University of Reading

Better museum maps: an empirical study comparing the appeal and effectiveness of graphic design approaches

Thesis submitted for the Doctor of Philosophy in the Department of Typography & Graphic Communication

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Declaration

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

Andrew McIlwraith, 16 September 2018

Abstract

Visitor maps are a key resource that many people use to facilitate their visit to a museum. This thesis sets out to understand how such maps are used by visitors, to investigate the range of graphic design approaches and elements that are employed in their design, and to consider how map design can improve museum visitors' experiences. The research examines the range of information different maps attempt to convey, and the graphic means they use to do it, using of a corpus of around 250 contemporary museum maps from around the world. A historical perspective is also gained through an examination of the design of maps produced by two major UK museums throughout their history. Three linked surveys of museum visitors investigating the use of maps and digital guides reveal that, when using maps, while people are interested in navigation, their prime interest is what the museum holds. These surveys also reveal that, at a time of high digital device ownership and use, many museum visitors still favour printed maps over digital guide devices.

Two empirical studies examine particular aspects of map design: the relative effectiveness and appeal of two-dimensional or three-dimensional depictions; and the appeal of two methods for labelling exhibition spaces (location labels on the map, and a directory-style list).

The first study suggests that three-dimensional representations can better help people understand the layout of a museum, as they can more clearly show the building as a whole, and the ways of moving between floors. However, three-dimensional representations can, in themselves, create complexity that make maps difficult for some users to use. The second study suggests that using a directory labelling system may mitigate this sense of complexity.

This research provides insights into how museum visitors use maps, and particular issues in the design of maps that can impede their understanding of the museum's layout, which can help map designers. The thesis concludes by identifying avenues for further research that would improve our understanding of design features that best serve museum visitors with varying needs and map-reading abilities.

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Introduction

Context

Museums are an important part of many people's cultural lives – in developed countries at least, a large proportion of the population will visit a museum every year.[1,2] Museums are also an important part of many cities' and countries' economies, generating income and supporting the businesses that serve them and their visitors.

Most museums strive to ensure that their visitors have a visit that is enjoyable and educational, and perhaps also inspirational. One way to facilitate this is to ensure that visitors understand the themes of the museum, what there is to see, and how to navigate the space. However, museums can struggle to do this: a study of 11 art museums concluded that they all had a problem explaining their layout to visitors;[3] another study, of 38 exhibitions, noted orientation as one of five key areas needing improvement.[4] Museums employ various resources to aid orientation and navigation, including museum staff, volunteer guides, and signs, apps and maps of the museum. Printed guide maps are a key tool: they are relatively easy and cheap for museums to produce, and are widely used and appreciated by museum visitors.[5]

Despite this, some maps can be difficult to interpret, and some people find maps difficult to use. The author's previous academic experiences – an undergraduate degree in architecture (1980-84) and a masters degree in information design (2012-23) – has provided some insight into the problems that museum visitors can face when using maps. First, floor plans, along with other drawings, were long the main means of explaining planned architectural projects to clients, and in particular the size, proportions and connections of spaces within a building, yet the author's experience when studying architecture was that lay people struggle to fully understand floor plans. Second, while studying information design, the author undertook a project to design a wayfinding scheme for a museum, including a map, and in the process, gained an understanding of the challenges facing map designers in depicting the museum and its elements and contents clearly and accurately.

1 LaPlaca Cohen (2017). *Culture Track '17: Supporting Data*. New York: LaPlaca Cohen Advertising Inc. Available at <https://culturetrack.com/research/reports/>. [Accessed 15 December 2017]. 26

2 Department for Digital, Culture, Media & Sport (2016). *Taking Part: Findings from the Longitudinal Survey Waves 1 to 3, April 2016*. London: DCMS. Available at <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/519629/Taking_Part_Year_10_longitudinal_report_FINAL.pdf>. [Accessed 17 January 2017].

3 Walsh, A. (ed) (1991). *Insights: Museums, Visitors, Attitudes, Expectations, a Focus Group Experiment*. Los Angeles: The J Paul Getty Trust. **18**

4 Serrell, B. (2013). *A Review of Recommendations in Exhibition Summative Evaluation Reports.* Building Informal Science Education (BISE) Research Synthesis. Available at <http://informalscience.org/sites/default/files/exhibits_summative_recommendations_serrell.pdf>. Accessed [4 April 2018]. **6-8**.

5 For example. Wright, P., Lickorish, A. and Hull, A. (1990). The Importance of Iterative Procedures in the Design of Location Maps for the Built Environment. *Information Design Journal*. 6:1. **67-68**.

Aims, research questions and methods

This thesis therefore aims to provide insight into visitors' use of maps and their responses to different design details; in particular, how effectively different designs allow visitors to understand what the museum offers, and how to find their way around. There are three main strands of research within this thesis:

What information do museum maps attempt to convey and how do visitors use them? A foundation for the research is a corpus of museum maps covering a representative a range of map designs and museum types (described in detail on page 39). This research question is answered first through an analysis of the corpus, and second through an examination of the maps produced by two large museums in the UK since the mid-18th century. In answering this question, there is also the consideration why museums might or might not choose to produce maps for their visitors. This includes an assessment of the characteristics of a museum (physical and otherwise) that may contribute to its need to produce a map. As part of this, the role of printed museum maps in an increasingly digital world is examined – specifically, how popular printed maps are compared with digital guide and navigation systems, such as multimedia guides and smartphone apps.

Are 2D maps better than 3D maps? A fundamental element of the design of a museum map is the way in which the museum building is projected. In most cases, this is either as a series of two-dimensional (2D) floor plans, or as a three-dimensional (3D) diagram (axonometric or perspective). A study is devised to compare the relative effectiveness and appeal of each type, among a group of participants using each type of map in the same museum. These participants report on their ability to find their way in the museum using the map, and on how the map facilitates their understanding the layout of the museum, in order to plan or undertake a visit.

Do users prefer location labels to a directory system on museum maps? Another difference revealed in the analysis of contemporary maps was the way the galleries, exhibits and other areas are denoted on maps, which divide broadly between labels on the map at the relevant location, and a directory system, listing the areas with reference to a key (usually a letter or number). The study of 2D and 3D maps revealed that, for some users, there was a sense of added "complexity" in the 3D map. Another study was therefore devised to compare users' responses between the use of location labels and a directory on 2D and 3D maps.

Outline of thesis

The thesis begins by considering why museums produce visitor maps, including what defines a museum. This leads to a discussion of the different types of museum, and the characteristics of a museum that make it more likely (and compelling) to provide a map for visitors.

The second chapter discusses the material forms that maps take, ie, the documents in which they are provided, and related aspects to this (such cost, availability and size), that affect how the maps are used by people to facilitate their visit to the museum. The second part of this chapter considers the role of printed maps in an increasingly digital world, and the range of digital devices and resources that, to varying degrees, provide the kind of information that maps do. It looks at digital alternatives available in contemporary museums, how they can act as a substitute for maps, and why most museums continue to produce printed maps for visitors, often alongside digital alternatives. This issue is probed further in a small-scale study that is described in Chapter 5.

A detailed examination of a range of contemporary museum maps forms the first part of chapter 3. A corpus of maps (described on page 39) is used as the basis of this investigation, which considers the graphic elements used in maps. The result of the analysis is a proposal of four “information roles” – specific purposes for which visitors can use maps. The second part of this chapter takes a different view of maps, looking at the range of visitor maps produced by two museums, the British Museum and the Victoria & Albert Museum (V&A), over a period of around 150 years. This provides insight into the different approaches that designers have taken to museums that have remained physically largely unchanged. The insights gained from these two exercises informed the focus of the two studies into map design that are described in Chapters 6 and 7.

Chapter 4 is an overview of published and museum-conducted research that has relevance to museum map design. It begins with an overview of research into how people orientate themselves and navigate indoor spaces. There is then an overview of research into museum visitor behaviour, which has implications for map design, in some cases because it covers broadly what people do when they are in museums, or, more specifically, where it assesses how people move around museums, and the resources and strategies they employ when they plan or undertake a visit. The chapter also considers the limited amount of directly relevant research that is focused on the design and use of museum maps, and how useful studies of particular maps in particular museums are when considering museum map design more generally.

Taken together, Chapters 2 and 4 provide a comprehensive overview of research of relevance to map design. But the picture is still incomplete. To get a more targeted understanding of how visitors use museum maps, a survey was undertaken, described in Chapter 5, of museum visitors at the V&A. Respondents

were interviewed about their use patterns in relation to the information roles for museum maps proposed in Chapter 3; and about their use of and attitude towards digital alternatives to museum maps. This survey was further developed, and undertaken with different study populations and locations, in order to validate the findings, and generate wider variety of responses. The further studies are reported on in the two subsequent chapters.

Chapter 6 describes a user study devised to compare a specific aspect of museum map design, as identified in the analysis of the corpus of maps in Chapter 3, namely two-dimensional (2D) and three-dimensional (3D) maps. The study, undertaken at the National Maritime Museum in Greenwich, London, compared people's navigation abilities with two specially-prepared maps: one consisting of a series of 2D floor plans, and the other an axonometric (3D) diagram of the building. The study also recorded the perceived usefulness of each map by participants as a device for understanding the layout and contents of the museum.

The study described in Chapter 6 revealed some other design issues in maps, including that of the clearest way to label spaces within the museum. To investigate this, a study was devised, described in Chapter 7, to compare maps with two types of labelling system: labels are located on or adjacent to the spaces they describe, and a directory-style list next to the map, with a key letter to indicate their location. The study aimed to explore participants' preferences for each type, and whether there was any connection between this and the map projection style (2D or 3D).

The Conclusion and Discussion considers the insights gained from the analysis of the corpus of maps, and the three studies. It explains the issues raised by participants in the final two studies, and the context of the particular design issues investigated (building projection, labelling style) in relation to other design elements. Some recommendations for map designers based on the outcomes of the studies are outlined. The limitations of the studies are described, as well as recommendations for further research, some of it to validate these findings and to address the limitations, and some to address other issues of museum map design that emerged during the research.

The corpus of maps

A corpus of contemporary museum maps was gathered for the purpose of analysing the range of types and designs of map and the type of information being conveyed. In collating the maps for the corpus, the aim was to include a representative sample of maps of different types, from different types of museum throughout the world. To begin with, a list of the largest and most visited museums in the world was collated, from several sources: the annual survey of art museum visitor figures by The Art Newspaper,[6] industry reports

6 The Art Newspaper (2016). Special Report: Visitor Figures 2016. *The Art Newspaper*. 289: April 2017.

from the Themed Entertainment Association[7] and the Association of Leading Visitor Attractions,[8] and Trip Advisor Traveller's Choice awards.[9] From these sources, 68 maps were obtained; the corpus was expanded with maps from other museums gathered from ad hoc visits to museums by the researcher and the researcher's personal contacts and web searching.

For the purpose of the analysis, the corpus includes only maps that depict the entire museum building or buildings, and excludes:

- temporary exhibition guides or room guides that show only part of a museum, and
- site maps and outdoor maps that do not show the internal layout of the museum building or buildings.

The corpus includes documents of two types: printed maps made available to visitors on visiting the museum, and pdf versions of printed maps made available on museums' websites. Pdf documents were included in the corpus in order to increase the size and range of maps, and because it was not practical to collect a sufficient number of printed maps personally from museums.

The corpus consists of 251 maps (72 printed and 179 pdf) from 29 countries. A list of the maps in the corpus, with analysis of their type and content, is in Appendix 1.

7 Themed Entertainment Association/AECOM (2014). *TEA/AECOM 2013 Theme Index & Museum Index: The Global Attractions Attendance Report*. Burbank, CA: TEA/AECOM. Available at: <http://www.teaconnect.org/images/files/TEA_28_915227_140617.pdf>. [Accessed 15 July 2015].

8 Association of Leading Visitor Attractions (ALVA) (2017). *Visitor Figures*. [online] Available at: <http://www.alva.org.uk/details.cfm?p=423>. [Accessed 12 November 2014].

9 Trip Advisor (2015). *Trip Advisor Travellers' Choice 2015: Top 25 Museums – World*. [online] Available at: <http://www.tripadvisor.co.uk/TravelersChoice-Museums>. [Accessed 16 October 15]

Chapter 1: Why museums produce visitor maps

Why museums produce visitor maps

Museums are often complex environments: the museum buildings and spaces can be large and complicated; many visitors will be wholly unfamiliar with the environment, the themes and arrangements of the displays – even the language and culture of the country in which the museum is located.

Therefore, as with other public spaces, most visitors will need some information to help them understand what is in the museum, and how to navigate their way through it; Cohen et al found that museum visitors have "an insatiable demand for orientation information".[1] That information can take many forms, such as signage, static maps (such as wall-mounted maps), static dynamic information (digital information on in situ screens), museum staff and volunteers, portable dynamic information (audiovisual guides, or information delivered to visitors' own devices) and portable printed guide maps.

Few visitors will rely on just one of these forms of information, but printed guide maps are widely used by museum visitors. Falk and Dierking state that "… almost every museum provides a map",[2] and Bitgood that "visitor guides with a map of the [museum] facility should be a fundamental part of any orientation system".[3] When well designed, maps can be very effective in helping visitors orientate themselves, plan their visit, and navigate the museum. Hayward Brydon-Miller found that handout maps are "extremely useful" for spatial orientation – 95% of visitors surveyed at an open-air museum said that the handout map was useful, compared with 10% for standing display maps, and 8% for signs and photo panels (though this research was undertaken in a largely pre-digital age, so there is no provision for digital navigation and orientation options).[4]

Despite Falk and Dierking's claim, not all museums provide a visitor map, and they are not required to. There are various national and international museum membership and professional bodies around the world that have requirements for membership or produce best-practice guidelines for museums. But requirements, where they exist, for visitor maps or wayfinding systems, tend to be brief and general. For example, the International Council of Museums (ICOM), the international professional body for museums and those who work in the industry, makes no mention of maps or wayfinding systems in its requirements for members[5]; nor does the UK Museums Association.[6]

1 Cohen, S., Winkel, G.H., Olsen, R. and Wheeler, F. (1977). Orientation in a Museum – an Experimental Visitor Study. *Curator: the Museum Journal*. 20:2. **92**

2 Falk J.H. and Dierking L.D. (2013). *The Museum Experience Revisited*. Walnut Creek: West Coast Press. 183

3 Bitgood S. (2011). *Social Design in Museums: The Psychology of Visitor Studies. Collected Essays Volume One.* Edinburgh: MuseumsEtc. **326**

4 Hayward, D.G. and Brydon-Miller, M. (1984). Spatial conceptual aspects of orientation: Visitor experiences at an outdoor history museum. *Journal of Environmental Systems* 13:4. **325-326**.

5 International Council of Museums (2015). [online] Available at: <http://icom.museum> [accessed 29 April 2015].

6 Museums Association>About (2015). [online] Available at: <www.museumsassociation.org/about> [accessed 29 April 2015].

The Arts Council England (ACE), the statutory funding body for the arts in England, includes a general requirement for wayfinding systems in its museum accreditation scheme (which is also used in the rest of the UK, through ACE equivalent bodies in Scotland, Wales and Northern Ireland). This scheme "enables museums and governing bodies to assess their current performance, and it supports them in planning and developing their services".[7] The ACE accreditation scheme states that "The museum must have appropriate signs and directions inside and outside the building"[8], and that museums must be able to demonstrate that "There is clear guidance available to help visitors navigate their way around the museum and [to] locate facilities".[9] The American Alliance for Museums' (AAM) standards and best practice guidelines state only that a museum should "manage its facilities… in such a manner as to ensure they are clean, well-maintained, safe and accessible".[10]

Similarly, the Museums and Accreditation Programme (MAP) for Australian museums, based on standards developed by public museum agencies in the country has a requirement that "There is orientation information to help visitors find their way around the museum and understand what there is to see and do there", listing maps among the materials and devices for providing this.[11]

In reviewing the role of museum maps in orientation, it is first important to consider current thinking about what kinds of institutions and entities can be considered a museum.

What is a museum?

The Oxford English Dictionary defines a museum as "A building in which objects of historical, scientific, artistic, or cultural interest are stored and exhibited."[12] However, many museum professionals and cultural organisations involved in museums taker a broader view of what a museum is. Ginsburgh and Mairesse go so far as to say that "in practice, anyone can set up a firm, construct a factory or restore a cemetery and call it a museum"[13], and Alt that "a museum can be

7 Arts Council England (2015). *Accreditation Scheme*. [online]. Available at: <http://www.artscouncil.org.uk/what-we-do/supporting-museums/accreditation-scheme> [Accessed 21 June 2015].

8 Arts Council England. (2011). *Accreditation Scheme for Museums and Galleries in the United Kingdom*, [pdf] London: Arts Council England. Available at: <http://www.artscouncil.org.uk/what-we-do/supporting-museums/accreditation-scheme/> [Accessed 21 June 2015]

9 Arts Council England (2014). *Accreditation Guidance. Section three: users and their experiences*, [pdf] London: Arts Council England. Available at: <http://www.artscouncil.org.uk/media/uploads/FINAL_201406_GuidanceSection3.pdf >[Accessed 21 June 2015]

10 The American Association of Museums. (2008). *National Standards & Best Practices for U.S. Museums*. Washington, D.C.: The AAM Press. **73**

11 National Standards Taskforce (2016) *National Standards for Australian Museums and Galleries*, Version 1.5. Benchmark B3.3.3.

12 Oxford University Press (2006). *Concise Oxford English Dictionary*. Oxford: Oxford University Press.

13 Ginsburgh, V. and Mairesse, F. (1997). Defining a Museum: Suggestions for an Alternative Approach. *Museum Management and Curatorship*. 16, **15**

Fig 1. The main entrances to the British Museum, London

Fig 2. The main entrance to the National Gallery of Art (West Building), Washington, DC

Fig 3. UK roadsign for England to indicate a museum (variable size)

anything (within reason) that its managers or trustees decide it should be".[14] Nevertheless, the everyday notion of a museum as primarily a monumental building that contains objects is reinforced by the symbol widely used to denote a museum on maps and signs. The stylised neoclassical facade as seen at large, famous, long-established museums such as the British Museum (Fig 1) and the National Gallery of Art, Washington, D.C. (Fig 2) and the National Gallery, London is the inspiration for the symbol denoting the location of a museum on popular digital map apps and websites, including Apple Maps and Google Maps. Similarly, the official road sign for England and Wales to indicate a museum to motorists uses the portico symbol (in England it also includes an enclosed "M")[15] (Fig 3).

Current thinking about what constitutes a museum tends to focus more on the institution's role in engaging visitors (Simon[16]; Alexander[17]; Fleming[18]) and the preservation of cultural heritage than it does on the notion of a physical building that houses objects. Many organisations and individuals have refined the definition of a museum to encompass the changing and expanded roles and forms they take.

For example, the definition of museum within the United States' Museum and Library Services Act 1996[19] states:

> The term "museum" means a public or private nonprofit agency or institution organized on a permanent basis for essentially educational or aesthetic purposes, that utilizes a professional staff, owns or utilizes tangible objects, cares for the tangible objects, and exhibits the tangible objects to the public on a regular basis.

In the UK, the definition of the UK Museums' Association, which is also used by the government-funded Arts Councils, states:

> Museums enable people to explore collections for inspiration, learning and enjoyment. They are institutions that collect, safeguard and make accessible artefacts and specimens, which they hold in trust for society.[20]

However, the Museums Association appears to acknowledge that even this definition does not fully encompass what is or is not a museum, as it also states:

> It is estimated that there are about 2,500 museums in the UK, *depending on what you include* [author's emphasis].[21]

14 Alt, M.B. (1982). *A Cognitive Approach to Understanding the Behaviour of Museum Visitors*. PhD thesis. London: University of London Institute of Education. **182**

15 Department for Transport (2007). *Know your Traffic Signs*, 5th ed. London: TSO.

16 Simon, N. (2010) *The Participatory Museum*. Santa Cruz: Museum 2.0

17 Alexander, J. (2015). Being Contemporary: Refining the Museum for the 21st Century [conference paper]. In *Communicating the Museum 2015 Istanbul*. Istanbul, Turkey, 8-11 September 2015. Paris: Agenda.

18 Fleming, D. (2015) *The 21st Century Museum* [video online]. Available at <https://www.futurelearn.com/courses/museum/1/steps/33569> [Accessed 1 June 2015].

19 *Museum and Library Services Act* 1996. Sec 272. Available at <https://imls.gov/sites/default/files/1996.pdf>. [Accessed 26 June 2015].

20 Museums Association FAQs. URL: http://www.museumsassociation.org/about/frequently-asked-questions [Accessed 29 April 2015].

21 ibid.

The International Council of Museums (ICOM) acknowledges that what museums are and do has changed over time, and updates its definition from time to time “in accordance with the realities of the global museum community”.[22] Its current definition, in place since 2007, states:

> A museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment.[23]

Concluding thoughts on defining museums

The way museums have been defined has changed over the years, with a move to defining museums in terms of what they do (for example, educate, entertain, enlighten) rather than what they are (for example, a building that contains important objects). The research for this thesis focuses on museums that are physical spaces containing exhibits, and describe themselves as museums (though it includes non-commercial art galleries, which is how art museums are generally described in the UK). This is the criteria for the museum maps included in the corpus that is used as a basis for analysis in this research. Institutions such as zoos and outdoor museums, which are considered to be museums in many definitions, are mostly excluded from the research, apart from a brief discussion of them on page 55.

The fact that definitions of a museum vary is in part a reflection of the fact that there are many different types of museum. The following section considers how museums can be classified or categorised, and how this relates to the importance of producing a visitor map.

Ways of categorising museums

As with definitions, some governmental bodies and professional museum organisations provide guidance on categories of museum. However, most of these systems, such as that of the UK Museums Association,[24] the International Council of Museums (ICOM)[25] and the US Institute of Museum and Library Services (IMLS)[26] are for purposes relating to funding or organisational management, and have little bearing on visitor-related matters, including navigation or information requirements.

22 ICOM Museum Definition. URL: http://icom.museum/the-vision/museum-definition [Accessed 29 April 2015].

23 ibid.

24 Museums Association: FAQs. URL: http://www.museumsassociation.org/about/frequently-asked-questions [accessed 12 May 2015].

25 ICOM International Committees. URL: http://icom.museum/the-committees/international-committees/ [accessed 15 May 2015].

26 Grimes, J., Manjarrez, C.A., Miller, K.A., & Swan, D.W. (2014). *Museum Universe Data File: Documentation.* (IMLS-2015-MUDF-01). Institute of Museum and Library Services: Washington, DC. **3**

A contrasting approach to categorising museums has been proposed by Gurian.[27] She supports the point made by ICOM about the shifting definition of what a museum is, arguing that "over the last fifty years, museums have been busy reviewing and enlarging their definitions of purpose and vision".

Gurian's motivation for devising a series of categories is to help museums better define their purpose and goals.

> [Museums] are not and should not be programmatically uniform. Museums should choose among the many possible emphases and carefully define their vision so that their stated vision and direction are accurately articulated and achievable.[28]

Gurian proposes five museum categories, each of which "was formed from legitimate but different directions, by different pressures and each has contributed different areas of excellence to the museum field":

- object-centred: "'treasure-based' museums that concentrate on the material they own or borrow"
- narrative: museums that "base [their] primary focus on the explication of a story", in which "objects serve primarily as evidence"
- client-centred: museums, "especially children's museums and some science centers, [that] have audience as their priority rather than content", "often [with] no collections at all"
- community: museums whose "primary concern, no matter what the subject matter, is the well-being of the community" which "often look the least like museums and are often named cultural or community centers", and
- national (and government): museums "created by a 'nation'", "often… to celebrate their achievements".

Gurian adds that these categories are not mutually exclusive; in fact, museums are "a mixture of some or all of these types". But she says that the categorisation "offers a filter for viewing institutional intentions, allowing for future possibilities and celebrating the gifts that each type of museum has brought".

Further, Gurian explains that these categories are not based on subject matter. By way of explanation, she lists five different art museums each of which falls into one of her categories:

- The Metropolitan Museum of Art, New York (object-centred)
- Picasso Museum, Paris (narrative)
- Zoom, a children's art museum in Vienna (client-centred)
- an (unnamed) art gallery in Soweto, South Africa (community), and
- The National Gallery of Canada, Ottawa (national).[29]

27 Gurian, E.H. (2002). Choosing Among the Options: an Opinion about Museum Definitions. *Curator*. 45:2, **75-88**

28 Ibid. **85**

29 ibid. **84**

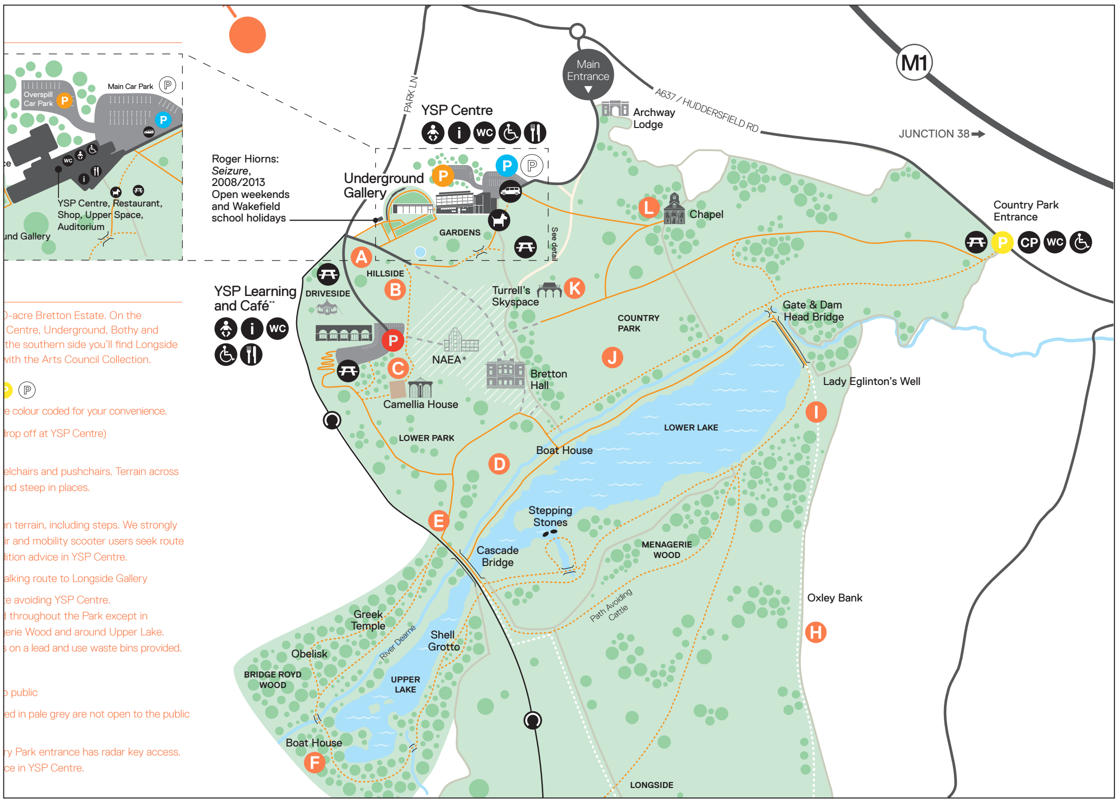


Fig 4. Example of sculpture park map: Yorkshire Sculpture Park Map, Summer 2015 (detail, at 50% actual size)

Museum types and visitor navigation requirements

Gurian's categorisation system provides some insight into how museums' aims, audiences and physical arrangements can vary – factors that, in turn, inform the role of, and need for, museum maps, and the importance of maps in contributing to visitors' experiences and understanding of the museum's spaces.

For example, a narrative museum in Gurian's definition is much more likely to have a prescribed sequence for visitors to follow than an object-centred museum. A map may therefore be deemed not essential, on the grounds that there is a defined route through the museum, indicated by signage, and the design and arrangement of the displays. In contrast, an object-centred museum (in Gurian's system) consists primarily of a collection of objects, artefacts or artworks that may not have a single connecting theme that dictates or suggests an order in which they should be viewed. A visitor map in such circumstances can be an important means of explaining how objects are themed and grouped, and/or to identify particular objects and their location.

So, although Gurian's system provides a useful starting point for analysing the role of museum maps, a more nuanced and detailed approach is required: a system that takes as its starting point how visitors will physically approach and navigate a museum, and how they will relate to and engage with the displays within it. The most fruitful approach is to work from an analysis of the characteristics that can have an effect on the degree to which a map is useful in a museum, and the elements or form of that map.

These characteristics can be grouped as follows:

- **environment**: the physical space that the museum embodies
- **contents**: the nature of the artefacts and displays within the museum, and
- **visitor experience**: factors that are not physical aspects of the museum

Explanations of characteristics are described below.

Environment: whether the museum environment is "open" or "closed"

As discussed earlier, the traditional notion of a museum is that of a building that is a home for objects that are collected, cared for and displayed. Since the elements a building consists of — rooms, corridors, doors or doorways, stairs, ramps, lifts — are familiar to most people, visitors will tend to navigate them in a way that appears logical to them, based on their general experience of moving around buildings. However, not all museums are contained within enclosed built environments. There are two types of "open" museum: sculpture parks and open-air museums (sometimes called "living museums").

Sculpture parks, such as the Yorkshire Sculpture Park, near Wakefield, England (Fig 4), are open spaces, typically in a landscaped or parkland setting, that contain large-scale sculptures or "land art" (art made directly in the landscape, sculpting the land into earthworks or making structures using natural

Fig 5. Example of open-air museum map: Skansen open-air museum, Stockholm, 2012 (detail, at 50% actual size)

Fig 6. Example of historic building open-air museum map: Vogtbauernhof Schwarzwälder Freilichtmuseum open-air museum, Gutach, 2013 (detail, at 50% actual size)

materials found in the landscape such as rocks or tree branches).[30]

Open-air museums can be either preserved or re-created places, or collections of historic buildings that have been relocated from their original sites. An example of the former is Skansen, near Stockholm, the world's first open-air museum, where visitors can "meet a miniature historical Sweden reflected both in the buildings and their surroundings"[31] (Fig 5). An example of the latter is the Vogtbauernhof Schwarzwälder Freilichtmuseum, south-west Germany, which has a collection of historic Black Forest farmhouses (Fig 6).

The experience of visiting and navigating such an "open" space is different from visiting a museum building because it lacks the navigational physical cues within a building (doors, corridors and so on) – though of course there are others (such as paths). In terms of morphology, such open spaces have much in common with theme parks and zoos. But an added motivation for visitors to use a map is that they may wish to plan their visit to limit the amount of walking required.

Of course, few museums are completely "open" in the sense that they contain no buildings: some will contain indoor exhibition spaces in addition to the outdoor ones, and most will also have buildings for facilities, such as visitor information services, eating places, shops and toilets.

Environment: the physical size of the museum

The physical size of a museum is self evidently an attribute that can determine the need for a museum map. Broadly, the smaller the museum, the less likely the need for a map. For example, Jane Austen's House Museum, in Hampshire, England, is a museum dedicated to the famous author in the "unpretentious cottage" she lived in for part of her life.[32] The museum is a cottage consisting of only a handful of small rooms containing important artefacts related to Austen's life and work. Navigating the building is straightforward.

Conversely, large museums almost always benefit from a map. The Musée du Louvre, Paris, for example, is the most visited museum in the world,[33] with 35,000 items on display[34] in buildings covering more than 60,000 square metres.[35]

There is no standardised system for categorising museums by physical size, on the basis of floor area. One way of considering the size of the museum, for the purposes of considering the need for a map, is the required or recommended likely duration of a visit. For example, it is entirely feasible to see everything in

30 Tate: Glossary of Art Terms. <http://www.tate.org.uk/learn/online-resources/glossary/l/land-art>. [Accessed 14 July 2015].

31 Skansen: About Skansen. <http://www.skansen.se/en/artikel/about-skansen-0> [Accessed 14 July 2015].

32 Jane Austen's House Museum: About. URL: http://www.jane-austens-house-museum.org.uk/#!about/c1c32 [Accessed 14 July 2015].

33 Themed Entertainment Association (2014). *TEA/AECOM 2013 Theme Index & Museum Index: The Global Attractions Attendance Report*. Burbank: TEA/AECOM. **20**

34 The Louvre: Collection and Louvre Palace. URL: http://www.louvre.fr/en/moteur-de-recherche-oeuvres?tab=3#tabs [Accessed 19 July 2015]

35 Live Science: The Louvre Museum: Facts, Paintings & Tickets. URL: http://www.livescience.com/31935-louvre-museum.html [Accessed 19 July 2015]

Fig 7. Image of exhibition space, Cité de l'Automobile, Mulhouse, France

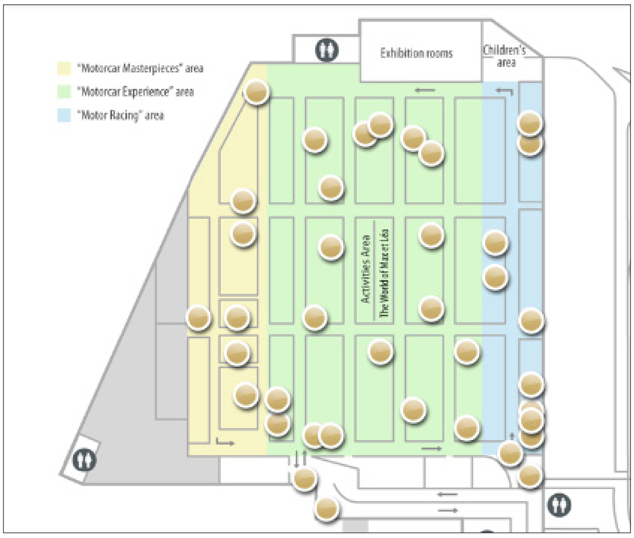


Fig 8. Example of large museum with simple layout: Visitor map screen from Cité de l'Automobile mobile device app (variable size, detail), Cité de l'Automobile, Mulhouse, France

Fig 9. Example of relatively small museum with complicated layout: Interior of Musée Hergé, Louvain la Neuve, Belgium

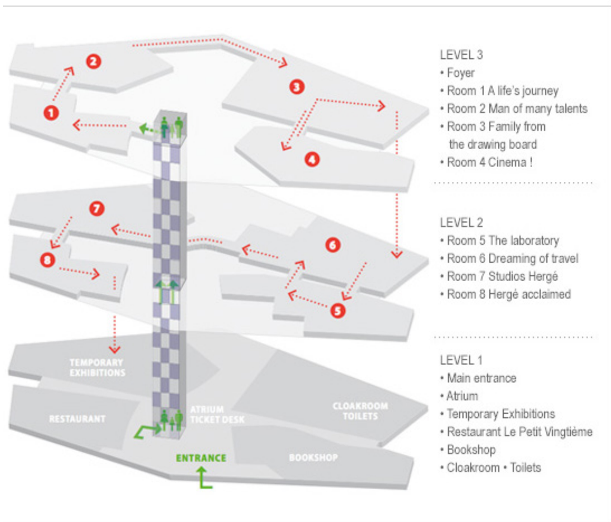


Fig 10. Example of relatively small museum with complicated layout: Plans of Musée Hergé, Louvain la Neuve, Belgium, 2015 (from http://www.museeherge.com/en/visite/plan)

Jane Austen's House Museum in a visit of, say, 45 minutes. However, it would be impossible to visit the entire Louvre even in a long day visit. This means that visitors (unless they are satisfied to see a completely random selection of displays) must make choices about what they wish to see during their visit there. A map helps them choose what areas, galleries, displays or works of art they wish to see, and also how to plan a route to those points.

Environment: complexity

As well as the physical size of a museum, the need for a map will depend on the complexity of the building(s) and other spaces that constitute the museum. The contribution of the arrangement of a building's spaces to people's ability to navigate them, called "architectural legibility" has been studied by, among others, Weisman. A study he conducted found that there was a relationship between the complexity of building floor plan layout and disorientation among participants.[36] And many museums – especially larger, long-established ones – have very complicated layouts, often having been added to, with new wings, storeys or separate buildings, or had their spaces reorganised throughout their history.

The Victoria & Albert Museum (V&A), London, established in 1857, has had new buildings and spaces added to it throughout its history.[37] As a consequence, the museum is a complex series of exhibition, administrative, functional and circulation spaces, made particularly difficult to navigate by various half floors and staircases and lifts that provide access to only some floors, as will be discussed in detail in Chapter 3.

Occasionally, large museums can have a relatively straightforward layout, and the need for a map may not be as strong. For example, the Cité de l'Automobile, in Mulhouse, France, is a car museum housed in a former textile factory (Fig 7 and Fig 8). Most of the collection of 243 cars is displayed in 17,000-square-metre exhibition hall.[38] Navigating this space – understanding the displays within it, and devising a route through it – is straightforward, despite its size, because the cars are arranged in regular rows, and broadly organised chronologically.

Conversely, some smaller museums can have complicated layouts that generally do require a map. See, for example, Fig 9 and Fig 10 of the Musée Hergé in Louvain-la-Neuve, Belgium, a purpose-built museum that was completed in 2009 to commemorate the life and work of the creator of the Tin Tin comic strips. This striking angular building clearly announces itself to visitors. The

36 Weisman, J. (1981). Evaluating Architectural Legibility: Way-finding in the Built Environment. *Environment and Behavior*, 13:2. 189-204

37 Victoria and Albert Museum (2015). *100 Facts about the V&A* [pdf]. Available at: <http://www.vam.ac.uk/content/articles/0-9/100-facts-about-the-v-and-a> [Accessed 1 March 2015]

38 Cité de l'Automobile: Discovering the site: Main areas. [online]. Available at: <http://citedelautomobile.com/en/discovering-site/main-areas> [accessed 20 July 2015].

Fig 11. Example of museum with diverse object sizes: Visitors view small artefacts (around 25cm high), and a visitor views a large statue (around 5.4m-high) in the Victoria & Albert Museum

actual exhibition space is not particularly large, but the design, incorporating irregularly shaped rooms, and internal walkways, allows for interesting vistas for the visitor within the building and to the surrounding town and landscape. The museum's architect has stated that he aimed to create "mental labyrinth, in keeping with Hergé's world".[39]

Contents: size

The physical nature of the objects and displays in a museum may have some effect on how easy or difficult it will be for visitors to discover and navigate. For example, very small items (such as jewellery) can only be identified from a relatively close distance – see Fig 11. They may not be readily located by visitors walking past or through galleries.

Conversely, in museums with large objects or displays (such as the car museum discussed above), visitors may be able to locate and identify the objects at a distance. However, even the Cité d'Automobile (Fig 7 and Fig 8) includes other exhibits and displays, such as automobilia (advertising material and other ephemera, and motoring accessories) and rooms with displays of text, images and audio-visuals describing the history of the car.

Contents: familiarity and diversity

The degree of familiarity of the subject matter of a museum may affect the way visitors approach and navigate it, and therefore the format and/or need for a map. Museums that hold collections of certain types of object, with historic and/or aesthetic interest, can be considered "familiar" in this context. For example, The Fan Museum, in London, is a museum dedicated to "celebrating the history of fans and the art of fan making".[40] The nature of its displays is will be obvious to most visitors (as with the Cité de L'Automobile). Visitors will generally understand that these museums contain primarily a range of displays of and about the theme of the collection (fans or cars); navigating the museum, therefore, presents few intellectual challenges.

Other types of museum contain artefacts or displays with which most visitors will be unfamiliar. Museums with historical displays or themes often fall into this category for the obvious reason that the artefacts are not familiar to modern audiences. The Ancient Egyptian galleries of the British Museum, for example, contain objects such an "Apotropaic wand" (an object associated with rituals in childbirth) – most visitors would have no idea about its purpose and significance, either from its name or its appearance.

Art museums in this context can be considered a special case; they can be described as "unfamiliar", because "art" is different from "artefacts". Many types

39 Musée Herge (2015). *Testimony of Christian de Portzamparc*. [pdf]. Available at: <http://www.museeherge.com/content/portzamparc_architecte_en.pdf> [Accessed 20 July 2015].

40 The Fan Museum (2015). [online] Available at: <https://www.thefanmuseum.org.uk> [Accessed 24 July 2015].

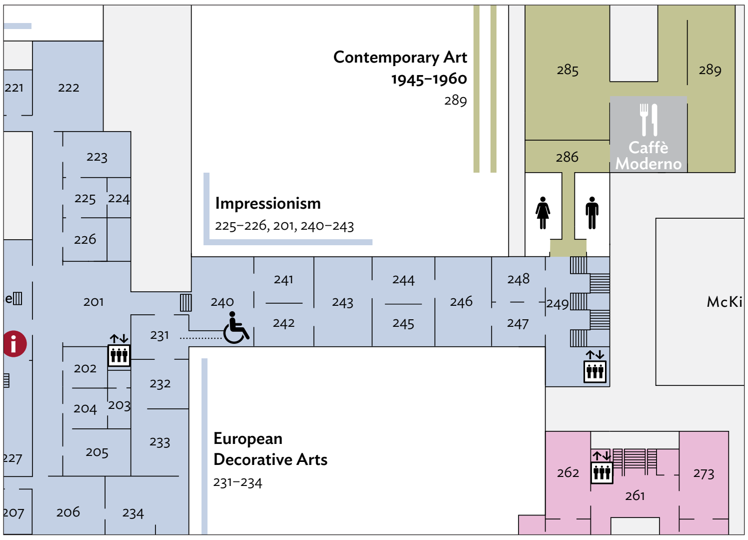


Fig 12. Example of thematic arrangement of art: map of Level 2, Art Institute of Chicago floor plan, 2014 (detail, at 33% actual size)

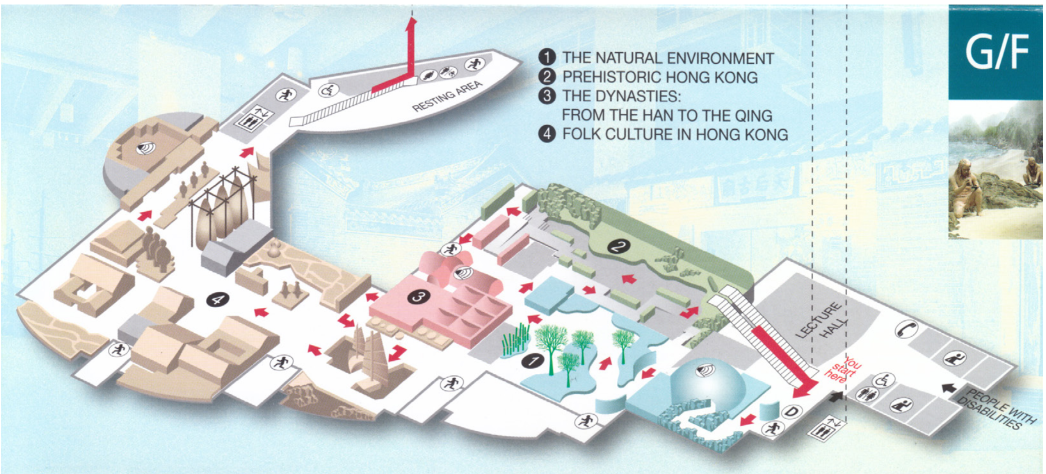


Fig 13. Example of a "national" museum with diverse displays: Hong Kong Museum of History ground floor of Guide Map (at 66% actual size; page size: 210mm × 96mm)

Fig 14. View of Folk Culture Gallery, Hong Kong Museum of History

of works of art, such as paintings, are in themselves familiar objects, but the value to the visitor is in experiencing the artistic expression first-hand. So visitors may require guidance – often through a map – on how the art is arranged (for example, whether thematically, by time period, artistic movement, medium, geographical origin of the artist, or individual artists or groups of artists) and/or on the location of particular works. For example, the Art Institute of Chicago explains the way its collection is arranged in a map for visitors (Fig 12).

Several of the museums cited earlier in this section, such as The Fan Museum and the Cité d'Automobile, can be considered "subject-specific" or "specialist" in that they deal with one type of object or interest. In that sense, their contents can be considered to have a low degree of diversity.

In contrast, other museums will have a very diverse range of artefacts and displays. One type of museum that is typically in this category is "national" museums (which Gurian defines as museums "created by a 'nation'… often… to celebrate their achievements")[41]. The Hong Kong Museum of History (Fig 13 and Fig 14) is one such museum, which comprises natural history (the flora and fauna of Hong Kong before the current city existed), ethnography (the indigenous peoples who inhabited the area over hundreds of years), and social and political history (of the lives of people in modern times). There is little to connect these, apart from a shared geographic location, and therefore a map provides visitors with guidance to the thematic arrangement of the museum.

Other museums with very diverse displays include those that primarily consist of series of collections that have been gathered over a long period of time, from a range of sources, and therefore often lack a strong overall theme. For example, the V&A, which has a collection of more than a million objects (of which around 60,000 are on display)[42]. It contains what might be considered conventional objects of art and design, such as paintings, which visitors would expect to see, but also objects that visitors may not expect, such as spectacles belonging to the pop star, Elton John.[43] Arranging displays of these is obviously a challenge for the museum, as is providing visitors with information to help them understand what there is to see, and how to plan a visit.

Visitor experience: prescribed and unprescribed routes through the museum

Some museum exhibits are arranged in such a way that there is a defined order in which the museum should be visited; others have areas or sections which can be visited in any order. Those museums that are arranged with a prescribed (or recommended) visitor pathway can be described as having sequentiality. The

41 Gurian, E.H. (2002). Choosing Among the Options: an Opinion about Museum Definitions. *Curator*. 45:2: **83**.

42 Victoria and Albert Museum (2015). Size of the V&A Collections. [online] Available at: <http://www.vam.ac.uk/content/articles/s/size-of-the-v-and-a-collections/> [accessed 3 August 2015]

43 Victoria and Albert Museum (2015). *100 Facts about the V&A* [pdf] Available at: <http://www.vam.ac.uk/content/articles/0-9/100-facts-about-the-v-and-a> [Accessed 1 March 2015].

