd ed. New York: Basic Books.

Salazar, K., 2021. The Practice of Customer-Journey Management. *NN/g,* July 18. Available at: <https://bit.ly/3i3stUd> [Accessed14 March 2022].

Salkind, N. J., 2010. Triangulation, in: N.J. Salkind ed., 2010. *Encyclopedia of Research Design.* Thousand Oaks: SAGE Publications, Inc. pp. 1538-1540 Available at: <https://dx.doi.org/10.4135/9781412961288.n469> [Accessed 17 Mar 2022].

VR Owl, 2021. *De Hondsrug Hunzebosroutes* (Version 1.6) [Mobile app]. Available at: Google Play Store [Downloaded 15 March 2022].

Özdil, E., 2020. *Museums in 2020+: The Search for Meaning*. Available at: <https://www.thisisjunior.com/books> (Accessed 14 March 2022).

Share This Page

Corresponding Author

Pau Sanchis Rota
Universitat Autònoma de Barcelona
Plaça Cívica
08193 Bellaterra, Barcelona
Spain
E-mail Contact

Gallery Image

FIG 1. COVER OF THE OPEN-AIR MUSEUM APPS REPORT. SOURCE: PAU SANCHIS ROTA

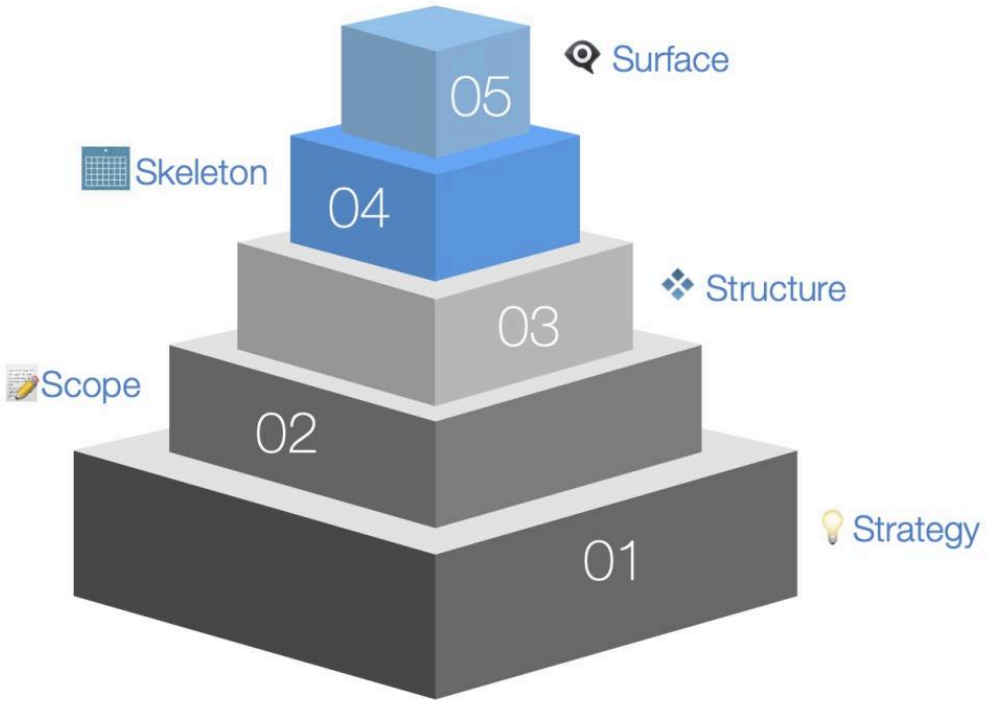

FIG 2. GARRET'S SCHEME. SOURCE: THE AUTOR FROM (GARRETT, 2011).

FIG 3. MAP OF THE SELECTED MUSEUMS. SOURCE: PAU SANCHIS ROTA

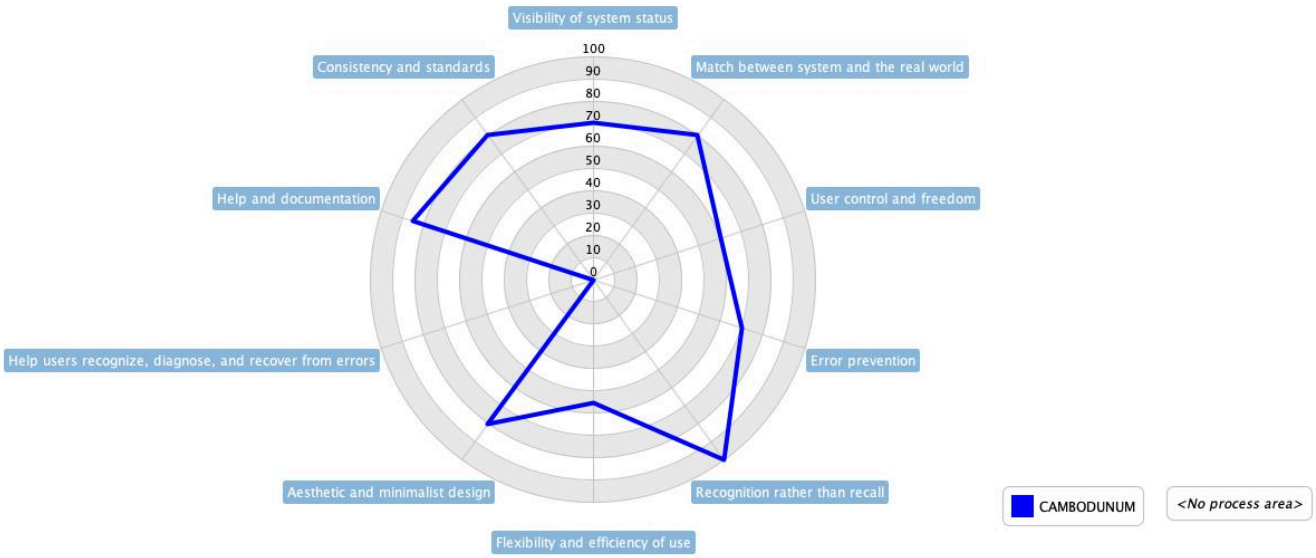

FIG 4. RADAR CHART OF THE HEURISTIC EVALUATION OF CAMOBODUNUM APP. SOURCE: PAU SANCHIS ROTA