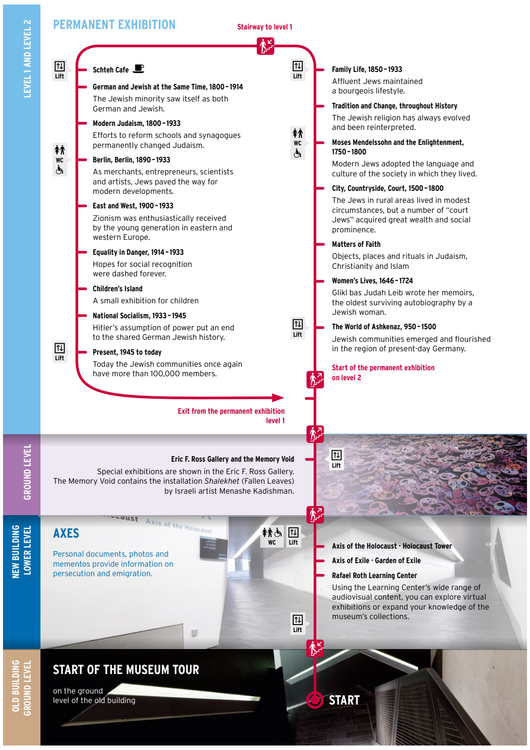


Fig 15. Description of museum tour, Jewish Museum Berlin Museum Map, 2015 (at 33% actual size, page size 210mm × 297mm)

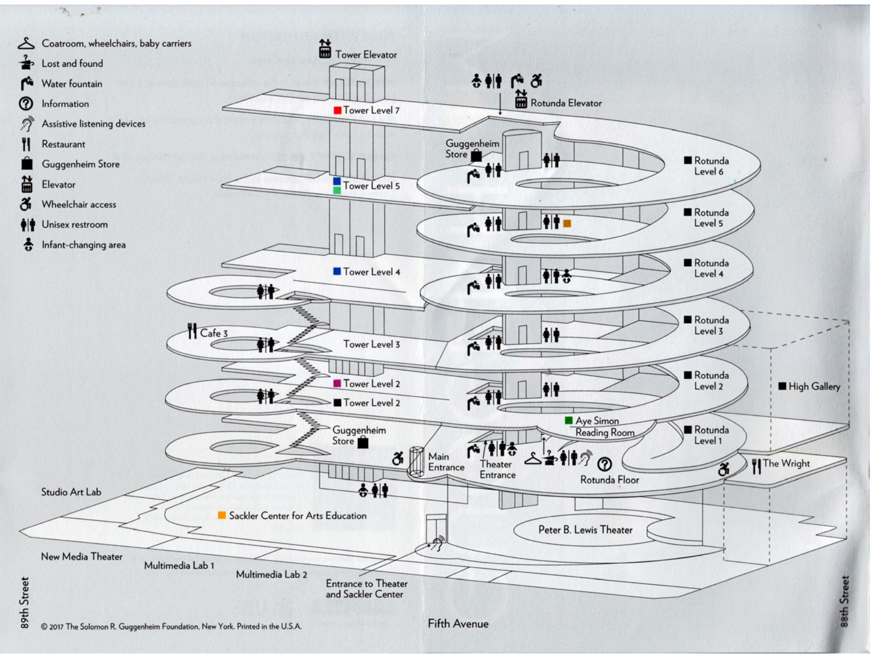


Fig 16. Example of a partially sequential museum: floor plan of Solomon R Guggenheim Museum, from *Guggenheim Feb-Apr 2017* (at 50 % actual size, 230mm x 170mm)

order may be prescribed, for example:

- for curatorial reasons, ie, that the subject matter of the museum is best understood or explained if seen in a particular order, or
- for logistics reasons, if, for example, the design of the museum building effectively dictates a circulation path.

An example of the former is the Jewish Museum Berlin, which tells the story of Judaism and the Jewish people with a sequence of displays that are broadly chronological (Fig 15). An example of the latter is the Solomon R Guggenheim Museum in New York, famous for its spiral ramp, making the core of the museum a long, seamless gallery that winds down from the top of the building (Fig 16). A museum's degree of sequentiality varies, depending on the following factors:

- whether the museum consists of single sequential path, or a number of discrete sequential sections or spaces
- how controlled the sequential path is (that is, whether the visitor has any choice at all about the order in which they see parts of the museum), and
- whether the entire museum is sequential (that is, whether parts of the museum are sequential, and parts are not).

Museums with a strictly prescribed route may have less need of a map than those with more open access. Neither of the museums in the examples above can be considered strictly sequential because both contain spaces that divert from the core visitor route or pathway. They both, therefore, provide maps for visitors (Fig 16, Fig 17).

However, even in a strictly sequential museum, maps still fulfil a role as a visual digest and guide to facilities, and may, therefore, be provided.

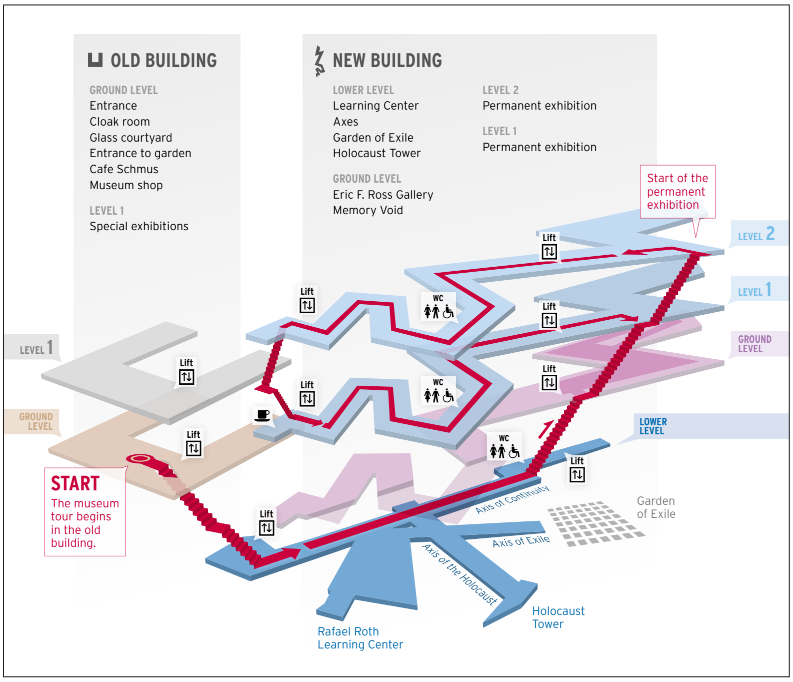


Fig 17. Example of a partially sequential museum: Jewish Museum Berlin Museum Map (detail, at 50% actual size)

Visitor experience: cost of entry

Some museums are completely free to enter. Otherwise, charging for entry can take any of the following forms:

- entry to certain areas, such as special or temporary exhibitions
- per-visit entry, where visitors pay to enter the museum on each visit (often with different rates, sometimes including free entry, for different groups of people, such as children, elderly people, students or unemployed people)
- combination entry, where visitors pay for a ticket that gives them entry into several museums or other attractions, or
- season ticket, where the entry fee allows visitors to enter the museum as often as they wish for a period of time (for example, a weekend, a month or a year).

Having to pay for entry to a museum can be an important factor how or whether people may visit a museum. In 2001 the UK government made a commitment that all of the country's national (that is, state subsidised) museums and galleries should be free to enter. Following the introduction of this policy, visitor numbers "shot up", in the words of the Museums Association,[44] with a 62% increase in visitor numbers in the first seven months of free entry.[45] (And visitor numbers since then have continued a mostly upward trend: in the nine years to 2014, the total number of visitors to the UK's 16 national museum groups increased by more than a third, from 35 million to 48.7 million.)[46]

Conversely, prior to this, in the 1980s many of the UK's national museums that had previously been free to enter introduced admission charges, in response to political pressure to reduce reliance on state funding. According to the Museums Association, some of those that began charging "suffered marked declines": at the V&A, visitor numbers halved after the museum introduced a £5 entry charge in 1987.[47] The Policy Studies Institute put the average decline of visitor numbers at museums that introduced a charge at 40% (albeit followed by a "slow recovery").[48]

The issue of charging for entry, and the effect it has on museums and their audiences has been considered by many researchers within the disciplines of museum studies, marketing and economics. However, much of the debate focuses on the principle of free access to museums, the effects of paid-for or free entry on visitor numbers or on particular demographic groups (such as lower-

44 Museums Association: Campaigns: Free admission and the lottery. URL: http://www.museumsassociation.org/campaigns/free-admission-and-the-lottery [accessed 6 August 2015]

45 Martin A. (2003). *The Impact of Free Entry to Museums*. London: MORI. **1**

46 Department for Culture Media & Sport (2015). *Sponsored Museums: Performance Indicators 2013/14*. London: DCMS. Available at <https://www.gov.uk/government/statistics/sponsored-museums-annual-performance-indicators-2013-14> [Accessed 7 March 2015].

47 Museums Association: Campaigns: Free admission and the lottery. URL: http://www.museumsassociation.org/campaigns/free-admission-and-the-lottery [accessed 6 August 2015]

48 Feist, A. and Hutchinson, R., eds (1989). *Cultural Trends 4*, 1 (4). London: Policy Studies Institute.

income visitors);[49, 50] or the consideration of alternative charging models;[51] there has been little on how it affects the behaviour of visitors. Falk and Dierking find that, while admission price alone is rarely the single major determinant of visiting a museum,[52] it is clearly a contributing factor. Further, there are other potential effects on how entry price (or, more specifically, whether a museum has free entry or not) affects visitor behaviour:

- the duration of the visit (for example, if, having paid to enter, visitors wish to get "value for money")
- the frequency of visits (for example, whether visitors to free-entry museums are likely to make multiple, shorter visits), and
- expenditure on ancillary activities (for example, whether visitors to free-entry museums are likely to spend more money, and time, elsewhere in the museum such as on special exhibitions, in cafés and restaurants or in the museum shop).

There is no evidence either way to suggest that paying museum visitors are more likely to use maps than non-paying visitors, or vice versa. Admission charging may drive visitor behaviour that could suggest either greater, or less, use of maps. For example, non-paying visitors (in particular those who are local to the museum) may be happy to explore a museum in an unguided way, because they can return at no expense to explore another part of the museum, or find anything they have missed. Alternatively, they may be more inclined to call in for a short, spontaneous visit, when passing the museum. Visitors who pay for entry may want a map to ensure they know exactly what is in the museum and how to find it, so they can see those displays of most interest to them in one visit, and not risk having to pay again to see anything they have missed.

But the causes and effects could work the other way around. Casual visitors or passers-by who have no prior knowledge of the museum, who are more likely to visit if there is no entry charge, may require a map to understand what the museum contains, more so than those who have undertaken some research before a visit.

49 Bailey S, Falconer P, Foley M, McPherson G, Graham M. (1997). Charging for Admission to Museums and Galleries: Arguments and Evidence, *Museum Management and Curatorship*, 16:4, **362**.

50 Lampi, E. and Orth, M. (2008). Who Visits the Museums? A Comparison Between Stated Preferences and Observed Effects of Entrance Fees. *Working Papers in Economics No 298.* Gothenburg: School of Business, Economics and Law, University of Gothenburg.

51 Frey, B.S. and Steiner, L. (2012) : Pay as You Go: A New Proposal for Museum Pricing. *Museum Management and Curatorship.* 27:3. **223-235**

52 Falk J.H., and Dierking, L.D. (2013). *The Museum Experience Revisited*. Walnut Creek, California: Left Coast Press Inc.: **42**

Visitor experience: guide options

When visiting a museum, there are essentially four modes of assistance that may be available to visitors:

- an unstructured visit, using no guiding material (apart from static signage, which in any case may be difficult to avoid or ignore)
- a self-guided visit, using printed leaflets and guidebooks or their digital equivalents that provide information on the museum's contents, for visitors to choose what they wish to see and, if desired, plan an itinerary
- a directed visit, using printed material or digital means, such as audioguides, audio-visual guides, or smartphone or tablet apps that provide a tour or itinerary for visiting the museum, and
- a person-led guided tour, in which (usually) a member of museum staff or volunteer will lead a tour of the museum and provide a commentary on the exhibits.

Some museums either encourage a directed visit (for example, by providing either a printed tour information or a digital guide), or require visitors to take a guided tour. This may be:

- for security reasons, where the museum building or its contents are too precious to risk being damaged by visitors, or
- in order to control the flow of visitors in particularly small and/or complicated museum spaces, or those that are especially popular, by limiting the number of visitors in the museum at any given time, and regulating the route through the museum (and also the speed through which they move through the museum).

The Tenement Museum in New York is an example of a museum that requires visitors to take a guided tour. It is housed in historic tenement buildings[53] that are not only cramped, but have steep and narrow staircases, so it is necessary to control both the numbers of visitors and the routes they take through the museum, for expediency and the safety of visitors. Another museum that requires a guided tour is George Washington's Mt Vernon, the home of the first US President. It receives around a million visitors a year,[54] so a timed guided tour is necessary primarily to accommodate such large numbers of people.

In museums that require visitors to take a guided tour, there is less need to provide a map, since visitors will not need one to navigate the museum.

53 The Tenement Museum (2015). [online] Available at: <http://www.tenement.org/> [Accessed 15 September 2015].

54 George Washington's Mount Vernon: About Mount Vernon. [online] Available at: <http://www.mountvernon.org/about/> [Accessed 13 July 2017].

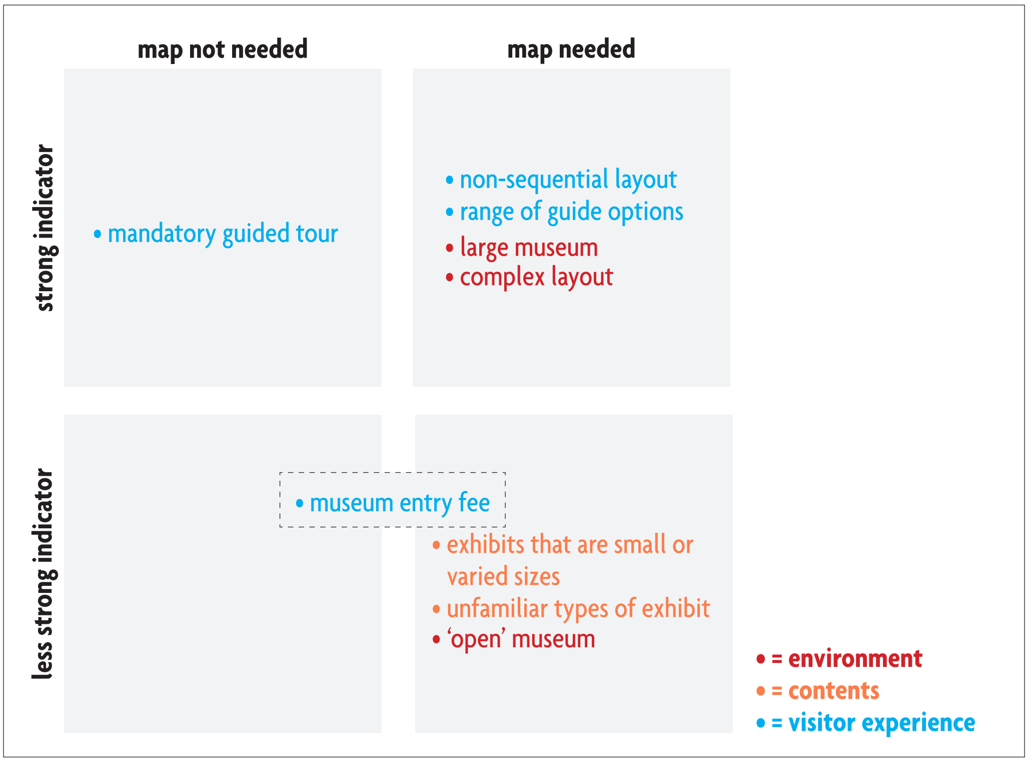


Fig 18. Summary diagram of the characteristics of a museum than can indicate need for a map

Conclusion and summary: museum characteristics that affect museum maps

As the preceding sections suggest, following from Gurian's characteristation of museum types, there are some characteristics of a museum that make the production of a map more compelling. Fig 18 summarises the analysis of the characteristics discussed.

The decision by a museum to produce a visitor map will depend on many factors. The strongest case for a museum to do so is if it:

- has a large and/or has a complicated layout
- does not have a strong narrative path through the museum, and
- allows visitors to undertake self-guided visits.

This combination of characteristics is relatively common among museums. It applies to virtually all large, collections-based museums, which includes national museums, natural history museums, science museums and many public art museums.

Chapter 2: Forms of museum maps

Contents

The forms of museum maps

Printed museum maps vary considerably in their material form, from single-page standalone maps that are often disposed of after a visit to substantial souvenir books in which the map sits among text and images. The purpose of, and audience for, different museum maps can affect what they contain and how they are designed. This chapter first considers the range of material formats in which museum maps are produced. It is based on a examination of all the publications containing maps produced by 10 major London museums (available in 2016),[1] and of a sample of contemporary tourist guide books produced by leading guidebook publishers.[2]

The second part of this chapter considers the digital alternatives to printed museum maps. It is based on: the range of guide systems and devices available in the same London museums as for the printed maps; information from two of the major companies producing digital guide systems (Acoustiguide and Antenna Audio); and museum guide apps available in the Apple App Store in 2016.

The chapter compares printed and digital guides, in terms of what they offer, how they work, the logistics of producing them, how museum visitors relate to them, and what they think of them. In particular, it considers whether digital systems are replacing paper maps or whether they should be seen as an alternative or a supplement to paper maps.

1 British Museum, Museum of London, National Gallery, National Maritime Museum, National Portrait Gallery, Natural History Museum, Science Museum, Tate Britain, Tate Modern, Victoria & Albert Museum

2 *Lonely Planet*, *Rough Guides*, *Michelin Travel*

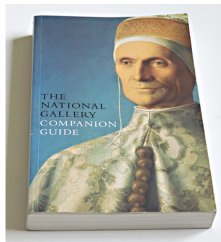
	map as primary source				map as subsidiary source
	standalone map	folder/leaflet	booklet	museum guide	guide book
Physical characteristics	single page, which may be folded	more substantial folder, or stitched leaflet, typically no more than four leaves	bound or stitched booklet, typically more than 16 pages	substantial book	tourist guide book, generally paperback
Typical price (2016)	free, included with entry ticket, or by donation	included with entry ticket or low cost (less than £5)	typically £2 to £5	more than £5	more than £5
Prominence of map	map constitutes virtually all of document with minimal extraneous text	at least half of document, with text/images of practical information about the museum, highlight objects, and temporary exhibitions	map or maps constitute one to four pages of document, with substantial text about and images of the museum and its displays	map or maps constitute minority of document, with substantial content about the museum and its displays	map or maps, and text about museum constitute minority of document, which contains substantial content about city, region or country in which museum is located
Producer	museum	museum	museum	museum; occasionally commercial publisher	commercial publisher
Likely use mode	collected at beginning of visit, for use before and during visit, normally disposed of/ recycled at end of visit	collected at beginning of visit, for use before and during visit, may be kept as memento or passed on	bought at beginning or end of visit, for use before and during visit, kept as memento or passed on	bought at end of visit, or after visit, as memento and for further reading and reference	bought before or during visit to city, region or country covered
Example	Science Museum (undated, c. 2016), *Map*, Fig 1	The British Museum (2016), *Map: colour plans and visitor information*, Fig 2	*Guide to the National Portrait Gallery*, Fig 3	*The National Gallery Companion Guide*, Fig 4	*The Rough Guide to Paris*, Fig 5
					

Table 1. Range of museum map contexts, mapped along dimension of use as a primary to subsidiary source

Printed museum map forms and formats

The graphic elements of the diagram that forms the museum map, how they can vary, and how they have developed over time, are discussed in detail in Chapter 3. The physical form of printed maps – ie, the documents that contain them – varies, too. One way of considering the range of physical forms is to consider the relative prominence of the map diagram in the printed document, ie, whether the map is the primary (or sole) source of information, or whether it is subsidiary to other types of information (such as text and images).

Table 1 describes typical examples of the types of document available that include museum maps, according to several characteristics:

- **physical characteristics:** the type of document, including its physical extent, general quality and binding, which suggests its likely period of use (ie, from ephemeral to long-term)
- **typical price,** which also indicates its likely period of use
- **prominence of map:** how much space the map takes up within the document, and
- **producer**: the type of organisation that creates and publishes the document.

These together imply a **likely use mode**, which is a combination of where and when the item may be procured and consulted, in relation to a visit to the museum, and how it may be used. It is important to note that the categories and types shown are representative, but they are neither absolute nor exhaustive, as there will be documents that have characteristics from each type described.

The relationship between document type and map design

Some museums, in particular larger ones, may produce a range of documents to meet different visitors' needs. For example, as of 2016, the British Museum, produced a free, single-sheet map as well as low-cost (£2) nine-leaf folder, and a 128-page guidebook (£5). In many such cases, the map diagram will be fundamentally the same, though perhaps reproduced at different sizes, or, in the large documents, annotated so it relates to the text and images. In the case of the British Museum, there is a more significant difference in that the free map (see Fig 6) lacks the colour coding of the map in the paid for documents (such as the folder map, Fig 2).

Most contemporary museum maps are published by museums themselves. However, occasionally, tourist guidebooks produced by commercial publishers include museum maps. These maps are often different from museum-produced ones, for several reasons. First, the publishers may not have the rights to reproduce the museum's own maps (or may not want to pay to do so). Second, they may want their maps to relate to their own text about the museum, so their maps may have different information from the museum's maps (for example, highlighting different parts of the museum). Finally, the publishers

may wish to use a graphic style that is consistent with the book's design and its other illustrations, diagrams and maps. An example of this is the map of the Louvre Museum in *The Rough Guide to Paris* (Fig 5), which uses a graphic style, colours and typefaces that are consistent with other graphic elements used throughout the book.

Museum maps produced by third-party publishers are relatively rare. This may be due, in some cases, to the fact that the publishers see no point in reproducing what is readily available at little or no cost elsewhere (a principle noted by the founder of the popular Rough Guides series in its first edition)[1]. Another reason is that editorial space is always in short supply in guidebooks, and there is always much more content than can be included in the published book;[2] museum maps are mostly considered low priority in this sense.

Fig 1. Example of standalone map: Science Museum Map (undated, around 2016) (approximately 25% actual size, page size 98mm × 210mm)

Fig 2. Example of folder map: The British Museum (2016), *Map: colour plans and visitor information.* (approximately 25% actual size, page size 134mm × 215mm)

1 Ellingham, M. (1982). *The Rough Guide to Greece*. London: Routledge & Kegan Paul Ltd. **4**.

2 Conversation with Tim Locke, editor, Rough Guides. 23 January 2018.

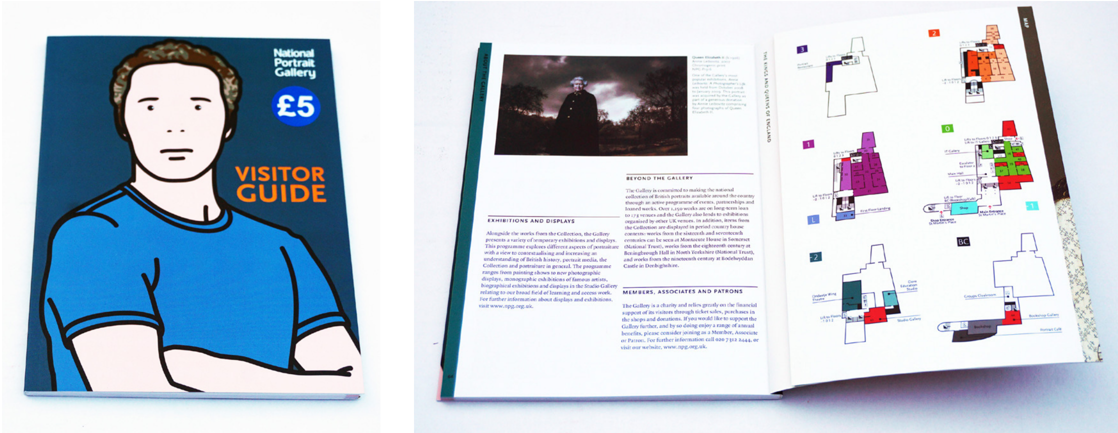


Fig 3. Example of guide booklet with map: Cooper, J. (2009). *A Guide to the National Portrait Gallery.* London: National Portrait Gallery Publications. 64 pages, with museum map on inside cover (approximately 25% actual size, page size 180mm × 240mm

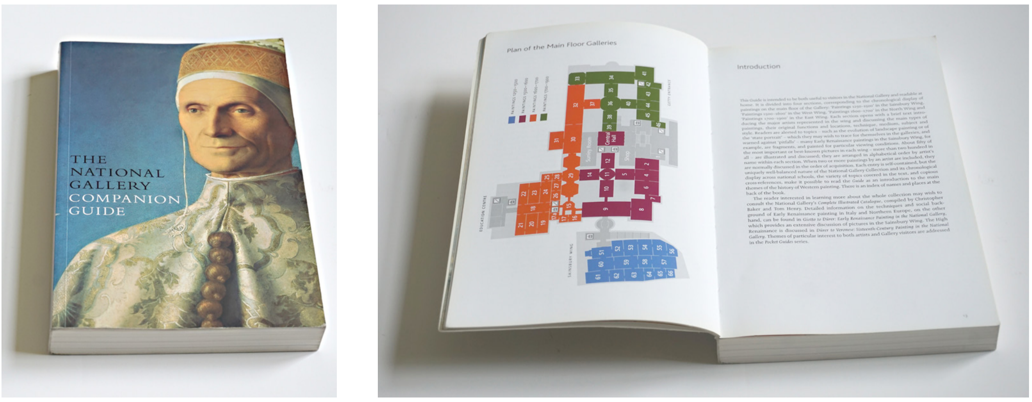


Fig 4. Example of museum-published guidebook with museum map Langmuir, E. (2007). *The National Gallery Companion Guide*. London: National Gallery Company Ltd, 352 pages, with plan of Main Floor galleries (at approximately 25% actual size, page size 150mm × 240mm)

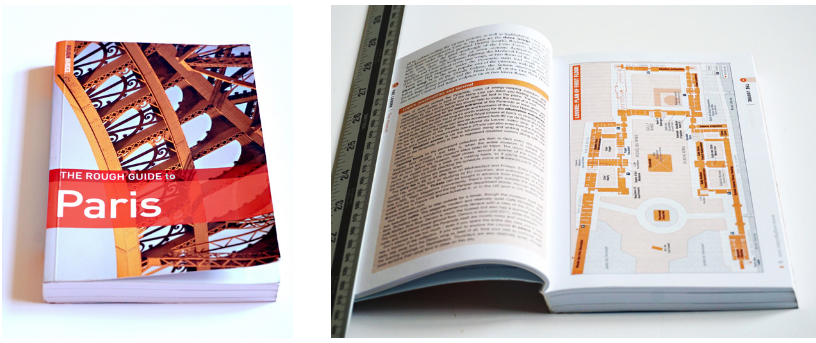


Fig 5. Example of third-party guidebook with museum map: Blackmore, R. and McConnachie, J. (2010). *The Rough Guide to Paris*. London: Rough Guides Ltd, 464 pages, with plan of The Louvre, First Floor (at approximately 25% actual size, page size 130mm × 200mm)

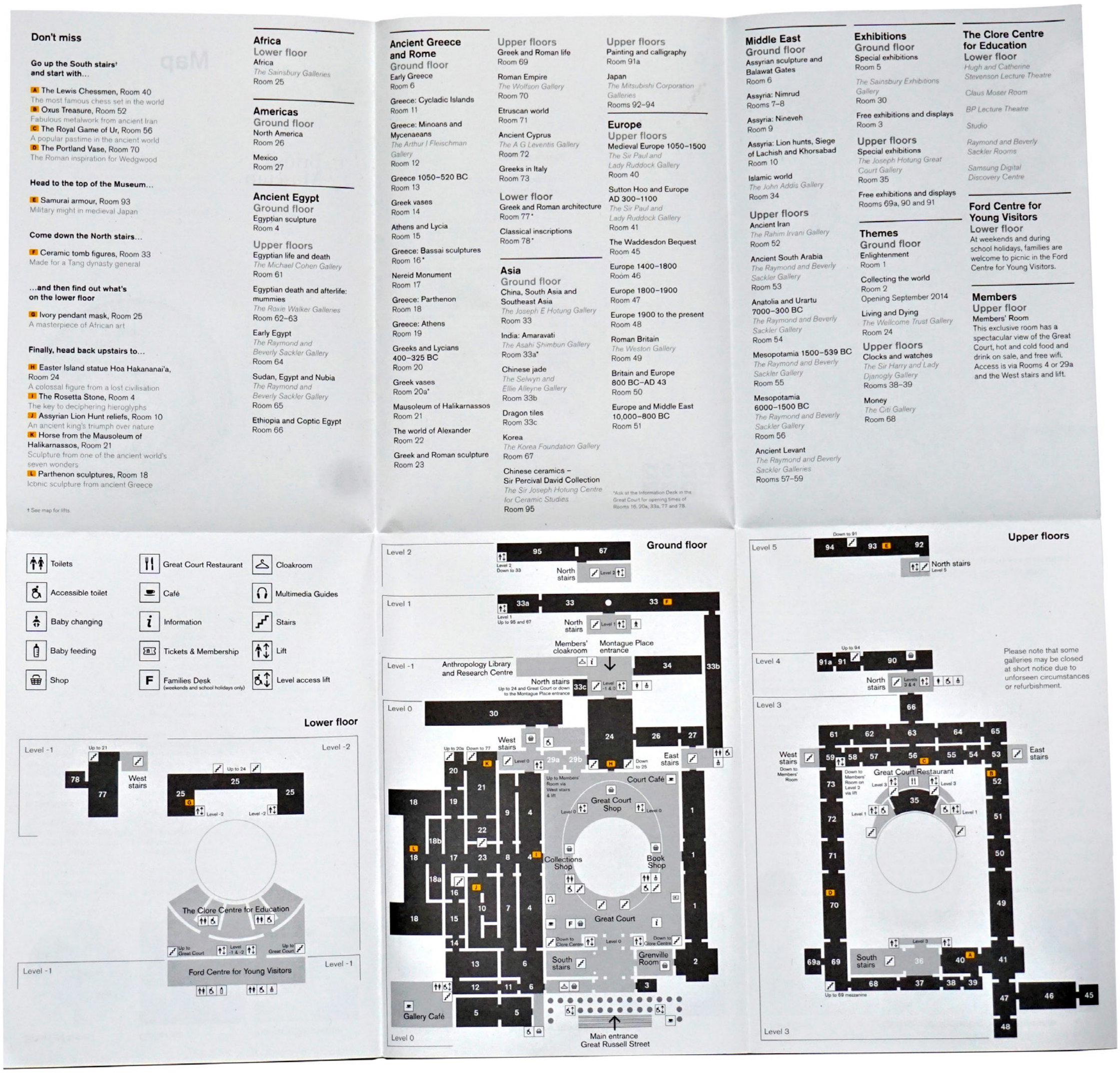


Fig 6. Floor plans, 'Don't miss' and gallery list, from *The British Museum: Map* (2014). London: Trustees of the British Museum. (at 33% actual size, sheet size 441mm × 420mm)

Digital and electronic alternatives to paper maps

Digital and electronic devices and systems to help museum visitors orientate themselves, plan their visit and navigate through museums are widely available, and come in many forms. The advent of the internet, smartphones and tablet devices and their enabling technologies has seen a boom in the development of new ways for visitors to navigate and experience museums. But non-paper-based alternatives to maps and guidebooks are not new and have seen steady development for more than 50 years.

The first “audioguides” – personal, portable devices that provided visitors with a recorded commentary on the museum and its exhibits, including navigational information – are believed to have appeared in the Netherlands in the early 1950s, using a wireless receiver.[3,4] Other technologies followed: reel-to-reel tape devices in the 1960s, cassette tape devices in the 1970s,[5] solid-state digital devices in the 1990s,[6] and devices with screens displaying text and images in the 2000s.[7] That development has continued as museums find ways of employing new technologies to enhance the visitor experience.

Separately, away from the physical museum, museums began to make available versions of their visitor maps on their websites in the 1990s: for example, the Metropolitan Museum of Art, New York, at least as early as 1999,[8] and the Natural History Museum, London, in 1997.[9] This predated internet access on personal portable devices (smartphones and tablet devices), so the maps could not be used during an actual museum visit (unless they were printed off), but rather for planning a visit, or as a rudimentary “virtual” visit.

3 Open Images: Wireless tour in the Stedelijk Museum in Amsterdam. <https://www.openbeelden.nl/media/22823/Draadloze_rondleiding_in_het_Amsterdamse_Stedelijk_Museum.en > [Accessed 14 August 2017].

4 Stedelijk Museum: Visit Us: Hours and Admission: Audiotours. [online] <http://www.stedelijk.nl/en/visit-us/hours-and-admission/audiotours> [Accessed 14 August 2017].

5 Galligan, A. (1996). Tape Recorded Tours and the Museum-Going Experience. *Journal of Arts Management, Law, and Society*. 26:1. **8**.

6 Acoustiguide: About us: History. [online] Available at The Internet Archive <https://web.archive.org/web/20090302120441/http://www.acoustiguide.com:80/about/history.html> [Accessed 11 October 2017]

7 Tsai, A.M.F. (2010). *The Integration of New Media Technologies into the Wayfinding System of a Museum Environment*. PhD. Swinburne University of Technology. **30-33**

8 The Metropolitan Museum of Art. [online] Available at: The Internet Archive: The Metropolitan Museum of Art. 29 April 1999. <http://web.archive.org/web/19990220182403/http://metmuseum.org/htmlfile/gallery/gallery.html> [Accessed 24 September 2015].

9 The Natural History Museum. [online] Available at: The Internet Archive: The Natural History Museum: The Life Galleries. 21 April 1997. <http://web.archive.org/web/19970421155438/http://www.nhm.ac.uk/museum/lifegal/interface/plan.html> [Accessed 24 September 2015].

low — technical sophistication — high

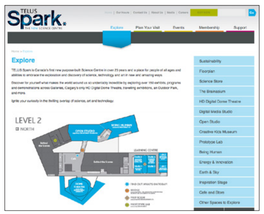
	Online static map	Online interactive map	Audioguide	Multimedia guide	App	“Smart” guide/app
Format and content	A map image (in jpg or pdf file format) that can viewed on museum’s website, downloaded and printed	Interactive map that can be viewed on museum’s website	Recorded commentary describing a tour of the museum and/or descriptions of individual displays	Similar to audioguide but also with screen providing static images, moving images and/or text; may also include an interactive map	Application that visitors can download to a mobile phone or tablet computer with content similar to that of a multimedia guide	A multimedia guide or app that uses geo-location, computer learning and/or augmented reality technology to provide dynamic information
Delivery platform	Visitor’s own PC, laptop or tablet computer	Visitor’s own PC, laptop or tablet computer	Bespoke handheld device rented or borrowed at the museum	Bespoke handheld device rented or borrowed at the museum	Usually visitor’s own smartphone or tablet; some museums may also lend or rent devices to visitors	As per multimedia device or app
Typical price (2016)	free	free	free, included with entry ticket or typically <£5	free, included with entry ticket or typically <£5	Free or low cost (<£3); also may be a rental fee if device is not visitor’s own	Usually free; may be a rental fee
Producer	museum	museum	museum	museum	mostly museum; some commercial producers	museum
Likely use mode	Viewed on visitor’s device before and/or after museum visit; map may be printed for taking to museum	Viewed on visitor’s device before and/or after museum visit; may be available for viewing at museum	Borrowed or hired at beginning of visit and used continually or intermittently during visit	Borrowed or hired at beginning of visit and used continually or intermittently during visit	Can be downloaded before a visit or in the museum; can be used for planning a visit and during a visit; can be kept on device for future reference	As per multimedia device or app
Examples	Telus Spark Science Center, Fig 7 and Field Museum, Fig 8 	Victoria & Albert Museum, Fig 9, Google Map, Fig 10, Hans Christian Andersen Museum Fig 11 		British Museum, Fig 12 	Mauritshuis, Fig 13, Dorling Kindersley Eyewitness Guide Rome, Fig 14 	San Francisco Museum of Modern Art (SFMoMA) – see page 101

Table 2. Range of digital map contexts, mapped along dimension of use from low to high levels of technological sophistication

From audioguide to augmented reality: the range of digital and electronic guides

Digital wayfinding and orientation in museums now take many forms, utilising a range of technologies and delivery devices. Table 2 shows typical examples of the platforms and devices in current use. It is arranged in terms of increasing technological sophistication. The first group, the online static map, is the closest equivalent to a printed map and, in fact, in many cases is simply a digital variant of the printed map (an image) that is available to museum visitors. This type is likely to be viewed off-site, ie, not during a visit to the museum, but by people considering or planning a visit, people after their visit (as a reminder of their visit), or people who are unable to visit the museum in person. Where these static maps are provided as pdf (portable document format) files, it may also be possible to print these off ahead of a visit for use during a visit. However, often this is either not practical (because the dimensions of the pdf document do not match those of the paper in a standard home printer), or not preferable (because the same map is likely to be available as a paper map on arrival at the museum, and may be a better quality document).

The more sophisticated types of digital navigation system use hardware (for example, handheld devices provided by the museum, or the user's own mobile phone) and technologies (voice recording, static or moving screen images), which mean they have extended functionality compared with a map.

As with printed maps, most digital and electronic equivalents are produced by museums themselves, mostly for the same reasons as printed maps. However, the move in recent years from museum-provided devices (audioguides and multimedia guides) to visitors' own ones (smartphones and tablets), has allowed for museum guide apps to be created and provided by third-party commercial content providers. Since these are commercial, such apps tend to be produced only for those museums for which there are large numbers of visitors and therefore the potential for a profit from selling the app. For example, for the Musée du Louvre, one of the most visited museums in the world, as of January 2018, there were seven commercial guide apps listed on the Apple App Store, in addition to the museum's own app (listed in Appendix 5). Some of these are free of charge for a basic version, but charge extra for extra features, functions or content; others costs between 99p and £2.99 (at time of research, in 2016).

Fig 7. Example of a jpg map on a museum website: Telus Spark Science Center, Calgary, Canada (http://www.sparkscience,ca), with image of floor plan (detail). [Accessed 24 September 2015]

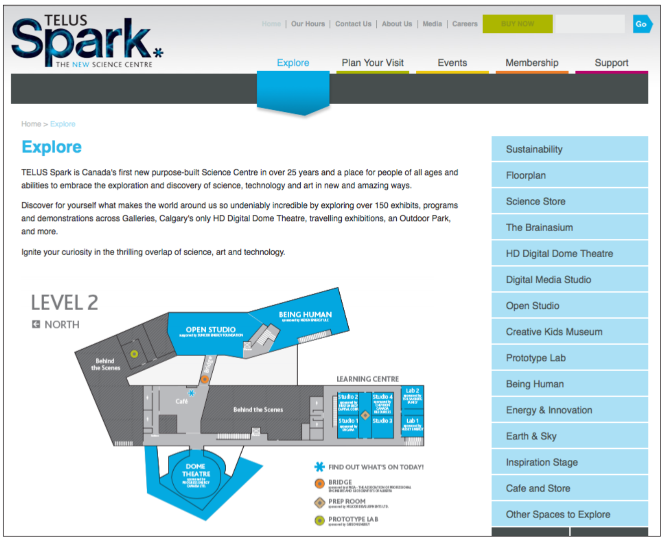
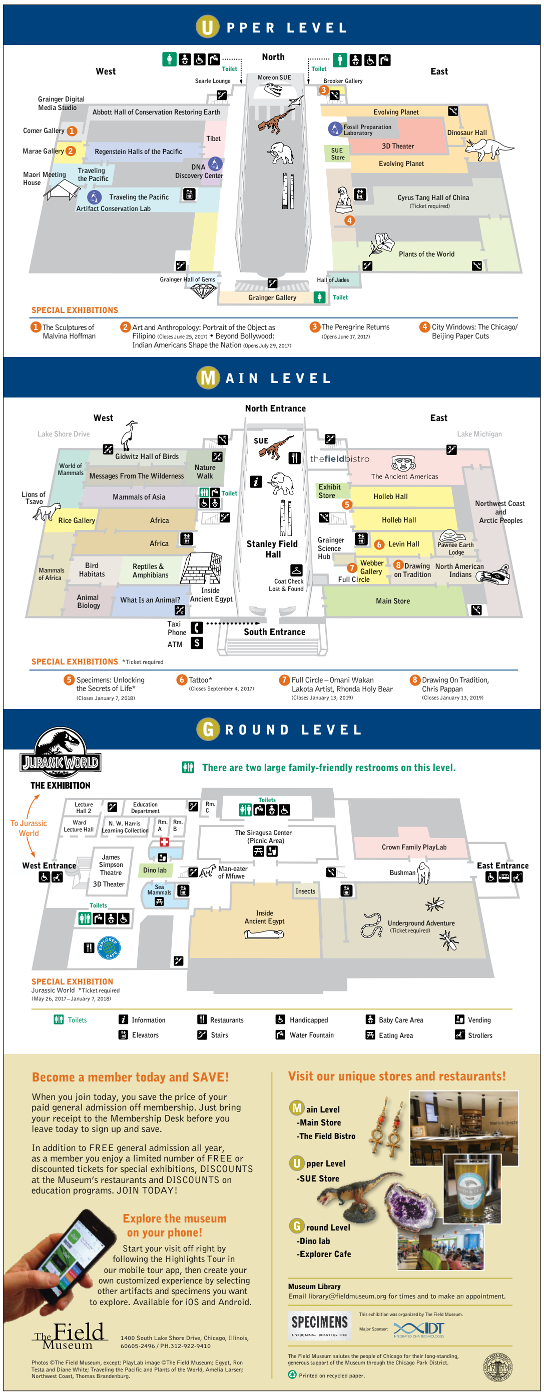


Fig 8. Example of a pdf map on a museum website: Floor plans of The Field Museum, Chicago, 2017 (https://www.fieldmuseum.org/sites/default/files/english_visitors_map_spring_2017_web.pdf). The size of this document suggests it was not designed for printing on a conventional home printer, but it can be downloaded for viewing on a computer or mobile device (at 33% actual size; 213mm × 549mm)



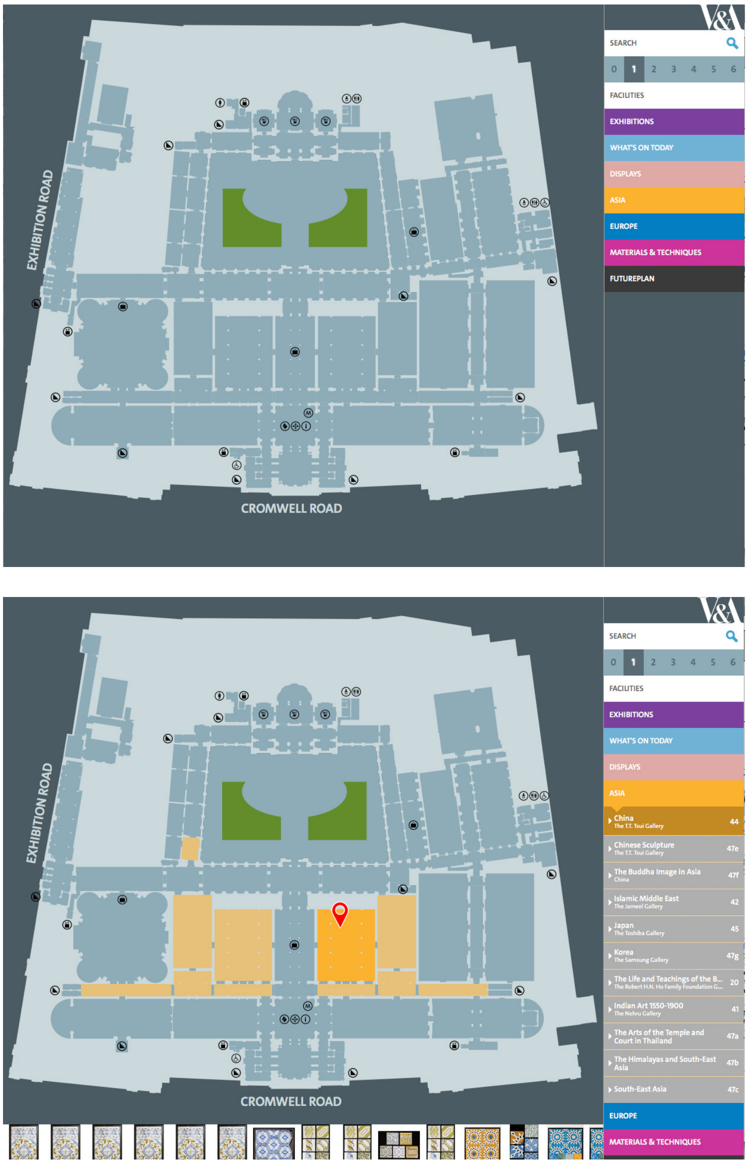


Fig 9. Example of online an interactive map: screenshots of interactive map of Victoria & Albert Museum, London (http://www.vam.ac.uk/features/digitalmap/), and with "China" galleries highlighted. [Accessed 24 September 2015]

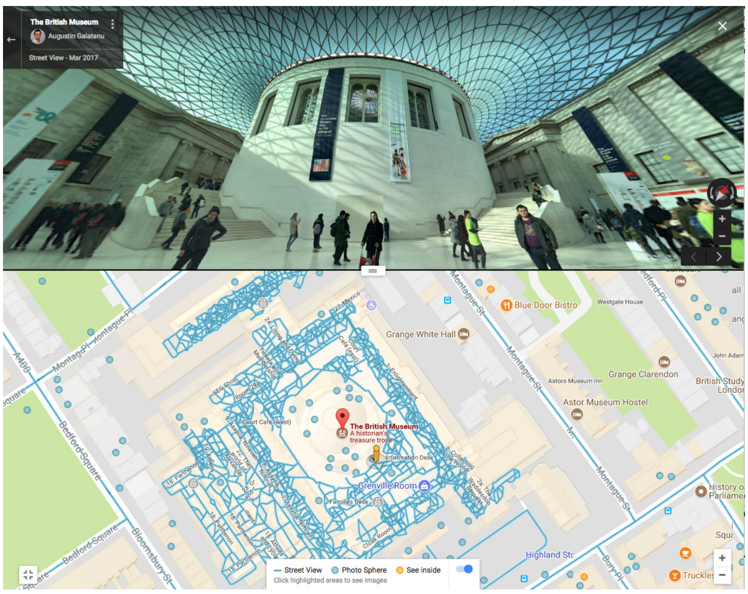


Fig 10. Example of an online interactive map: Google Map and Street View of Ground Floor of British Museum, London (via https://www.google.co.uk/maps/place/The+British+Museum/@51.5194133,-0.1291453,17z). [Accessed 12 September 2017]

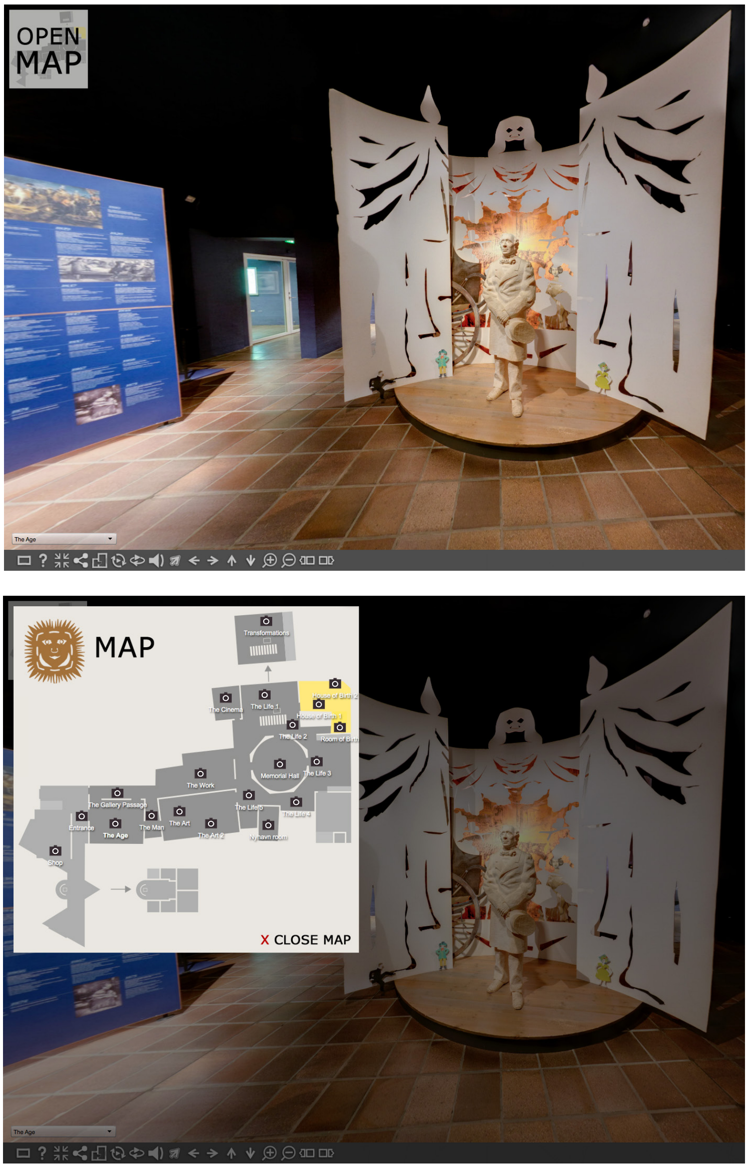


Fig 11. Example of an online interactive map: screenshots of virtual tour of the Hans Christian Andersen Museum at Odense, Denmark (http://hca.museum.odense.dk/rundtur/), with view of House of Birth gallery, and the map showing location of gallery in museum

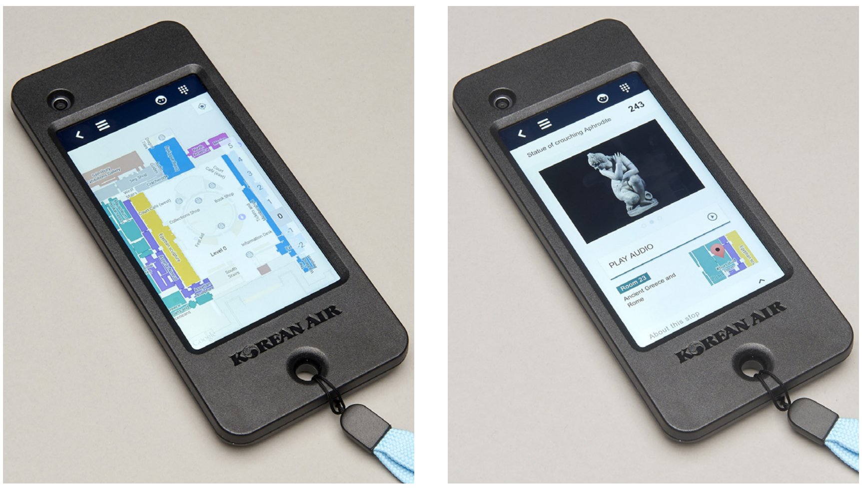


Fig 12. Example of a multimedia guide: British Museum multimedia guide showing ground floor map and image of Statue of Crouching Aphrodite with locating diagram

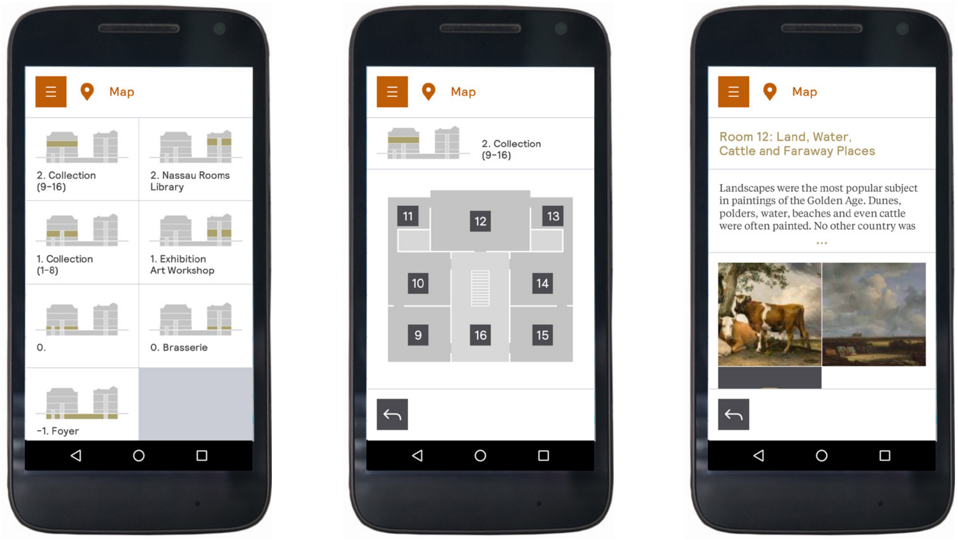


Fig 13. Example of a museum app: screenshots from app for Mauritshuis museum (v.1.7.65), The Hague, showing building cross-sections, second floor plan and description of Room 12 displays (at 50% actual size on 5-inch screen mobile phone)

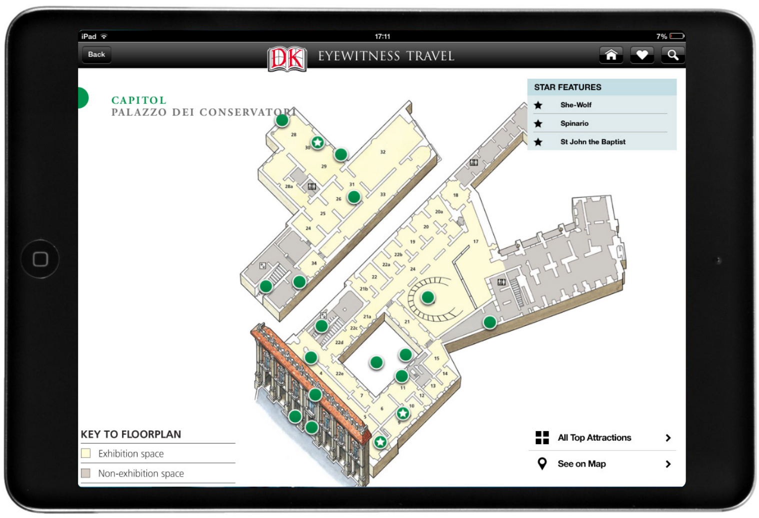


Fig 14. Example of a third-party produced museum app: Screenshot from Dorling Kindersley Eyewitness Travel app for Rome, showing plan of the Palazzo dei Conservatori (at 50% actual size on 7.9-inch screen tablet)

Printed maps and digital guides: similarities and differences

Comparisons between printed museum maps and digital equivalents can be considered according to three main criteria:

- the type and extent of information provided
- the way they are designed for their intended use, and
- the characteristics of use inherent in the format (affordance).