FIG 5. EXAMPLE OF THE PARCO COLOSSEO SITEMAP. SOURCE: PAU SANCHIS ROTA

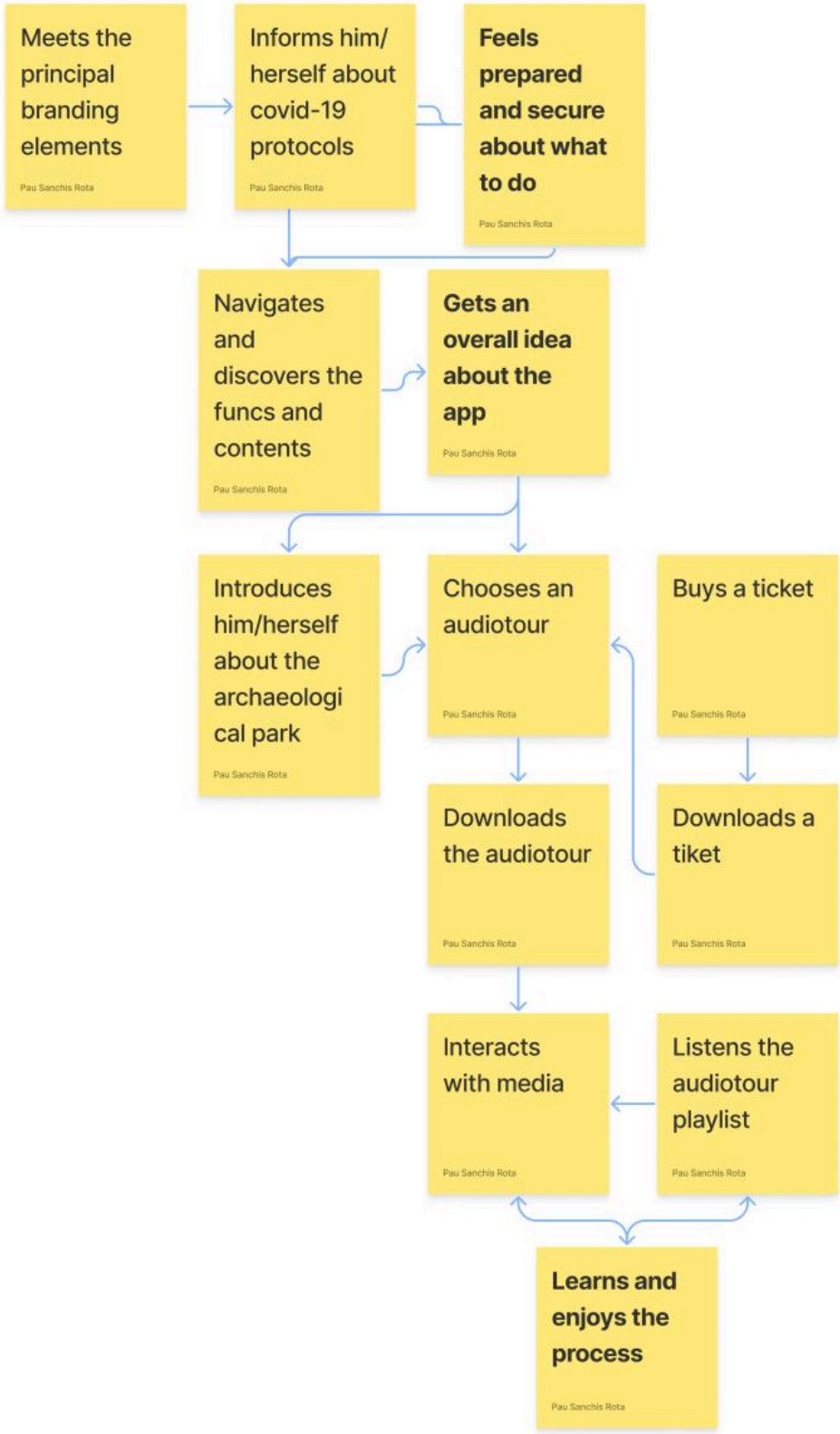

FIG 6. EXAMPLE OF A USER JOURNEY OF THE PARCO