An advantage of digital products over printed ones is that they can provide visitors with very large – almost infinite – amounts of information (depending on the system), in a variety of formats beyond text and images. The amount of content that can be included in printed documents is constrained, especially so with the single-sheet, standalone maps that are widely produced by museums. A single-sheet document is easy for visitors to carry around the museum and is also cheaper to produce than a multi-page document (a booklet or book) – a significant factor when the maps are provided free or at low cost. Further, a small and/or simple format can signal to users that the map will not contain more information than they feel they want or can use effectively – and research by the Victoria & Albert Museum in London among visitors found that people did not want to use their smartphones "simply to access more content".[10] This space constraint – as with maps more generally – has led to the development of sophisticated design techniques that convey large amounts of layered information in a single document (as discussed in detail in Chapter 3).

The widespread provision of mostly free, single-sheet maps by museums has led to many museums publishing more substantial guidebooks for those visitors who wish for more information, or want something more substantial as a souvenir of their visit. Such books typically include content (text and images) about the museum and its displays, and often also a map – the same as that on the free map, or a variation of it.

The distinction between "map" and "guide" is much less clear-cut with many forms of digitally-provided information. For example, taking one of the digital map contexts in Table 2, the online interactive map uses the map device as its basis, but may allow for users to click, tap or swipe on particular points or areas on the map to reveal further information about the theme or contents of a gallery, or about a particular object in the museum. It therefore has elements of both a map and an exhibition guide. Most audioguides focus on information about the exhibition themes, objects and displays that the visitor can listen to instead of reading. Some audioguides, however, may include navigational information, in the form of verbal instructions on how to proceed through the exhibition or museum space or how to locate a described display.

10 Price, K. (2018). Designing a New Welcome Experience at the V&A. *V&A Blog.* [blog] 9 March. Available at <https://www.vam.ac.uk/blog/digital-media/designing-a-new-welcome-experience-at-the-va> [Accessed 29 May 2018].

Table 3. Use modes of different types of digital guide

	Plan (pre-visit)	**Visit** (during visit)	**Recall/review** (post visit)
online static map	√		√
online interactive map	√	√	√
audioguide		√	
multimedia guide		√	
app	√	√	√
“smart” guide		√	
“smart” app		√	√

Multimedia guides, apps and "smart" guides can use various technologies to combine information about the exhibition, objects and displays with orientation and navigational information. (Economou and Meintani's 2010 study of museum apps found that, of 64 examined, 53 offered a guided tour of some or all of the museum.)[11] Contemporary examples include:

- the multimedia guide of the British Museum (Fig 12), which includes, among other features, a series of guided tours with "turn-by-turn" directions, information about the museum's most famous objects, and an interactive map that tracks visitors' locations to help them orientate themselves and find their way,[12] and
- the app for the San Francisco Museum of Modern Art (SFMoMA), which uses location-sensing technology that precisely locates the visitor in the museum, to automatically trigger an audio commentary on the artwork they are looking at.[13]

The use modes of different types of electronic and digital map equivalents are summarised in Table 2. The elements that make up the use mode amount to how, where and when the content can be accessed and used.

There are three possible use points of any system (digital or printed):

- **planning** a visit (which ranges from using the information to decide whether or not to visit the museum, to planning a detailed itinerary or tour)
- **during** a visit (which includes planning a detailed itinerary or for ad hoc reference during a visit to find information, including the location of facilities and exhibits within the museum), or
- **reviewing or recalling** a visit (after the visit is complete, in order to find out more about what was seen, to recall the experience or to make recommendations to other people who may visit the museum).

Table 3 shows how the use modes relate to the different types of digital guide, as described in Table 2. Self-evidently, when a system relies on equipment provided by the museum, such as an audioguide, it will be available only during the visit. Digital information that can be accessed on a visitor's own device does not have such limitations, of course; in theory, it may be possible to use it at any time and location. However, some such systems are designed specifically for use within a museum and it may not be feasible to use them, or use them fully, elsewhere. This might be because of technical limitations, in particular, location sensing and augmented reality (where computer-generated images or

11 Economou, M. and Meintani, N. (2011). Promising Beginnings? Evaluating Museum Mobile Phone Apps, in Ciolfi, L., Scott, K., Barbieri, S. (eds) *Rethinking Technology in Museums 2011*, Limerick: University of Limerick. Available at <https://www.academia.edu/7605612/Promising_beginning_Evaluating_museum_mobile_phone_apps> [Accessed 28 November 2016].

12 British Museum. (2015). *British Museum Announces New Audio Guide*. Press release. Available at <http://britishmuseum.org/about_us/news_and_press/press_releases/2015/new_audio_guide.aspx> [Accessed 5 May 2017].

13 Chun, R. (2016). The SFMoMA's New App Will Forever Change How You Enjoy Museums. *Wired*. 5 May 2016. Available at < https://www.wired.com/2016/05/sfmoma-audio-tour-app/> [Accessed 13 May 2016]

sounds enhance the real environment), which will provide specific information to visitors depending on the point in the museum in which they are located. In other cases, digital systems may be structured around physical labels within the museum (room numbers or names, or object codes) which make using a system difficult when not on site. This may be less of a problem for visitors who wish to review or recall because they will have gained an understanding of how the digital system relates to the physical museum from their visit.

As can be seen in Table 3, the online interactive map is the only system that can be used at all three use points. However, in practice, this is fairly unlikely, in many cases because such a map is viewed within a website; using it within a museum would therefore require a device such as a tablet computer, rather than a mobile phone, and research indicates that few visitors use a tablet for such a purpose in a museum. A 2013 study of visitors at the Natural History Museum in London, found that around half of those surveyed owned a tablet, but only 5% brought it to the museum;[14] and a 2012 study of visitors at the Victoria & Albert Museum found that 38% owned a tablet, but only 7% had brought it to the museum.[15]

The affordances of maps

Some insight into how digital devices are used and perceived by museum visitors may be seen in terms of their affordance. Affordance is a concept originally developed by Gibson meaning "what the environment furnishes the animal"[16]. Later, Norman described affordance as "a relationship between the properties of an object and the capabilities of the agent that determine how the object could be used", pointing out that physical objects convey important information about how people can interact with them.[17] In relation to museum maps and guides, paper maps are different from a handheld multimedia guide or smartphone app, not only because they are physically different in very obvious ways, but also because of the relationship between their users and the maps/devices as objects: ie, what users know, understand and expect of such types of object. Considering the affordances of each type can provide some explanation as to the ongoing popularity of paper maps, in the face of some apparent, clear advantages of digital information systems.

Sellen and Harper considered the relative affordances of paper and digital-reading technologies as part of their investigation into paper vs digital

14 Fusion Research & Analytics (2013). *Natural History Museum: Understanding the Mobile Visitor*. Available at: <http://www.nhm.ac.uk/about-us/visitor-research-evaluation.html>. [Accessed 27 January 2016].

15 Fusion Research & Analytics and Frankly, Green + Webb (2012). *Understanding the Mobile V&A Visitor: Autumn 2012*. [pdf] Available at: <http://www.vam.ac.uk/__data/assets/pdf_file/0009/236439/Visitor_Use_Mobile_Devices.pdf> [Accessed 20 July 2015].

16 Gibson, J.J. (1979). *The Ecological Approach to Visual Perception*. Boston; London: Houghton Mifflin. **127**

17 Norman, D.A. (2013). *The Design of Everyday Things*. Revised ed. Cambridge, Mass; London: MIT Press. **11-12**.

documents in workplace settings.[18] They found that there were five key attributes of digital reading technologies:

- storing and accessing large amounts of information
- displaying multimedia documents
- fast full-text searching
- quick links to related materials, and
- dynamically modifying or updating content.[19]

Although using a map is not the same as reading a document, there are parallels with the affordances mentioned above. Sellen and Harper also mention four specific reasons why paper was thought to be particularly useful for reading:

- quick, flexible navigation through documents
- ability to read across more than one document at once
- ability to annotate a document while reading, and
- ability to "interweave" reading and writing (for example, taking notes while reading).[20]

These reasons are not as directly applicable to paper maps as the digital reading affordances are, but they can apply in some cases. For example, where there are separate floor plans printed across more than one page, or where the document includes text or images as well as a map, one can easily flip between these different parts. Annotating a map is also a useful possibility, for example, to mark the exhibits or parts of the museum a viewer wants to see during a visit, or for a member of museum staff to indicate the best route to a point in the museum.

Are digital and electronic maps and guides replacing printed ones?

Despite their clear advantages of greater functionality and information capacity, as described, there is little empirical evidence to date that digital maps and guides are supplanting printed ones. Printed maps remain an important part of many museums' wayfinding and visitor information offerings. For example, in the research for this thesis, visitor maps were obtained for 18 of the 20 most visited museums in the UK.[21] Globally, at least 17 of the 20 most visited art museums in the world[22] produce printed maps for visitors (the other three may do so, but they were not provided on the museums' websites, and it was not possible to establish whether they provided them at the museum).

The Victoria & Albert Museum, in developing new a wayfinding and orientation system for the museum in 2017 included printed maps alongside its digital systems. The Head of Digital Media at the Victoria & Albert Museum

18 Sellen, A.J. and Harper, H.R. (2002). *The Myth of the Paperless Office*. Cambridge, Mass: MIT Press.

19 ibid. **148**

20 ibid. **145-156**

21 Association of Leading Visitor Attractions (2015). *Latest Visitor Figures.* [online] Available at: <http://www.alva.org.uk/details.cfm?p=423> [Accessed 15 Feburary 2015]

22 The Art Newspaper (2016). Special Report: Visitor Figures 2016. *The Art Newspaper*. 289. April 2017, **3-14**

has noted the shortcomings of museum apps, in particular, that they have not proved as popular with visitors as many museums had hoped, and that most had become "expensive, hard to maintain experiments".[23] As noted previously (see page 99), the author also commented that visitors do not want to use their phones in the museum "simply to access more content", which suggests a mismatch between some museum app developers' aims, and museum visitors users' expectations and desires.

Even recently opened or reopened museums that have developed innovative, state-of-the-art digital map and guide systems often also provide printed maps for visitors. These include SFMoMA, described on page 101; the Cooper-Hewitt museum in New York, which reopened in 2014 with a newly-developed technology for exploring its collection that "encourage[s] visitors to engage with the works […] rather than looking at them through the small screen of the more traditional approach of a 'museum App'".[24] The same applies to the Museum of Old and New Art (Mona) in Tasmania, Australia, which dispensed with wall-mounted labels within the museum describing the objects on display in favour of a bespoke location-sensing digital guide called "the O".[25] These examples suggest that even the most sophisticated, flexible and user-centred digital guide systems will not suit all visitors' needs or preferred ways of exploring a museum. In the case of SFMoMA, the museum explicitly stated that its app was specifically designed for particular types of visitor, saying that it did not want to create an app "that tried to be everything for everyone, and none of it particularly well"; its app was therefore designed for young, first-time visitors who fitted into two of their visitor-type categories ("fact finders" and "self improvers").[26]

Another museum that has developed a sophisticated app is the De Young Museum in San Francisco, which sees a synergy between its app and printed guide map. A key part of this app is precise location-aware technology, which continually provides data on which exhibits in the museum are proving most (and least) popular with visitors. The app developers state that this provides visitor behaviour intelligence to various departments in the museum (such as marketing and education) – including allowing the museum to highlight popular works on their printed maps.[27]

23 Price, K. (2018). Designing a New Welcome Experience at the V&A. *V&A Blog.* [blog] 9 March. Available at <https://www.vam.ac.uk/blog/digital-media/designing-a-new-welcome-experience-at-the-va>. [Accessed 29 May 2018].

24 Cooper Hewitt Museum: the New Experience: Designing the Pen. [online] Available at: < https://www.cooperhewitt.org/new-experience/designing-pen/>. [Accessed 2 November 2017].

25 Mona. [online] Available at: < https://mona.net.au/museum/the-o>. [Accessed 2 November 2017].

26 Pau, S. (2017). Audio That Moves You: Experiments with Location-aware Storytelling in the SFMOMA App. In *Museums and the Web 2017*. Cleveland, USA, 19-22 April 2017. Silver Springs, MD: Museums and the Web LLC.. Available at <https://mw17.mwconf.org/paper/audio-that-moves-you-experiments-with-location-aware-storytelling-in-the-sfmoma-app/> [Accessed 21 July, 2018].

27 Robson, T., Castro, G., Paddon, M. and Beaman, A. The de Young Museum App by Guidekick as a Model for Collaborative Development, Technological Innovation, and Visitor Behavior Insight. In *MW2016: Museums and the Web 2016*. Los Angeles, 6-9 April 2016. Available at: <http://mw2016.museumsandtheweb.com/paper/the-de-young-museum-app-by-guidekickas-a-model-for-collaborative-development-technological-innovation-and-visitor-behavior-insight/>. [Accessed 28 November 2016]

How widely used are printed maps compared with digital navigation devices?

The fact that printed maps are widely provided by museums of all types and sizes for their visitors suggests that they are an important way of helping improve the visitor experience. Data on how many visitors use maps generally come from individual museums' own internal visitor surveys or observational studies. The following provide some insight:

- In a 1987 study at the Arizona Sonora Desert Museum, 65% of visitors questioned said they had used a museum map during their visit.[28]
- In a 1984 study at the Victoria & Albert and Science Museums, "well over half" of first-time visitors to the former and "considerably over a quarter" of first-time visitors to the latter used a map (the study concludes that take-up would be greatly increased if the maps were more prominently displayed).[29]
- In a 2012 study at the Victoria & Albert Museum, 70% of visitors questioned said they were aware of the museum map, and 42% of visitors said they had used it during their visit; this figure was greater than that for the museum's other wayfinding materials and resources, such as signage, wall maps and staff.[30]

These studies provide limited insight into the level of engagement by visitors – ie, to what extent visitors use the maps and whether they helped them plan or undertake their visit. In particular, in museums where the maps are provided free, some visitors may take the map and not use it at all.

There is more available data on the use of digital devices in museums. LaPlaca Cohen's 2017 study of cultural engagement in the US asked museum visitors about their preference for a "digital/non-digital experience". At art/design museums, preferences were fairly evenly divided: about a third of respondents said they preferred an experience that integrated digital technology, a third an experience that did not integrate digital technology, and a third had no preference. The figures were different for science, technology and natural history museums (perhaps not surprisingly), where around half of respondents preferred an experience that integrated digital technology, a sixth preferred one that did not, and a third had no preference.[31] La Placa Cohen's study does not provide insight as to the reasons behind people's preferences for digital or non-digital experiences. However, research by Thom-Santelli et al into the use of digital

28 Shettel-Neuber, J. and O'Reilly, J. (1987). *"Now Where?" A Study of Visitor Orientation and Circulation at the Arizona-Sonora Desert Museum.* Jacksonville, AL: Center for Social Design. **23**

29 Heady, P. (1984), *Visiting Museums: a Report of a Survey to Visitors to the Victoria and Albert, Science and National Railway Museums for the Office of Arts and Libraries*. London: Office of Population Censuses and Surveys. **90**

30 Morris Hargreaves McIntyre. (2012). [Unpublished report.] *Navigation at the V&A: Current and Future Wayfinding*.**18**

31 LaPlaca Cohen (2017). *Culture Track '17: Supporting Data*. New York: LaPlaca Cohen Advertising Inc. **109**. Available at <https://culturetrack.com/research/reports/>. [Accessed 15 December 2017].

handheld museum guides provides one possible reason.[32] Their study found that handheld guides dictate particular ways of navigating and experiencing a museum to the exclusion of other ways; for some visitors, this may be seen as didactic, and perhaps also at odds with the exploratory and serendipitous nature of a museum visit that some visitors value.

There is also more data from museums' own research, spurred by a desire to assess new technologies (especially when a museum is considering investing in a new device or system). The same factors accounting for variation in the take-up of printed maps in museums apply to digital devices, but there is also the often-significant factor of the wide variety of types of digital device available.

It is therefore not surprising that figures for use of such devices vary considerably from study to study, for example:

- In a 2013 survey of visitors to the Natural History Museum, London, 35% of respondents said they "always or sometimes" used an audio- or multimedia guide when visiting a gallery or cultural site, while 41% said they never did.[33]
- In a 2012 survey of visitors to the Victoria & Albert Museum, 8% of respondents said they "always" used an audioguide or multimedia guide when visiting a museum, and 36% said they "sometimes" did. Further, 11% of respondents who owned a smartphone said they had (at some point) used their phone to download a gallery app (from a survey population in which 71% of people owned a smartphone).[34]
- In a separate 2012 study of visitors to the Victoria & Albert Museum, 3% of visitors said they were aware of the museum's smartphone app, and 1% of visitors had used it during their visit.[35]
- When launching its new multimedia guide, the British Museum aimed for 180,000 rentals per year;[36] given that the museum received 6.8 million visitors in the year 2015-16, this equates to an estimated take-up rate of

32 Thom-Santelli, J., Toma, C., Boehner, K., and Gay, G. (2005). Beyond just the facts: Museum Detective guides, In *Proceedings of the International Workshop Re-thinking Technology in Museums: Towards a New Understanding of People's Experience in Museums*. Limerick: University of Limerick Interaction Design Centre. **99-107**

33 Fusion Research + Analytics (2013). *Natural History Museum: Understanding the Mobile Visitor*. **44.** [pdf] Available at: <http://www.nhm.ac.uk/about-us/visitor-research-evaluation.html>. [Accessed 27 January 2016].

34 Fusion Research & Analytics and Frankly, Green & Webb (2012). *Understanding the Mobile V&A Visitor: Autumn 2012*. 6, 13, 21. [pdf]. Available at: <http://www.vam.ac.uk/__data/assets/pdf_file/0009/236439/Visitor_Use_Mobile_Devices.pdf> [Accessed 20 July 2015].

35 Morris Hargreaves McIntyre (2012). Unpublished report. *Navigation at the V&A: Current and Future Wayfinding*. **18**

36 GLAMi Nomination: Audio Guide at the British Museum. In: *Museums and the Web 2016*. Los Angeles, USA, 6-9 April 2016. Silver Springs, MD: Museums and the Web LLC. Available at: <http://mw2016.museumsandtheweb.com/glami/audio-guide/>. [Accessed 6 November 2017].

- 2.6%.[37] The British Museum claims that 3% take-up for audioguides for permanent collections (rather than temporary exhibitions) is typical for museums generally.[38]
- After the Van Gogh Museum, Amsterdam introduced a new type of multimedia guide in 2013, the proportion of visitors taking the guide rose from 16% to 25%, which the museum considered a significant improvement.[39]

There are many possible reasons for the large variation in these figures, not least that the latter two relate to the use of multimedia guides at a specific museum, rather than digital guides more generally. It is also significant that both these museums' guides are paid-for items (as of November 2017, the British Museum charges £6 and the Van Gogh Museum €5), though the British Museum is free to enter, while the Van Gogh Museum charges for entry. However, despite the variation in figures from these studies, it can be concluded that, on the basis of existing evidence, only a minority of museum visitors use digital guides of any type.

Take-up rates of digital devices can be much higher when museums provide particular motivations to use them. For example, the Museum of Old and New Art in Tasmania states that 92% of its visitors use its guide app, called The O, for at least part of their visit, and 73% of visitors use it "throughout their visit".[40] The high use rate is likely to be partly because the guide is free, but also because the museum has no physical text labels, so visitors must use the app to find out about the displays. Other aspects of the guide and the museum may have increased take-up, such as a range of highly opinionated, sometimes irreverent commentaries, such as "Art Wank" ("look for the cock-and-balls icon, you can't miss it").[41] However, the impact of innovative content styles on the take-up rate of a digital guide is less clear than the free cost, and the lack of text labels.

The studies mentioned above provide some insight into visitor use of and attitudes towards digital guide devices in museums, but little insight into the effectiveness of the map functions included in most of the devices that are considered in those studies.

Another important consideration is the timeframe in which these studies were done. Even though the quoted studies are relatively recent, this is (still)

37 Department for Digital, Culture, Media & Sport (2017). *Museums and Galleries Monthly Visits, 2 November 2017 update*. [online] Available at: < https://www.gov.uk/government/statistical-data-sets/museums-and-galleries-monthly-visits>. [Accessed 6 November 2017].

38 Mannion, S., Sabiescu, A. and Robinson, W. (2015). An Audio State of Mind: Understanding Behaviour Around Audio Guides and Visitor Media. In: *Museums and the Web 2015*. Chicago, USA, 8-11 April 2015. Silver Springs, MD: Museums and the Web LLC. Available at: <https://mw2015.museumsandtheweb.com/paper/an-audio-state-of-mind-understanding-behviour-around-audio-guides-and-visitor-media/>. [Accessed 28 August 2017].

39 De Vet, M., Pondaag, E. (2015). The Van Gogh Museum Success Story. [conference paper]. In: *Communicating the Museum 2015 Istanbul*. Istanbul, Turkey 8-11 September 2015. Paris: Agenda.

40 Art Processors: projects: MONA. [online] Available at: <http://artprocessors.net/projects/mona/>. [Accessed 12 October 2017]

41 Museum of New and Old Art: Museum: the O. [online] Available at: <https://mona.net.au/museum/the-o>. [Accessed 12 October 2017].

a fast-changing area in relation to public attitudes towards and use of digital devices (including personal ownership of them, as well as the provision of apps and digital devices by museums), and the form and capabilities of those apps and devices. For example, the proportion of people in the UK aged 55 to 75 years old owning a smartphone more than doubled between 2012 and 2017 (from 29% to 71%), and the proportion of people in the same age group owning a tablet increased more than five times (from 12% to 64%).[42]

Against this background of limitations of existing research, and the issue of timeliness explained above, a study was undertaken to investigate museum visitors' use of and attitudes towards museum maps and their digital and electronic alternatives. This study is described in Chapter 5.

Conclusion and discussion

It has been shown that printed museum maps and map-type information come in a variety of document forms, from single-page documents provided free of charge to visitors, to substantial guidebooks that include museum maps alongside text and images that provide a comprehensive overview of a museum and its collection and displays. The former may be considered ephemera, in many cases disposed of after being used in the museum (or kept for only a short time), the latter a publication that is intended as a souvenir of a visit, and for future reference. Most of the printed items that include maps are published by the museums they describe. There are some independently produced maps in tourist guidebooks by commercial publishers, but such maps are relatively rare. In fact, by far the most common document form for museum maps is the simplest leaflets provided by museums free or at low cost. Therefore the corpus (described in the introduction) that is used for the analysis in the following chapter, consists of this type of map (including pdf versions made available on museum websites).

Digital and electronic alternatives to paper maps come in many forms. Some of them, such as audioguides, are not maps, but can provide spoken navigational guidance for visitors as an alternative to a map. Others include screen-based maps (which can sometimes be printed off from a home computer for visitors to use both before and during a visit to the museum). But increasingly, new technologies are providing more sophisticated services that combine sound, images (still and moving), text, and interactive, user-responsive, and location-aware content, available either on devices provided by the museum (multimedia guides) or as apps that visitors can download and use on their own smartphones or tablets. Many museums have invested in developing such guides as a way of providing a richer experience for their visitors, and of attracting and engaging new audiences.

42 Deloitte (2017). *State of the Smart. Global Mobile Consumer Survey 2017: UK Cut*. <Available at https://www.deloitte.co.uk/mobileuk/>. [Accessed 25 November 2016].

Despite the apparent advantages of digital and electronic guides – extra functionality and greater information capacity – to date, at least, they appear to appeal to only a minority of museum visitors. Printed museum maps remain widely produced by museums, because there is clear demand for them by their visitors. There are several possible reasons why digital devices have failed to attract museum visitors in larger numbers. It may in part be due to poorly designed digital system user-interfaces, making them unappealing or frustrating to use. This may be overcome in time, as designs improve. There may also be an issue of generational change, with "digital natives" (those who have grown up using digital devices) being more comfortable with and adept at using such systems in a museum environment. It is also possible that there are inherent and enduring characteristics of paper maps – familiarity, clarity of function – which make them easy to engage with, and do not distract from the museum's displays, as digital devices can.

These issues are explored in Chapter 5, which describes an exploratory study in which museum visitors were questioned about their use of and attitudes towards printed museum maps and their digital alternatives.

Chapter 3: How maps convey information

Contents

How maps convey information

The previous chapter considered the material forms of museum maps – the kinds of document in which they are published – and how they are made available to museum visitors. This chapter takes a closer look at what museum maps are aiming to tell reader and visitors about the museum, and the graphic design techniques and devices they use to do this.

This chapter first considers museum maps in relation to other kinds of map: how they are similar and how they differ, and why this is. It then considers two distinct aspects of the information being conveyed in a map:

- the museum as a **physical entity**: its building(s), and
- the museum as an **experience**: its contents (displays and exhibits).

In terms of the museum as a physical entity, the range of ways of depicting museum buildings is discussed, through an analysis of the corpus of maps (as described in the introduction). It looks at the different graphic methods that are used and considers the motivations for using different methods.

In terms of the museum as an experience, the thesis proposes four information "roles" that museum maps can fulfil, and discusses the different means that are used to fulfil these roles. The purpose of this exercise is not to specify what a museum map should include because that will depend on the type of museum (discussed in Chapter 1), the building or buildings in which it is housed, and other issues, such as how the museum wants to present itself and its exhibits, and whether its map is meant to appeal to particular audiences. Instead, the aim is to identify the range of options used in maps and the criteria by which they can be assessed.

The final part of this chapter looks at museum maps from a historical perspective. It looks at the range of maps produced at two large museums – the Victoria & Albert Museum (V&A) and the British Museum – over a period of around 140 years. The purpose of this is to consider the different design approaches that each of the museums has taken at different times in the past to representing the museums to visitors and, in particular, to identify areas where there have been a variety of design solutions attempted, which may be an indication of what were considered the most challenging design problems.

What makes museum maps distinctive

In many respects, museum maps are not dissimilar to maps of other built environments, such as hospitals, campuses, shopping centres, public buildings and transportation hubs. However, the information that such maps aim to convey to readers, and the way they do this, can be very different, because of the different ways people use those spaces, and what they need from maps in order to use them.

A key difference between maps of museums and those of many other institutions and locations lies in the difference between spaces that people either pass through, or have a clear specific destination within the space, and those that are destinations in themselves. So, for example, people mostly visit an airport, railway station or hospital with a clear purpose (for example, to catch a plane or train, to attend a medical appointment), a clear end destination within the space (a gate, platform or clinic) and stay only as long as they need to in order to fulfil this aim (to catch a plane, attend a medical consultation). They are not places that people normally linger by choice. Museums are mostly the opposite. As Loomis points out, museums present a "somewhat unique wayfinding situation" because museum visitors may not be searching for a specific destination; they may be happy to browse, and arriving at a destination point may be more a matter of determining whether they have seen everything, or whether their tour of the museum is complete.[1] Nevertheless, museum maps are not entirely unique in this – Loomis's characterisation of museum visitors' behaviour could equally apply to shoppers at a shopping centre.

Therefore, a fundamental distinctiveness of museum maps, compared with many other types of building map, is that the primary aim is not to facilitate wayfinding in the truest sense ("the process of determining and following a path or route between an origin and a destination"[2]). It is perhaps notable that museums get no specific mention in certain key texts on wayfinding. Lynch, who coined the expression "wayfinding", does not mention museums in his seminal 1960 work on the subject,[3] nor do Arthur and Passini (1992). The latter study is perhaps more significant since the authors describe four types of wayfinding setting: travel, working, recreational and retail. Although museums may be considered "recreational" Arthur and Passini mention only "sports facilities", "public parks and zoos" and "theme parks and fairs" in this category.[4]

Essentially, printed museum maps are most useful, and most used, for "conceptual orientation" (understanding what is in the museum, and how it is

1 Loomis, R. J. (1987) *Museum Visitor Evaluation: New Tool for Management*. Nashville: The American Association for State and Local History. **162**

2 Golledge R. G. (1999). *Wayfinding Behaviour: Cognitive Mapping and Other Spatial Processes*. Baltimore: Johns Hopkins University Press. **32**.

3 Lynch, K. (1960). *The Image of the City*. Harvard: Massachusetts Institute of Technology Press.

4 Arthur, P. and Passini, R. (1992). *Wayfinding: People, Signs, and Architecture*. New York: McGraw-Hill, **77-79.**

arranged), rather than wayfinding. (For further discussion of this, see Chapter 4.) And although this may not be true to the same degree with shopping centre maps, the similarity lies in the many parallels in terms of visitor behaviour. The connection was probably first made more than a century ago by John Dana Cotton, a museum director, who wrote that "A great city department store of the first class is perhaps more like a good Museum of Art than are any of the museums we have yet established".[5] More recently, the Director of the Dallas Museum of Art has drawn parallels between visitor experience data gathered by shopping malls and by museums.[6]

Falk also draws parallels between shopping centres and museums, in particular with the behaviour of shoppers and that of museum visitors: he contends that "serious shoppers", who know what they want to buy, are similar to museum visitors who have a predetermined idea about what they want to see, and that "window shoppers" are similar to those museum visitors with no agenda, for whom a visit is primarily a social activity.[7] There is further discussion of research into the similarities and differences in the behaviour of shoppers and of museum visitors in Chapter 4.

5 Dana J.C. (1917). The Gloom of the Museum. In Anderson, G. ed. (2012). *Reinventing the Museum: the Evolving Conversation on the Paradigm Shift. 2nd ed*. Lanham; New York; Toronto; Plymouth: Altamira Press.

6 Inscho J. and Cairns S. (2014). *Episode 14: The Economics of Free*. Museopunks [podcast]. Available at <http://staticmade.com/museopunks-archive/> [Accessed 12 February 2015]

7 Falk, J.H. (1982). The Use of Time as a Measure of Visitor Behavior and Exhibit Effectiveness. *Roundtable Reports: Issues in Research: Language and Methodology*. 7:4. **12**.

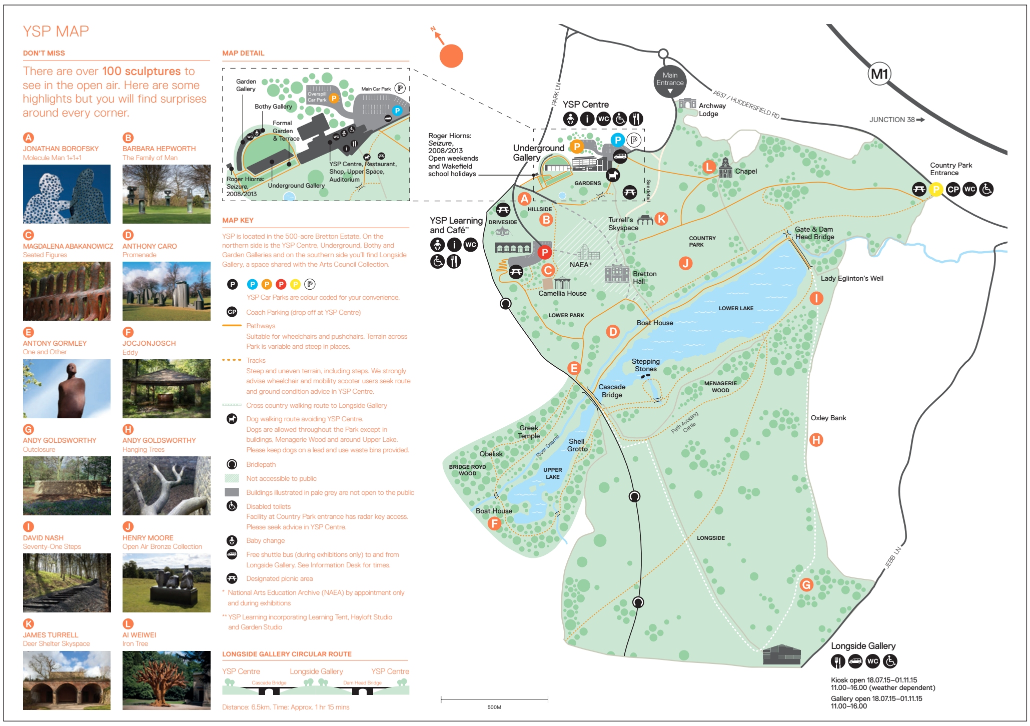


Fig 1. Example of a sculpture park sitemap: the Yorkshire Sculpture Park, Wakefield, 2015 (at 33% actual size, 406mm × 284mm)

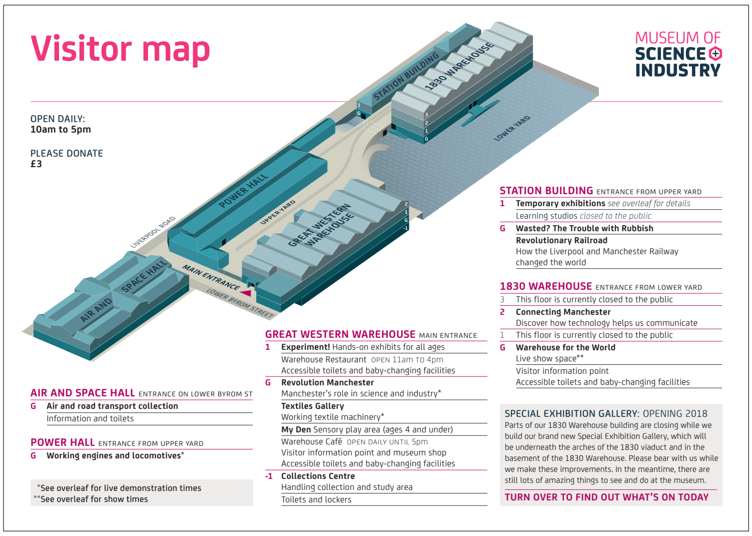


Fig 2. Example of a "campus-style" sitemap: the Museum of Science and Industry, Manchester, 2016 (at 33% actual size, 297mm × 210mm)

How museum spaces are shown on maps

In considering the different ways of depicting the museum spaces, it is first worth considering the physical extent of the museum and of the intended depiction. There are essentially three different types of depiction in this respect:

- **site maps**, which depict an external place, either showing large-scale exhibits (such as a sculpture park – see Fig 1, for example) or a "campus-style" map, showing location and arrangement of a series of buildings that together form the museum (such as that shown in Fig 2)
- **floor plans or maps**, which depict a building or series of linked buildings that constitute the museum (see later pages of this chapter for various examples), and
- **room guides**, which depict a room or rooms within a building and their contents (the displays), and which are designed as a guide to a particular exhibition, rather than a navigational or descriptive guide to the museum as a whole (such as that shown in Fig 3).

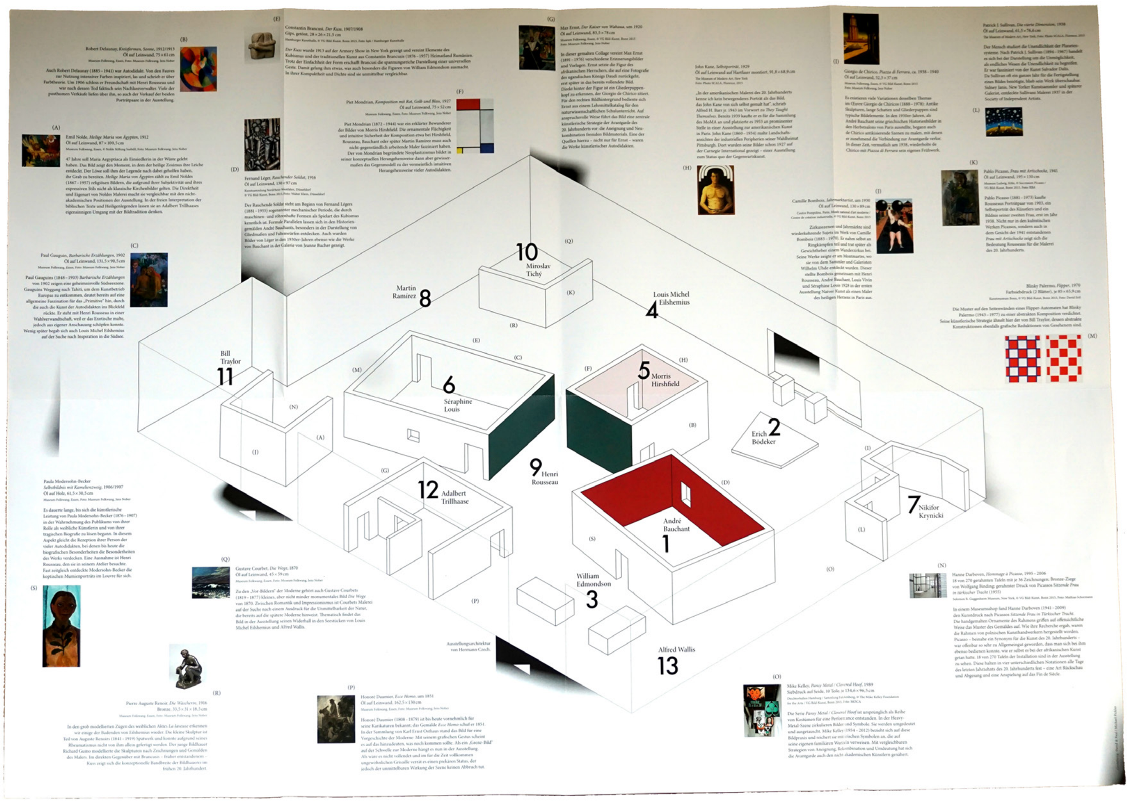


Fig 3. Example of a room guide: Ausstellungsbegleiter, Der Schatten der Avantgarde: Rousseau und die vergessenen Meister, Museum Folkwang, Essen, 2015 (at 25% actual size, 590mm × 420mm)

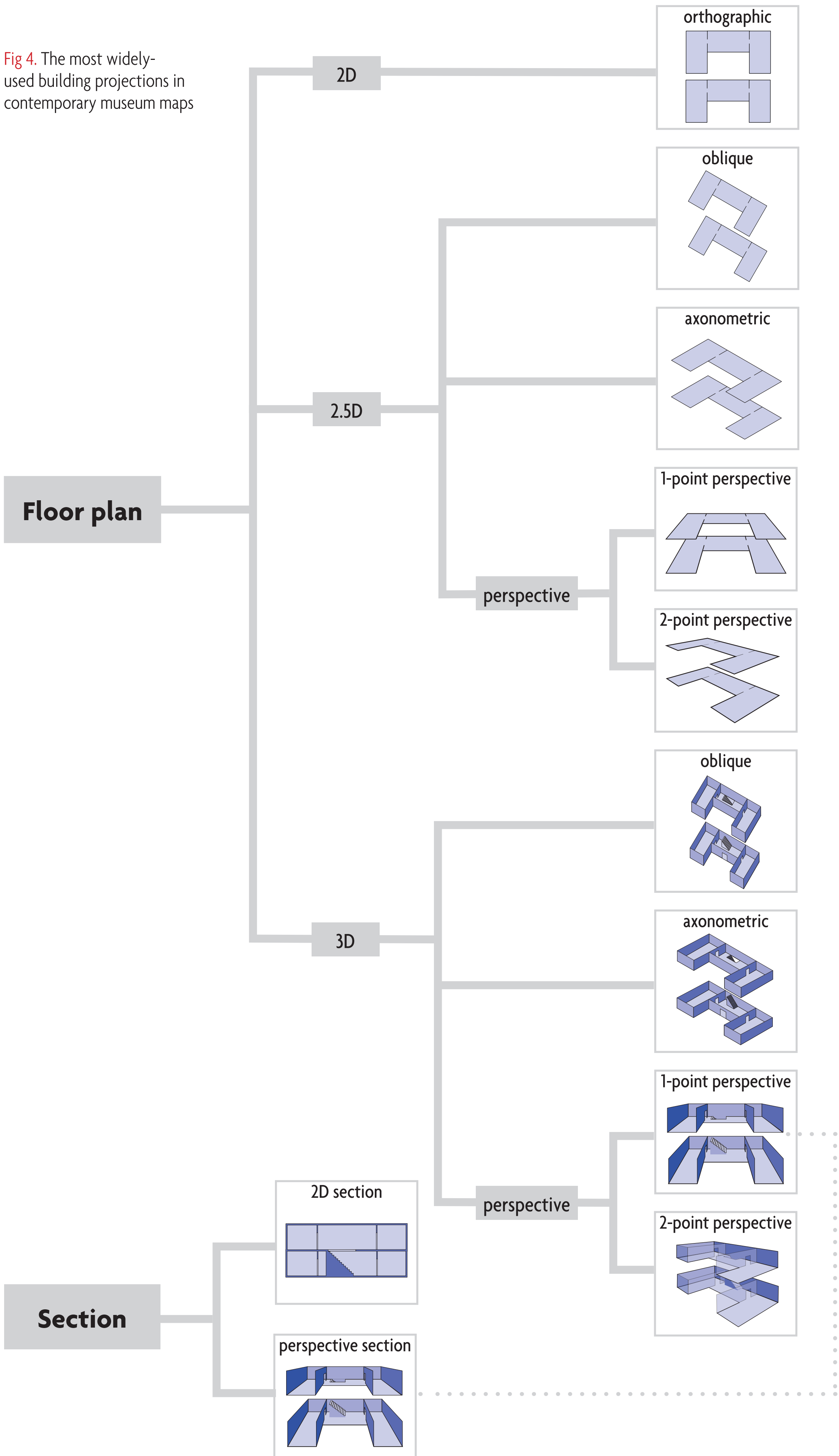


Fig 4. The most widely-used building projections in contemporary museum maps

Presentations based on floor plans are the most common type of museum map and are the main focus of the analysis in this chapter. Fig 4 shows the most commonly used types of building depiction in museum plans. Each type is discussed on the following pages, with examples.

The three categories — site maps, floor plans and room guides — are not always discrete. Occasionally, a map may be a site map that also includes building floor plans; or museums may provide more than one type of map for visitors (for example, a site map and a floor plan, or a floor plan and room guides).

Many of the earliest museum maps were essentially adaptations of architectural plans, with added information, such as labels for the various rooms (see, for example, the 19th-century map of the British Museum, London, Fig 53, page 184). But more sophisticated floor plans, including those with three-dimensional-style projections, have been widely used by museums for their maps for many years now. The widespread availability of graphic design and illustration software that can be used to produce (and edit and update) maps – notably Adobe Illustrator, released in 1987[8] – has contributed to innovation in this area. As an alternative (or addition to) the floor plan, some museums use a cross-sectional representation of the building.

8 Hemphill, T. (2014). The Adobe Illustrator Story. *Adobe Illustrator Blog*. [blog] May 14. Available at: <http://blogs.adobe.com/adobeillustrator/2014/05/the-adobe-illustrator-story.html> [Accessed 7 June 2018].

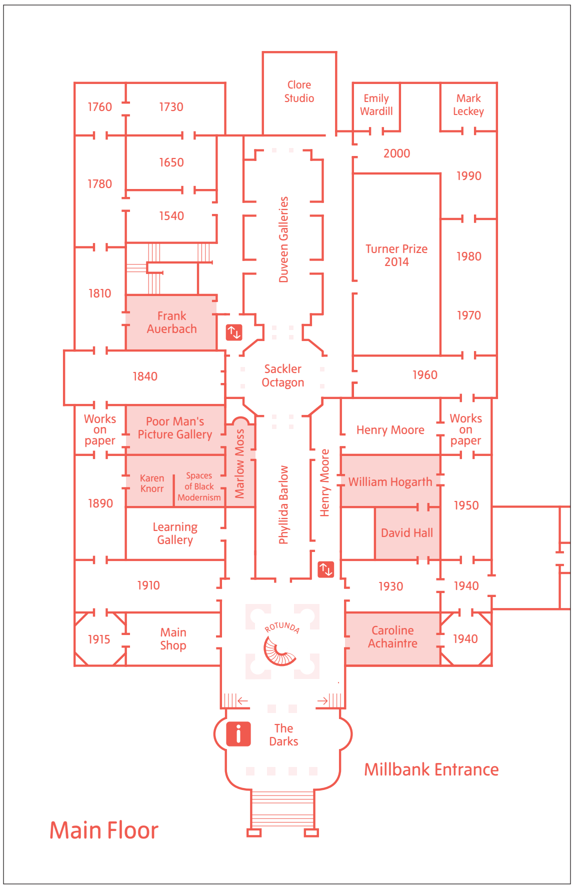


Fig 5. Two-dimensional floor plan: Map of Main Floor, Tate Britain, London, 2014 (at 75% actual size, page size 106mm × 143mm)

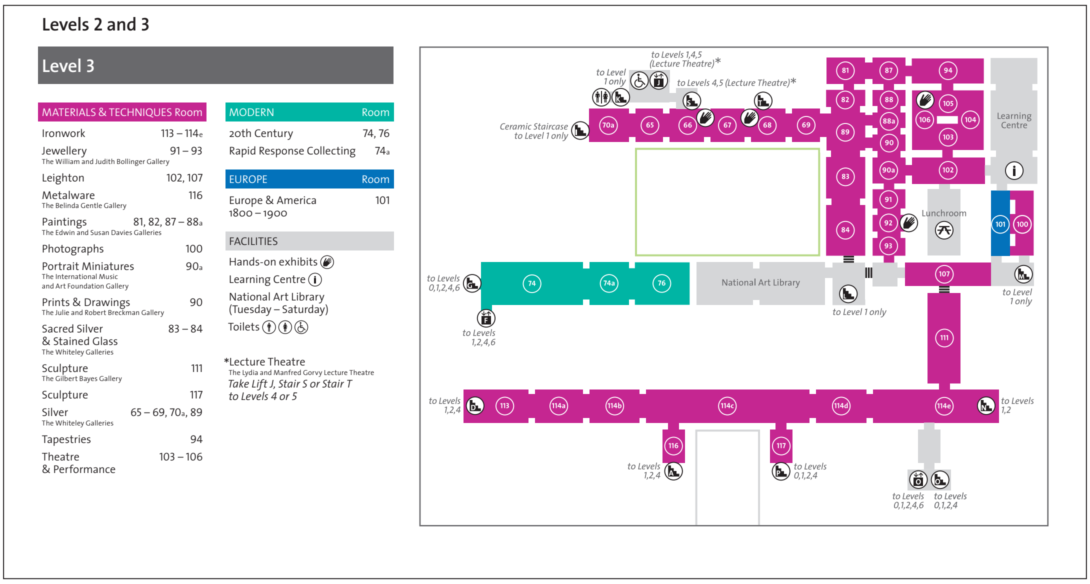


Fig 6. Two-dimensional floor plan: Map of the Victoria & Albert Museum, London, 2014 (detail, at 50% actual size)

Two-dimensional floor plan representations

The two-dimensional (2D) floor plan (orthographic projection), was used in early museum maps and is still widely used; within the corpus of maps examined, about two-thirds were 2D. Its popularity may be because, compared to other views, it is simple to create and revise (with changes in the museum).

Fig 5, Fig 6 and Fig 7 are all examples of 2D floor plans, each showing different aspects of the space: the map in Fig 5 represents the walls of the building only, Fig 6 the extent of the internal spaces (the rooms) and Fig 7 only the extent of the entire floor areas, ie, without any internal walls or other architectural elements.

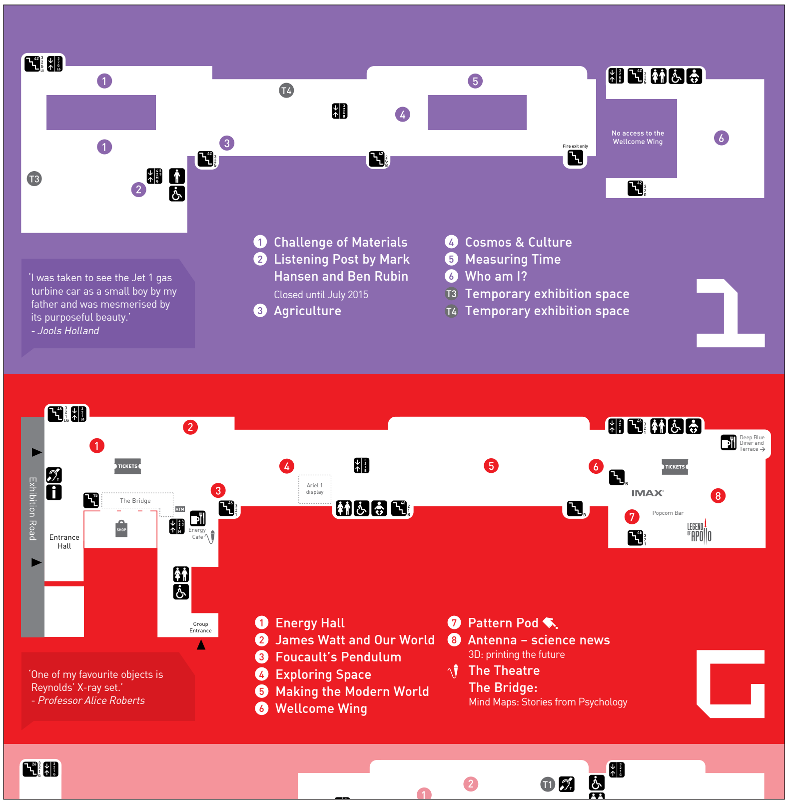


Fig 7. Two-dimensional floor plan: Map of Science Museum, London, 2014 (detail, at 50% actual size)

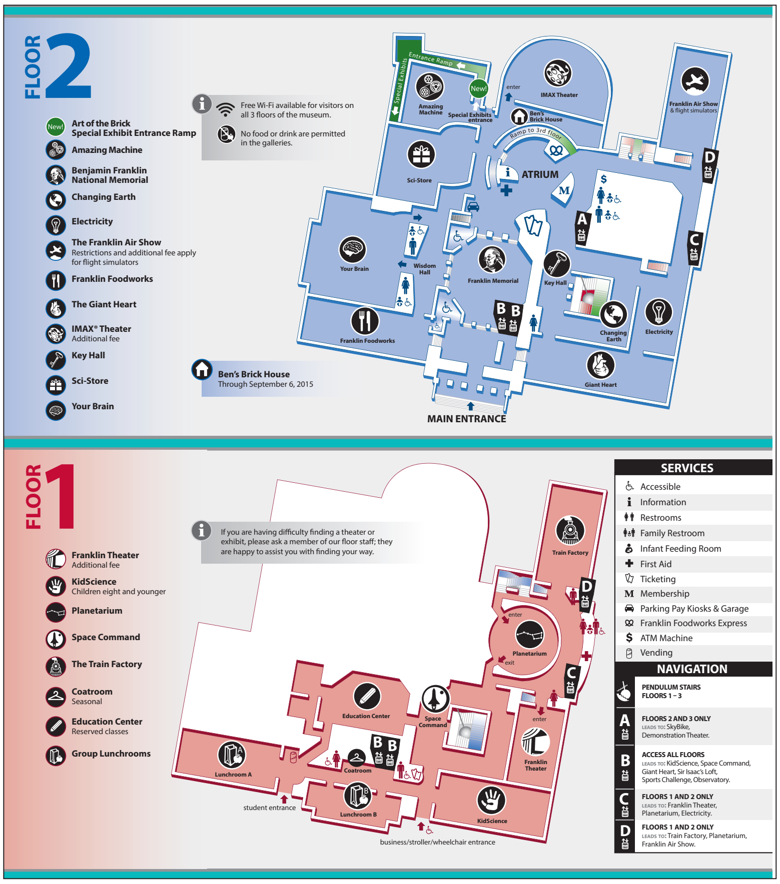
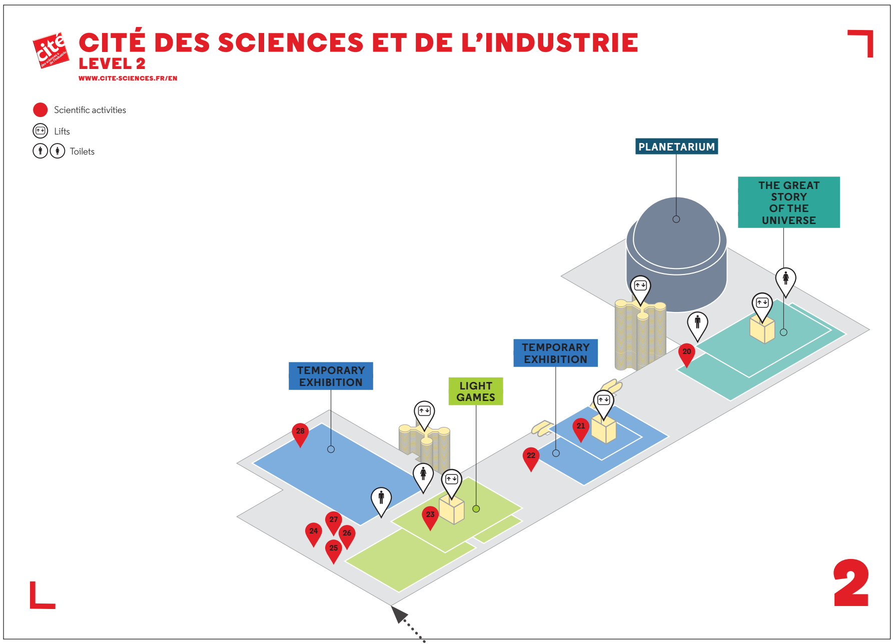


Fig 8. Example of a 2.5D oblique projection: map of The Franklin Institute, Philadelphia, 2015 (detail, at 40% actual size)



angle of projection=120°

Fig 9. Example of isometric projection: map of Level 2, Cité des Science et de L'Industrie, Paris, 2014, with annotation (at 40% actual size, page size: 297 × 210mm)

Three-dimensional floor plan representations

Three-dimensional (3D) representations attempt to give the impression of depth or height in the representation of the building. In the context of a museum plan (or other building plans), 3D maps can provide a better sense of the layout of the building as a whole – to show how different levels in a building fit together, and the means of moving between levels. So, although 2D maps will include an indication of staircases, ramps and lifts (often through symbols and arrows), 3D maps can better show where staircases, ramps and lifts lead to.

A variation on the 3D plan is the **2.5D plan,** so called because it contains elements of both 2D and 3D ones. It is a diagram consisting of a series of floor plans rendered so as to give an impression of how each floor level relates to each other, but it does not include walls or indicate heights of spaces in the building. This means they can be graphically simpler than 3D ones without necessarily losing the detail that is important for orientation or navigation. Fig 8 and Fig 9 are examples of 2.5D plans, and Fig 11 an example of a 3D one.

The simplest type of 3D (or 2.5D) plan is one is the **oblique** projection, in which a floor plan is rotated to give the impression of depth, ie, the third dimension (see Fig 8). This type of diagram is relatively simple to create, as it involves no geometric distortion of the floor plan, though it does not provide a very convincing impression of depth (see also "Comparing a floor plan and an axonometric map", Chapter 4). A more common type of projection is **axonometric**, which distorts the plan, so the angle between two walls at right angles is greater than 90°, foreshortening the depth axis, and thus creating a sense of depth in the diagram. One common type of axonometric projection is **isometric** (Fig 9), in which the angle between two walls at right angles is 120°. However, axonometric projections can be created at any angle between the building's axes (walls) between 90° and 180°, with resulting varying amounts of distortion of the plan; the map designer can choose to use one that is appropriate to the proportions and shape of the building being depicted relative to the space available on the document in which it will be used.

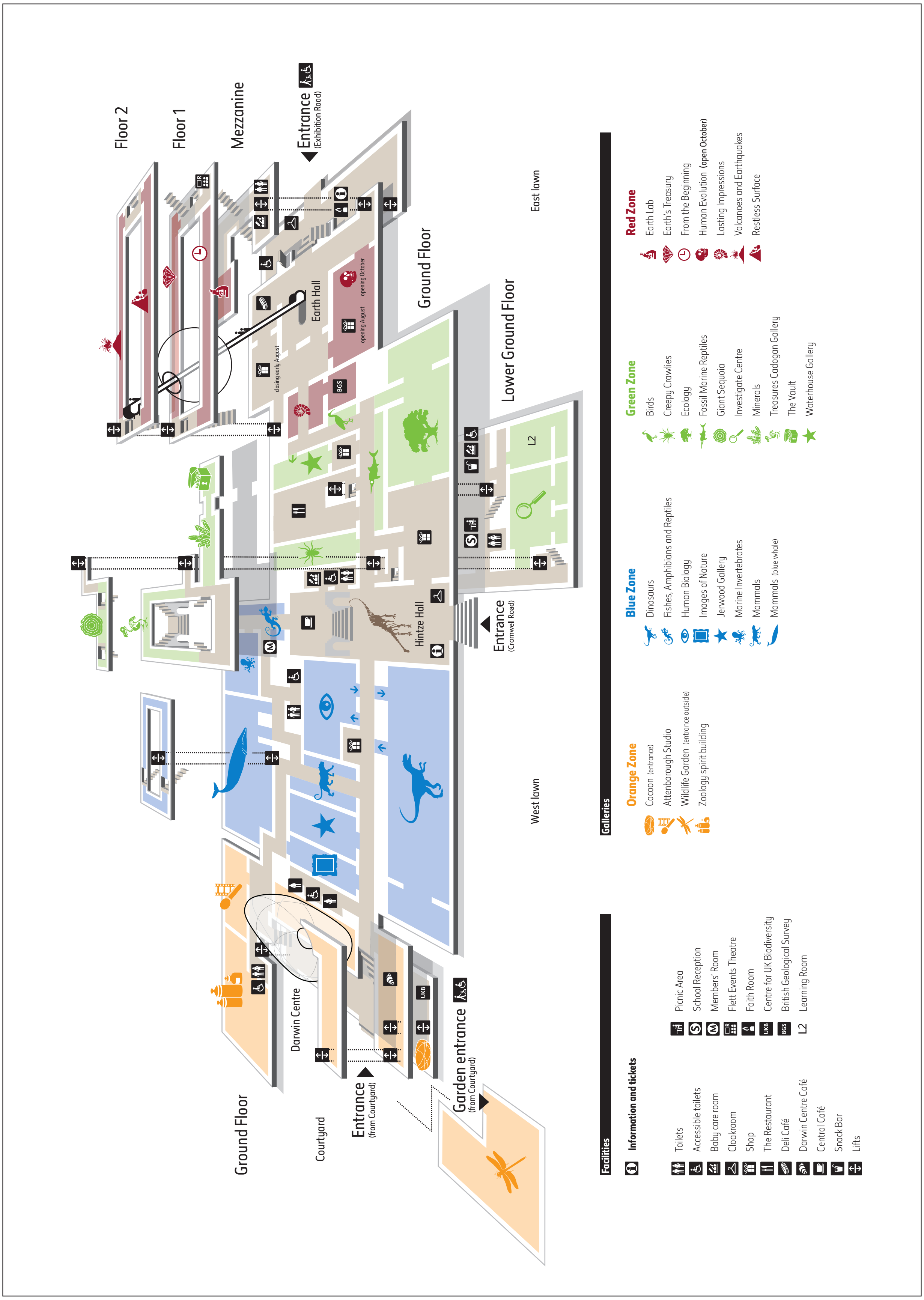


Fig 10. Example of single-point perspective: Map of the Natural History Museum, London, 2015 (at 50% actual size, page size: 460 × 327mm)

A more sophisticated type of projection is **perspective**, which is more difficult to render, though it can give a more realistic view of the floor layout. There are two types of perspective generally used in museum maps: **single-point** and **two-point**. In practical terms, a single-point perspective is a view as if the building is being viewed from a central point, head on, and a two-point perspective as if from an angle. The single-point perspective (for example, Fig 10) is created with a single "vanishing point": an imaginary point on the horizon at which the lines of sight converge; the second has two "vanishing points" on the horizon. A two-point perspective (for example, Fig 11) can provide a more realistic impression. In principle, it allows for flexibility in terms of the view of the building; if the map designer chooses the viewpoint carefully, according to the shape, size and layout of the building, it can allow for more detail of the important parts of the museum. However, within the corpus of museum maps, there were only a few two-point perspective renderings, probably due to the fact that these are more difficult to produce than other 3D projections. Also, in practice, there may be few circumstances in which they provide any significant advantage over a one-point perspective or axonometric rendering.

It is worth noting that, although a 3D (or 2.5D) rendering of a museum building allows for the possibility of a single diagram that shows the entire building and how different levels are connected (as in Fig 10), not all 3D maps are produced this way. Many are – like 2D maps – are a series of individual floor plans, each rendered in perspective (as in Fig 8, Fig 9 and Fig 11).

The decision as to the type of projection to use for a map will inevitably be based on a number of factors but it would appear that, for some museums as least, the choice is not straightforward. Within the corpus of maps, three museums in recent years had redesigned their maps to use different types of projection: two had changed from 3D to 2D (the Museum of New and Old Art in Hobart, Australia, and the Jewish Museum Berlin) and one from 2D to 3D (the National Gallery of Art, Washington, DC).

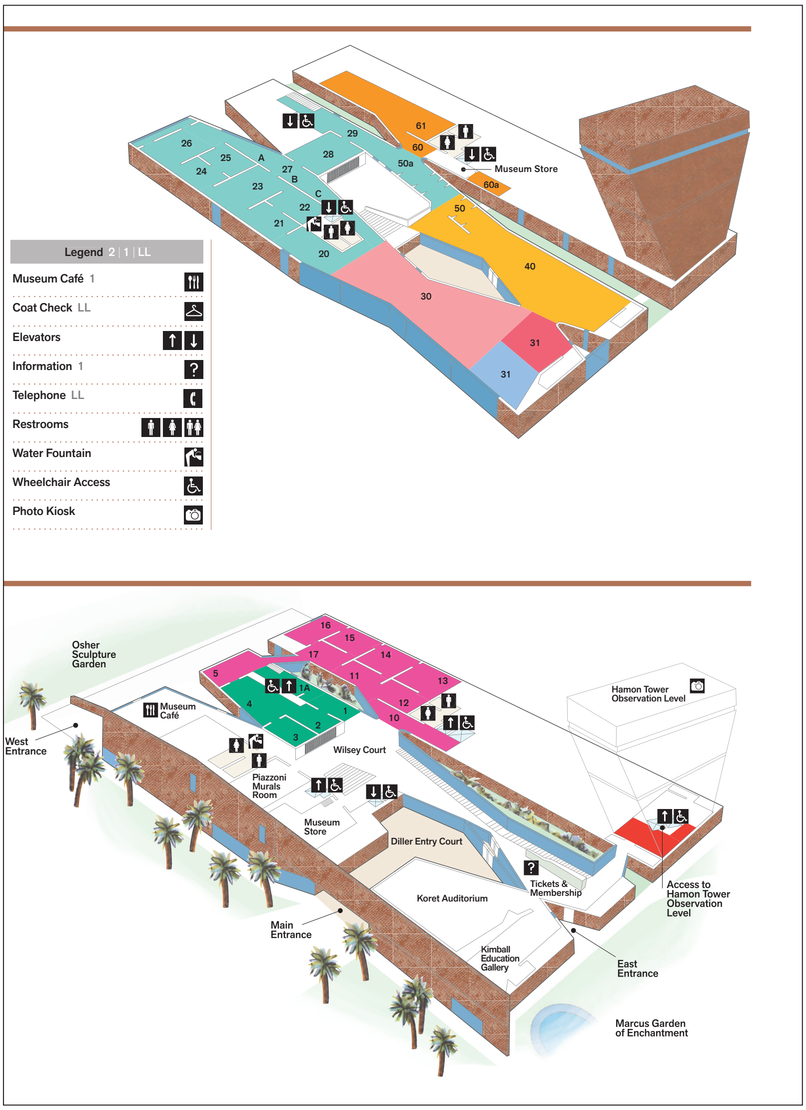
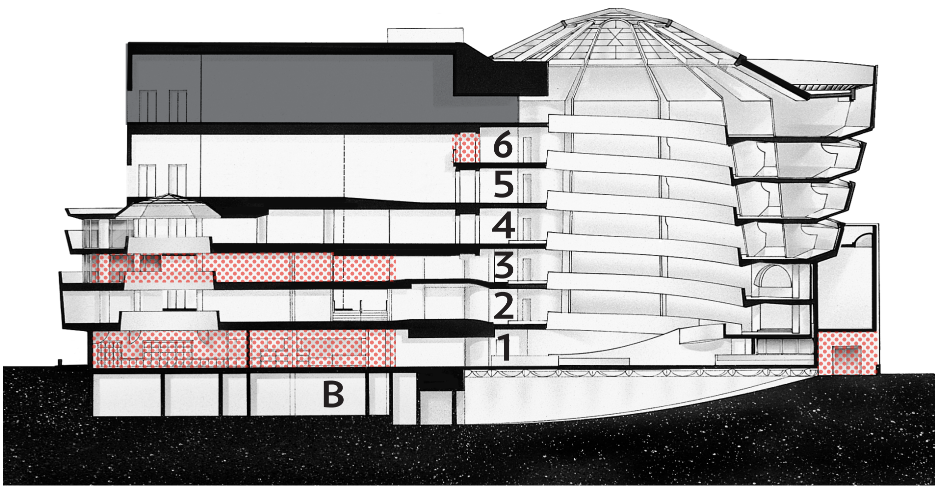


Fig 11. Example of two-point perspective: map of Main Level and Upper Level, De Young Museum, San Francisco, 2014 (detail, at 50% actual size)



Tower

5 Tales of Our Time
Maurizio Cattelan: "America"

4 Tales of Our Time

3 Cafe 3

2 Guggenheim and Thannhauser Collections
Including paintings by Monet, Picasso, Renoir, Kandinsky, Chagall, and Mondrian

B Sackler Center for Arts Education
A Long-Awaited Tribute: Frank Lloyd Wright's Usonian House and Pavilion

Rotunda

6 Agnes Martin
Guggenheim Store

5 Agnes Martin

4 Agnes Martin

3 Agnes Martin

2 Agnes Martin

1 Guggenheim Store
The Wright

Fig 12. Example of a cross-section: map of the Solomon R Guggenheim Museum, New York, 2016 (at 50% actual size, page size: 361mm × 368mm)

Another type of map projection is a **section** (or cross-section), which is a view of the building as if it has been cut through vertically to reveal the internal spaces. It provides a clearer view of the levels in a building and their inter-relationships than a series of floor plans does but is self-evidently less effective at identifying different spaces on the same level. For this reason, sections are much less frequently used than plan maps for museums and are generally suitable only for particular types of museum building. This includes, for example, a small, but tall building (The Museum of Innocence, Istanbul, Fig 13) or one that does not have a conventional system of floor levels, such as the Solomon R Guggenheim Museum, New York (Fig 12), famous for its circular gallery that winds from the bottom to the top of the building.

Section diagrams are often more schematic than floor plans, in part because they do not show the relative shape and proportions of rooms within a building. Sections generally only exist to allow users to understand how the different levels of the building work, and what is on each level, as the height of rooms is normally not relevant for orientation or navigation purposes.

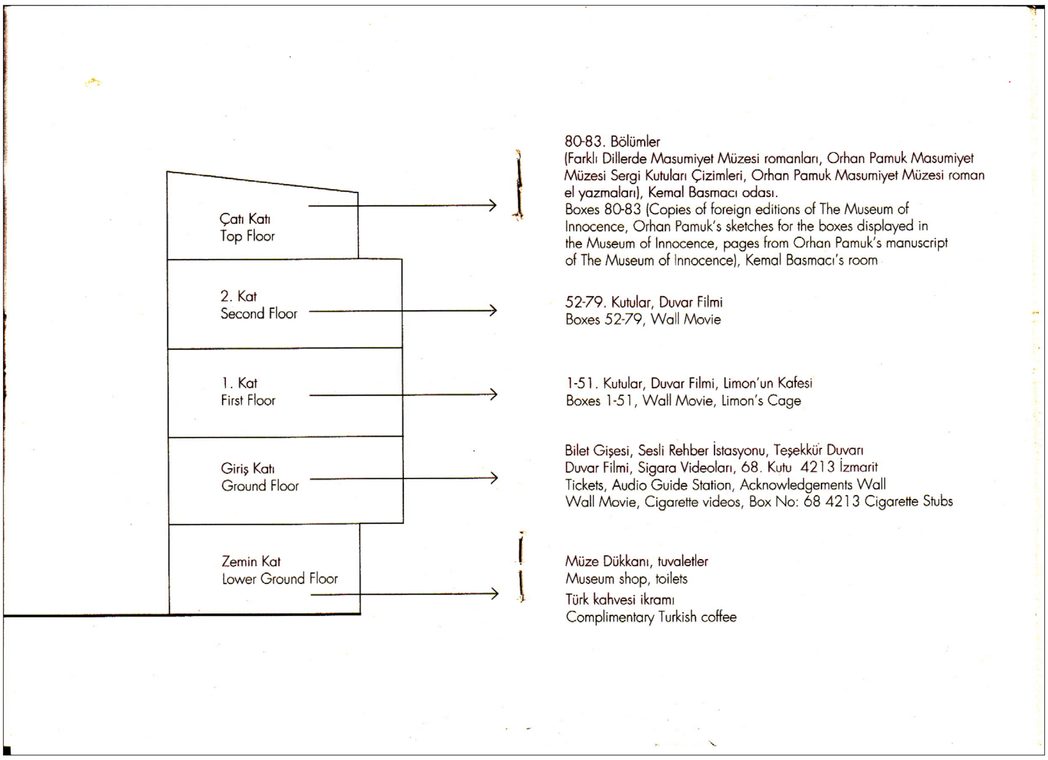


Fig 13. Example of a cross-section: map of the Museum of Innocence, Istanbul, 2015 (at 66% actual size; spread size: 105 × 75mm)

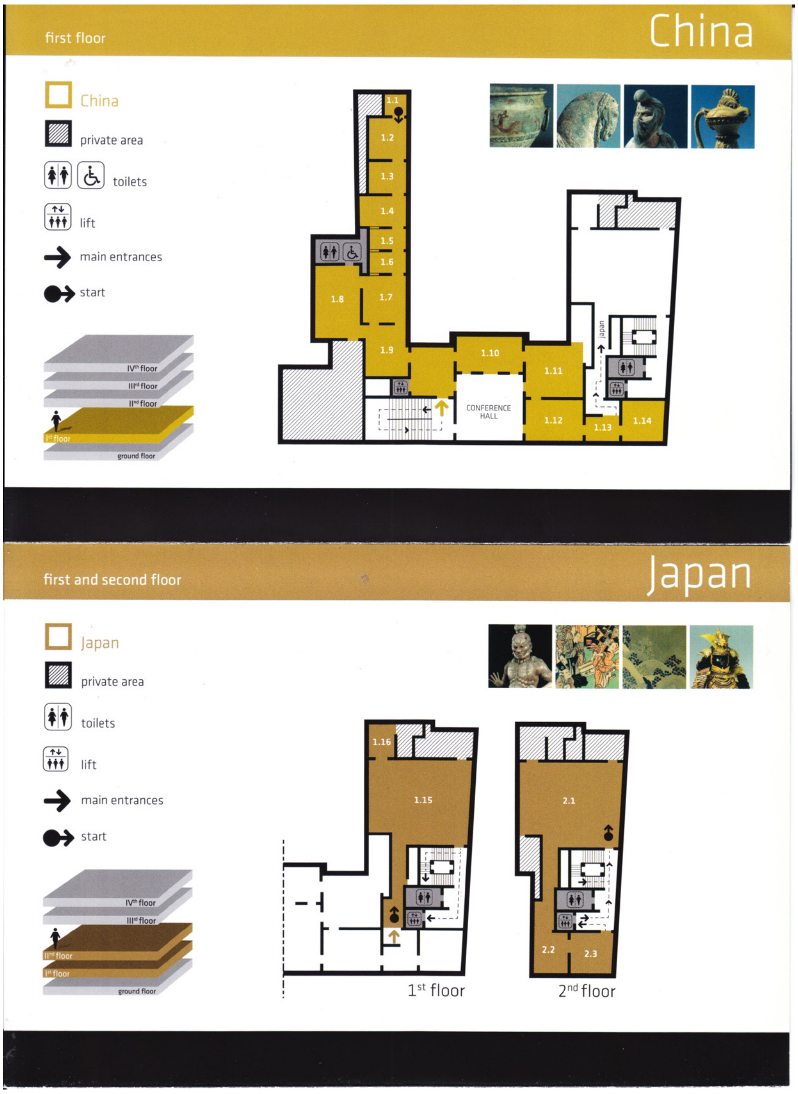


Fig 14. Example of hybrid map with 2D floor plans and axonometric diagram of floors: first and second floor plans of the Museo d'Arte Orientale, Turin, date unknown (at 33% actual size, leaf size: 210mm × 142mm)

Hybrid/combination maps

The compromises and shortcomings of the different types of building projection, as discussed above, have led some museums to produce what can be called "hybrid" or "combination" maps. These comprise two different projections of the museum in a single document, normally adjacent to each other on the map document so they can be cross-referenced. Inevitably, these are more likely to be used in large or complicated buildings. In these cases, there tends to be what can be called the primary plan and a secondary plan. The primary plan or plans are usually larger and include more detail. The secondary plan is more schematic: its purpose is typically to explain how the floor levels (as shown in the primary plans) are situated within the building (or buildings), but it contains limited or no information about what is on each floor.

Hybrid/combination plans can be helpful, but they may come with their own challenges for users. Having to deal with two types of graphic representation of the same building – particularly when they are not at the same scale – may be difficult for some readers. That said, they are relatively widely used, which suggests they can be useful. The research for this thesis has not uncovered any studies that compare their effectiveness compared with single-projection maps.

The earliest example of a hybrid map seen during the course of this research was in a guidebook for the V&A published in 1986 (Fig 39 and Fig 40), which combined 2D floor plans (the primary plans) with a colour-coded axonometric diagram of the building's floor levels (the secondary plan). Hybrid maps have increased in use since this design, and those seen during this research are one of two types:

- a primary map of floor plans (2D, 2.5D or 3D) with a secondary three-dimensional building plan or diagram (for example, the Museo d'Arte Orientale, Turin, Fig 14), or
- a primary map of floor plans (2D, 2.5D or 3D) with a secondary building cross-section (for example, the Ashmolean Museum of Art and Archaeology, Oxford, Fig 15).

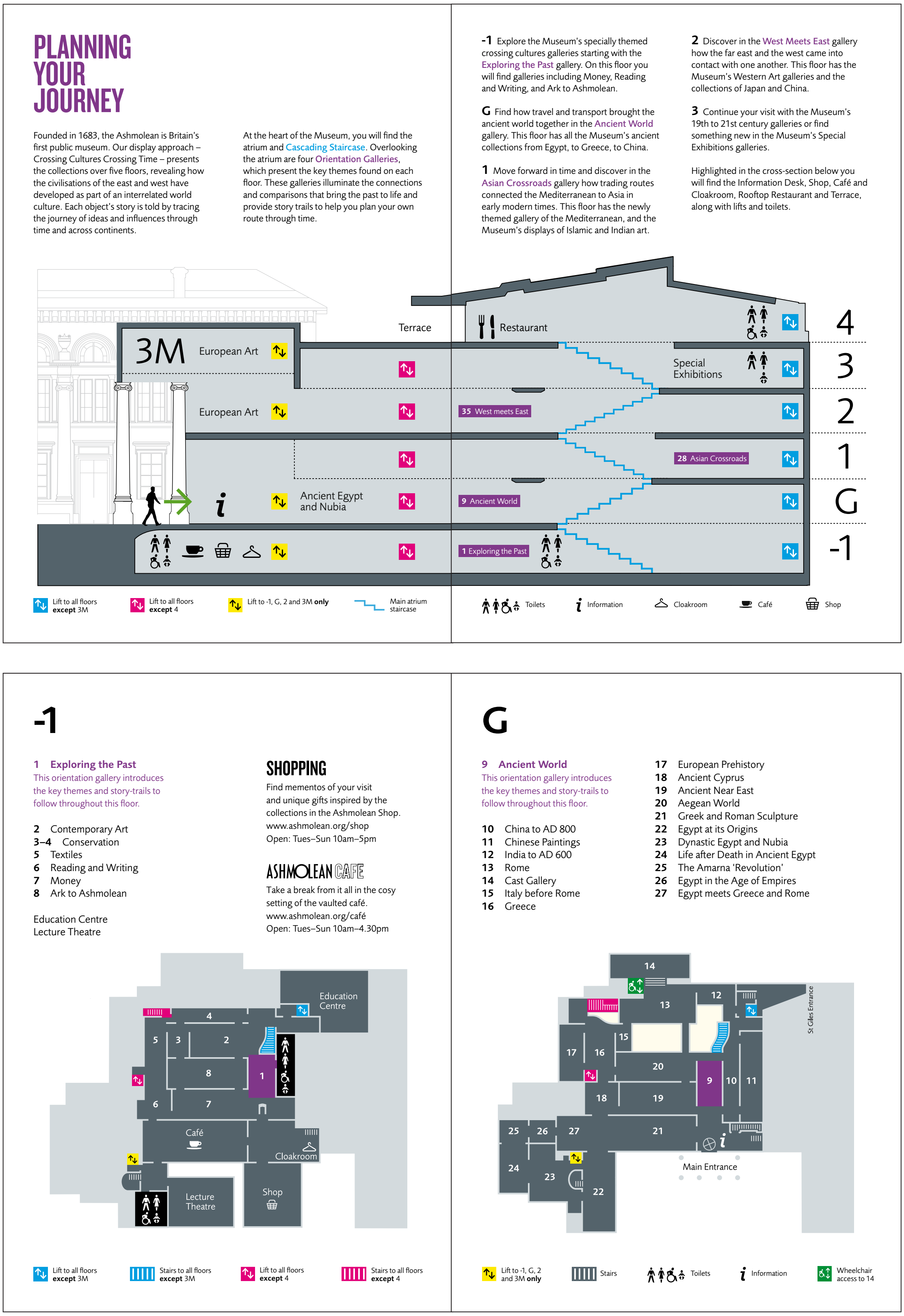


Fig 15. Example of hybrid map with 2D floor plans and cross section: from Ashmolean Museum of Art and Archaeology, Oxford, date unknown (at 50% actual size, page size: 148mm × 210mm)

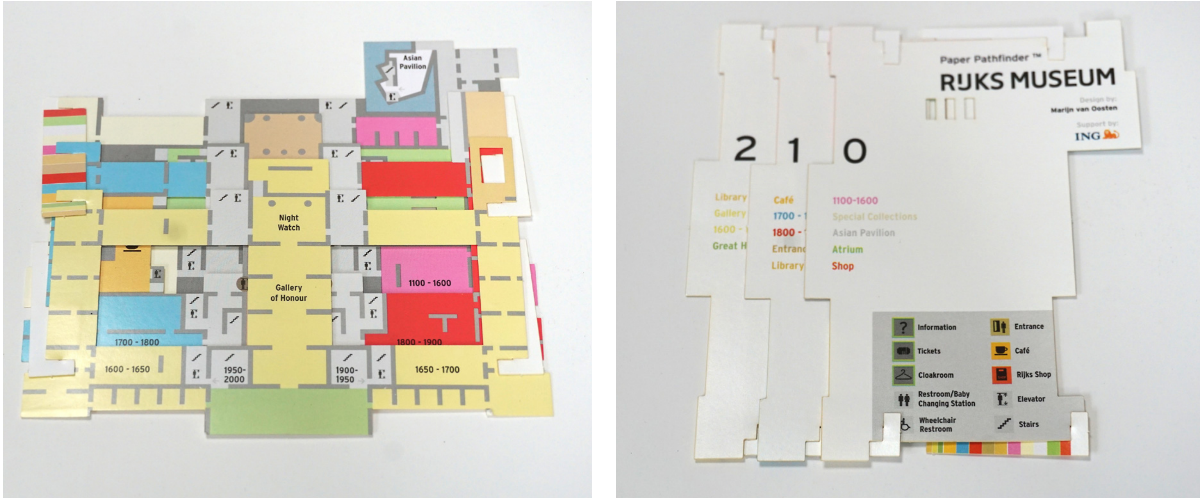


Fig 16. The folded Paper Pathfinder map of the Rijks Museum, Amsterdam (at approximately 50% actual size 148mm × 135mm), and reverse side (135mm × 148mm)

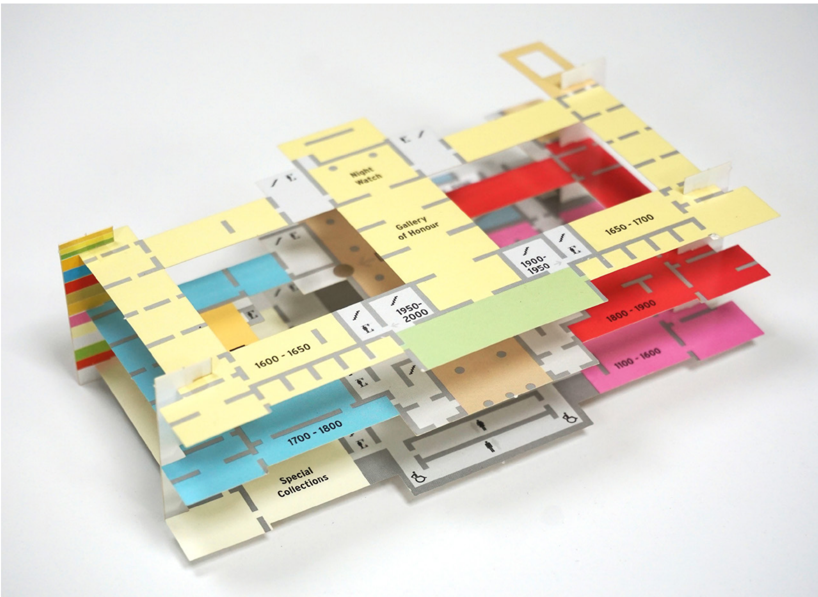


Fig 17. The unfolded Paper Pathfinder map of the Rijks Museum, Amsterdam (148mm × 135mm × 45mm)

Physical three-dimensional maps

A final, rare, type of a museum map is a physical 3D map: that is, one that is created and used in three dimensions, a kind of paper model of the museum. Only one example of this type of map has been seen, which was created for the Rijks Museum, Amsterdam. This particular example, called the Paper Pathfinder, consists of three two-dimensional floor plans of levels of the museum, which are physically connected with paper strips. The map is presented as a flat object (see Fig 16) but unfolds to become a 3D object (see Fig 17). However, the vertical elements that connect the three floor plans and support them do not themselves represent elements of the building such as its walls.

Beyond the ability to see how the three floors of the building are arranged (albeit in a schematic way), each of the floors uses similar elements to more conventional “flat” maps to describe the building and its contents: colour coding to describe the exhibition areas, pictograms to denote functions and spaces such as stairs, lifts and cafés, and labelling of particular gallery spaces.

There are many possible reasons why such a type of map is so rare, though the production cost it is likely to be an overriding one. (The Paper Pathfinder map was not produced by the museum itself, but for a museum corporate sponsor as a promotional item.)[9]

Also, it may not be technically possible to produce such a map for all museums, in particular those with complicated architecture, many levels, partial levels or physically unconnected buildings. And whether this design approach helps visitors understand the building and improve their visiting experience is unknown. The Paper Pathfinder has not been subject to any user testing or user feedback exercise.[10]

9 Conversation with Marijn van Oosten, designer of the Paper Pathfinder, February 2015.

10 ibid.

The information roles of museum maps

This part of the chapter considers in more detail the types of information that museum maps are conveying, and the graphic means they employ to do this. From analysis of the corpus, it has been possible to identify four "roles" that museum maps can play, ie, four ways that museum maps allow visitors to plan and undertake a visit to the museum. These are:

- **Visual directory**: explain the layout of the museum, its contents and how they are organised
- **Locator**: locating within the building or museum space the functional spaces, points and pathways
- **Highlighter**: locating within the building key exhibits and items, and
- **Trail**: describing a recommended route through the museum.

Below is a detailed explanation of each role, the graphical representations employed, with illustrative examples.

Visual directory

To some degree, any map or plan of a built environment is a visual directory, in that it shows how the spaces of the environment (be they rooms, buildings or outside spaces) relate to each other, and usually what they are or what they contain.

Within museums, the visual directory role is particularly important because – as is discussed in more detail in the following chapter – research suggests that museum maps are mostly used for conceptual orientation, rather than to facilitate wayfinding. In other words, people use maps in order to gain a sense of what is in the museum, in order to plan or organise their visit. As a visual directory, museum maps provide two types of information:

- about the physical shape and extent of the museum, and
- about the nature of the displays and exhibits.

The physical shape and extent of the museum can give visitors, either before their visit or on arriving at the museum, a sense of the size of the institution, and help them understand how much time they may need or want to spend at the museum (or at least visit the parts they wish to see – including non-exhibition areas, such as shops or restaurants). Maps of museums (and other buildings) are not like topographical maps, where scale and distance are important for map users to calculate the journey time from one point to another. Almost none of the maps in the corpus included a scale, and in any case, maps presented as an axonometric or perspective projection are graphically distorted, which means they are not scale diagrams. But even quite schematic building maps can give a general idea of the size of the museum through other cues, such as the relative size of elements such as stairs, doorways and elevators. And very occasionally, maps break with convention and aim only to represent the

arrangement of the contents of the museum, and not depict the shape and size of the building and its spaces and rooms. An example of this is a map of the V&A produced in 2004, which represents the buildings' rooms and spaces as standard-sized roundels (see Fig 45, and a detailed discussion of this map in "The 'tube-style' map at the V&A", Chapter 4).

Perhaps more important is how museums use maps to represent what they contain. A museum map can provide an easy-to-read overview of the museum's displays. This can help visitors plan a visit in detail, in that it can allow them to choose the areas of the museum they wish to see or prioritise. Evidence (from visitor studies – see Chapter 4; and from the visitor survey undertaken for this research – see Chapter 5) suggests that few visitors plan out their entire visit before they start. However, museum maps also allow for ad hoc reference during a visit, to consider which part of the museum to visit next.

Within the physical constraints of a map, it is not feasible to locate on the map and describe every displayed object in a museum – and even if that were possible, it would not necessarily be helpful to visitors. So museums and map designers must devise a system that provides an overview of what is in the museum. The way this is done will depend on a range of factors, notably the type of museum and the way its displays are organised. Typically, a museum's contents and displays may by organised and explained by:

- **time period or era** – for example, the Tate Britain, London, organises many of its rooms by year of production of works of art (see Fig 5)
- **object type** – for example, the Natural History Museum, London, includes areas such as "Fossils" and "Minerals" (see Fig 10)
- **genre or display theme** – for example, the Science Museum London, includes areas such as "Cosmos & Culture" and "Measuring Time" (see Fig 7), or
- **geographical area** – for example, the Ashmolean Museum of Art and Archaeology, Oxford, has areas covering China, Rome and Greece (see Fig 15).

It is common for museums to use more than one naming system for their spaces – as is the case with the museums referred to above. In particular in larger museums with diverse collections, it is not practical to arrange the entire museum's exhibits within one thematic structure.

Some museum maps also have ways of naming spaces that do not describe their contents. The most common of these are:

- a **room-numbering** system – for example, that used in the V&A (see various V&A maps Fig 33 to Fig 50), or
- another type of naming system, for example, related to **benefactors** who donated collections, or funded capital projects in the museum – for example, the Wellcome Wing in the Science Museum (see Fig 7).