COLOSSEO APP. SOURCE: PAU SANCHIS ROTA

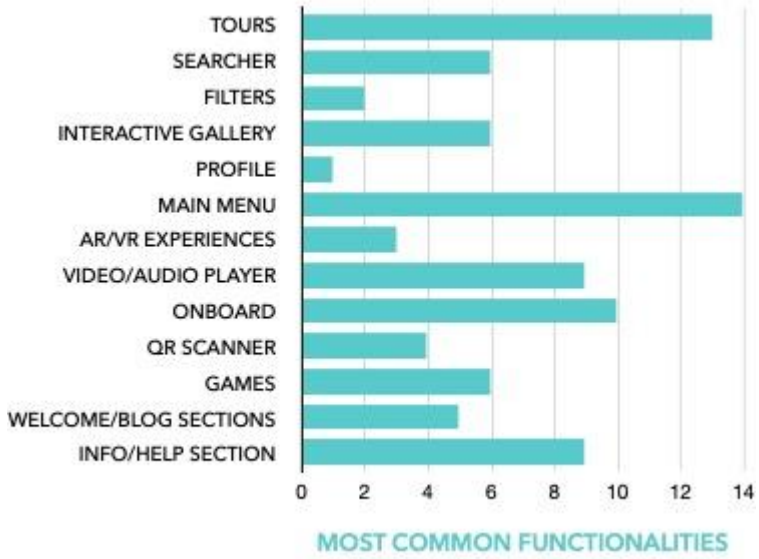

FIG 7. MOST COMMON FUNCTIONALITIES OF THE SAMPLE. SOURCE: PAU SANCHIS ROTA

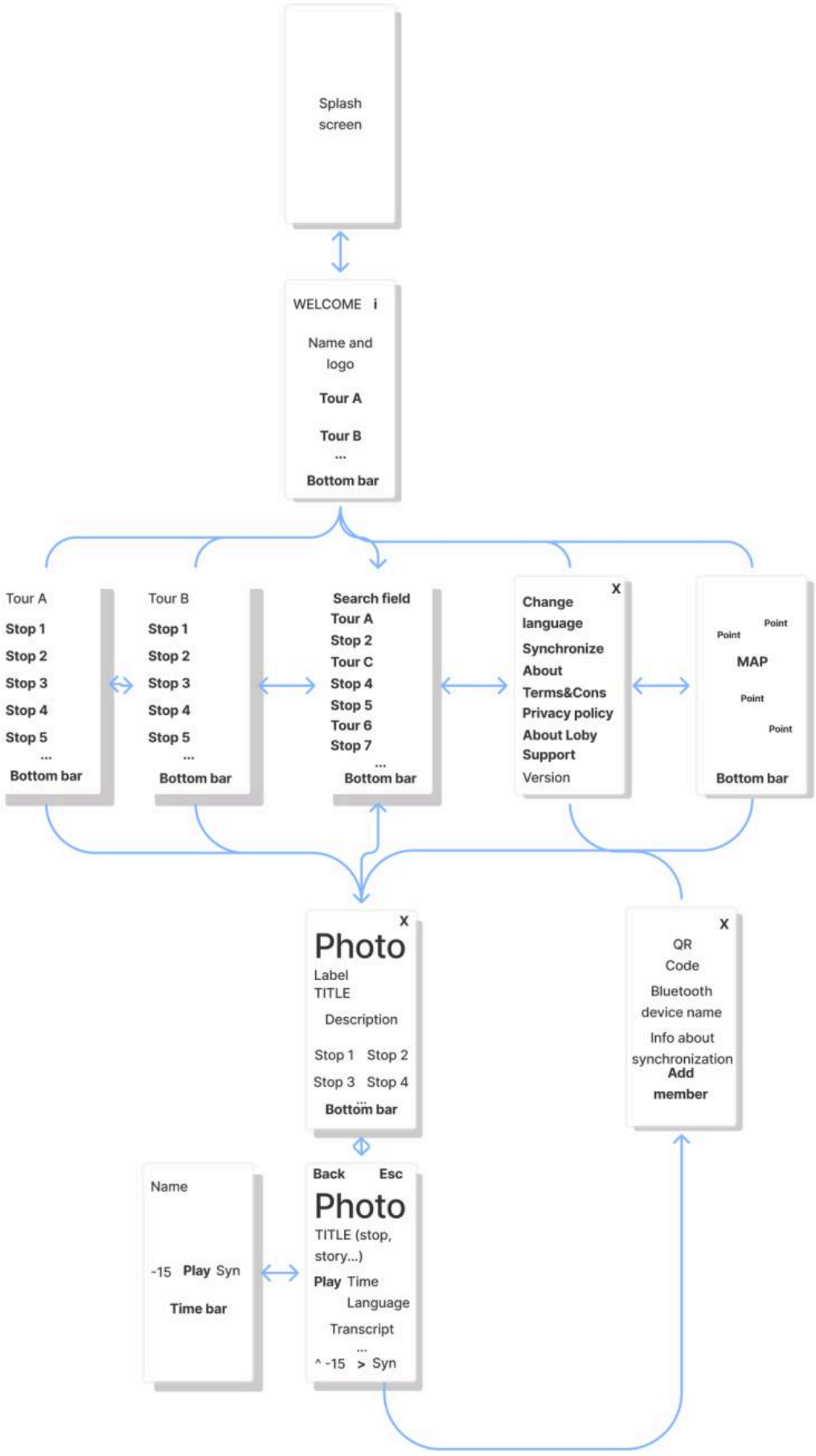