This second type of naming system, since it does not provide any information about the contents of spaces, can only be used for orientation purposes (allowing the visitor to locate themselves within the museum, by

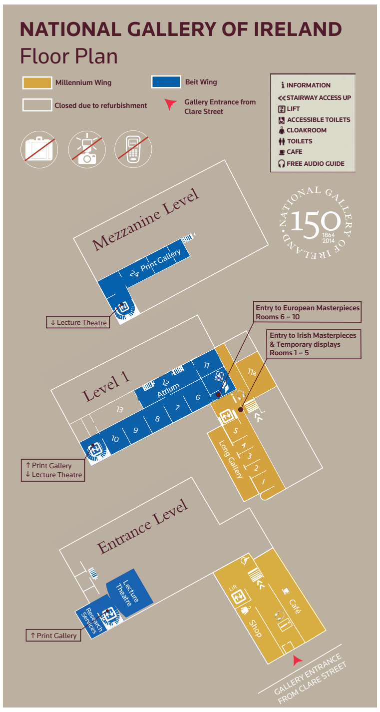


Fig 18. Example of architectural colour coding: map of National Gallery of Ireland, Dublin, 2014 (detail, at 50% actual size)

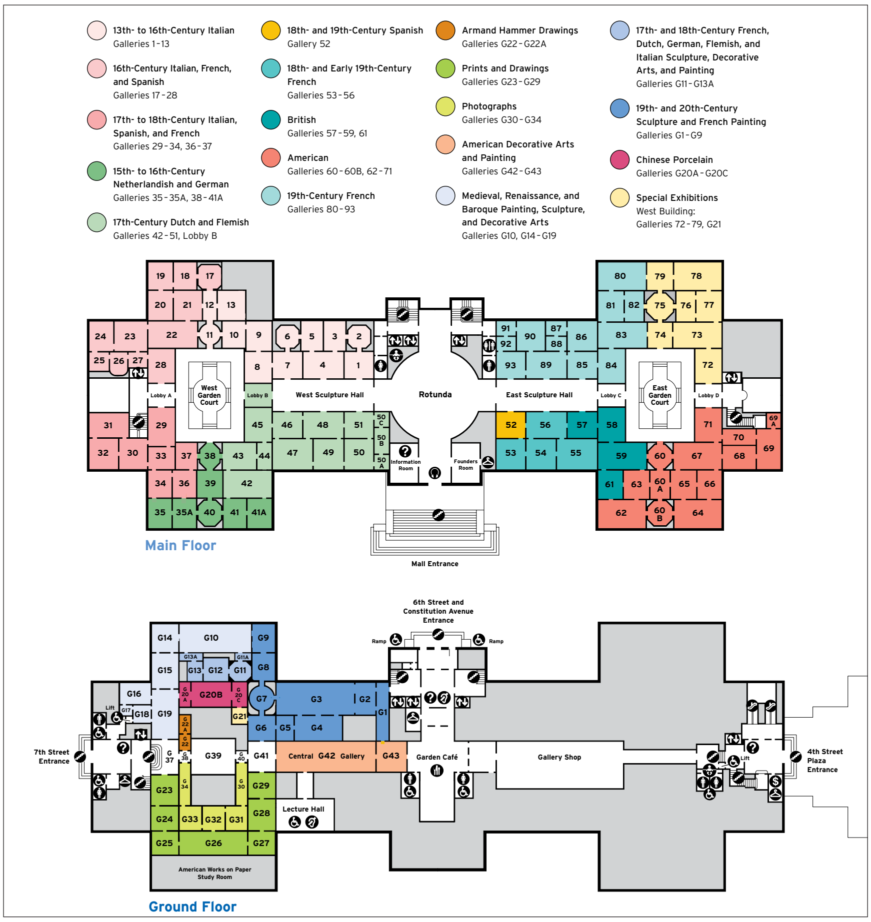


Fig 19. Example of thematic colour coding: map of West Building, National Gallery of Art, Washington, DC, 2014 (detail, at 50% actual size)

cross-referencing the map with signs in the museum) or navigation purposes (where the names are provided as destinations from some other source, such as a guidebook or a member of museum staff). Note that room numbering systems, in particular, are generally used in addition to, rather than instead of, a descriptive system – all those museum maps in the corpus that had room numbers also had a descriptive system.

There are three graphic means of denoting a visual directory:

- **labels**
- **colour coding**, and
- a **key** of letters, number or symbols.

Labels are widely used on maps, but they are not feasible for some museums because of the physical constraints of the map design. This is because there are too many areas to be labelled to fit on the map comfortably – either the type size would need to be unacceptably small to fit on or around the spaces in question; the text of the labels would be too abbreviated be able to identify these spaces precisely enough; or they would simply create too much visual “clutter”, reducing readability. Examples of maps that use labels can be seen in Fig 5, Fig 9 and Fig 11.

Colour coding is widely used as a means of describing the spaces in the museum – it is used in more than three-quarters of the maps in the corpus. Colour coding falls into two broad categories: what can be called “functional”, and what can be called “thematic”. In the first type, distinct physical areas of the museum building(s) have different colours, such as different floor levels (see, for example, Fig 7 and Fig 8), different wings (Fig 18) or different sections of a building (Fig 10). This helps visitors understand the layout of the building and can act as an orientation device, especially if the colours are used within the building itself (for example, on signage or architectural elements such as walls), as well as the map. However, (in isolation) this does not help visitors decide what to see in the museum. Thematic colour coding uses different colours as a way of marking different display areas or themes. Of course, unlike architectural colour coding, a description of each coloured area is also needed because the colours in themselves do not tell visitors what the theme of the space is. In most cases, maps therefore either also label coloured spaces on the map, or use colours as key devices. Both types of colour coding system are widely used: within the corpus, around half of the maps that used colour coding used a functional system and half a thematic one.

The numbers of colours used in individual maps vary considerably: in the corpus, it ranged from two (for example, Fig 18), to 19, in the map of the National Gallery of Art, Washington, DC (Fig 19). Using large numbers of colours in this way increases the opportunity for confusion among map users, as they may make mistakes of interpretation or have difficulty distinguishing colours that are of a similar hue – consider, for example, the colours for “18th- and Early 19th-Century

Fig 20. Gallery images on map of 1st Floor, Mémorial Charles de Gaulle, Colombey-les-deux-églises, France, 2001 (detail, at 50% actual size)

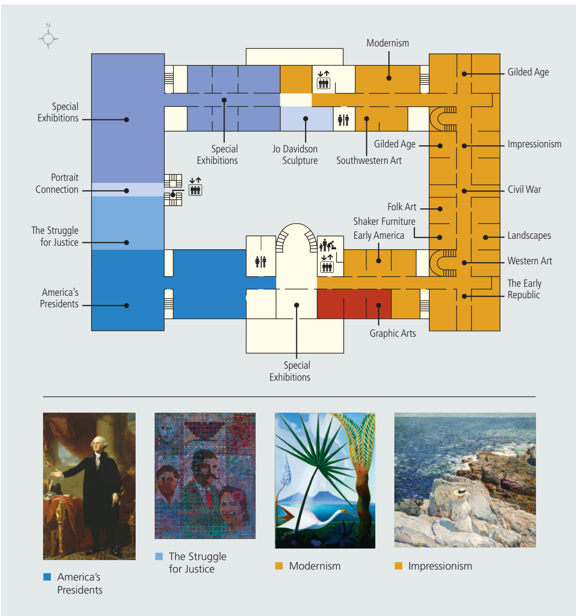


Fig 21. Representational images of gallery themes on map of Second Floor, National Portrait Gallery and Smithsonian American Art Museum, Washington, DC, 2014 (detail, at 50% actual size)

French" and "19th Century French" in the map of the National Gallery of Art.

Evidence on the optimum or maximum feasible number of colours is limited, not least because it will vary according to context: the type of map, the colours used, the medium (for example, print or digital) and what the colours signify. However, Vogel and Luck concluded from their research that it is possible to retain information about only four colours in visual working memory at a time.[11] Also, perception effects can result in misreading of colour coding in some maps, in particular matching the area of colour on the map with the corresponding area in the key. For example, when a light colour is surrounded by a dark colour, the light colour will seem lighter and the dark colour darker; and large areas of colour seem more saturated than small areas of colour.[12] Designers' recommendations therefore often suggest limiting the number of colours in a colour-coding system on a map: Pettersson recommends four to six colours[13] and Berger a maximum of six.[14] Of the maps in the corpus that use colour coding, most fit within that range, and very few have more than ten.

A **key** system is a widely-used method, too: just under half of the maps on the corpus used a key system to identify spaces in the museum, although often it is in conjunction with a labels and/or colour-coding system. Examples from the corpus can be seen Fig 7 and Fig 15 (numbered key), and Fig 8 and Fig 10 (symbol key).

As another graphic device, some museum maps also use indicative images of the exhibition spaces. In a few cases, these are images of the gallery spaces themselves (for example, in Fig 20). However, especially given the size at which the images are reproduced, these are rarely helpful, either to identify the spaces or to gain a sense of the theme of their contents. More often, images of objects that represent the theme of the space are used, which can perhaps provide a better at-a-glance impression theme than text (see, for example, Fig 21).

Locator

The locator role, like the visual directory, is common to virtually all building maps and plans. The role is to identify the location within the building of facilities, amenities and functional points whose purpose needs no explanation. They are therefore different from the visual directory role in that there is no explanation required of *what* the points are, only *where* they are. Of the maps in the corpus, the most common of these are:

- entry and exit points
- circulation elements (stairs, escalators, lifts, ramps)

11 Vogel, E.K. and Luck, S.J. (1997). The Capacity of Visual Working Memory for Features and Conjunctions. *Nature*. 390:6657. 279-281.

12 Monmonier, M. (1991). *How to Lie With Maps*. Chicago: University of Chicago Press. **155**.

13 Pettersson, R. (2002). *Information Design: an Introduction*. Amsterdam; Philadelphia: John Benjamins. **131**.

14 Berger, C. (2005). *Wayfinding: Designing and Implementing Graphic Navigational Systems*. Mies: Rotovision SA. **58**

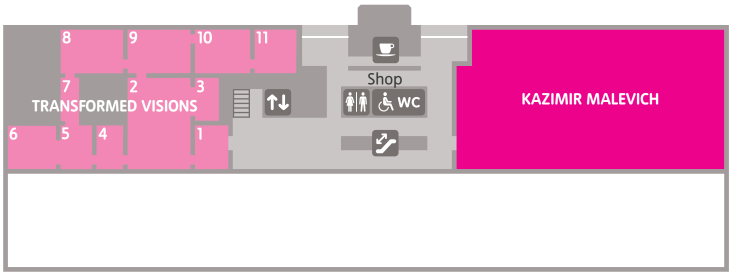


Fig 22. Pictograms of lifts, café, toilets, wheelchair-accessible toilet and escalator on map of Level 3, Tate Modern, London, 2014 (detail, at actual size)

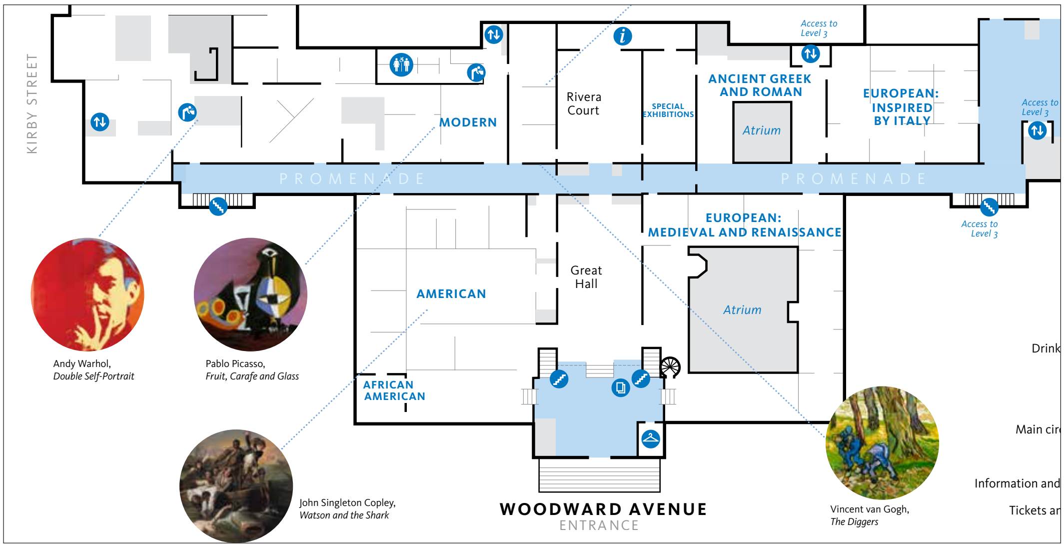


Fig 23. Highlight displays on map of Level 2, Detroit Institute of Arts, 2016 (detail, at 60% actual size)

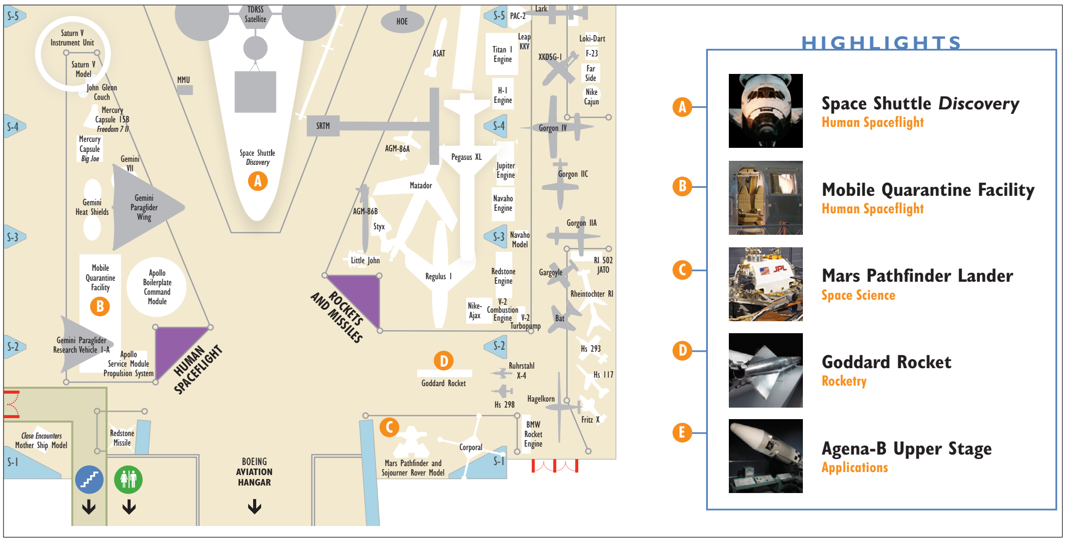


Fig 24. Highlight displays with letter key on map of Space Hangar, Smithsonian National Air and Space Museum Udvar-Hazy Center, Virginia, 2012 (detail, at 60% actual size)

- toilets and baby-change facilities
- cloakrooms
- shops
- ticket and information desks, and
- refreshment areas (cafés, restaurants, bars)

Other functional points represented on maps in the corpus include:

- pram or pushchair storage
- cash machine
- drinking fountain
- wheelchair-accessible points
- audioguide collection points
- picnic area, and
- first-aid point.

On virtually all of the maps in the corpus, locator points were represented by pictograms, though these are sometimes accompanied by labels, in particular when more information is provided – for example, a label next to a lift symbol that explains which floors the lift serves. The number of different locator pictograms used varies, though it is typically five to ten. Many of these pictograms are used at multiple points on a map.

A legend is a fundamental requirement of most types of map but a few of those in the corpus did not include any explanation of the symbols used (for example, those for the Tate Modern (Fig 22) and the Tate Britain). However, these maps, and others that included no legend, used few pictograms, and those that were used could probably be considered to be widely understood. Within the corpus, most of the pictograms used were broadly similar to those in the ISO standard on public information symbols,[15] with some variations.

Highlighter

Some museum maps, as well as providing an overview of the types of display, locate specific objects or displays on the map. These may be "star objects", which are better known by some people than the museum itself (for example, the *Mona Lisa* in The Louvre, Paris, or Michelangelo's *David*, in the Galleria dell'Accademia, Florence), or they may be objects chosen by the museum's curators as being particularly noteworthy.

Some maps include highlight objects as an aid for first-time visitors who are unfamiliar with the museum, or have a limited amount of time for their visit. Such items may also be described as "selection of artworks" (for example, Kröller Müller Museum, Otterlo, The Netherlands, 2014), "Masterpieces" (Museo Nacional del Prado, Madrid, 2013), "Top works" (Van Gogh Museum, Amsterdam, 2014), "Top 5 Things to See" (National Waterfront Museum, Swansea, 2014) or

15 International Organization for Standardization (2007). ISO 7001:2007(E). *Graphical Symbols – Public Information Symbols*. Geneva: ISO.

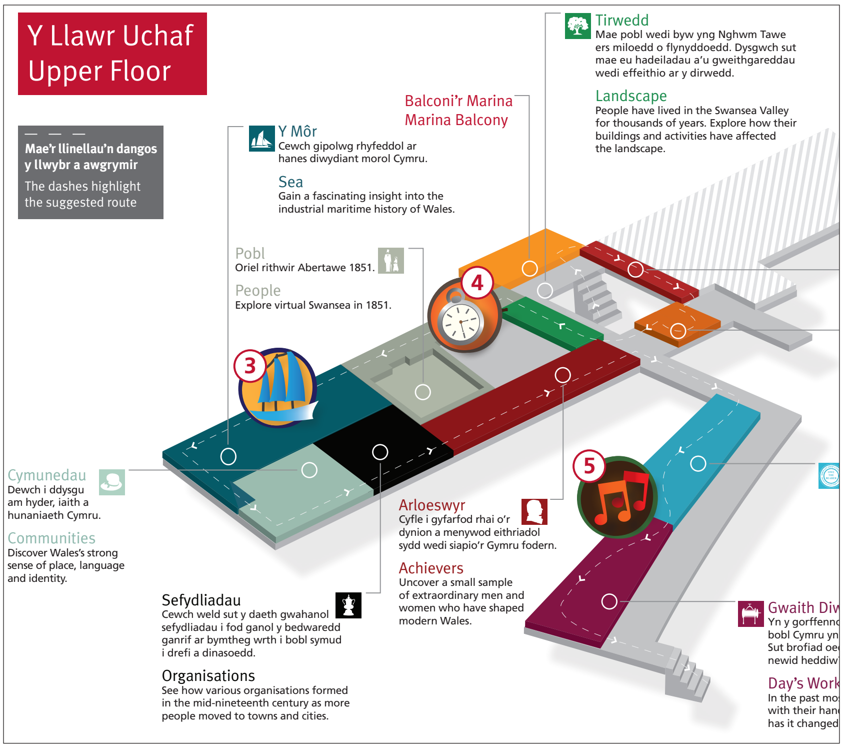


Fig 25. Example of a map with a trail: National Waterfront Museum, Swansea, 2013 (detail, at 50% actual size)

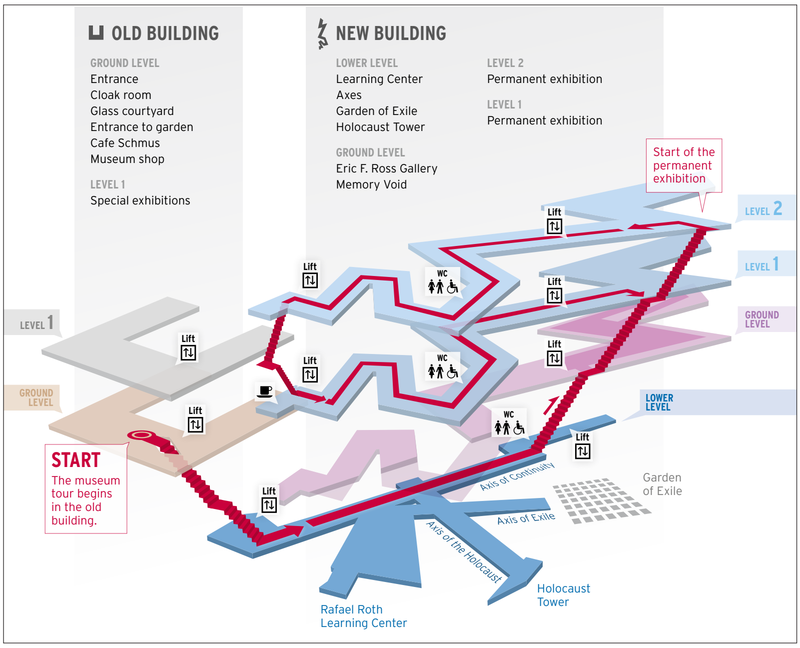


Fig 26. Example of map with a trail: Jewish Museum Berlin, 2015 (detail, at 50% actual size)

"Don't miss" (V&A, London, 2004).

The objects that are highlighted are often shown on the map with a thumbnail photograph, and their location indicated either on the map at the location of the object, or with a callout (see Fig 23), or letter or number key (see Fig 24). There may also be descriptive text for the objects on the map document.

Trail

Museum trails (also called "tours") aim to visually describe a route through the museum, using devices such as lines, arrows and sequential numbers or letters. There are effectively two types of museum trail shown on maps:

- those designed to describe a recommended route through a museum, to ensure visitors see all the displays in an order intended by the museum; and
- themed tours, that take in only part of the museum but describe a route to see particular displays with a common theme.

The first type includes museums where there is some sequentiality to the museum's theme (such as being arranged chronologically), and where the route to take is not obvious from the layout of the museum. This type of trail information is relatively rare on museum maps (seen on less than 10% of the maps in the corpus). Fig 25 and Fig 26 show two such examples, where it can be seen that the route is relatively convoluted, and not be obvious to visitors.

The second type, themed trails, can be based on, for example:

- a demographic group, such as children
- a theme related to objects (period, genre, artist or creator, object type) that are contained in various parts of the museum (see, for example, Fig 27), or
- another measure, such as duration of a tour (see Fig 28).

Themed trail maps are not very widely used in museums today. This may be in part because such tours can be better provided with digital devices such as audioguides and multimedia guides. Although audioguides have been produced by museums for many years, in recent years new technologies have allowed for a richer guiding experience – see Chapter 2 for a detailed discussion of digital alternatives to printed maps and their development.

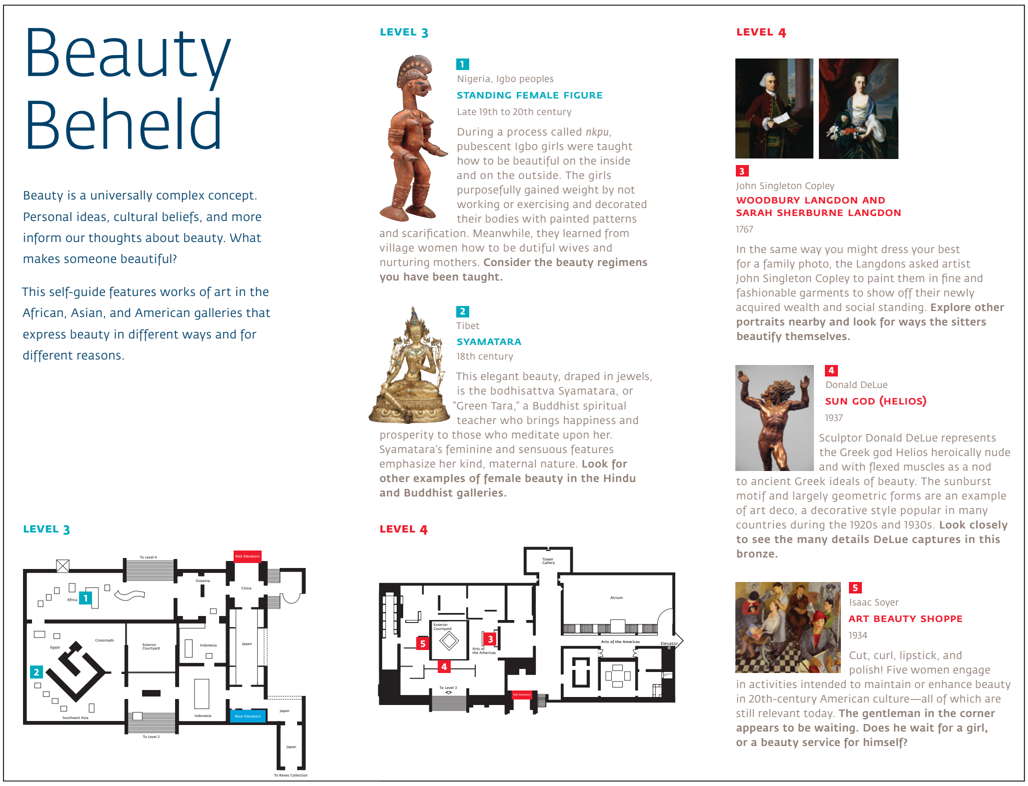


Fig 27. Beauty Beheld themed tour map, Dallas Museum of Art, 2013 (detail, at 50% actual size)

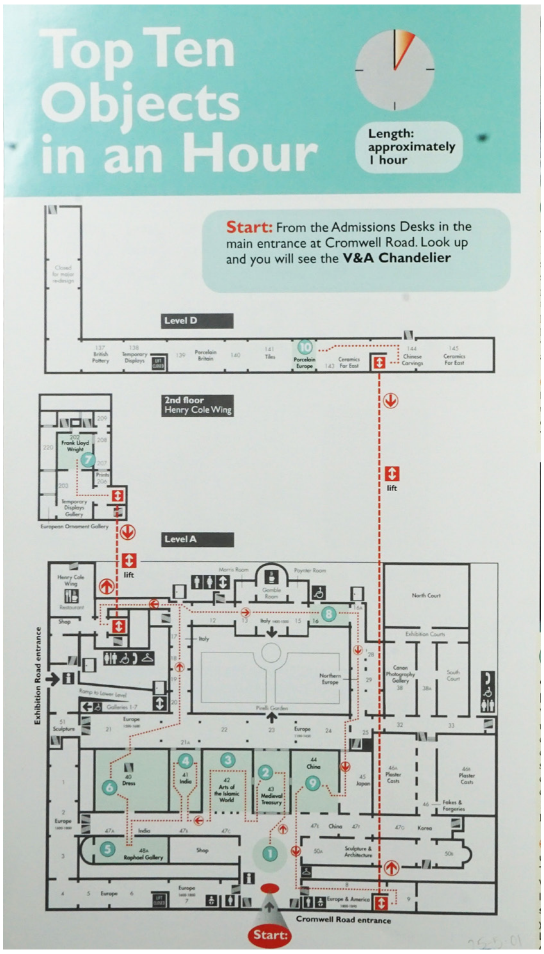


Fig 28. Timed-based tour map: Top Ten Objects in an Hour, Victoria & Albert Museum, London, 2001 (detail, at 50% actual size)

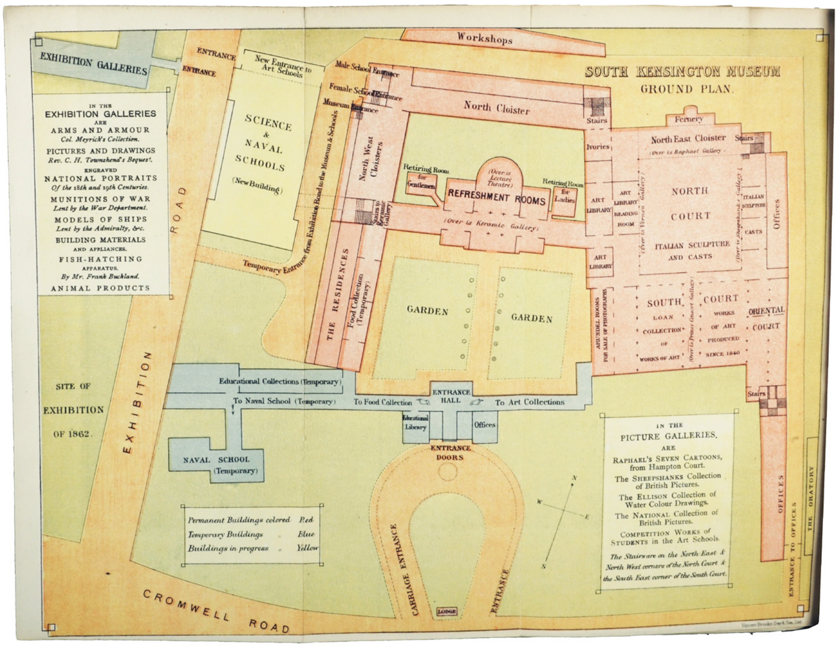


Fig 29. Ground Plan, from South Kensington Museum (1871), *A Guide to the Art Collections of the South Kensington Museum*, London: Spottiswoode & Co, printers (at 40% actual size, sheet size 290mm × 214mm)

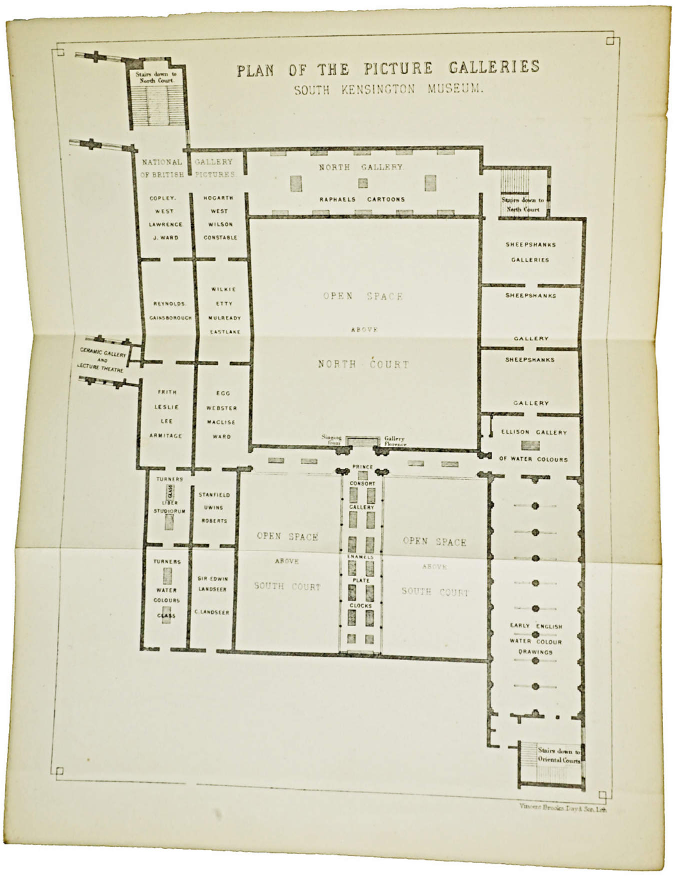


Fig 30. Plan of the Picture Galleries, from South Kensington Museum (1871), *A Guide to the Art Collections of the South Kensington Museum*, London: Spottiswoode & Co, printers (at 40% actual size, sheet size 214mm × 290mm)

The historical development of museum maps: two case studies

This section looks at the evolution of the maps in two museums, the V&A and the British Museum. Both are large museums with complicated layouts that have produced visitor maps for around 150 years, which have changed in their design and format over the years. This part of the chapter examines how the development of each museums' maps reflects both the culture of each institution and the specific challenges of producing maps for large, evolved museum sites, housing diverse collections. The discussion will reveal both cultural distinctions and commonalities in response to the design challenges of revealing complex spaces and collections through relatively constrained graphic representations.

Case study 1: Victoria & Albert Museum, London

The V&A was founded in 1857 as the South Kensington Museum, changing to its current name in 1899.[16] It is notable for both the size and diversity of its collections: its founding director, Sir Henry Cole, described it as "a refuge for destitute collections" and a later director, Sir Roy Strong, "an extremely capacious handbag".[17] By 1871, the museum was already receiving a million visitors a year, and had a collection including more than 20,000 examples of medieval and modern art alone;[18] in 2015, it received more than 3.4 million visitors,[19] and it had a collection of nearly 2.3 million objects (not all of which are on public display).[20]

The museum, which has more than seven miles of gallery space,[21] is also notable for the confusing layout of its buildings: a former director of the museum, Martin Roth, said the museum's greatest weakness was the "labyrinthine layout of the buildings", adding that "almost every visitor gets lost at some point".[22]

The V&A therefore has significant orientation and navigation challenges that have existed since its inception, and have become more acute over the years as its collection and visitor numbers have increased. Maps of the museum for visitors have been produced for more than 140 years. The first maps, such as the examples from 1871 in Fig 29 and Fig 30, were bound into guidebooks to the museum. As can be seen, the Ground Plan is a kind of site map, showing not

16 Victoria and Albert Museum (2015). *100 Facts About the V&A*. [pdf] Available at <http://www.vam.ac.uk/content/articles/0-9/100-facts-about-the-v-and-a/> [Accessed 1 March 2015]

17 ibid.

18 South Kensington Museum (1871). *A Guide to the Art Collections of the South Kensington Museum*. London: Spottiswoode & Co, printers

19 The Art Newspaper (2016). Visitor Figures 2015. *The Art Newspaper* April 2016: 278. **XV**

20 Victoria and Albert Museum (2016). *Size of the V&A Collections*. [online] Available at <http://www.vam.ac.uk/content/articles/s/size-of-the-v-and-a-collections/> [Accessed 10 August 2016]

21 Victoria & Albert Museum (2009?). *Series 1 Episode 7 – Way Finding*. V&A Podcast. [podcast]. Available at <http://www.vam.ac.uk/content/articles/v/v-and-a-podcast-way-finding/>. [Accessed 15 February 2015].

22 O'Ceallaigh, J. (2015). Victoria & Albert Museum, London: the Director's Guide. *The Daily Telegraph* April 13, 2015. Available at <http://www.telegraph.co.uk/luxury/travel/67851/victoria-and-albert-museum-london-guide-director-tips-martin-roth.html> [Accessed 27 September 2015]

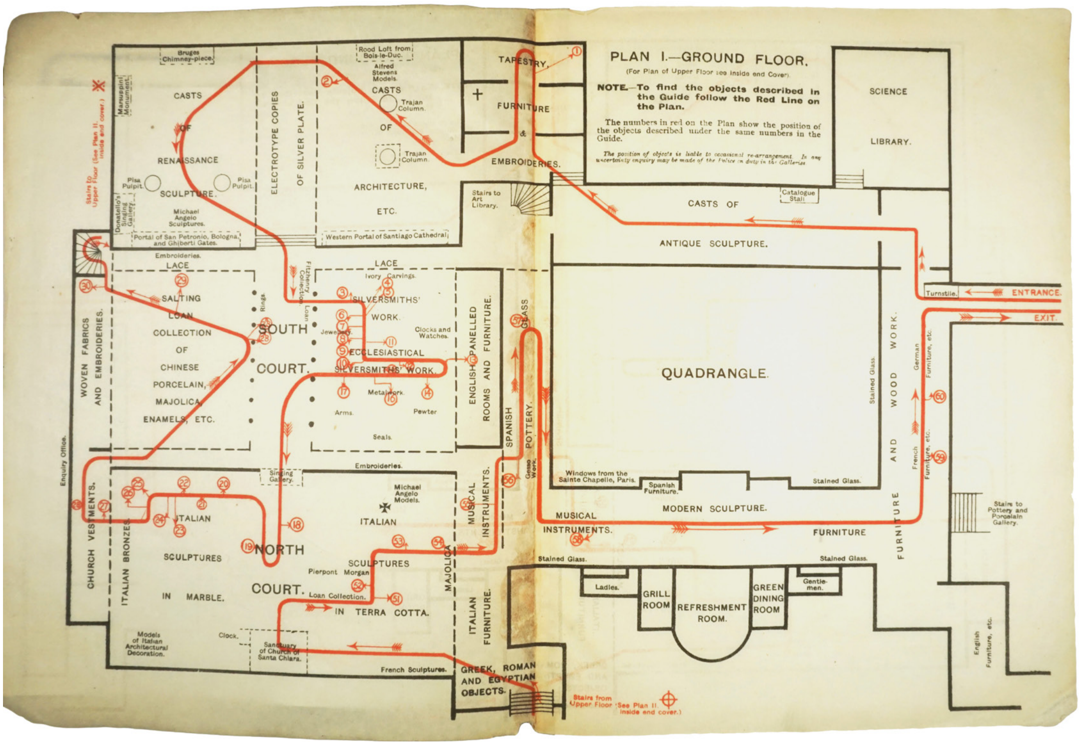


Fig 31. Ground Floor plan, from The Red Line Guides (1906), *The Red Line Guide to the Victoria and Albert Museum*, London: J.J. Keliher & Co (at 40% actual size, sheet size 380mm × 240mm)

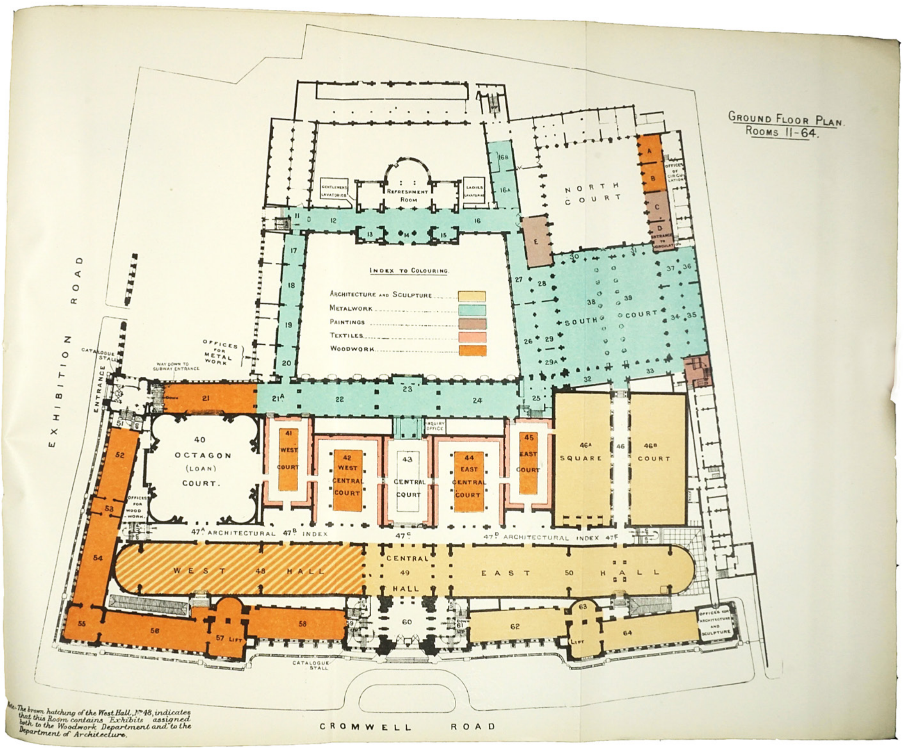


Fig 32. Ground Floor Plan: Rooms 11-64, from Victoria & Albert Museum (1914), *General Guide to the Collections*, London: H.M.S.O. (at 40% actual size, sheet size 315mm × 245mm)

only the arrangement of internal spaces in the museum, but external elements, such as the grounds and surrounding roads. The Plan of the Picture Galleries indicates the location of particular artists' work in that wing of the building (although it also mentions the Sheepshanks Collection, which relates to a benefactor of the museum, rather than an artist).

The Ground Plan uses a simple colour-coding scheme to denote permanent, temporary and under-construction sections of the museum at the time of publication (though the same colour is used for roads as for under-construction sections, which may have confused some readers).

The maps are subsidiary to the 64 pages of text in the guidebook, which explains the collection and its arrangement in detail, and recommended itineraries. This approach to visitor maps continued until the early years of the 20th century (by which time the museum had changed its name from the South Kensington Museum). There were changes according to the completion of new parts of the building, and rearrangement of the collections, but the stylistic approach, and the level of detail provided, remained much the same.

In 1906, an innovative new map appeared, in a guidebook called *The Red Line Guide to the Victoria and Albert Museum* (Fig 31). This is an early example of a trail map, providing a distinct route and itinerary for visiting the art collections in the museum. A numbered key refers the reader to detailed information on particular items to be seen along the trail. Unlike later trail maps, this one is not themed; the visitor is provided with a curated tour, which appears to follow the author's own interests, rather than a representative overview of the museum's collections – the map highlights around 12 objects in the Silversmiths' Work and Ecclesiastical Silversmiths' Work gallery, but none in either the Casts of Antique Sculpture or Casts of Renaissance Sculpture galleries.

Fig 32 shows a fold-out map in an early edition of a long-running guide series produced by the museum, *Victoria & Albert Museum: General Guide to the Collections*. The depiction of the building structure returns to a map that is clearly based on architectural drawings (as in the one from 1871). However, it uses a thematic colour-coding system to denote the types of display in different parts of the museum. The system uses six colours (including one not shown on the illustrated floor) to denote types of displays largely according to their material – and one gallery with a two-colour diagonal stripe (yellow and orange), which is a space containing two types of display ("architecture and sculpture" and "woodwork"), as explained in a note in the bottom left corner of the ground floor plan. The colouring on the map is the only colour used in the guidebook. The map also includes text labels for key spaces, facilities (such as "refreshments" and "lavatories"), and also the streets from which the museum has entrances; and exhibition room numbers, which are referred to in the book's text.

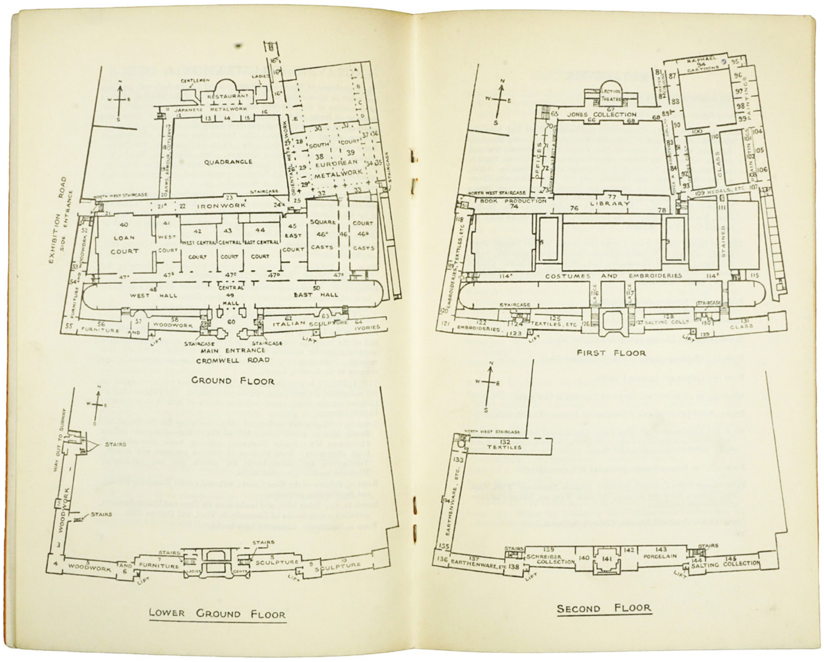


Fig 33. Ground Floor, Lower Ground Floor, First Floor, Second Floor, from Victoria & Albert Museum (1933), *Brief Guide*, London: H.M.S.O.; William Clowes & Sons (at 40% actual size, spread size 276mm × 210mm)

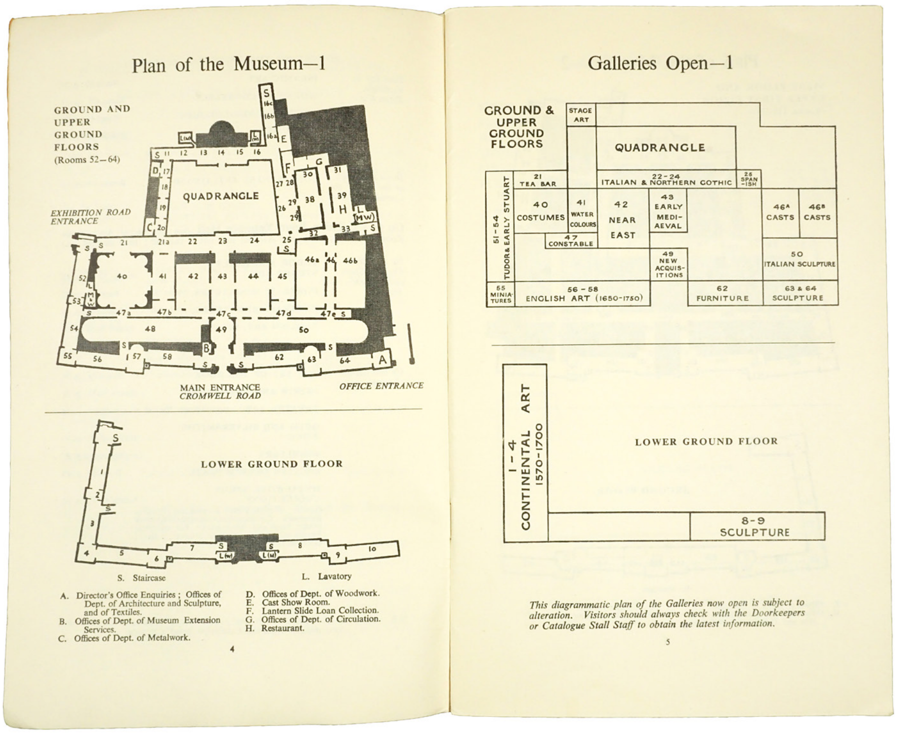


Fig 34. Plan of the Museum – 1, Galleries Open – 1, from Victoria & Albert Museum (1949), *Guide to the Victoria & Albert Museum*, Revised Edition Winter 1949-50, London: H.M.S.O. (at 40% actual size, spread size 300mm × 245mm)

Fig 33 shows a page spread of the floor plans from the 1933 edition of the museum's Brief Guide, a shorter version of the General Guide seen in Fig 32. There are two significant elements of the map. First, it marks a move toward a more schematic plan of the building, which represents in a simplified form the shape, relative size and arrangement of the building's spaces, but does not include, for example, the kind of detail present in architectural drawings that is not so relevant for museum visitors. Second, this format shows all the building's floor levels in one view, so the visitor has a better understanding of the building as a whole, and can plan a visit without having to flip between separate maps. A result of this is, however, that the individual maps are considerably smaller. Possibly for this reason (less physical space on the page), the labelling is inconsistent: some areas describe the contents (for example, "European metalwork"), but other simply label the space ("Central court") with a room number, which the visitor must refer to in the text of the book to discover what the space contains.

The map in Fig 34 is significant because of the time of its production: shortly after the end of the Second World War. During the war, the museum had been bombed, and much of its collection was moved out of the museum.[23] For these reasons (among others), the museum took some time to reopen fully after the end of the war. This guidebook therefore included two plans for each floor: one that was broadly similar to earlier maps, such as that in Fig 33, and a very simply drawn "Galleries Open" plan that showed which galleries and spaces within the museum were open at the time of publication (with an added note that this was "subject to alteration" and that visitors should check with museum staff for the latest information).

23 Victoria and Albert Museum (2015). *100 Facts About the V&A*. [pdf] Available at <http://www.vam.ac.uk/content/articles/0-9/100-facts-about-the-v-and-a/> [Accessed 1 March 2015]

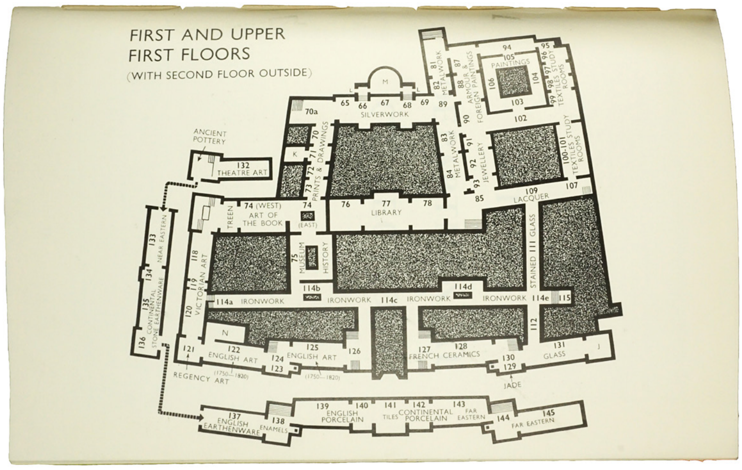


Fig 35. First and Upper First Floors, from Victoria & Albert Museum (1963), *Brief Guide to the Museum*, London: H.M.S.O. (at 40% actual size, page size 245mm × 150mm)

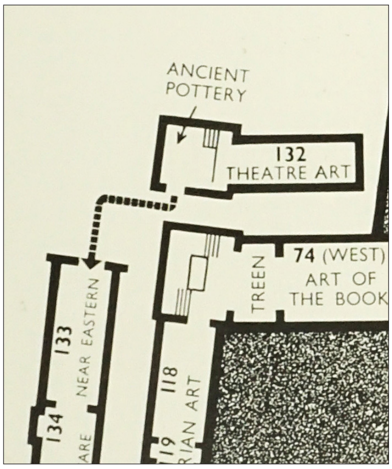


Fig 36. Detail of north-west corner of First and Upper First Floors, from Victoria & Albert Museum (1963), *Brief Guide to the Museum*, London: H.M.S.O. (at actual size)

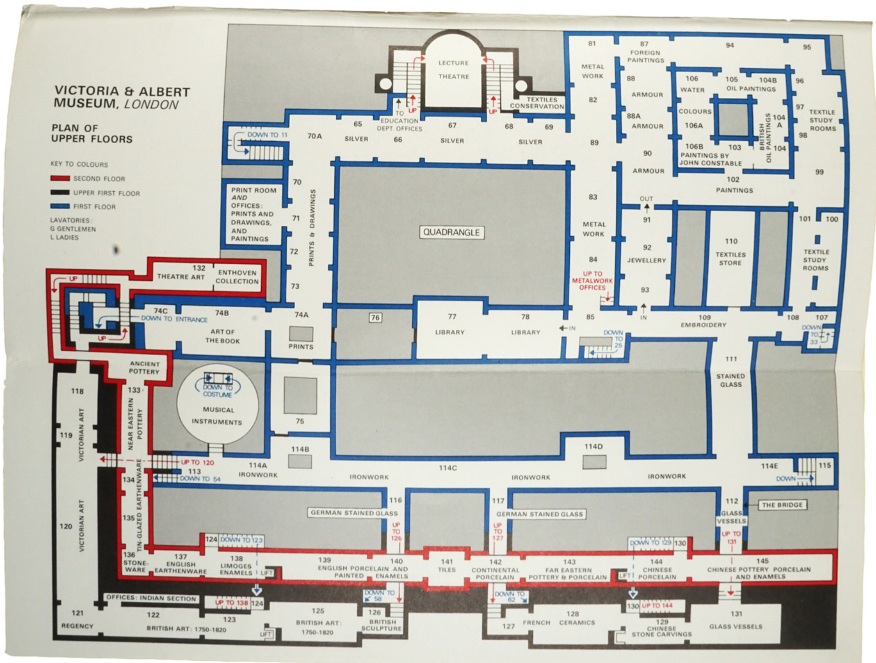


Fig 37. Plan of Upper Floors, from Victoria & Albert Museum (1969), *Brief Guide*, London: the Museum; Butler & Tanner Ltd. (at 40% actual size, sheet size 290mm × 225mm)

Fig 35 shows the map in the 1963 edition of the Brief Guide, and a development in the way the building is depicted. The building's irregular design, with its uppermost and lowermost floors being much smaller in area than the main floors, is clear from earlier maps (see, for example, Fig 33). This map attempts to combine these smaller floors on the maps of the main floors. There may be some advantage in this (for example, by having the maps of all four floors on two pages), but it may also confuse readers. Fig 36 shows room numbers 132 and 133 of the upper floor as if they were disconnected spaces; in fact, they are contiguous, which is indicated by the dashed arrow – though readers of the map may not interpret it in this way. The same is true of the connection between room numbers 136 and 137 in the south-west corner of the building (lower left-hand-side of the map).

The museum continued with this approach to the challenge of showing the different floor levels and, in its 1969 Brief Guide, refined it, primarily by introducing colour to denote different floor levels (Fig 37). So the first floor is outlined – ie, its internal and external walls are shown – in blue, the upper first floor in black, and the second floor in red. Further, the upper floor is shown as a single space (as it is in reality), which overcomes the problem described above with the 1963 map. However, the relationship between the second floor and those below it may be easily misunderstood. This becomes most apparent in the depiction of the staircase in the north-eastern corner of the building (Fig 38), which appears to show a complex, possibly concentric pair of staircases, rather than straightforward staircase that connects the three levels on the map.

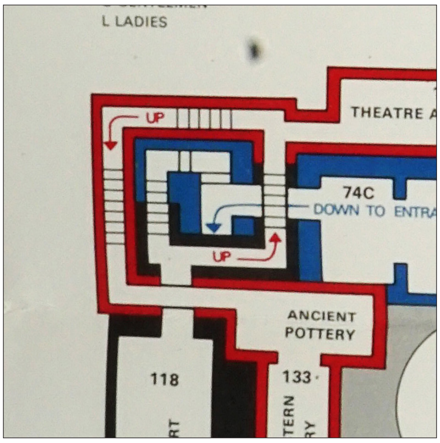


Fig 38. Detail of north-west corner of Plan of Upper Floors, from Victoria & Albert Museum (1969), *Brief Guide*, London: the Museum; Butler & Tanner Ltd. (at actual size)

Fig 39. Floor plans, from Bryant, J. (1986), *Victoria & Albert Museum Guide*, London: The Victoria & Albert Museum (at 40% actual size, spread size 340mm × 220mm)

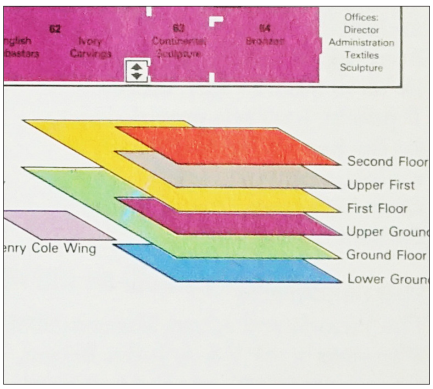


Fig 40. Detail of floor level diagram, from Bryant, J. (1986), *Victoria & Albert Museum Guide*, London: The Victoria & Albert Museum (at actual size)

The map shown in Fig 39, from a 1986 guidebook, had been developed a few years earlier. It uses a vivid colour palette of a type not seen in earlier maps. Aside from the visual impact, colour is used as another solution to explaining the complex floor and stair arrangements throughout the building, with each colour being used to denote a particular floor level, rather than being thematic, as in the map in Fig 32, for example. In a new development for the museum, the colour coding is supplemented by a small schematic diagram of the floors (Fig 40), which serves both as a key to the colour coding, and as a diagram explaining how the floors and half floors are arranged. This design is the first map of the museum to include pictograms to locate particular facilities (lifts, toilets, restaurants, public telephones, cloakrooms, information desks and "facilities for the disabled").

The map in Fig 41 is undated, but believed to have been produced around 1987, and is most notable as being an early (possibly the earliest) leaflet-style, standalone map of the V&A. It marks a clear change in the role and status of the map: until this point, the maps appeared in guidebooks in which the maps were subsidiary to the text, which not only discussed the objects within the museum, but also provided written descriptions of the museum's spaces and how the visitor should navigate them. This map appears to reflect an acknowledgement that, for many visitors, a single-sheet map is sufficient for them to explore the museum – with further information as required being available either as wall text, in books and other publications and from museum staff.

This map presents a new attempt to help visitors understand the museum's complicated floor arrangement and the pathways for moving between floors. First, there is a new naming system for the levels: Lower Ground, Ground, Floor 1, Floor 2 and Floor 3. Also, more interestingly, each staircase also has an arrow with text indicating the floor to which the stairs go (Fig 42). However, the lifts, indicated by a double-arrowhead symbol (also seen in the same image), do not include any equivalent explanation of the floors they serve.

The map is also notable for returning to a themed colour coding, not seen in V&A maps since the previous century, albeit in a simplified form. This map uses two shades of blue, representing the Art and Design Galleries and the Materials & Techniques Galleries; circulation areas and some galleries that presumably do not fall into either of these thematic categories are white, and external areas are grey.

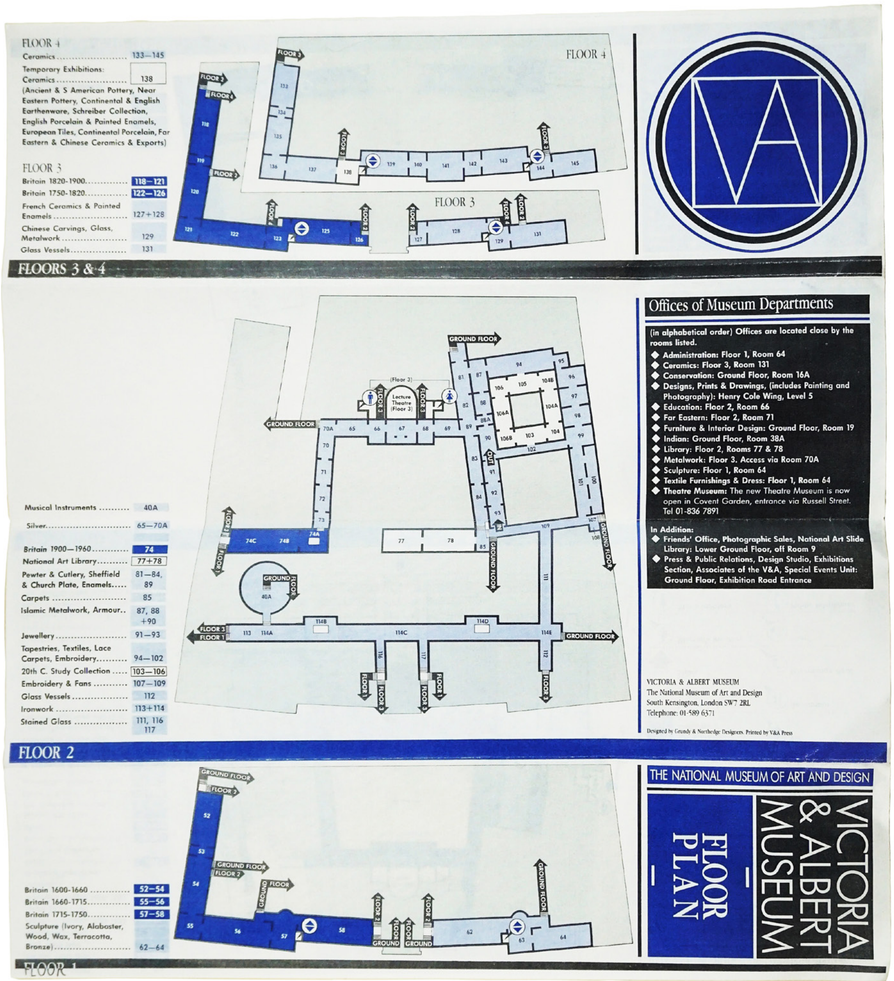


Fig 41. Floor 1, Floor 2, Floors 3 & 4, from Victoria & Albert Museum (undated, c.1987), *Floor Plan*, London: V&A Press (at 40% actual size, sheet size 295mm × 345mm)

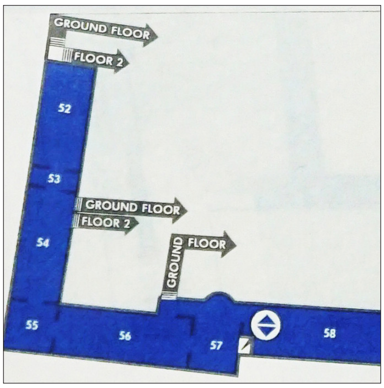


Fig 42. Detail of Floor 1, Floor 2, Floors 3 & 4, from Victoria & Albert Museum (undated), *Floor Plan*, London: V&A Press (at actual size)

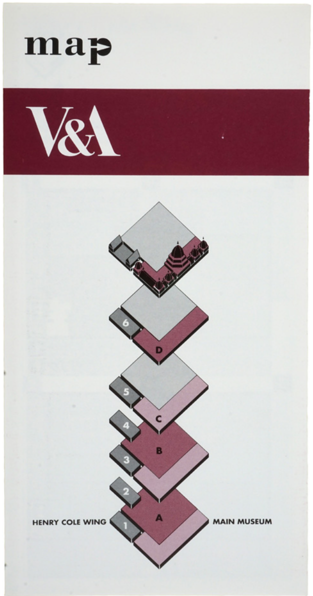


Fig 43. *V&A map* (undated), London: Victoria & Albert Museum (at 40% actual size, sheet size 99mm ×210mm)

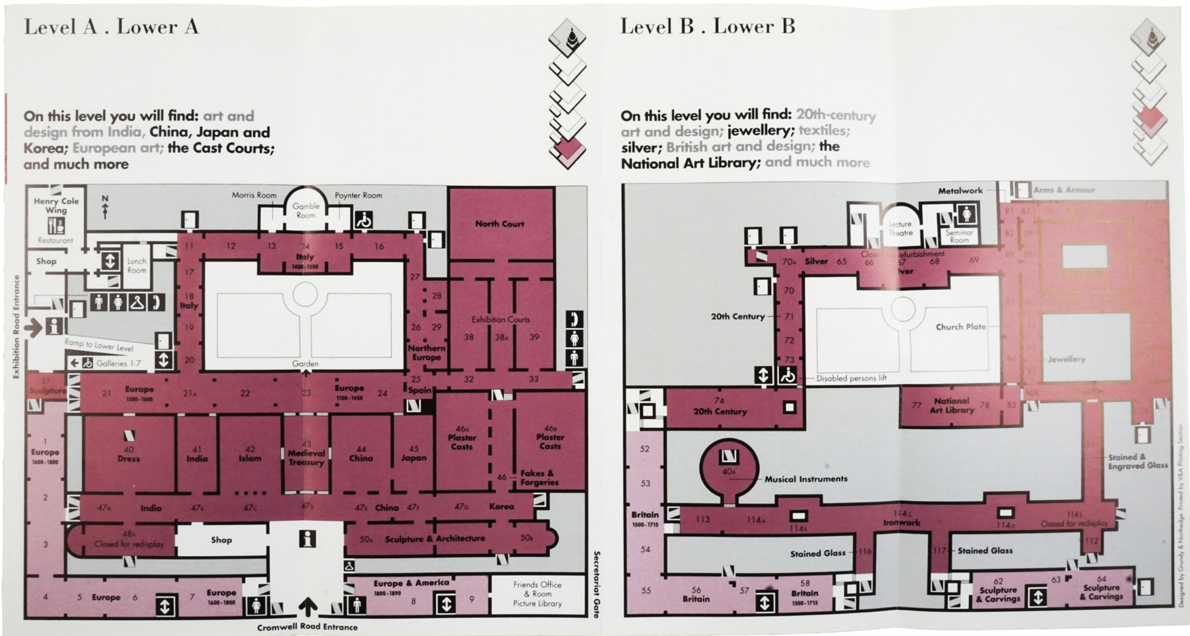


Fig 44. Level A, Lower A, Level B, Lower B, from *V&A map* (undated), London: Victoria & Albert Museum (at 40% actual size, spread size 396mm ×210mm)

The leaflet map in Fig 43 and Fig 44 is undated but was produced in 1995, designed by graphic and information designers Grundy & Northedge.[24] The designers noted that the museum was so architecturally complex that they spent a large proportion of the time creating the guide on planning and research.[25] The floor plan designs and some other design elements first featured in a booklet guide to the museum produced in 1988 that had been designed by the graphic design studio Pentagram. This development of that design is notable for its inclusion of an isometric diagram that describes the arrangement of the floor levels in a schematic way. It is broadly similar to that used in the 1986 map (Fig 40), but is more sophisticated: the diagram is repeated adjacent to each floor plan, with colour coding to show the position of the floor within the building. A larger version of the diagram is also used on the cover of the leaflet, though this appears to be largely decorative. This design uses yet another system for the distinguishing floor levels: A, Lower A, B, Lower B, C and D. The Lower A and B levels are differentiated from the main levels on their respective plans with a different shade of the colour used to denote gallery spaces in the museum.

Although each room is labelled with its content or theme, there is also text for each floor levels summarising its contents, for example, “On this level you will find: 20th-century art and design; jewellery; textiles; silver; British art and design; the National Art Library; and much more”, for Level B and Lower B.

24 Dugdale, J. (1996). Presenting the Facts. *Print*. 50:1. **166**.

25 ibid.

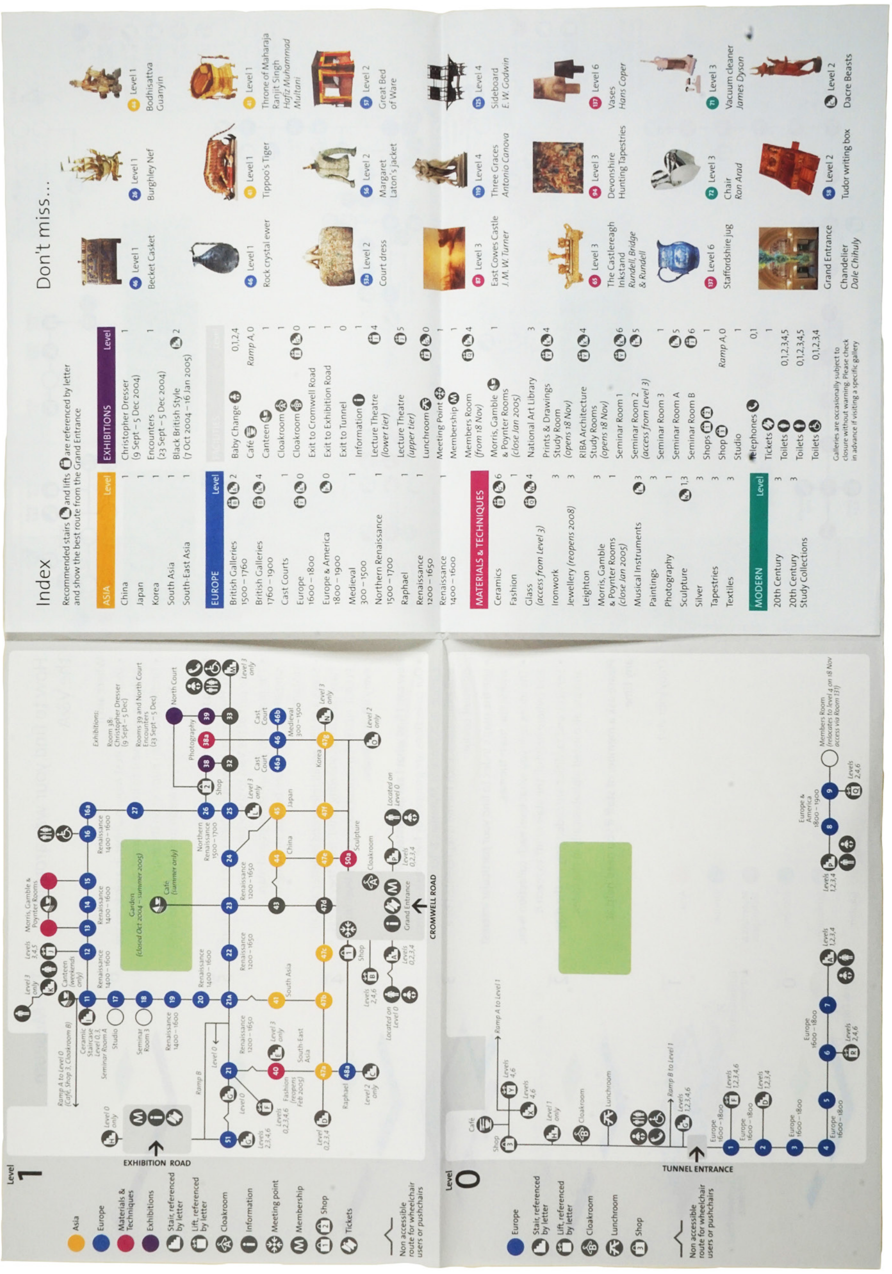


Fig 45. Level 1, Level O, Index and Don't Miss... from *V&A map* (2004), London: Victoria & Albert Museum (at 40% actual size, sheet size 420mm × 300mm)

In 2003, the museum underwent a major review of its navigation and signage, undertaken by the information design consultancy Holmes Wood. A new navigation and wayfinding system was developed, including a new colour-coding system that was used throughout the building's signage and on the new map that was developed. The colour-coding is thematic, and limited to five colours/themes: yellow for Asia, blue for Europe, red for Materials & Techniques, green for Modern and purple for Exhibitions (plus grey for Facilities).

The new map that was developed as part of the new navigation system (Fig 45), and first published in January 2004, included a new approach to representing the space using a schematic diagram of the spaces and facilities within the museum. Unlike most maps of buildings (museums and otherwise), it was not based on a scale plan of the building; there was no attempt to reproduce or describe the shape or relative size of the building, its rooms or spaces – except for the green rectangle that represents the internal open space that is variously referred to as the garden or quadrangle. The museum stated that the map "describes and navigates the building by acting as a journey-planner rather than trying to replicate the complex architecture".[26]

Nevertheless, the map was complemented, on the reverse side of the sheet, by an isometric representation of the building and its levels (Fig 47). This goes some way to depicting the shape and sizes of the internal spaces, using the colour-coding scheme, though it is largely schematic, and probably of most use in helping visitors understand the building's levels and how they are arranged. This design employs yet another floor level naming convention, from "0" to "6".

Also included on the sheet is text explaining to visitors how to navigate the building using the system devised for signage and for the map (Fig 47), a key to the colour-coding system, how the "Underground" map works, and a warning to visitors that "You cannot access every level from every lift or staircase".

The main map reduces the museum to its elemental spaces, represented by different types of equally-sized roundel, as can be seen in Fig 46. The exhibition space roundels are colour coded according to the scheme described above, and include the room number. The facilities, such as toilets, shops, cloakrooms and ticket desks, are represented by black roundels with relevant pictograms. Stairs and lifts are also represented by roundels with a pictogram and, unusually, a reference letter. A label next to each also explains the floors that can be reached via the stair or lift in question. The roundels are connected by horizontal, vertical or diagonal lines, which denote how the spaces are connected. Lines with a kink in them denote routes between spaces that are not accessible for wheelchairs or pushchairs.

26 Victoria & Albert Museum (2004). *Development of the Signage, 2004.* [online] Available at <http://www.vam.ac.uk/content/articles/d/development-of-the-signage/>. [Accessed 22 September 2016].

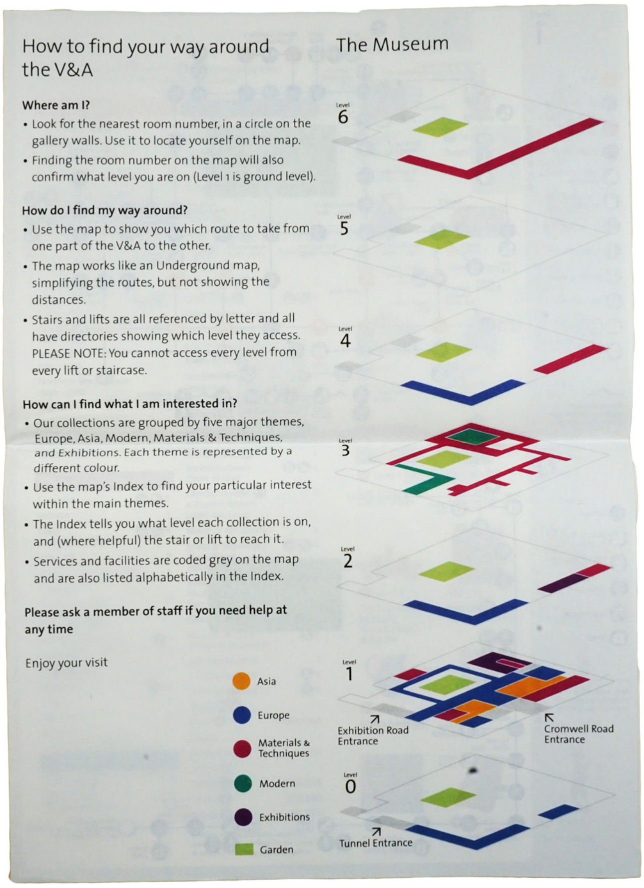


Fig 47. 'How to find your way around the V&A', from *V&A map* (2004), London: Victoria & Albert Museum (at 40% actual size, sheet size 210mm × 300mm)

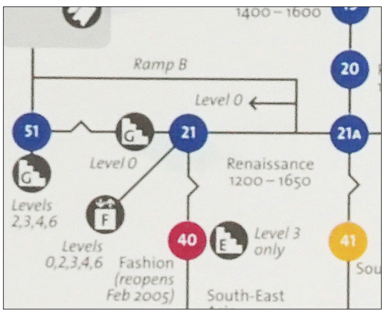


Fig 46. Detail of Level 1, from *V&A map* (2004), London: Victoria & Albert Museum (at actual size)

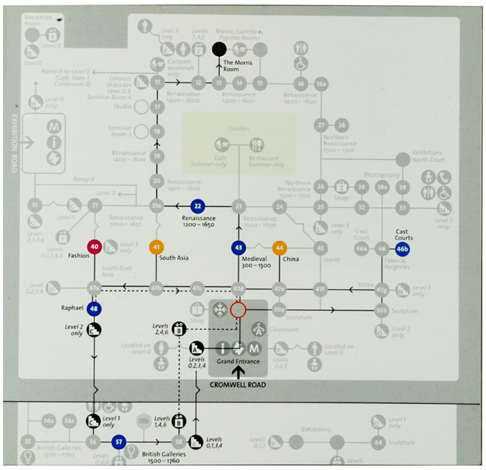


Fig 48. Tour 1 map, from Best, K. and Trench, L. (2004) *V&A Guide*, London: V&A Publications (detail, at 40% actual size)

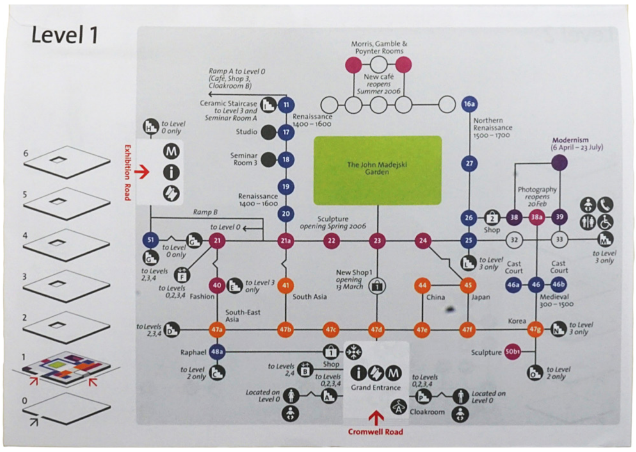


Fig 49. Level 1 from *V&A map* (2006), London: Victoria & Albert Museum (at 40% actual size, page size 210mm × 150mm)

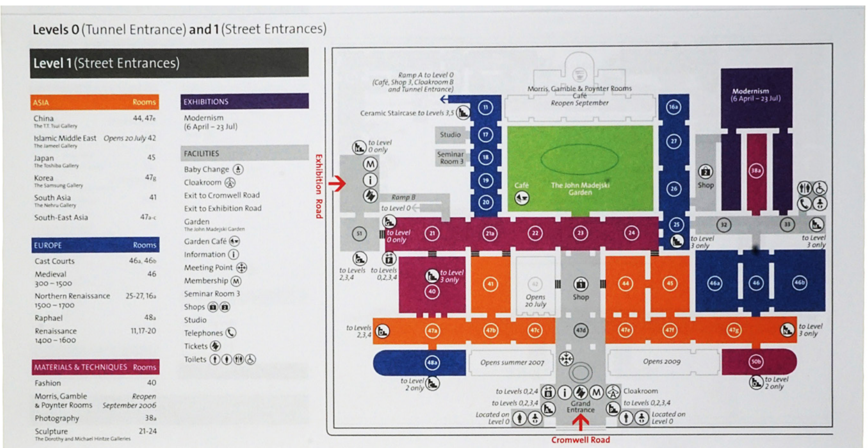


Fig 50. Level 1 from *V&A Map Spring/ Summer 2006* (2006), London: Victoria & Albert Museum (at 40% actual size, page size 290mm × 148mm)

Another version of the map appears in a guidebook published in the same year (Fig 48), which overlays a series of tour routes on the map. In this case, only those spaces to be visited on the tour are coloured (others are grey), and directional arrows indicate the direction of travel on the tour.

The map has been described by the designers as "Tube-style"[27] because of its supposed stylistic connection with the famous schematic London Underground map. However, the map proved controversial and was ultimately not a success with visitors. An article about visiting the museum in the Daily Telegraph newspaper published shortly after the new map was introduced described the map as "very hard to follow" and stated that the museum was "already looking at ways to improve or replace it".[28] This was despite the fact that a prototype of the map had been subject to user testing ahead of its publication, in which it had received positive responses. This research and its implications are discussed in detail in Chapter 4.

A new design of V&A map was produced around two years after the "Tube-style" one. Initially, the map was revised towards the end of 2005, primarily by including a small version of the isometric building diagram alongside each floor plan (with colour to indicate where this floor in question fitted within the building) (Fig 49). However, less than a year later (in mid-2006), a more comprehensive redesign of the map was produced. It retained some of the elements of the original one but, significantly, it dispensed with the "Tube-style" elements, and now looked more like a conventional floor plan, showing the shape and size of the various rooms and galleries, and entrances to them (Fig 50). Other design elements, such as the colour coding, were retained.

27 Victoria and Albert Museum (2003). Minutes of Meeting of Board of Trustees of Victoria and Albert Museum, 16 January 2003; McManus, P. (2003). *A formative evaluation of plans for a sign scheme and map prepared for the Victoria & Albert Museum by the Holmes Wood Consultancy*. London: Victoria and Albert Museum.

28 Trend, N. (2004). London: How to Visit the Victoria and Albert Museum. *Daily Telegraph*. 20 November 2004. Available at <http://www.telegraph.co.uk/travel/artsandculture/731714/London-How-to-visit-the-Victoria-and-Albert-Museum.html>. [Accessed 20 January 2015].

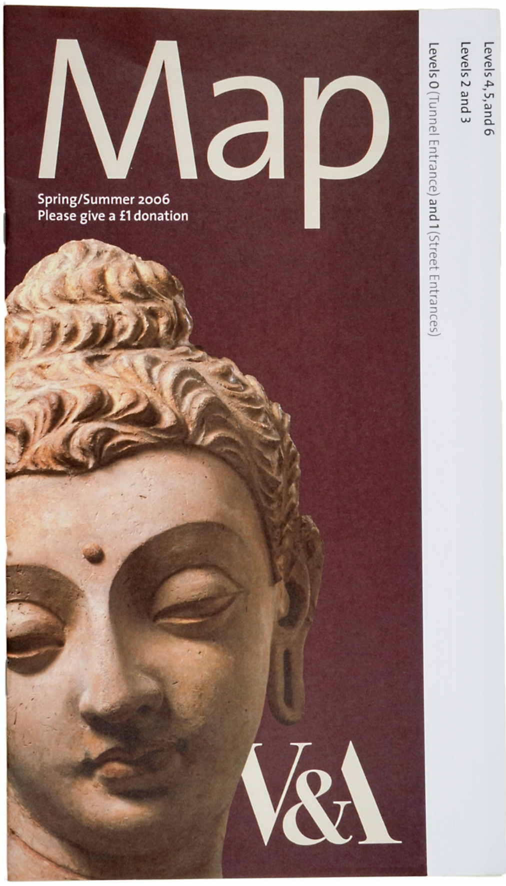


Fig 51. *V&A Map Spring/Summer 2006* (2006), London: Victoria & Albert Museum (at 40% actual size, page size 164mm × 290mm)

Fig 52. Detail of tabs of *V&A Map Spring/Summer 2015* (2015), London: Victoria & Albert Museum

The redesign of the map was accompanied by a more comprehensive redesign of the document that contained the map. Instead of a folded single page, the new map was included in a stapled booklet of 12 pages (Fig 51), which, though still titled “Map”, included more information for visitors about the museum, including text describing current and forthcoming temporary exhibitions, and illustrations of them. The booklet is designed with variably-sized leaves that provide tabs for the different floor level maps (Fig 52). Another feature of this approach was that the booklet was revised and published twice a year, with a new cover image, and new information about the current and forthcoming exhibitions for each edition. Changes were made to the map, as and when there were changes to the spaces within the museum (for example, to indicate the location of temporary exhibitions, or areas closed for refurbishment). However, there were otherwise very few changes to the map design, which was used at the museum for more than ten years. In 2015, the V&A revealed that it was to review its wayfinding and signage strategy, to coincide with a redesign of part of the museum, including new exhibition spaces.[29] As of June 2018, the new system had yet to be implemented.

29 Montgomery, A (2015). V&A to Develop “Holistic” Wayfinding Across All its Sites. *Design Week*. [online] Available at: <https://www.designweek.co.uk/va-to-develop-holistic-wayfinding-across-all-its-sites/>. [Accessed 17 April 2017].

Case study 2: British Museum, London

The British Museum is one of the best-known museums in the world, with a collection of around eight million objects[30] and more than 6.5 million visitors a year.[31] It claims to be the world's first public museum, having been established by an Act of Parliament in 1753 which stated that it would be maintained by the government, and offer free admission to all.[32] Despite its name, and the fact that it was established by Parliament, the museum was not a national museum, telling "the national tale", the former director Neil MacGregor, observes; instead, it was "intended to be not the story of these islands but a way of thinking about the world".[33]

Although the idea of a museum being free and open to all was an unusual one at the time, in reality the museum's visiting policies and procedures were restrictive by modern standards. Initially – and for some time – the museum's opening hours were limited, visitors had to apply for a ticket in advance (of which there were often not enough to satisfy demand), and visitors had to be taken around the museum by a trustee or staff member. These restrictions were in part a response to concerns (expressed by visitors, staff and trustees) about the consequences of the "lower classes" being allowed entry to the museum.[34]

More importantly, in the context of this thesis, the arrangement of the displays in the museum was poor, and the information provided about them criticised as being haphazard and unhelpful.[35] The requirement for guided visits ended in 1810 and the museum's first guidebooks appeared.[36] They were, of course, revised over the years, but in the 19th century were considered expensive and described as being of "ineffable dullness".[37]

30 The British Museum: Management: About Us. [online] Available at <https://www.britishmuseum.org/about_us/management/about_us.aspx> [Accessed 28 April 2017].

31 Department for Culture Media & Sport (2017). *Sponsored Museums Performance Indicators 2015/16 Statistical Release January 2017*. [pdf] London: Department for Culture Media & Sport. Available at: < https://www.gov.uk/government/statistics/sponsored-museums-annual-performance-indicators-2015-16> [Accessed 3 February 2017].

32 The British Museum (2017). *About Us: the Museum's Story: General History.* [online] Available at <http://www.britishmuseum.org/about_us/the_museums_story/general_history.aspx> [Accessed 28 April 2017].

33 MacGregor, N. (2007). Behind the Scenes at the British Museum. *Financial Times*. September 14, 2007. Available at: < https://www.ft.com/content/2f0b74b4-626b-11dc-bdf6-0000779fd2ac> [Accessed 1 May 2017].

34 Wilson, D. M (2002). *The British Museum: a History*. London: The British Museum Press. **35-39**

35 ibid. **101, 194**

36 ibid. **67, 101**

37 ibid. **194**

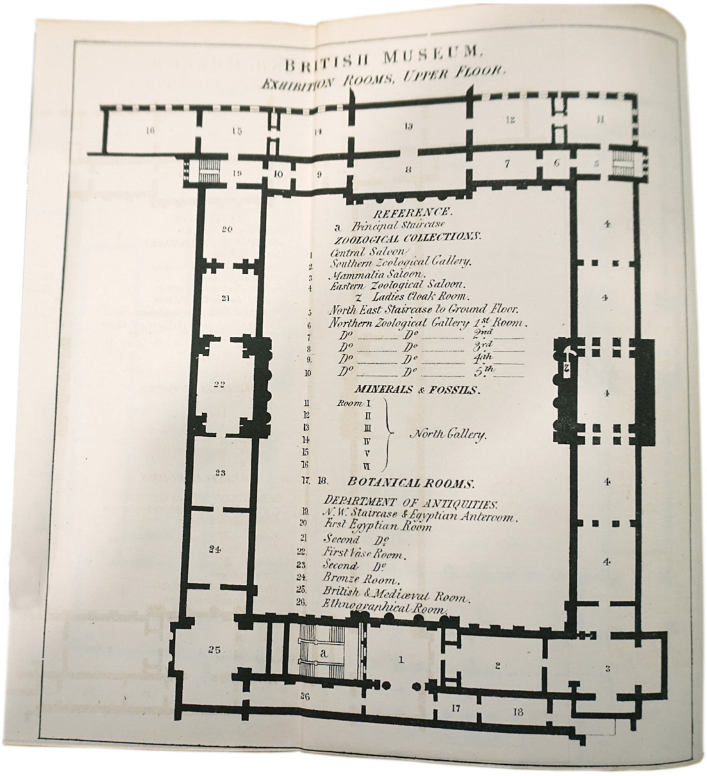


Fig 53. Exhibitions Rooms, Upper Floor map from *British Museum* (1869). London: the Trustees of the British Museum (at 50% actual size, page size 210mm × 205mm)

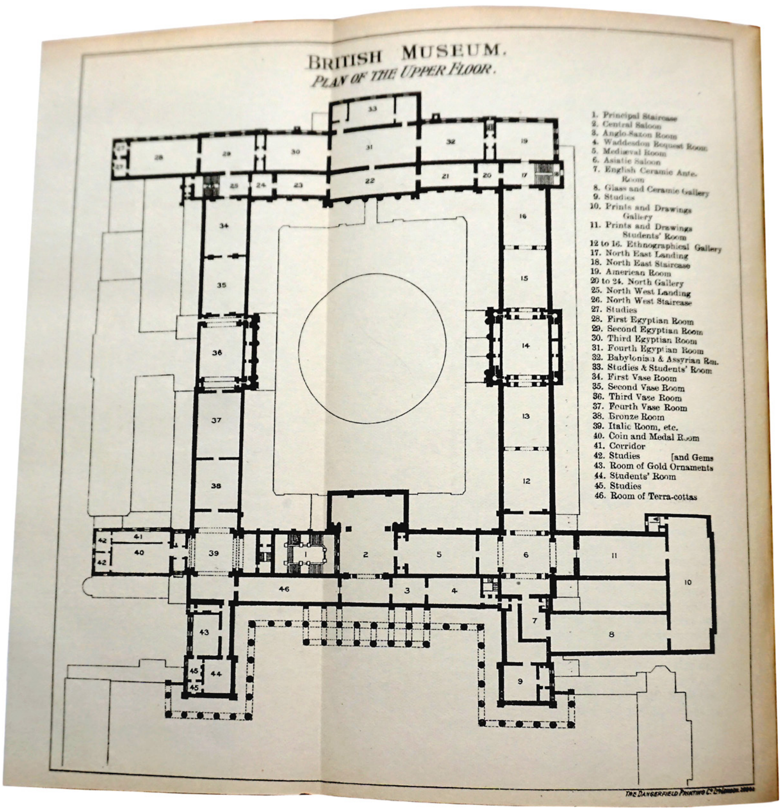


Fig 54. Plan of the Upper Floor from British Museum (1907). *A Guide to the Exhibition Galleries of the British Museum*, 7th ed. London: the Trustees of the British Museum (at 50% actual size, page size 225mm × 210mm)

Possibly because they were seen as a direct replacement for a personal guided visit, the first guidebooks were written as an instructional tour, with text describing in detail a route through the museum (for example, "The Visitor… having passed the Entrance in Great Russell Street, enters a spacious Court, with the main building of the New Museum fronting him. Upon entering the Hall, he can either turn to the left to the Gallery of Antiquities hereafter described, or, in the more regular course of his Circuit, ascend by the Great Staircase to The Zoological Collections…")[38], along with descriptions of the artefacts and displays.

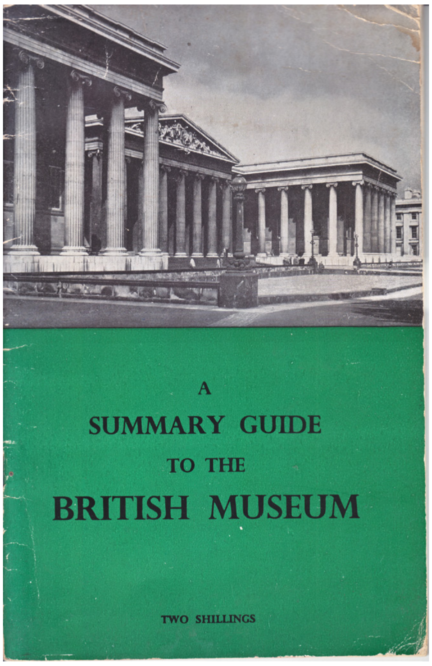
The first maps for visitors (within guidebooks) appeared sometime between 1856 and 1869 (incomplete archives at the museum mean it is not possible to identify the exact edition or date that they appeared). There were two maps included in the guide book: Ground Floor and Upper Floor, both bound-in fold-out maps. The floor plans are likely to have been adapted from architect's plans to which a numbered key for the exhibition rooms has been added. Fig 53 shows the Upper Floor plan which shows how (unhelpfully) the room numbering on the map has not been produced to match that of the museum, so Room I of the North Gallery is equivalent to room 11 on the map, Room II to room 12 on the map, and so on. These maps provide very little information about facilities or functional spaces, except for the Principal Staircase ("a" on the Upper Floor map) and Ladies Cloak Room ("z").

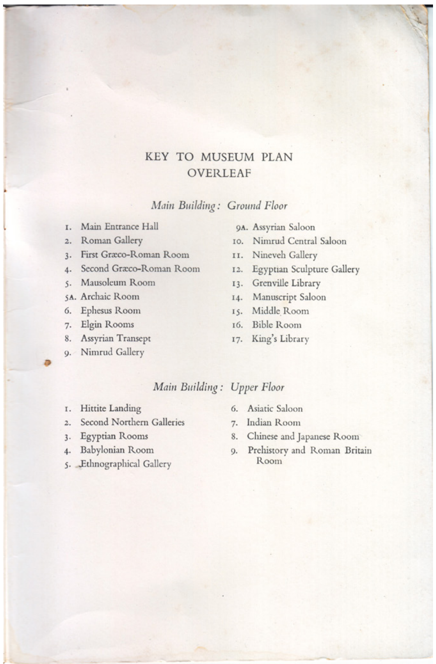
This style of map continued to be used for decades – at least until the Second World War – though with some refinements. Fig 54 shows the Upper Floor map from a 1907 guidebook. It depicts a larger area of the museum (several more galleries and another wing on the building's southern side), which brings the number of labelled spaces to 46, from 26 in 1869. The labels on the map are now typeset, and the plan gives an indication of external elements of the building (for example, the circular Reading Room), which may help users orientate themselves within the building.

A simpler graphic style was adopted for maps in guides after the Second World. The 40-page Summary Guides the museum produced at this time included two small, simply drawn plans on the back cover (Fig 55). Possibly because of the small size of the maps, there was a combination labelling system: numbers for some elements (with a key on the inside back cover); and text labels on the map for others. There is no obvious logic in which elements have labels and which have numbers: both systems are used to denote functional spaces (such as stairs), thematic exhibition spaces and highlight objects (such as the Rosetta Stone).