FIG 8. SITENAP OF THE MODEL A OR 'THE GUIDE MODEL'. SOURCE: PAU SANCHIS ROTA

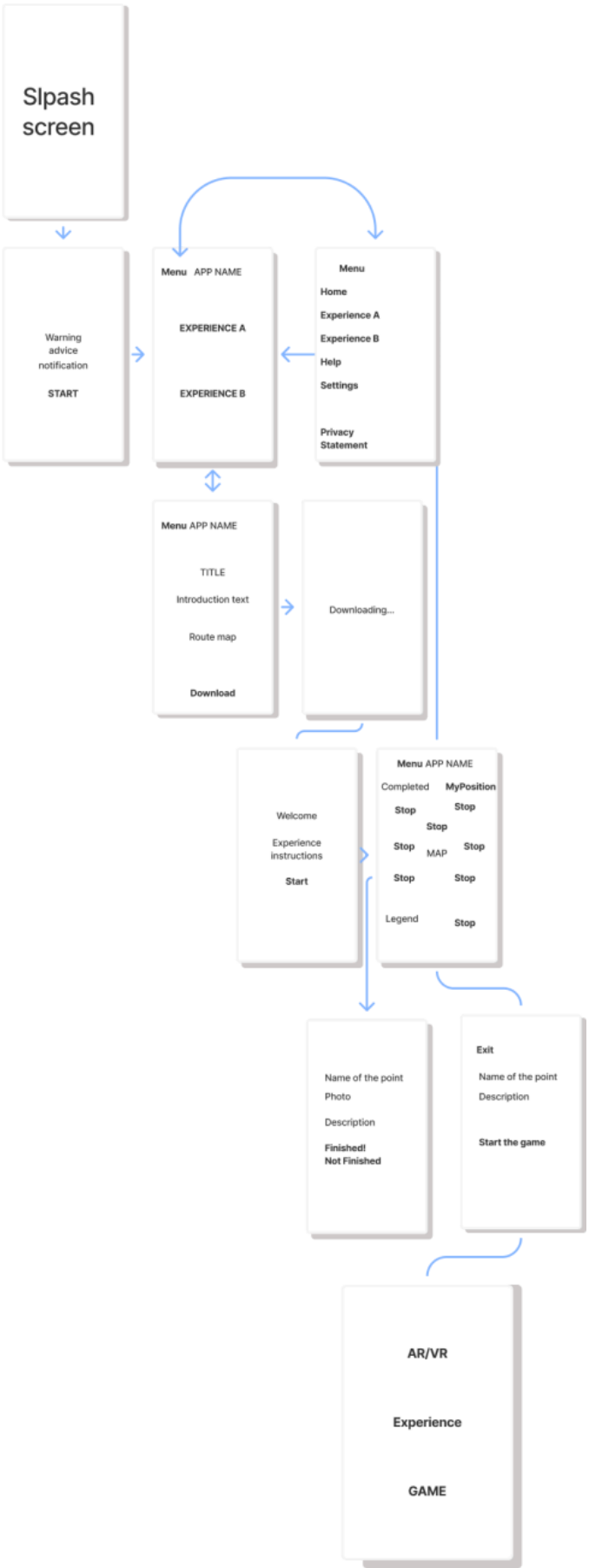

FIG 9. SITEMAP OF THE MODEL B OR ‘THE