An otherwise similar Summary Guide from 1963 contains no maps but text in the guide refers to a separate map, which can be bought in the museum. This is the first reference seen to a standalone map for the British Museum. This

38 British Museum (1856). *Synopsis of the Contents of the British Museum*, 63rd ed. London: Woodfall and Kinder.





KEY TO MUSEUM PLAN
OVERLEAF

Main Building: Ground Floor

1. Main Entrance Hall
2. Roman Gallery
3. First Græco-Roman Room
4. Second Græco-Roman Room
5. Mausoleum Room
5A. Archaic Room
6. Ephesus Room
7. Elgin Rooms
8. Assyrian Transept
9. Nimrud Gallery
9A. Assyrian Saloon
10. Nimrud Central Saloon
11. Nineveh Gallery
12. Egyptian Sculpture Gallery
13. Grenville Library
14. Manuscript Saloon
15. Middle Room
16. Bible Room
17. King's Library

Main Building: Upper Floor

1. Hittite Landing
2. Second Northern Galleries
3. Egyptian Rooms
4. Babylonian Room
5. Ethnographical Gallery
6. Asiatic Saloon
7. Indian Room
8. Chinese and Japanese Room
9. Prehistory and Roman Britain Room

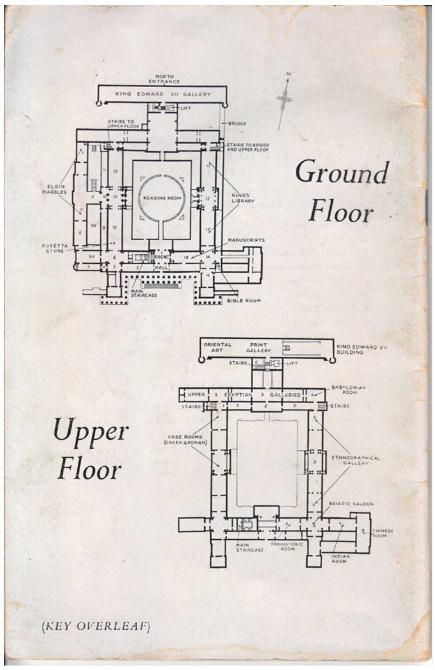


Fig 55. Cover, back cover and inside back cover, British Museum (1957), *A Summary Guide to the British Museum*. London: Trustees of the British Museum (at 40% actual size, 140mm × 215mm)

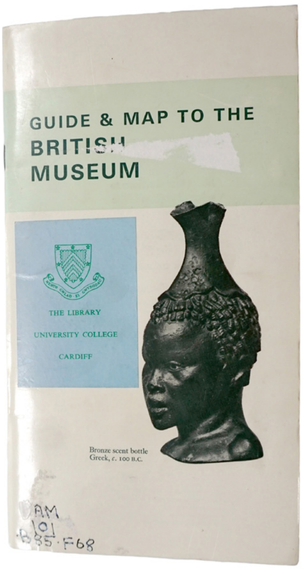


Fig 56. British Museum (1967). *Guide & Map to the British Museum*. London: Trustees of the British Museum. (at 33% actual size, 120mm × 225mm)

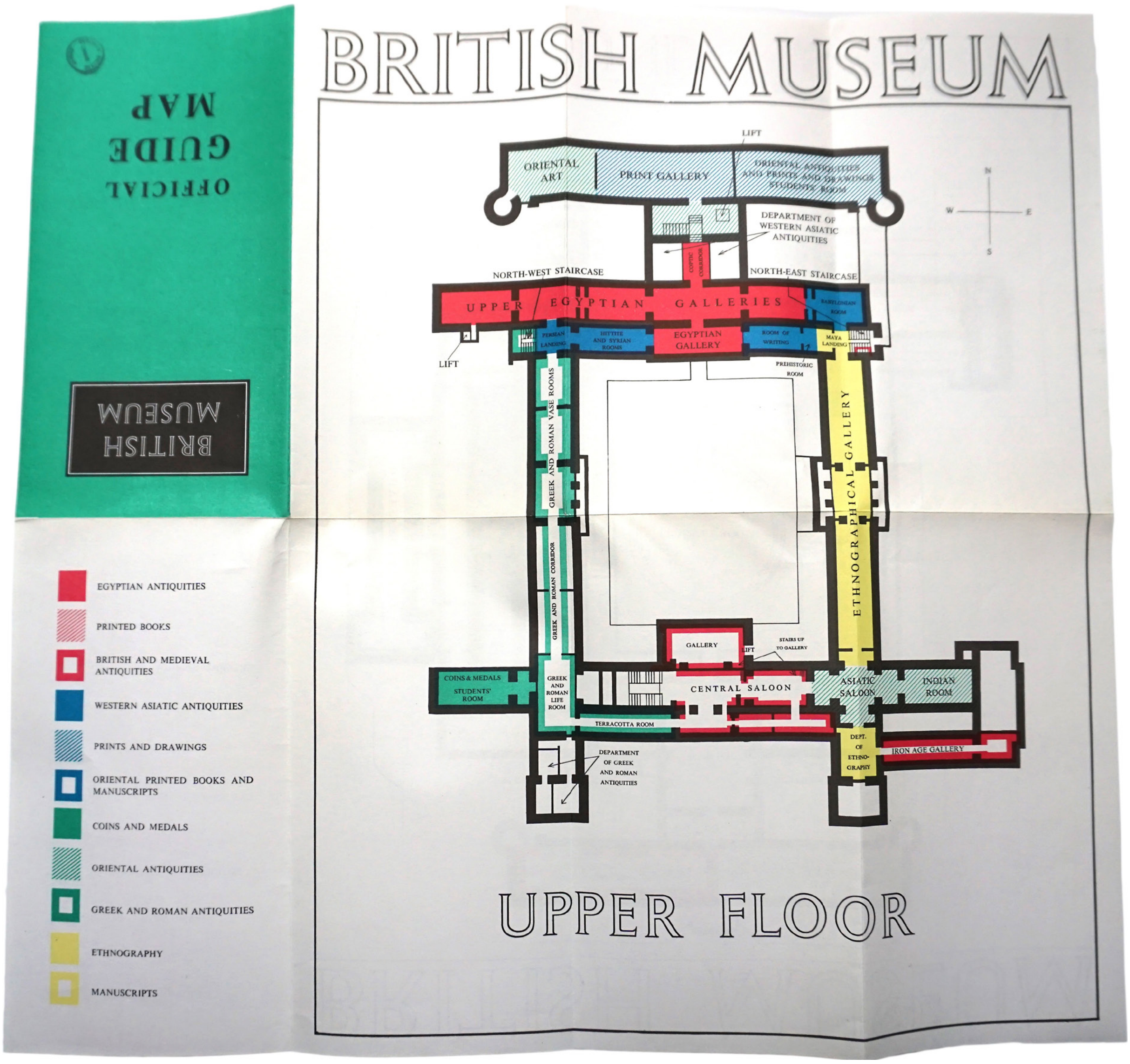


Fig 57. British Museum (1967). Official Guide Map, from *Guide & Map to the British Museum*. London: Trustees of the British Museum. (at 33% actual size, sheet size 480mm × 450mm)

guide states that the map "shows the departments in colour so that particular galleries or exhibits may be easily traced" — which is likely the first iteration of the map to use colour. (This may be in part why this map was separate from the guidebook, since the guidebook's illustrations were monochrome, the only colour being a spot colour on the cover). It was not possible to locate a copy of this map.

Later in the 1960s the museum produced a new style of guidebook (Fig 56), roughly the same size as the Summary Guides, though of slightly different proportions. This publication, as the title suggests, included a map of the museum (Fig 57). The map is a separate document, partly because of its size, and the fact that it is in colour, unlike the guidebook itself. It consists of a folded sheet contained in a sleeve in the inside cover of the book, with the ground floor on one side, and upper floor on the other. The sheet size is particularly remarkable: at nearly half a metre square, it is the largest portable paper museum maps seen in the course of this research (contemporary or historical), and to the point of being unwieldy to use while walking around the museum. One unusual feature of this map is that it employs a colour-coding system that uses each colour in three ways: solid fill, outline and cross-hatch. This appears to be due to the printing process used: using five pre-coloured inks (black, green, yellow, blue and red), rather than a more sophisticated CMYK system. As well as a colour key, the map includes labels, mostly for exhibition spaces, but also for staircases and lifts. Some of the labels appear to simply replicate the colour key: for example, the solid yellow colour is indicated as "Ethnography", yet this space also has a label "Ethnographic gallery". This format of map and guidebook continued to be produced until the mid-1970s (with updates and amendments).

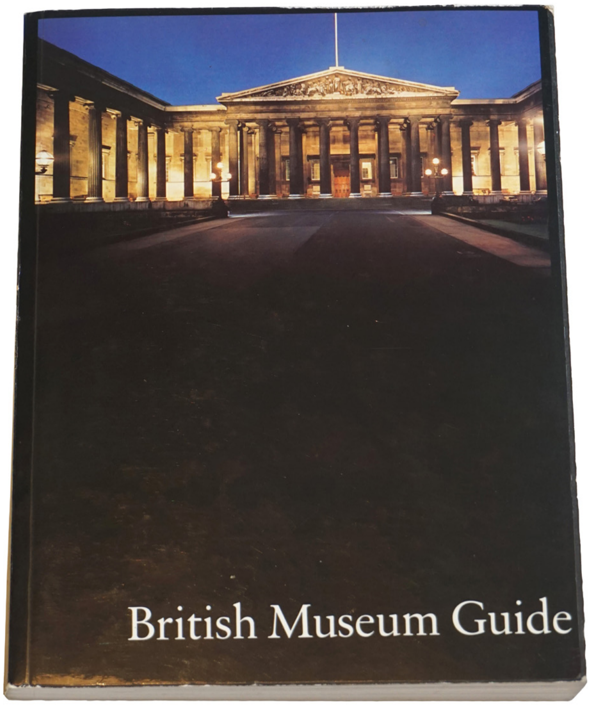


Fig 58. British Museum (1976). *British Museum Guide*. London: Trustees of the British Museum. (at 33% actual size, 190mm × 280mm)

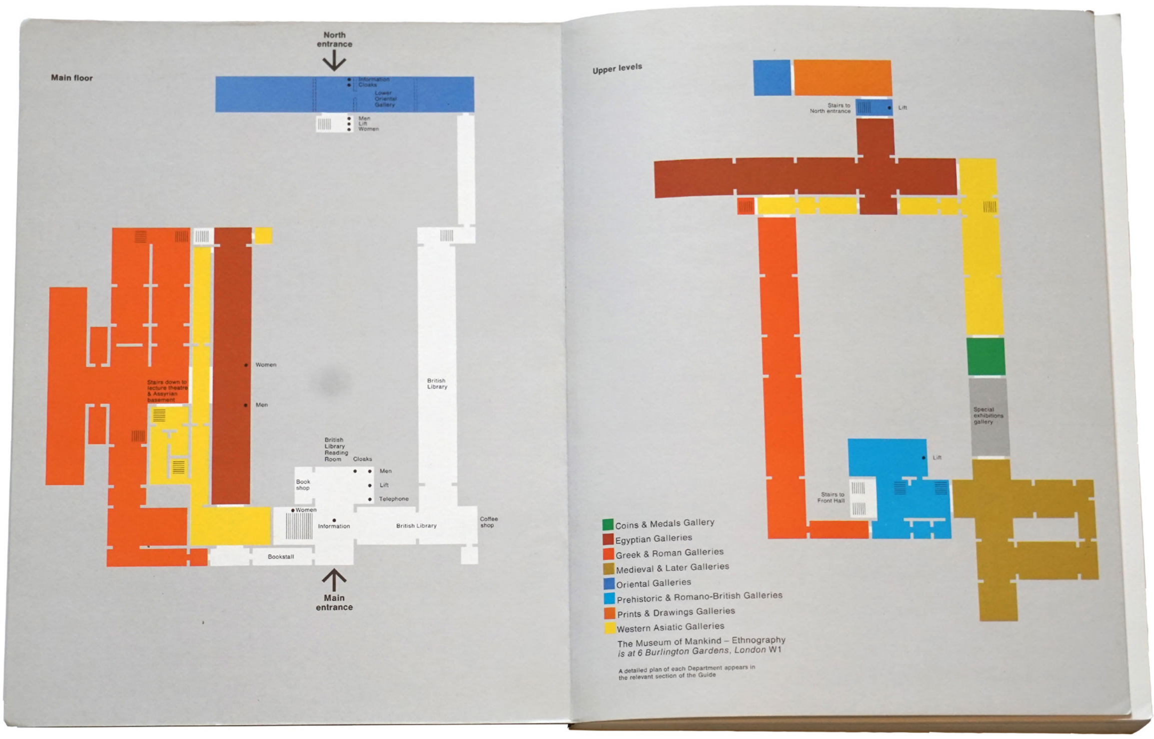


Fig 59. Main floor and Upper levels maps, from British Museum (1976). *British Museum Guide*. London: Trustees of the British Museum. (at 33% actual size, page size 190mm × 280mm)

In 1976, a much more modern-looking, minimalist map was produced, and published in a more substantial book, *British Museum Guide* (Fig 58). This was a souvenir guide, more likely to be read after a visit to the museum than during one, partly because of the amount of information contained in it (295 pages' worth) and partly because of its size (190mm × 245mm) and weight (820g). The main maps, of the Main Floor and Upper Levels (Fig 59), appear on both the inside front and inside back cover (presumably for ease of access by readers flipping between the map to the pages within the book). In a departure from previous maps to the museum, spaces are shown with blocks of colour, with very little detail of the building, and no external context (apart from the two entrances). The colours of spaces relate to the themes of the galleries, much as in earlier maps. Labelling is scant, mainly for functional areas, the smaller areas, such as toilets, being marked with a bullet symbol. Additional maps within the guide at the beginning of sections explain particular parts of the museum in more detail. These maps, such as the one in Fig 60, are monochrome, and show room numbers, and displays, at the same scale as the colour maps.

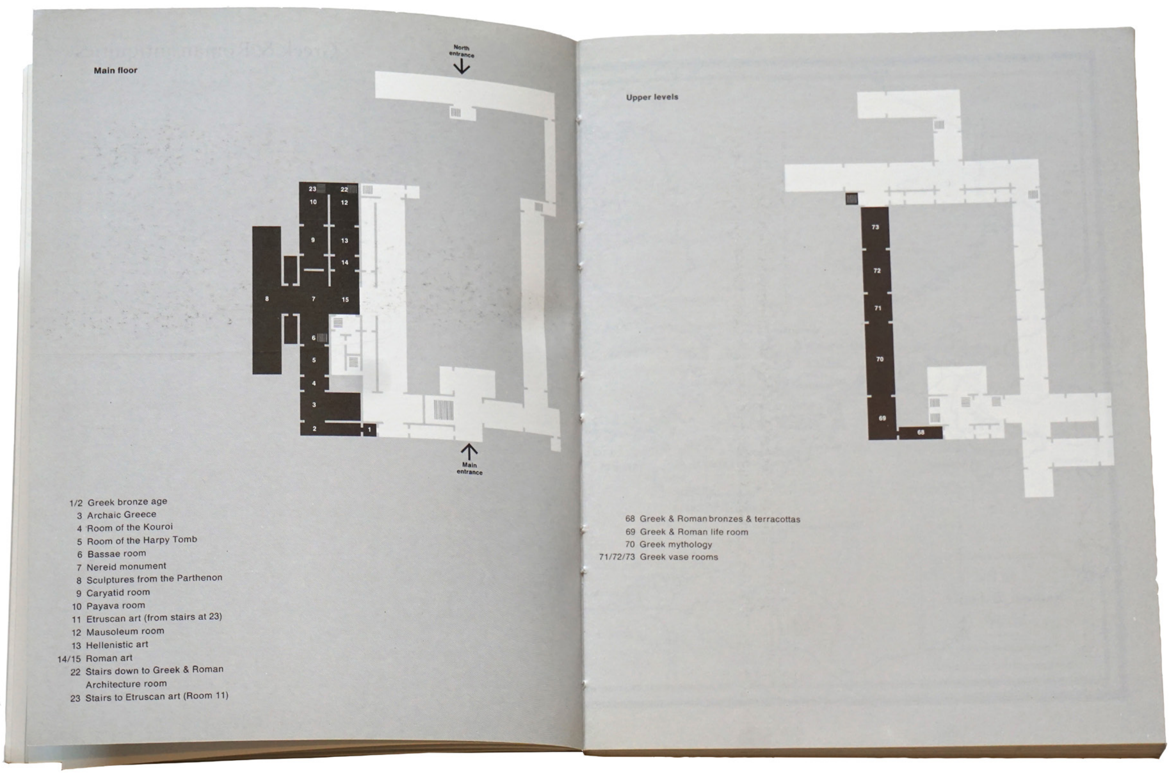


Fig 60. Greek and Roman galleries maps, from British Museum (1976). *British Museum Guide*. London: Trustees of the British Museum. (at 33% actual size, page size 190mm × 280mm)

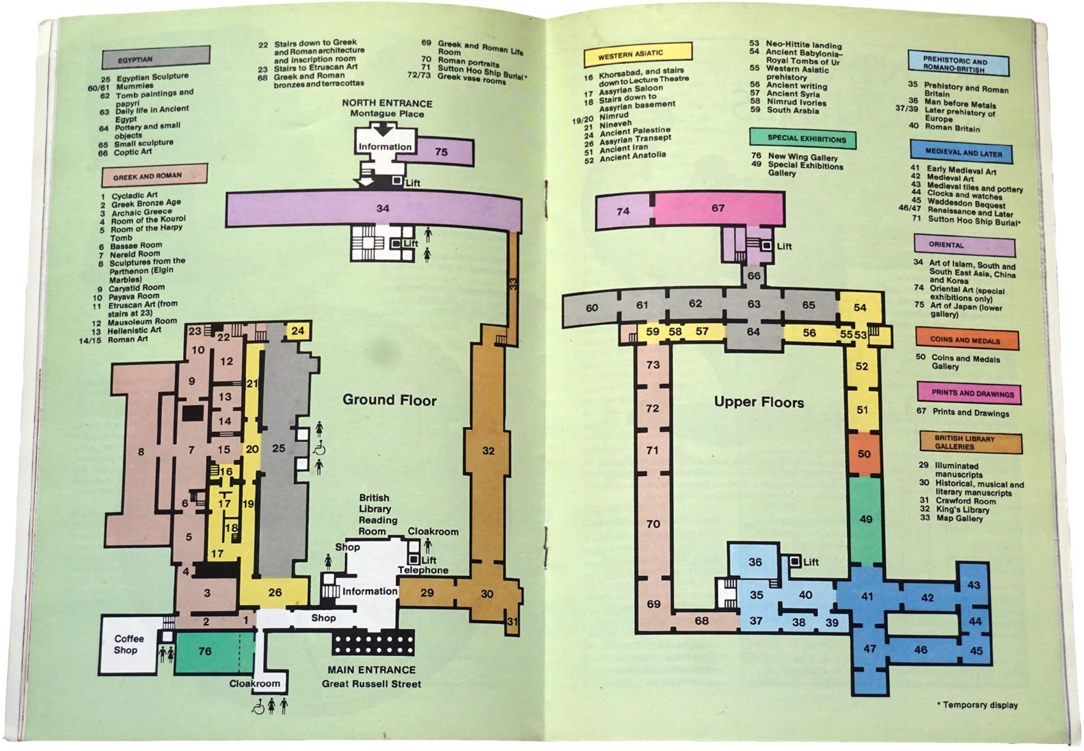


Fig 61. Ground Floor and Upper Floors maps, from British Museum (1981). *British Museum Guide & Map*. London: Trustees of the British Museum. (at 40% actual size, page size 168mm × 238mm)

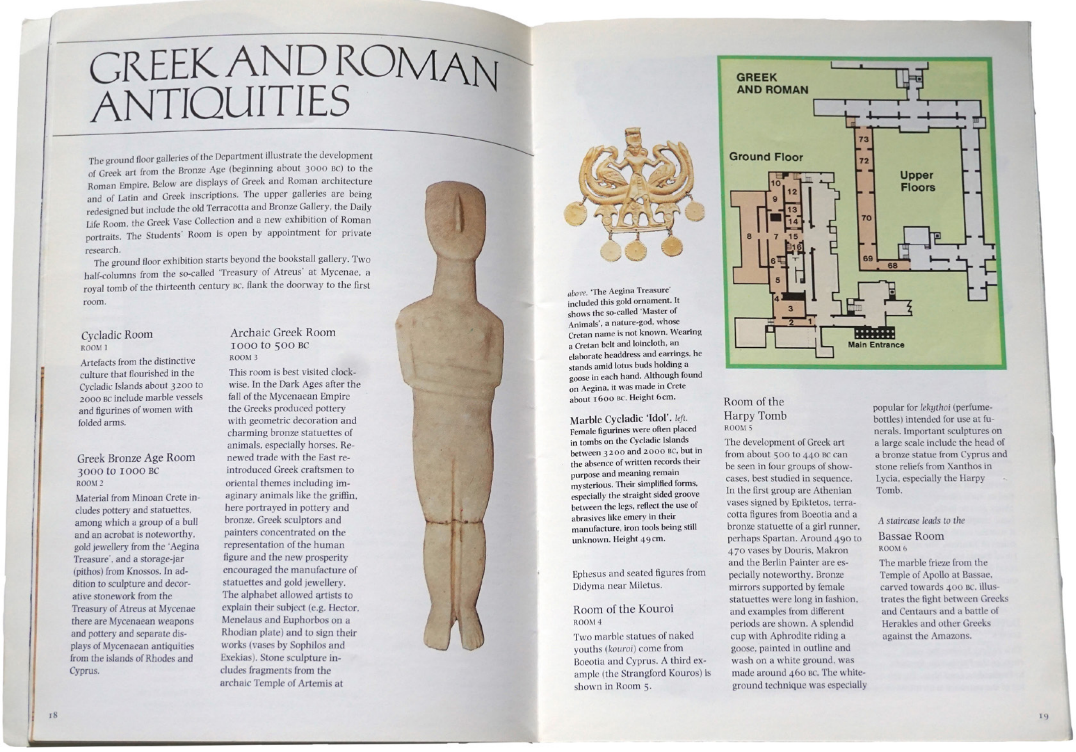


Fig 62. Greek and Roman Antiquities pages, from British Museum (1981). *British Museum Guide & Map*. London: Trustees of the British Museum. (at 40% actual size, page size 168mm × 238mm)

The 1981 guide marked a return to a smaller format than the 1976 guide, with far fewer pages (66) – and it weighed less, so was easier to carry and consult during a visit. Its main maps (Fig 61) combine the information from the earlier guide's main (colour) maps and section-specific (monochrome) maps, namely the room numbers and displays. The 1981 maps look denser, partly because of their depiction of the building's walls are outlined in black, and partly because the type used for labels is a heavier weight and larger. The map in this guide is on the centre spread of the booklet, which means it falls open for easy reference, as can be seen in Fig 61.

There are now also ten colours to distinguish spaces (compared with eight in the previous guide). It illustrates the potential problem associated with using a large number of colours discussed on page 151: readers may have difficulty distinguishing some colours/areas, in particular, Prints and Drawings (pink), Oriental (mauve) and Greek and Roman (pink-beige).

Despite the main map of this guide having a relatively comprehensive amount of information about the contents of the museum's galleries (with detail down to room level), it does also contain more detailed maps alongside the text descriptions of gallery sections – see, for example, the "Greek and Roman Antiquities" chapter, with map, in Fig 62. These detailed maps are at a slightly smaller scale than the main map, and do not provide any additional information to that on the main map. They therefore appear to be intended to provide readers with an easy reference for the text on the same pages and to avoid having to flip back and forth between the main map and the text.

This is the first of the British Museum's maps to use pictograms rather than text labels to denote the location of facilities, though they are limited to toilets (male and female figures) and disabled-accessible toilets (a wheelchair symbol).

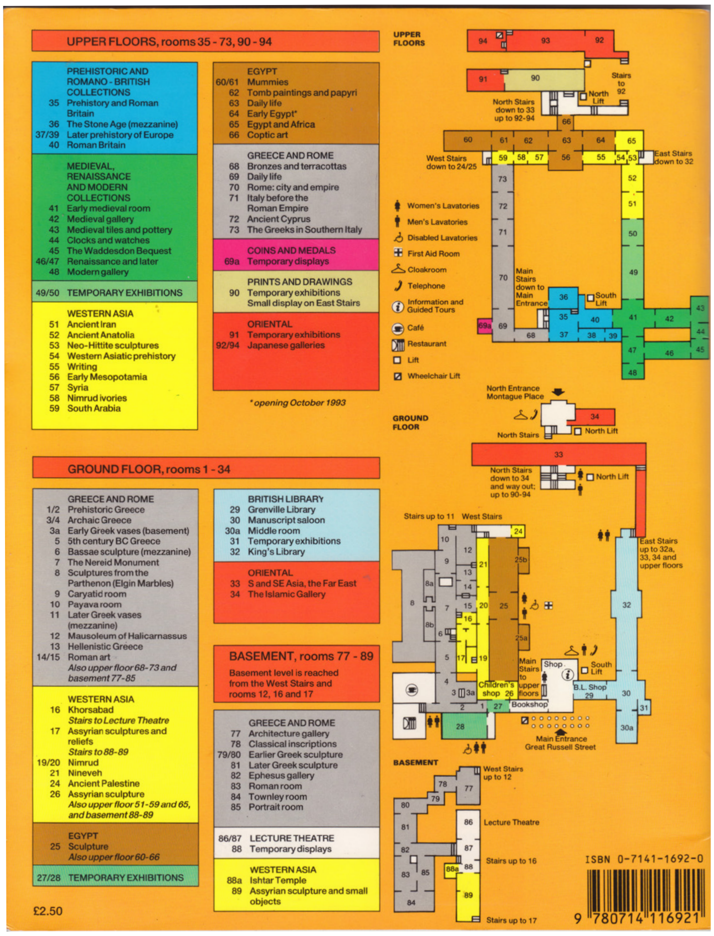
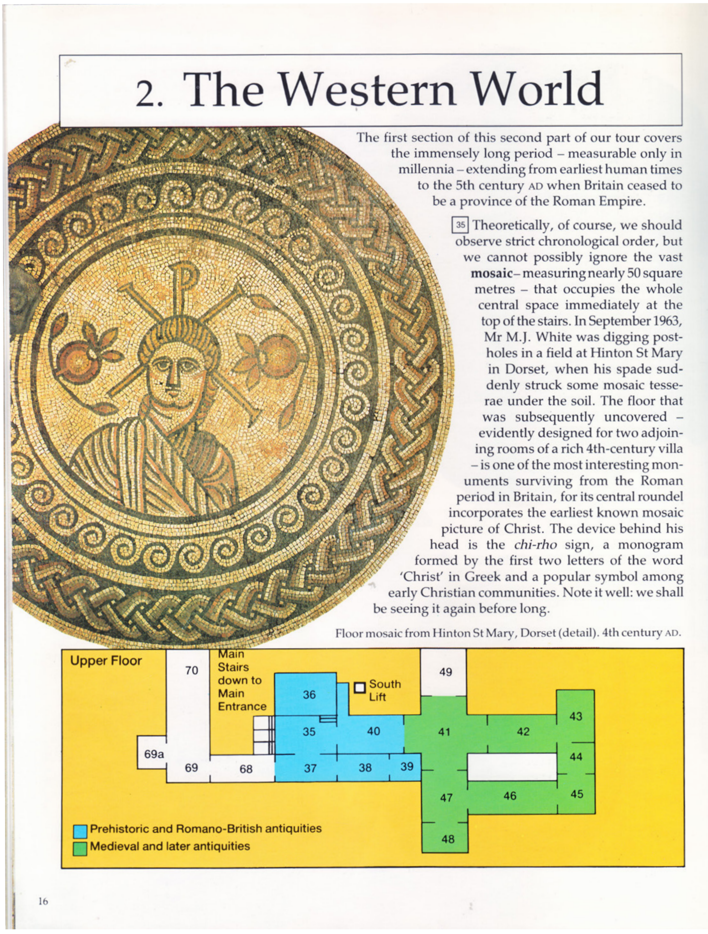


Fig 63. Back cover, British Museum (1989). *British Museum Souvenir Guide*. London: Trustees of the British Museum. (at 50% actual size, 188mm × 245mm)



2. The Western World

The first section of this second part of our tour covers the immensely long period – measurable only in millennia – extending from earliest human times to the 5th century AD when Britain ceased to be a province of the Roman Empire.

35 Theoretically, of course, we should observe strict chronological order, but we cannot possibly ignore the vast **mosaic** – measuring nearly 50 square metres – that occupies the whole central space immediately at the top of the stairs. In September 1963, Mr M.J. White was digging post-holes in a field at Hinton St Mary in Dorset, when his spade suddenly struck some mosaic tesserae under the soil. The floor that was subsequently uncovered – evidently designed for two adjoining rooms of a rich 4th-century villa – is one of the most interesting monuments surviving from the Roman period in Britain, for its central roundel incorporates the earliest known mosaic picture of Christ. The device behind his head is the *chi-rho* sign, a monogram formed by the first two letters of the word 'Christ' in Greek and a popular symbol among early Christian communities. Note it well: we shall be seeing it again before long.

Floor mosaic from Hinton St Mary, Dorset (detail). 4th century AD.

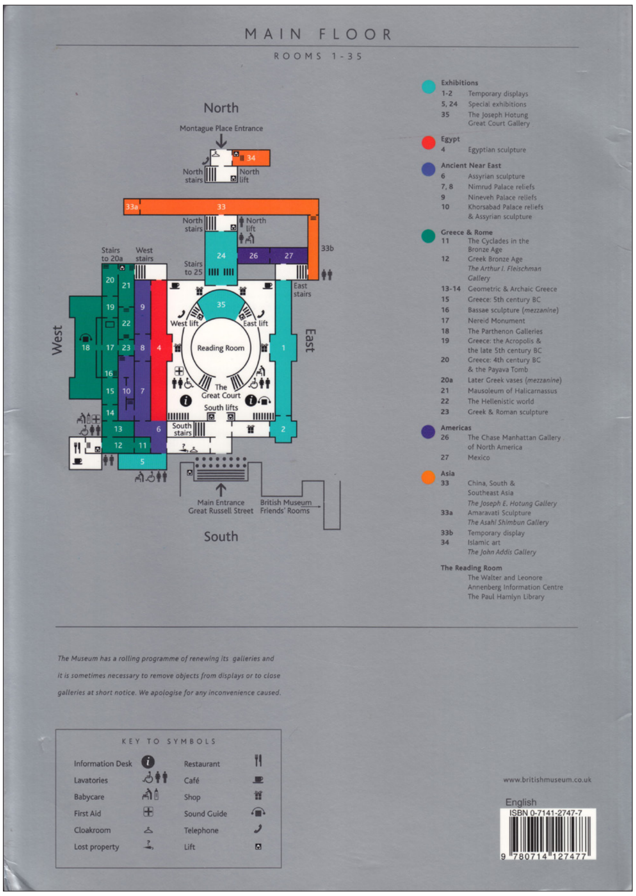
16

Fig 64. Page 16, 'The Western World', from British Museum (1989). *British Museum Souvenir Guide*. London: Trustees of the British Museum. (at 50% actual size, 188mm × 245mm)

Colour was also a defining feature of the map in the museum's *British Museum Souvenir Guide*, published in 1989 (Fig 63). This map used a similar directory-style list of spaces with colour coding for themed areas. However, it used a range of very bold colours to denote the spaces. This does not in itself necessarily make the colour-coding system any easier for readers to use, in part because there is still the potential for misreading colours (the pale green of Temporary Exhibitions can be confused with the mid-green of Medieval, Renaissance and Modern Collections). Also, the bright orange background of the page, and the red background banners for the Upper Floor and Ground Floor labels, may serve as a distraction. The coloured boxes that contain the lists of galleries for each themed area seem too visually dominant, since they are larger than the map itself (which is smaller than it had been in previous British Museum Guides over many years, and also has smaller type than that used in the gallery directory). This is the first map to include the basement area as a separate map, though this may be because the use of the basement for public galleries was extended at this time. There is no visual connection between the maps of three floors: instead, text labels state the destination of each staircase. This edition of the map extends the use of pictograms for facilities, now using nine for different facilities, plus another two for lifts and disabled-accessible lifts.

As with previous British Museum guides, this edition also uses detail maps throughout the booklet or relevant areas alongside text describing the galleries in those areas (see, for example, Fig 64). The detail maps here are at a larger scale than the main map, although they do not contain any extra information. The same colours as for the main map are used in the areas they are describing; adjacent areas, covered in other sections, are rendered in white.

Fig 65. The Great Court of the British Museum, after the museum's 2000 renovation



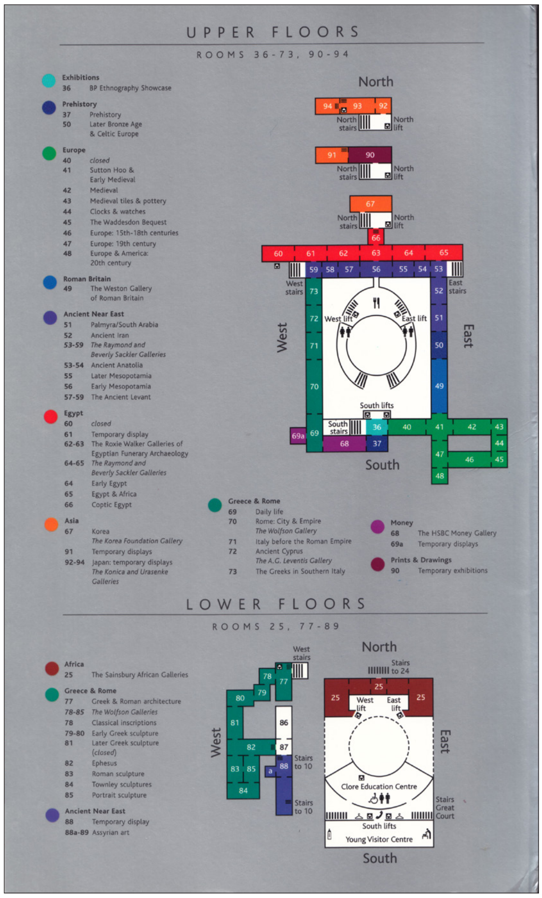


Fig 66. Main Floor and Upper Floors/Lower Floors maps, from British Museum (2000). *The British Museum*. London: Trustees of the British Museum. (at 40% actual size, 210mm × 297mm, 178mm × 297mm)

In the late 1990s, the British Museum underwent a major renovation, which significantly changed the way visitors encountered and navigated the museum. The renovation was prompted by the relocation of the British Library, which had been housed in the museum, to a dedicated new building nearby.[39] The Library's collection had hitherto been housed in a courtyard space contained by the museum's four wings, with its Reading Room, and circular building at the centre of this. These spaces can be seen only on earlier maps of the museum (see Fig 54 and Fig 55); the later, more schematic maps do not include them, because they were not public areas.

The former courtyard became a large, glass-roofed space called The Great Court with the historic Reading Room at its centre (see Fig 65). The Great Court, which opened to the public in December 2000, contains shops, cafés, ticket and information desks, but it is primarily a public circulation space, which provides visitors with more options for accessing galleries and navigating the museum.

The changes obviously required a new visitor map, and the first iteration of this can be seen in Fig 66, from a guidebook published in 2000. Aside from the inclusion of The Great Court and Reading Room, and new spaces on the lower floors which were also part of the renovation, the map retains most of the design elements of the pre-renovation map. It has a ten-colour thematic coding system for galleries, and room numbers with a directory listing of their contents. There is a new nomenclature for the maps: the ground floor is now called the "main floor" and the basement "lower floors". However, there is still no attempt to explain graphically how the different floor levels relate and connect; although the stair symbols are larger and clearer than in the previous map, the floors are not visually aligned in any way, and having the Lower Floors map on the same page as the Upper Floors map, with the Main Floor on an adjacent page, may create confusion. However, the map does better explain that there is a small group of galleries effectively on separate levels, above the main upper floor (see Fig 67); on earlier maps, these galleries appear to be contiguous with the main upper floor.

39 The British Museum (2017). *The British Museum: About Us: the Museum's Story: Architecture: The Great Court*. [online] Available at <http://www.britishmuseum.org/about_us/the_museums_story/architecture/great_court.aspx> [Accessed 18 May 2017].

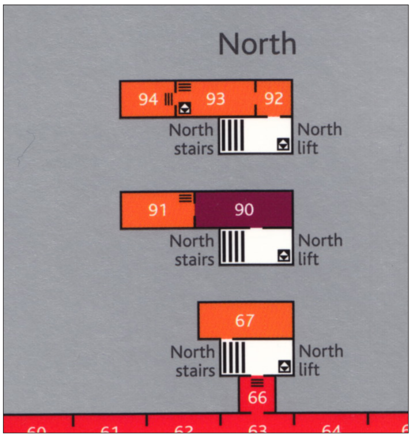


Fig 67. Detail of Upper Floors map, from British Museum (2000). *The British Museum*. London: Trustees of the British Museum. (at 90% actual size)

Fig 68. British Museum (2002). *The British Museum Map: Colour Plans and Visitor Information*. London: Trustees of the British Museum. (detail, at approximately 40% actual size, page size 135mm × 215mm)

Fig 69. Upper floors map, from British Museum (2002), *The British Museum Map: Colour Plans and Visitor Information*). London: Trustees of the British Museum. (detail, at 40% actual size, page size 135mm × 215mm)

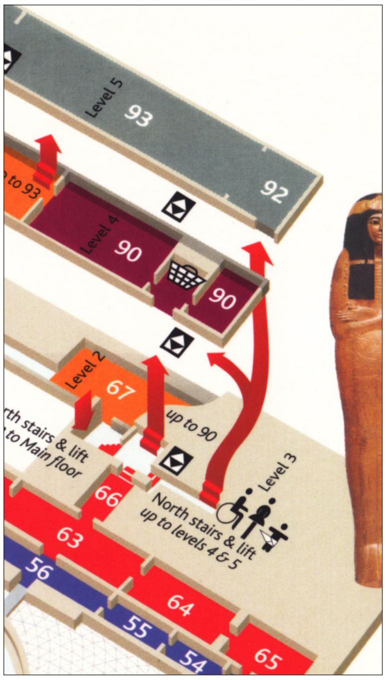


Fig 70. Detail of Upper floors map, from British Museum (2002), *The British Museum Map: Colour Plans and Visitor Information.* London: Trustees of the British Museum. (actual size)

A new map was produced in 2002, which, as far as can be established, is the only three-dimensional map of the museum that has been published. The map appeared first in a concertina-fold leaflet (see Fig 68), and depicted two "birds-eye"-type two-point perspectives. This projection attempts to better show the arrangement of a series of galleries that are above the upper floors (see Fig 69); the way these have been shown in earlier maps may have led visitors to mistakenly believe that these galleries are on the same level as the main upper floor. The three-dimensional map also employs an unusual graphic device, sweeping red lines with arrowheads, to show the origin and destination of the stairs. Examples of these can be seen in Fig 70, but are used throughout the map. There was no equivalent graphic depiction of the travel of the lifts, which are shown only as two-dimensional pictograms (also seen in Fig 70).

This map design is also notable for being the first of the British Museum to include images of key or highlight objects. The Upper floors map in Fig 69, for example, includes thumbnail photographs to indicate the location of five highlight objects. Also, for the first time in a British Museum visitor map since the early 1900s (see Fig 54), this map shows the full extent of the building, not just the public and exhibition spaces; non-public are spaces shown in a beige colour with no annotation. A further version of the map appeared in a guidebook, published the following year (Fig 71). The maps used in the guidebook were slightly smaller (even though the page size of the publication was larger) and used different colours to denote the themes of the exhibition areas. Also, it did not include the images of highlight objects, presumably because they were pictured and described within the book.

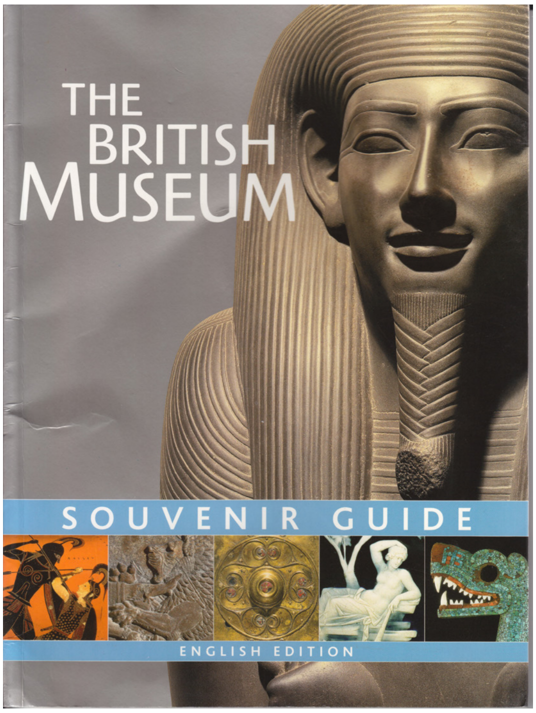


Fig 71. British Museum (2003). *The British Museum Souvenir Guide*. London: Trustees of the British Museum. (33% actual size, page size 210mm × 280mm)

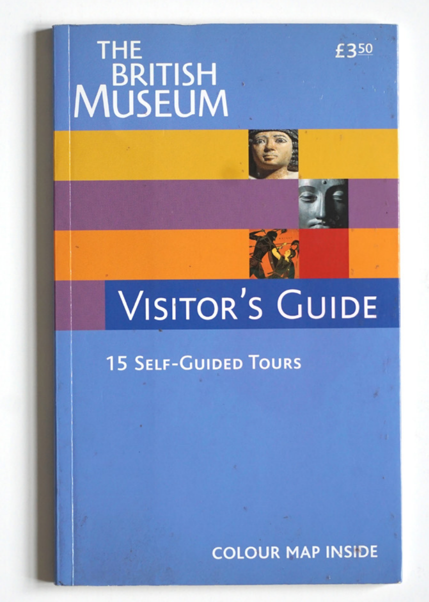


Fig 72. Reeve, J. (2003). *The British Museum Visitor's Guide*. London: Trustees of the British Museum. (at 33% actual size, page size 140mm × 225mm)

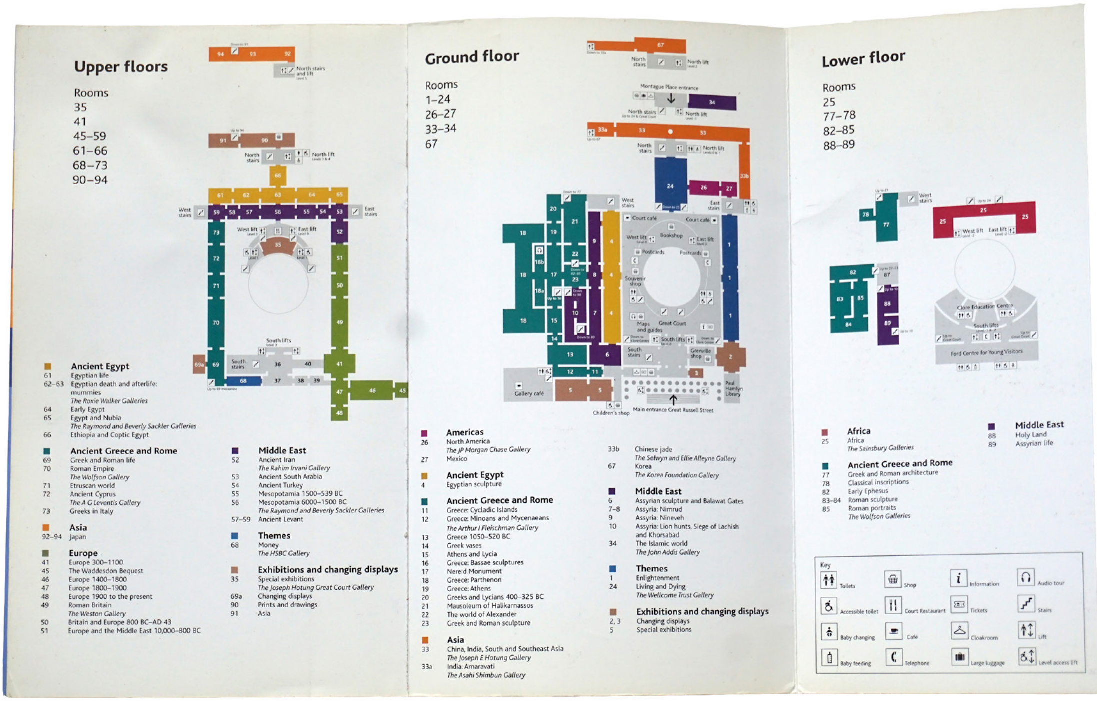


Fig 73. Upper floors, ground floor and Lower floor maps, from Reeve, J. (2003). *The British Museum Visitor's Guide*. London: Trustees of the British Museum. (at 40% actual size, total size 380mm × 225mm)

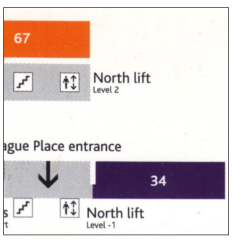


Fig 74. Detail of Upper floors map, from Reeve, J. (2003). The British Museum Visitor's Guide. London: Trustees of the British Museum. (actual size)

However, this three-dimensional map was apparently short-lived: later in 2003, a new guidebook was published (Fig 72), with a new two-dimensional map. The map largely reverted to a style used in previous relatively recent maps such as that published in 2000 (Fig 66): depicting only the gallery spaces, and not the full extent of the museum building, with the long-standing thematic colour coding and a numbered key with a directory of the individual rooms (Fig 73). And, again, the smaller gallery spaces that are on a separate level from the main ground floor and upper floor levels appear as unconnected spaces (though with pictograms for stairs and lifts). A new feature of this map is that there is an explanation of the floors served by particular lifts, in which levels are identified by a number (from Level –2 to Level 5) (Fig 74). However, this floor level naming system is not used elsewhere in the guide, either on the maps or in the text.

This style of map has been used for many years, and was still in use at the time of writing, in a variety of formats: as well as in printed material for visitors, it was used as wall- or totem-mounted you-are-here maps within the museum (see Fig 75), and on the museum's website (from the early to mid-2000s). A monochrome version of the map was produced around 2015, for download from the museum's website, and as a free, single folded sheet handout, while the colour map was included in the museum's paid-for guides. Without the colour coding, the free map lost the description of the thematic arrangement of galleries and therefore lost some functionality. The most recent versions of the monochrome map include a number of highlight objects ("Don't miss"), with their locations marked with a black-on-orange letter key (Fig 76).

Fig 75. You-are-here totem map, Great Court, British Museum, 2016

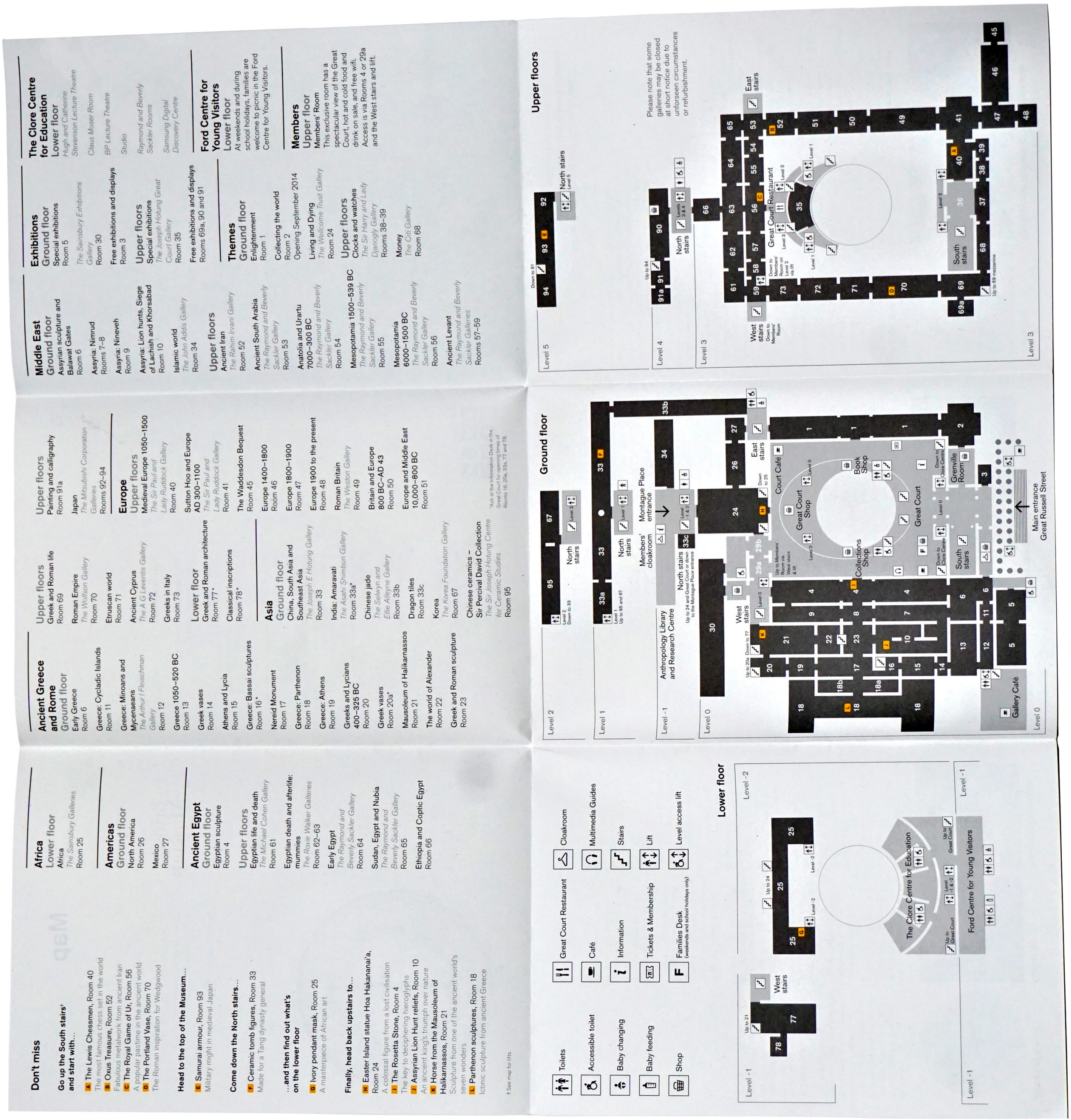


Fig 76. Floor plans, 'Don't miss' and gallery list, from *The British Museum: Map* (2014). London: Trustees of the British Museum. (at 33% actual size, sheet size 441mm × 420mm)

The development of maps at two museums: discussion

In several respects, the V&A and the British Museum have much in common. They are contained in large, complicated buildings that have been extended and reconfigured over more than 100 years; they hold large collections of objects that are very varied in their type and theme; they attract millions of visitors from around the world each year; and they are free to enter (though this was not always so for the V&A). They have both also produced maps for visitors for a very long time, beginning in the mid- to late-19th century.