EXPERIENCE-ORIENTED MODEL’. SOURCE: PAU SANCHIS ROTA

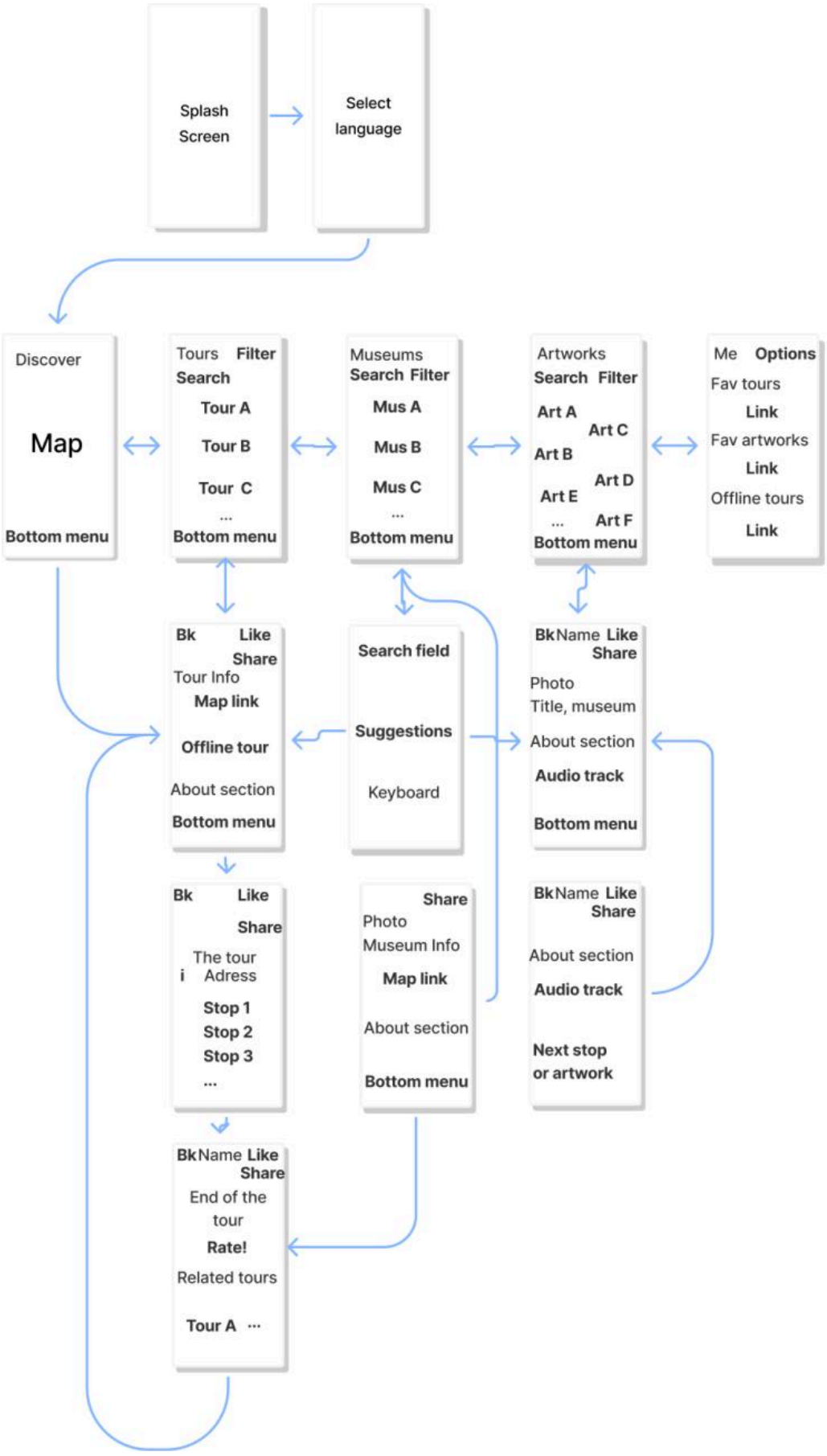

FIG 10. SITEMAP OF THE MODEL C OR 'THE EXPLORATION-ORIENTED MODEL'. SOURCE: PAU SANCHIS ROTA