Both institutions have produced a wide variety of designs of map over the years. The development of these reveal differences in each museum's institutional culture, and by extension, their approach to visitor information and improving the visitor experience. They also reveal common challenges that the institutions faced in clearly and concisely explaining their spaces and arrangement of displays within the constraints of a portable document.

The V&A appears to have been more adventurous in its designs of map over the years. For example, *The Red Line Guide* from 1906 (Fig 17) is an early example of a map that graphically describes a trail through the museum, while the 2004 "tube-map" style map (Fig 45) represented a bold, if largely unsuccessful, experimental approach. The V&A's map designers used a range of colour-coding systems and ways of showing how the complicated multi-level building was arranged. Perhaps also because it is a museum of design, it also engaged specialist graphic design and wayfinding consultants and agencies to produce maps (for example, Pentagram in the late 1980s, and Holmes Wood from 2003 until 2016).

In contrast, most of the British Museum maps show a consistent approach to depicting the building and its displays. Apart from the more illustrative perspective map in the early 2000s (Fig 69), the maps have been two-dimensional floor plans of similar design, with detail differences, and allowing for changes in the building (notably the major renovation in the late 1990s). The system for explaining the themed display areas of the museum also changed little as various iterations of the map were produced. In many of the maps reviewed, this involved a colour-coding system using so many colours (typically nine or ten) that users of the map may have had difficulty distinguishing different areas. The British Museum maps appear to have a less sophisticated graphic and typographic design than those of the V&A. (With one exception, it has not been possible to establish who was responsible for designing the British Museum maps.)

Finally, most of the British Museum maps examined exist within guidebooks of varying size and detail, and it seems that standalone maps were only made available to visitors relatively recently. The V&A has produced standalone maps for a longer time, at least since the 1980s. This is possibly due to the legacy of visiting protocols at the two museums. The British Museum, has

been since its inception free to enter and open to anyone (not, for example, just scholars, as was often the case with other museums prior to the 20th century). As mentioned previously, the British Museum initially could only be visited by guided tour; this eventually gave way to self-guided visits (that is, unescorted, but with a guide book). The issue of cost of entry may also play a role in the type of map provided for visitors – the British Museum has always been free to enter, while the V&A has had periods of charging for entry (though it has been free since 2001)[40]. It is common in museums that charge for entry to provide a basic guide or map as part of the ticket price, while conversely, there is evidence that some visitors are more likely to pay for a guidebook if they have not had to pay to enter a museum.[41]

Regardless of the two museums' similarities and differences, the various iterations of map produced by both reveal some ongoing issues and challenges that the designers of the maps faced.

Several issues relate to the depiction of an irregular building, that is, a building with floor levels of different sizes and shapes, including half-levels, with the resulting complication of having stairs, lifts and ramps that do not serve all floors, or do not necessarily lead to levels and building users might expect.

Dealing with this issue begins with a naming system for the floor levels in the building. Among the V&A maps analysed for this chapter, there are nearly as many floor-naming conventions, including ones based on text descriptions (for example, "ground", "upper"), numbers (1,2,3) and letters (A,B). Further, the actual number of floors into which the museum is divided varies from two to seven. The British Museum, a slightly less complicated building, has fewer variations, using only word descriptions for the levels, though in some cases describing the entrance level as "ground" and in some cases "main". However, later maps use the plural "upper levels", (rather than the singular "level"), to reflect the fact that the northernmost galleries are in fact a flight of stairs above the main upper level of the museum.

More significant is the large variety of ways in which the museums have attempted to show the location of stairs and lifts, and to describe where these stairs and lifts lead. The different approaches here reveal designers' dilemma of balancing clarity with detail. So, for example, early maps of both institutions used a relatively simple stair symbol (a series of usually parallel lines, representing the treads) and/or a text label of "stairs" or "stairway", but generally with no indication of the destination or direction of the stairs. In an attempt to remedy this, a map of the V&A published in 1969 used a combination of colour, directional arrows, and text destination information for each staircase (Fig 37).

40 Museums Association (undated). *Museums Association: Campaigns: Free admission and the Lottery*. [online] Available at <http://www.museumsassociation.org/campaigns/free-admission-and-the-lottery> [Accessed 13 May 2015]

41 Martin, A. (2003). *The Impact of Free Entry to Museums*. London: MORI. **8**. Available at <https://www.ipsos.com/ipsos-mori/en-uk/impact-free-entry-museums> [Accessed 13 May 2015]

However, the clarity of this information was compromised by an unorthodox map style. Most subsequent V&A maps used a variety of graphic techniques to give users an idea of the destination of each staircase, such as the floor level to which it led (for example, Fig 42, Fig 46).

British Museum maps have provided less information about the destination or direction of stairs. The earliest available British Museum map that provided such information was published in 1989, and included text next to each staircase indicating direction (down or up) and the numbered room(s) to which they led (Fig 63). More radical was the three-dimensional map from 2002, which used a series of three-dimensional arrows to show how the stairs connected the different floor levels, with little actual representation of the stairs (Fig 70). Subsequent maps reverted to a stair pictogram, usually with adjacent destination text.

The size of the map and the size and shape of the document within which it is contained varies greatly among the corpus examined for this chapter, from both museums. This also reveals a design challenge in terms of making the map readable while making it physically manageable. At one extreme is the British Museum map of 1967 (Fig 57), which is large enough, with large type, to be easily read but, when unfolded to its full extent of nearly a half a metre square, is unwieldy to use during a visit to the museum. The smallest map, also of the British Museum, on the back cover of a guide booklet, has two floor plans (ground and upper floors) on a page of approximately A5 size (Fig 55), rendering the text labels and, particularly, the key numbers that describe the gallery contents, difficult to read for many users. This is likely to be particularly so when the guide is being used during a visit, that is, when moving around the museum and when reading distance and lighting levels may not be the same as for static reading.

One issue in relation to these maps that is unclear is what motivated the map designers to produce the maps in the way they did. This relates to who commissioned and contributed to each map, in particular what specific information was to be included on the map – and whether this was informed by any evidence, for example, from visitor research or other research about map use. There is very little available evidence in this respect. The sole exception is the V&A map of 2004 (Fig 45), which was subject to some user testing in late prototype stages, and is discussed in the following chapter.

Conclusion and discussion

The first part of this chapter consisted of an analysis of a corpus of contemporary museum maps in order to establish what types of information maps are attempting to convey to museum visitors, and the graphic means used to do that. The findings reveal a huge variation in the design and appearance of museum maps, which is due to a complex inter-relationship of factors, including the type of museum, what the museum wants the map to achieve for visitors, and what the map designers believe is the best way of doing that. It is clear from the corpus of maps that there are many possible design approaches and options, and that there is no single ideal solution for any museum, whatever its type or size. For example, the analysis of the types of building projection (2D, 3D and so on) reveals that there are advantages and disadvantages to all types, and that for many museums, there may not be an optimum one. Designers' rationales for using one type over the other are not known

The latter part of the chapter took a different view of museum maps. Instead of analysing maps of a range of different museums, it considered the range of maps produced over a period of time for two specific museums. As with the first analysis, this revealed a wide range of design styles and approaches – so much so that certain designs may not, at first glance, even appear to represent the same museum. Since the maps spanned a period of more than 100 years, some of the differences can be due to changes in the economics and technology of print production, notably the advent of digital design capabilities. But much of the difference is likely to be down to different designers' attempts to render the large and complicated buildings to make them as easy as possible for museums visitors to understand. In particular, it is clear from the many different ways that stairs and lifts are depicted and annotated that circulation systems throughout these buildings are a major challenge for map designers. Some of the differences are also evidently due to different approaches to the way the museums wish to present or describe their displays and exhibits.

Museum maps can mostly be considered items of ephemera. As such, it is rarely obvious who was responsible for designing them, and also little is apparently documented about the process that led to the final published form. For example, it is not clear whether design decisions were made on the basis of any evidence from visitor research at the museum, or research into wayfinding and map use more generally. Similarly, it is not possible to identify the role museums' curatorial (or other) staff had in the maps' designs: whether, for example, the museum commissioned a map design to a detailed brief about what the map must include or not include or, alternatively, whether the designers were primarily responsible for those decisions.

The following chapter considers research that has a bearing on museum map design, from general research into wayfinding and navigation behaviour to more specific research into visitor behaviour in museums.

Chapter 4: Existing research relevant to the design and use of museum maps

Contents

What is known about museum navigation and map use

The previous chapter considered the variety of graphic styles and elements used in a range of contemporary museum maps, and related these to four distinct functions of museum maps.

This chapter considers research and published literature relevant to how museum maps are designed. It first considers research into indoor wayfinding. There is a large amount of research into wayfinding in buildings, in environments other than museums: hospitals (and other healthcare environments), office buildings, and transport hubs (such as airports and railway stations). Whereas the prime motivation for improving wayfinding systems in museums is to improve the visitor experience, in these other environments there can be more serious or urgent motivations. In an airport or railway station, effective wayfinding is critical in order for travellers to reach their gate or platform quickly and do not miss their plane or train; in a hospital, it can be to ensure that staff can reach a patient, or a patient can reach help quickly in what can literally be a life-and-death situation.[1] Another motivation for improving wayfinding in buildings is to reduce the amount of time spent by the people who work there helping lost visitors; Zimgring found, for example, that in hospital, staff spent 4,500 hours per year – the equivalent of two full-time staff posts – directing and escorting lost patients and visitors.[2] Therefore, the focus of research can be different in different environments. But in all cases, of course, there is a general aim to minimise the chances of building users getting lost, or feeling confused about where they are, or where they are going.

Having considered some of the research (and types of research) into indoor wayfinding, this chapter considers research in museums into how visitors behave. It begins with a general discussion of visitor research, which has been undertaken in museums for at least 90 years. Much of this research is concerned with how visitors move through a museum, with a focus on the characteristics of exhibition layouts, and the presentation of individual displays that attract visitors (and hold their attention). However, some of this research also includes insights into wayfinding and orientation.

The chapter then looks more closely at the general areas of research that are most relevant to the issue of museum map design: research that has a specific aim of understanding wayfinding behaviours (and associated problems in museums). Finally, it also considers the limited amount of research that has looked specifically at the design of museum maps.

1 Carpman, J.R. and Grant, M.A. (2002). Wayfinding: a Broad View. In Bechtel, R. and Churchman, A. (eds). *Handbook of Environmental Psychology*. New York: John Wiley & Sons. **428**.

2 Zimring, C. (1990). *The Costs of Confusion: Non-Monetary and Monetary Costs of the Emory University Hospital Wayfinding System*. Unpublished manuscript, cited in Ulrich, R. and Zimring, C. (2004). *The Role of the Physical Environment in the Hospital of the 21st Century: a Once-in-a-Lifetime Opportunity*. Concord, California: Center for Health Design. Available at <http://www.imaginewhatif.com/wp-content/uploads/2010/10/FutureHospitalPhysicalEnvironment.pdf> [Accessed 27 October 2017]

Research into indoor wayfinding and orientation

Kevin Lynch's 1960 book, *The Image of the City*,[3] marked the beginning of research into people's navigation of spaces and introduced the word "wayfinding". Although the studies that formed the basis of the book were broader – about the way people perceive and describe the urban environment, not just how they navigate it – it did herald a new era of study in this field. Many studies in the late 1960s and 1970s focused on people's memory of the spatial layout of urban spaces,[4] and this was followed, from the 1980s, by research that looked at people's navigation experiences in buildings and other indoor settings.

Carpman and Grant describe six types of such wayfinding research:[5]

- how humans perceive the environment
- theories about the process of wayfinding
- experiments to test different wayfinding strategies
- the influence of environment features, such as building configuration
- wayfinding differences by type of user (gender, age, disability or cognitive impairment), and
- "post-occupancy studies": investigating wayfinding issues in specfic buildings, or the effectiveness of wayfinding aids, such as maps and signs.

The types of research that are most relevant to museum map design are those in the final type, not least since map design is almost always a "post occupancy" exercise: maps are produced to describe existing spaces, rather than being produced at a point where they can influence the design of the space. Nevertheless, some of the other categories of research can provide insights that may influence how maps are designed.

Research into types of wayfinding behaviour and individual difference has demonstrated how wayfinding abilities vary from person to person. Kozlowski and Bryant, for example, found that there was a relationship between people's judgement of their own "sense of direction" and their performance in wayfinding tasks.[6] This conclusion was broadly confirmed by Kato and Takeuchi, with the added finding that this was possibly due to participants with a good sense of direction making more flexible use of different wayfinding strategies.[7]

Weisman produced early and influential research into the influence of environmental features, investigating "architectural legibility", which he defines as "the degree to which a building facilitates the ability of users to find their way

3 Lynch, K. (1960). *The Image of the City*. Harvard: Massachusetts Institute of Technology Press

4 Gärling, T., Lindberg, E. and Mäntylä, T. (1983). Orientation in Buildings: Effects of Familiarity, Visual Access, and Orientation Aids. *Journal of Applied Psychology*. 68:1. **177**.

5 Carpman, J.R. and Grant, M.A. (2002). **430-431**.

6 Kozlowski, L.T. and Bryant, K.J. (1977). Sense of Direction, Spatial Orientation, and Cognitive Maps. *Journal of Experimental Psychology: Human Perception and Performance*. 3:4. **590**.

7 Kato, Y. and Takeuchi, Y. (2003). Individual Differences in Wayfinding Strategies. *Journal of Environmental Psychology*. 23:2. **171**.

within it".[8] Weisman conducted experiments in which participants were given wayfinding tasks in buildings and then asked about their experience, including whether they got lost and how easy they thought the building was to navigate. He identified four "environmental variables" that influence wayfinding ability in buildings: visual access (how much of the building can be seen through or out of); the provision of signage; architectural differentiation (how similar or different various parts of a building look); and plan configuration (the overall layout of the building).[9] Among his conclusions is that, for a "substantial minority" of people, "successful wayfinding is a problem". He also found that familiarity with an environment (ie, by regular users of a building) can be either helpful or unhelpful: in some locations, it improves wayfinding performance, in others, it has the opposite effect, simply providing more "opportunities" to become lost.[10] This finding appears to have been confirmed by Moeser in a study in a hospital that compared the ability of staff members with that of new visitors to develop cognitive maps of the building.[11] Despite their long-time experience of using the building, the staff members had not necessarily developed more accurate cognitive maps than the inexperienced users.

O'Neill's studies of wayfinding in a series of university buildings also considered architectural legibility.[12] He found that the more complex a building's floor plan, the worse people's wayfinding performance. O'Neill also considered the effect of signage on wayfinding performance, and its relationship to floor plan complexity. He found that signs with graphics increased the speed of participants' journeys through a building, but that signs with text were better at reducing wayfinding errors (such as wrong turns). Nevertheless, he concluded that floor plan complexity had a greater effect on wayfinding performance than signage.

A development of the study of architectural legibility can be seen in space syntax, which is a theory of space and a set of analytical, quantitative and descriptive tools for analysing the layout of space in buildings and cities.[13] In practical terms, it can be used to describe how people will inhabit and move around spaces (such as visitors to a museum). In this context, space syntax theory has been used to predict where visitors to the Tate Britain, London, will congregate, information that the museum can use to arrange exhibits to encourage the flow of visitors, and avoid bottlenecks and logjams.[14]

8 Weisman, J. (1981). Evaluating Architectural Legibility: Way-finding in the Built Environment. *Environment and Behavior*. 13:2. **189**.

9 ibid. **191**.

10 ibid. **200-201**.

11 Moeser, S.D. (1988). Cognitive Mapping in a Complex Building. *Environment and Behavior.* 20:1. **21**.

12 O'Neill, M.J. (1991). Effects of Signage and Floor Plan Configuration on Wayfinding Accuracy. *Environment and Behavior*. 23:5. **553**.

13 Hillier, B. and Tzortzi, K. (2006). Space Syntax: the Language of Museum Space. In Macdonald, S. (ed). *A Companion to Museum Studies*. Oxford: Blackwell Publishing. **282**.

14 Ellard, C. (2009). *You are Here: Why We Can Find Our Way to the Moon, but Get Lost in the Mall*. New York: Doubleday Books. **165**.

Research into use of wayfinding tools

Research into wayfinding tools generally focuses either on a particular aid, and how effective it is, or the relative effectiveness of different types of aid in a particular environment.

Signage is probably the most common wayfinding aid, though its effectiveness relies on the quality and consistency of signage. Carpman et al, for example, in a study in a hospital, found that, as the number of signs in a hospital hallway increased, wayfinding performance decreased,[15] and Beaumont et al's evaluation of orientation and wayfinding in an office building found that visitors to the building who had used signs (or directories) reported as many problems finding their destination as visitors who did not.[16]

In a different context, Meilinger and Knauff considered the relative effectiveness of using a map and following verbal directions in finding a destination. Their research was in an urban environment, not an indoor space, but museums in particular are spaces where asking for directions is a likely wayfinding strategy, given most museums have staff (or volunteers) for whom giving directions is part of their job. Meilinger and Knauff concluded that neither method was more effective than the other.[17]

Levine and Montello both conducted studies of fixed you-are-here maps, evaluating the particular problem of the orientation of the map, which is critical if users are to be able to use it to orientate themselves in the space depicted.[18, 19] This presents a particular difficulty for indoor you-are-here maps, because it may be virtually impossible to fix the map in the correct orientation for the point at which it is being viewed, due to the design of the building.

Butler et al looked more broadly at you-are-here maps as wayfinding aids. In their study of an indoor you-are-here map, they found that newcomers to a building were actually slower at wayfinding using this map than they were with no wayfinding assistance at all.[20] They also compared participants' wayfinding speeds using signs with the you-are-here map, and found that the signs resulted in them reaching their destination faster, which they suggest is due to the fact

15 Carpman, J.R., Grant, M.A. and Simons, D.A. (1984). *No More Mazes: Research About Design for Way Finding in Hospitals. Patient and Visitor Participation Project*. Ann Arbor, MI.: University of Michigan Hospitals. In Zwaga, H., Boersema, T. and Hoonhout, H. (eds). (1998). *Visual Information For Everyday Use: Design And Research Perspectives*. Boca Raton: CRC Press. **229**.

16 Beaumont, P.B., Gray, J., Moore, G.T. and Robinson, B. (1984). Orientation and Wayfinding in the Tauranga Departmental Building: a Focused Post-occupancy Evaluation. In Duerk, D. and Campbell, D. (eds). *The Challenge of Diversity*. St Paul: Environmental Design Research Association. **77-90**.

17 Meilinger, T. and Knauff, M. (2008) Ask for Directions or Use a Map: A Field Experiment on Spatial Orientation and Wayfinding in an Urban Environment. *Journal of Spatial Science*. 53:2. **13-23**. doi: 10.1080/14498596.2008.9635147

18 Levine, M. (1982). You-Are-Here Maps: Psychological Considerations. *Environment and Behavior*. 14:2. **221-237.**

19 Montello, D.R. (2010). You Are Where? The Function and Frustration of You-Are-Here (YAH) Maps. *Spatial Cognition & Computation*. 10:2-3. 94-104. DOI: 10.1080/13875860903585323

20 Butler, D.L., Acquino, A.L., Hissong, A.A. and Scott, P.A. (1993). Wayfinding by Newcomers in a Complex Building. *Human Factors*. 35:1. **159**.

that signs require little study time and low "memory load". However, they point out that the test task was relatively simple and, in a complex environment, with many possible destinations, this finding may not hold true.[21] There is no mention in the study of printed paper maps, for which memory load, if not study time, would be different from a you-are-here map.

Research by Devlin and Bernstein primarily focused on examining whether there were differences in wayfinding performance by men and women (an area also examined by other researchers, such as Lawton and Kallai[22] and Chen et al[23]). However, they also came up with some more general conclusions about wayfinding performance: when using a map to undertake a wayfinding task in a computer-based simulation, wayfinding errors were significantly reduced when the map included landmarks.[24]

Much of the more recent research into wayfinding and map use has, not surprisingly, been related to screen-based digital maps, including the dynamic three-dimensional (virtual reality-type) representations, most widely seen in vehicle navigation devices that use GPS (global positioning system) technology. Ishikawa et al compared pedestrian wayfinding accuracy and speed using paper maps and a GPS-based mobile navigation device, and found that the GPS users travelled further, took longer and made more errors.[25] Boumenir et al compared people's ability to follow a route after looking at it on a two-dimensional map and a three-dimensional virtual reality environment, and found the map much more effective, concluding that this was because the virtual environment gave inaccurate representations of scale and distance.[26] Both these studies were in outdoor environments, and how much their findings may be replicated in indoor environments is not known. This may be the subject of future research, especially if indoor digital wayfinding systems (for example, on smartphones) become more widely used.

21 ibid. **163**.

22 Lawton, C.A. and Kallai, J. (2002). Gender Differences in Wayfinding Strategies and Anxiety About Wayfinding: a Cross-Cultural Comparison. *Sex Roles*. 47:9-10. **389-401**.

23 Chen, C.H., Chang, W.C. and Chang, W.T. (2009). Gender Differences in Relation to Wayfinding Strategies, Navigational Support Design, and Wayfinding Task Difficulty. *Journal of Environmental Psychology*. 29:2. **220-226**.

24 Devlin, A.S. and Bernstein, J. (1995). Interactive Wayfinding: Use of Cues by Men and Women. *Journal of Environmental Psychology*. 15:1. **23**.

25 Ishikawa, T., Fujiwara, H., Imai, O. and Okabe, A. (2008). Wayfinding with a GPS-based Mobile Navigation System: a Comparison with Maps and Direct Experience. *Journal of Environmental Psychology*. 28:1. **74-82**.

26 Boumenir, Y., Georges, F., Rebillard, G., Valentin, J. and Dresp-Langley, B. (2010). Wayfinding Through an Unfamiliar Environment. *Perceptual and Motor Skills*. 111:3. **829-847**.

Museum visitor behaviour research

The earliest formal research into visitor behaviour in museums is believed to have been published 80 years ago,[27] though such studies have been widely undertaken for decades. There are professional organisations and groups dedicated to the area (such as the Visitor Services Group in the UK[28] and the Visitor Studies Association in the US[29]), and peer-reviewed journals dedicated to the subject (such as *Visitor Studies*)[30].

Bitgood describes four areas of visitor research:[31]

- **audience research**, which is concerned with why people visit a museum (or do not visit – for example in Trevelyan's study[32]), people's impressions of the museum, how leisure values relate to visiting patterns and satisfaction
- **exhibit and programme evaluation/development**, which can be during the planning stage ("front-end" evaluation), during the preparation stage ("formative" evaluation), or after installation ("remedial" or "summative" evaluation)
- **orientation and circulation**, which includes information and "delivery devices" for visitors ahead of their visit, wayfinding, and circulation ("patterns of movement through museum settings"), and
- **visitor services**, also described as "customer relations" issues.

Any research that may be relevant to map design falls within the "orientation and circulation" area. However, these categories are not discrete (and Bitgood states that "it is important to emphasise that they [the four areas] must all work together to make a successful museum environment"[33]). Research into maps and their usefulness may also come within the "audience research" and "visitor services" areas.

Bitgood (an academic, rather than a practising museum professional) states that "audience research… is most clearly associated with marketing and publicity, and professionals who conduct these types of studies are often marketing firms or marketing departments within a museum". This may be true, but there are other departments, including those devoted to visitor experience and curating, that have a strong interest, too.

27 For example, Robinson, E. (1928). *The Behavior of the Museum Visitor*. New Series No. 5. Washington, DC: American Association of Museums.

28 Visitor Services Group (2015). [online] Available at: <http://visitors.org.uk/> [accessed 9 February 2015]

29 Visitor Studies Association (2015). [online] Available at: <http://www.visitorstudies.org/> [accessed 9 February 2015]

30 Available at http://www.tandfonline.com/loi/uvst20#.VroWoim2945

31 Bitgood, S. (2002). Environmental Psychology in Museums, Zoos and Other Exhibition Centers. In: Bechtel, R., and Churchman, A. (eds). (2002). *Handbook of Environmental Psychology*. New York: John Wiley & Sons. **466**

32 Trevelyan, V. (1991). *'Dingy Places with Different Kinds of Bits': an Attitudes Survey of London Museums Amongst Non Visitors*. London: London Museums Service.

33 ibid.

Visitor types

A specific area of visitor research that has been investigated by many museums and researchers is visitor categorisation and segmentation: developing systems as a means for identifying target audiences. In some cases, they are market research tools, which museums use in order to improve their visitors' experiences, and attract types of people who do not visit their museum.[34, 35]

Early research of this type tended to categorise visitors in demographic terms, such as by age, income, occupation, education and ethnicity. But, although these can generate some identifiable patterns and trends, researchers have questioned how meaningful this type of data is – for example, Falk found that race/ethnicity, age and education were poor predictors of who did or did not visit a particular museum.[36]

More recent research has taken a more sophisticated approach to describing and categorising groups of visitors. An example of this is the "culture segments" model developed by the cultural strategy consultancy Morris Hargreaves McIntyre, which it says can help museums "target people more accurately, engage them more deeply and build lasting relationships [with visitors]". Their model comprises eight segments – Enrichment, Entertainment, Expression, Perspective, Stimulation, Affirmation, Release and Essence – which take account of people's wealth and spending habits, likes and dislikes, and the "needs they are looking to fulfill".[37] Falk and Dierking's categorisation system focuses more on visitors' approaches and their relationship to the museum and displays. Their system, when first reported in 1992,[38] included five categories: Explorers, Facilitators, Professionals/hobbyists, Experience Seekers and Rechargers. They later added two more categories, Respectful Pilgrims and Affinity Seekers, which they say was the result of developments in museums, rather than developments in their thinking about museum visitors – specifically the "growth of... museums devoted to specific national, ethnic/racial or affinity groups".[39]

Another means of categorisation considers the characteristics of the museum visit, rather than the visitor, sometimes called visiting modes. This system acknowledges that museum visitors are, in Rounds' words, "strategic agents",[40] and

34 Dawson, E. and Jensen, E. (2011) Towards A Contextual Turn in Visitor Studies: Evaluating Visitor Segmentation and Identity-Related Motivations. *Visitor Studies*. 14:2. **128**. DOI: 10.1080/10645578.2011.608001

35 Muse Marketing Strategy (undated, 2011?). *Audience Insight Research and Non Visitor Recruitment Strategy*. [Unpublished report]. London: Muse Marketing Strategy.

36 Falk, J. (2012). Reconceptualizing the Museum Visitor Experience: Who Visits, Why and to What Effect?. In Anderson, G., ed. *Reinventing the Museum: the Evolving Conversation on the Paradigm Shift*. Lanham; New York; Toronto; Plymouth: Alta Mira Press. **320**

37 Morris Hargreaves McIntyre (2016). *Culture Segments*. Manchester: Morris Hargreaves McIntyre. Available at <https://mhminsight.com/articles/culture-segments-1179>. [Accessed 28 August 2017].

38 Falk, J.H. and Dierking, L.D. (1992). *The Museum Experience*. Washington, DC: Whalesback Books

39 Falk, J.H. and Dierking, L.D. (2013). *The Museum Experience Revisited*. Walnut Creek: West Coast Press. **48**

40 Rounds, J. (2004). Strategies for the Curiosity-Driven Museum Visitor. *Curator: The Museum Journal*. 47:4. **391**

their visiting behaviour varies depending on such things as their familiarity with the museum, who they are visiting with, and their expectations of and motivations for a visit (for example, their level of interest in the museum's subject, and whether they are expecting a primarily educational or entertaining experience).[41] James suggests ten examples of visitor mode: learning families, kids-first families, aficionados, actualisers, sensualists, researchers, self improvers, sightseers, urban cool and social spacers.

None of these visitor segments or visit modes directly addresses how visitors navigate or orientate themselves in a museum (including how – or whether – they use maps), though one may speculate on the connections. Some other studies do address navigation strategies more directly. For example, Klein suggests three types of visitor, largely based on how long they spend in a particular part of the museum:

- **streakers**, who move quickly through an area
- **strollers**, who tend to move at a more leisurely pace, and
- **studiers**, who spend the most time in an area or exhibit.[42]

Tzortzi suggests four visitor modes, defined by visitors' movement patterns:

- **space-driven** visitors, who traverse the middle of rooms and stand at locations providing a wider view of space or groups of objects
- **object-driven** visitors, who move at the periphery of rooms and stand close to individual objects
- **browsers**, who scan space and browse objects on display while moving in the middle of spaces, and
- **eclectic** visitors, who engage with selected objects only, stopping more frequently at certain rooms and less at others.[43]

In terms of practical applications, both these systems are primarily aimed at museum or exhibition designers, rather than map or wayfinding designers. There may be implications for wayfinding and map design arising from them, but they are not addressed by the authors.

As mentioned earlier in this thesis (see Chapter 3), there are similarities between museums and shopping centres, and the considerations relating to the design of maps for these types of location. Research into shopper orientation and navigation behaviour may also provide insights into the behaviour of museum visitors. Gil et al observed and analysed shoppers' behaviour in a supermarket and from that devised five movement patterns of shoppers:

- **the specialist**, who focuses on a few products, interacting with them for a long time (but not necessarily buying)
- **the native**, who makes a long visit, visiting only relevant aisles, and is more

41 James, E. (undated). Visit Modes. [online] Available at: <https://mhminsight.com/articles/visit-modes-2526> [Accessed 14 December 2015].

42 Klein, L. (1986). *Exhibits: Planning and Design*. New York: Madison Square Press. **17**

43 Tzortzi, K. (2007). *The Interaction Between Building Layout and Display Layout in Museums*. PhD thesis. University College London. **160**

likely to purchase

- **the tourist**, who is a fast-moving shopper who prefers main corridors but does not go far from the entrance, and is looking more than buying
- **the explorer**, who makes the longest visits, going everywhere more than once, slowly, with long interactions, and buying a lot
- **the raider**, who is a fast shopper, both in moving and in making decisions, with a clear preference for main corridors.[44]

At a superficial level, these shopper categories appear to mirror somewhat the segments and modes mentioned above. However, it is difficult to say how far the parallels between shoppers and museum visitors extend, in particular since this research makes clear distinctions between navigating the environment and buying items, for which there is no direct equivalent in a museum.

Research into visitor navigation and orientation in museums

Robinson's study in 1928 was a seminal piece of research, investigating how long visitors spent in the exhibition rooms of an art gallery, the number of pictures they stopped at and how long they spent looking at each picture.[45] Variations on this approach have been the subject of numerous studies since then, and are now considered to be "an important part of understanding the visitor experience".[46]

The simplest such "timing and tracking" studies use a pen-and-paper method, in which observers record visitors' movements and behaviour by making notes (and timings, where relevant) as they follow them, or watch them move, through the museum. However, the presence of an observer is problematic. Observing visitors surreptitiously can be difficult in practical terms (by having to watch and make notes while not allowing the subject to be aware of this), and raises ethical concerns about consent and privacy – an issue even when the earliest studies were undertaken. When tracking is done with the visitor's consent, it creates problems of research quality, since, as Alt found, visitors behave differently when they know they are being observed.[47] Some researchers devised novel techniques which partly overcame these problems, including measuring the popularity of individual displays by counting the number of noseprints on glass display cases each day, assessing the wear of floor tiles around particular exhibits,[48] and using a sensing device built into the floor

44 Gil, J., Tobari, E., Lemlij, M., Rose, A. and Penn, A.R. (2009). The Differentiating Behaviour of Shoppers: Clustering of Individual Movement Traces in a Supermarket, in Koch, D., Marcus, L. and Steen, J. *Proceedings of the 7th International Space Syntax Symposium*. Stockholm: Royal Institute of Technology. Available at < http://www.sss7.org/Proceedings/09%20New%20Modes%20of%20Modelling%20and%20Methodological%20Development/036_Gil_Tobari_Maia_Rose_Penn.pdf> [Accessed 12 February 2016].

45 Robinson, E. (1928). *The Behavior of the Museum Visitor.* New Series No. 5. Washington, DC: American Association of Museums.

46 Yalowitz, S. and Bronnenkant, K. (2009). Timing and Tracking: Unlocking Visitor Behavior. *Visitor Studies*. 12:1. **48**

47 Alt, M.B. (1982). *A Cognitive Approach to Understanding the Behaviour of Museum Visitors.* PhD. Institute of Education, University of London. **52**

48 Webb, E.J., Campbell, D.T., Schwartz, R.D. and Sechrest, L. (1966). *Unobtrusive Measures: Nonreactive Research in the Social Sciences* (Vol. 111). Chicago: Rand McNally, cited in Alt (1982).

(a hodometer) which records the location and number of footsteps.[49] However, these techniques and devices do not allow for any tracking element in a study, ie, any assessment of how visitors move around a museum or gallery.

Technological developments have more successfully addressed the problem using various types of electronic audio-visual equipment to monitor and record visitors, which, just as importantly, allow for more efficient collection of data that is also more precise and richer in detail. Various studies have used time-lapse cameras[50] and video recording, though they are not without their own practical problems.[51] More recently, Yoshimura et al tracked visitors' movements through the Louvre Museum, Paris, by tracking their mobile phones using Bluetooth technology, which allowed them to gather large amounts of fine-grained, anonymised data on visitors' movements over a short period of time.[52]

Although timing and tracking studies focus on how people move through a museum, they are often not specifically concerned with wayfinding and navigation; they do not distinguish between deliberate, planned movement and random movements, or movement that are an attempt by visitors to orientate themselves. Yalowitz and Bronnenkant state that this type of study is best for "understanding how visitors are using the various elements of the exhibition. They can then evaluate whether the placement and combination of elements are working as expected."[53] As such, some studies (for example, Meijer and Scott[54]) are focused on a particular exhibition or gallery (and therefore one room, or a series of contiguous rooms), rather than on the museum as a whole, so the wider issue of wayfinding and orientation is not considered. Other studies (for example, Kirchberg and Tröndle[55]) use timing and tracking as part of broader investigations into visitors' motivations, expectations and experiences in museums.

Becker and Bechtol's study at the Natural History Museum of Utah is one timing and tracking study that did specifically consider wayfinding, concluding that "wayfinding was an issue in the museum […] many visitors indicated some confusion"[56] and "The biggest challenge to visits for some people… is finding their

49 Bechtel, R.B. (1967). Hodometer Research in Museums. *Museum News*. 45:7. 23-26. Cited in Alt (1982).

50 Shettel-Neuber, J. and O'Reilly, J. (1987). *"Now Where?" A Study of Visitor Orientation and Circulation at the Arizona-Sonora Desert Museum*. Jacksonville, AL: Center for Social Design.

51 Yoshimura, Y., Krebs, A. and Ratti, C. (2017). Noninvasive Bluetooth Monitoring of Visitors' Length of Stay at the Louvre. *IEEE Pervasive Computing*. 16:2. **26**

52 ibid.

53 Yalowitz, S. and Bronnenkant, K. (2009). **58**.

54 Meijer, R. and Scott, M. (2009). Tools to Understand: An Evaluation of the Interpretation Material used in Tate Modern's Rothko Exhibition. *Tate Papers* 11. Available at <http://www.tate.org.uk/research/publications/tate-papers/11/tools-to-understand-an-evaluation-of-the-interpretation-material-used-in-tate-moderns-rothko-exhibition>. [Accessed 15 March 2017].

55 Kirchberg, V. and Tröndle, M. (2015). The Museum Experience: Mapping the Experience of Fine Art. *Curator: the Museum Journal*. 58:2. **169-193**.

56 Becker, B.A. and Bechtol, E./Serrell & Associates (2013). *Natural History Museum of Utah Whole Museum Tracking Study*. [pdf] Available at <http://www.informalscience.org/whole-museum-tracking-study-natural-history-museum-utah>. [Accessed 27 January 2016]. **14**

way".[57] Meijer and Scott's study of visitors at the Tate Modern, London, drew on observations to devise four different ways that people moved around an exhibition:

- **browsing**: wandering aimlessly between works/resources
- **following**: a conscientious route-following approach
- **searching**: [displaying] more confidence, suggesting prior knowledge of the subject matter, and
- **choosing**: [displaying] the most confidence, actively picking works/resources of interest and engaging deeply.[58]

Another widely-used way of investigating museum visitor experiences (often used in combination with timing and tracking studies) is to survey visitors. This can be done via questionnaires, focus groups or in-depth interviews. One common method is the "exit interview", where visitors are asked about their visiting experience at the point of leaving the museum, but surveys may also be done at the beginning of a visit, or during a visit.

Much of this type of research does not specifically aim to assess wayfinding and orientation experiences, but in some cases, the study conclusions do refer to this, because participants (museum visitors) had mentioned the difficulties they had faced understanding how the museum is arranged, or how to find their way around. For example, a 1991 study that involved focus group discussions at 11 art museums in the US found that "Orientation (introductory information on how to organise the visit, what to see and how the museum is arranged) is a problem at all 11 museums".[59] And a 1982 study at the Metropolitan Museum of Art, New York, involving interviews with visitors, found that they were much more concerned about conceptual orientation information ("the kinds of objects in the museum in order to plan a visit") than they were about wayfinding information.[60] Becker's 2012 study at the Natural History Museum of Utah focused on how long visitors spent at the museum through questionnaires, and how this was related to demographics, but concluded that first-time visitors could "use more support in understanding their options for where to begin" and suggested further research on whether wayfinding in the museum could be improved.[61] Finally, in Serrell's meta-analysis of 38 exhibition evaluations, she noted that orientation was one of five key areas requiring improvement, an area

57 ibid. **90**

58 Meijer, R. and Scott, M. (2009).

59 Walsh, A. (ed) (1991). *Insights: Museums, Visitors, Attitudes, Expectations, a Focus Group Experiment*. Los Angeles: The J Paul Getty Trust. **18**

60 Wolf, R. (1982). *Visitor Information at the Metropolitan Museum of Art: a Conceptual Analysis*. [Unpublished report]. Cited in Loomis, R. J. (1987) *Museum Visitor Evaluation: New Tool for Management*. Nashville: The American Association for State and Local History. **163**

61 Becker, B.A./Serrell & Associates (2012). *Natural History Museum of Utah Whole Museum Stay-Time Study*. Available at <http://www.informalscience.org/sites/default/files/2015-04-23_NHMU_Stay-Time_Study_Report_6.29.12c.pdf>. [Accessed 19 July 2015]. **20**.

she describes as “the single biggest challenge to get right in museums”.[62]

Some visitor research does include a specific focus on orientation and wayfinding. Shettel-Neuber and O’Reilly’s 1987 study at the Arizona-Sonora Desert Museum sought to “understand the process of visitor orientation and circulation”. Among their findings from questioning visitors were that 15% had said that, at some point, they had felt “lost, confused or unsure of what to do next”. Visitors were also asked what methods they had used to help them see the museum; the most-used ones were a map (65% of visitors), “wandering/exploring” (44%), signs (35%) and knowledge from previous visits (32%).[63]

A 1984 UK government-sponsored study compared the experiences of visitors to three British museums, and included in its visitor surveys questions about wayfinding and orientation. It found wide variations between the museums in relation to wayfinding problems and use of orientation and wayfinding resources. More than half of visitors (52%) to the Victoria & Albert (V&A) Museum said they felt the signs needed improving to help people find their way around, but only 40% of visitors to the Science Museum and 12% of visitors to the National Railway Museum felt the same way.[64] This study indicates (as is pointed out by Shettel-Neuber and O’Reilly) that wayfinding and orientation requirements are very specific to the institution, and related to a complicated combination of, among other things, the type of museum, its architecture and the provision and availability of wayfinding and orientation resources. This is also raised in the discussion in Chapter 1 about categorising museums, and the relationship between museum type and the need for a visitor map.

A more recent (2012) study at the V&A looked in more detail at visitors’ wayfinding experiences, using a combination of research techniques, including visitor behaviour observation, visitor surveys and focus groups. In particular, the researchers considered the proportion of visitors who had said they had wayfinding difficulties in the museum by visitor type, using the visitor types described by James on page 229. They found that 63% of “families” and 64% of “sightseers” said they found wayfinding “very” or “quite” easy during their visit, compared with 83% of “aficionados” and 82% of “third spacers”, and concluded that those visitors who are less experienced or less engaged have more difficulty with wayfinding.[65] (However, it should be noted that, since the figures are based on self-reported experiences, there is also the issue of willingness to admit having problems, which may vary from one visitor type to another.)

62 Serrell, B. (2013). *A Review of Recommendations in Exhibition Summative Evaluation Reports.* Building Informal Science Education (BISE) Research Synthesis. Available at <http://informalscience.org/sites/default/files/exhibits_summative_recommendations_serrell.pdf>. Accessed [4 April 2018]. **6-8**.

63 Shettel-Neuber, J. and O’Reilly, J. (1987). *“Now Where?” A Study of Visitor Orientation and Circulation at the Arizona-Sonora Desert Museum*. Jacksonville, AL: Center for Social Design. **23**.

64 Heady, P. (1984), *Visiting Museums: a Report of a Survey of Visitors to the Victoria and Albert, Science and National Railway Museums for the Office of Arts and Libraries*. London: Office of Population Censuses and Surveys. **89-90**.

65 Morris Hargreaves McIntyre (2012). *Navigation at the V&A: Current and Future Wayfinding*. [Unpublished report]. Manchester: Morris Hargreaves McIntyre. **11**.

Research into wayfinding tools and resources in museums

Some studies focus more specifically on the take-up and effectiveness of resources that visitors use in a museum. A 1977 study by Cohen et al was an early investigation of this type, which aimed to discover "which orientation devices, or systems of devices, were most helpful to visitors".[66] The study, at part of the National Museum of History and Technology of the Smithsonian Institution, Washington, DC (now the National Museum of American History), tested the effectiveness of maps and signs by comparing visitor behaviour (including observed signs of disorientation) in part of the museum without signs and maps, and then in the same area with signs only, maps only, and signs and maps together. The maps used in this study were not the printed maps that are the main focus of this thesis, but fixed "you-are-here"-type maps (though the authors do not state whether these maps were true you-are-here maps, indicating the viewer's location on the map).

The researchers reported "dramatic" reductions in their indicators of disorientation among visitors when either the maps or signs were present (though the combination of the two was not much better than either type separately). However, they found that signs and maps worked in different ways: visitors did not use maps for route planning, but instead for conceptual orientation – specifically, telling them what exhibits there were in the museum, allowing them to see the exhibits that most interested them, and helping them organise their visits. Overall, 60% of visitors surveyed said they had used the maps; 80% found them useful and 90% found them "clear enough – not too confusing".

Despite the general success of maps and signs in helping visitors understand and navigate the museum, 40% of visitors in the study said they wanted more help, with "brochures" (which would presumably include printed maps) the type of resource that was most often mentioned as being wanted.[67]

The study by Heady at three British museums mentioned earlier in this chapter (page 237) also included survey questions on wayfinding and navigation materials. Heady found that around half of visitors to the V&A (47%) were aware they could buy a plan of the museum, and 17% of them did so; at the Science Museum, 28% of visitors were aware they could buy a plan and just 6% did.[68]

Hayward and Brydon-Miller investigated the use of wayfinding and orientation resources as part of a two-year study at an outdoor museum (Old Sturbridge Village, Massachusetts). They found that 41% of visitors had used fixed board-mounted maps and 99% had used printed guide maps (the latter figure is not surprising since the map was given to visitors with their entry tickets).

66 Cohen, S., Winkel, G.H., Olsen, R. and Wheeler, F. (1977). Orientation in a Museum – an Experimental Visitor Study. *Curator: the Museum Journal*. 20:2. **86**

67 ibid. **89-92**.

68 Heady, P. (1984).

The printed map also got strong approval from visitors: 94% said they found it helpful. The researchers concluded that the popularity of the map was because it "puts information in people's hands when they need it… referring to it as they move around the site", although they qualified their findings by commenting on the map's quality ("somewhat stylised and not to scale") and the fact that "people often have trouble reading maps".[69]

Wright et al's study of map design in the built environment focused on a map for a hospital setting, but included a small-scale survey that included questions about map use in different environments. They found hand-held (ie, printed) maps were greatly preferred by visitors to exhibitions, compared either with other settings and with wall maps. Specifically, 74% of respondents said they preferred using a hand-held map to wall maps in an exhibition, compared with 49% in a hospital and 34% in a shopping precinct. Meanwhile, 15% preferred using a wall map in an exhibition, 34% in a hospital and 51% in a shopping precinct.[70]

The 2012 study at the V&A by Morris Hargreaves McIntyre mentioned earlier in this chapter (page 237) also considered the use of wayfinding and orientation material by visitors, and developed six visitor types based on their "arrival mode" – collector, planner, selector, conformer, wanderer and insider. These groups are defined by visitors' attitude towards seeking and gathering information about the museum, from most intensive ("collectors", picking up lots of information whether or not they need it) to least intensive ("wanderers", who prefer to just look around, and "insiders", who know where they are going).[71]

This study also included a survey about the take-up and use of maps upon arrival at the museum, and found that 17% of visitors picked up a map, and, of those, 51% had read it (either briefly or more closely) before starting their visit. The relatively low take-up figure may be as much to do with the ready availability of the maps as it is to do with visitors' interest in them; the report notes that many survey respondents commented that the maps were hard to find. Also, the report refers to findings from rolling exit surveys at the museum, in which a much larger proportion of visitors (42%) said they had used the map (though this figure includes visitors who picked up a map at any point during their visit, not just at the beginning). The map was by far the most used of 13 specific wayfinding resources; the other resources that had the highest use levels were members of staff (consulted by 25% of visitors), banners inside the building (used by 22% of visitors) and object labels (23% of visitors).[72]

The study considered the effectiveness of wayfinding resources, based on data from the rolling exit interviews, and from a separate exercise in which

69 Hayward, D.G. and Brydon-Miller, M. (1984). Spatial Conceptual Aspects of Orientation: Visitor Experiences at an Outdoor History Museum. *Journal of Environmental Systems*. 13:4. **323-325**.

70 Wright, P., Lickorish, A. and Hull, A. (1990). The Importance of Iterative Procedures in the Design of Location Maps for the Built Environment. *Information Design Journal*. 6:1. **67-68**.

71 Morris Hargreaves McIntyre (2012). **12**.

72 ibid. **17-18**.

members of a focus group were given a task to find specific objects and galleries in the museum and to report on the wayfinding resources they found and used during the task. In relation to the exit interviews, 87% of those who used the map said they thought it was helpful. This is a high figure (and similar to that found in Cohen et al's study – see page 239) but it is not as high as that for most of the other resources (for example, 91% of those who had spoken to a member of staff said they had been helpful, and 96% of those who had used object labels said they had been helpful)[73], which suggests that there were deficiencies in the maps in the eyes of some of the people who used them.

In relation to the focus group task, the map and the "welcome panel" (the contents of which are not explained in the report) were considered the most effective wayfinding resources. The maps were seen as portable and comprehensive, but also very complex, and containing information that was seen as irrelevant to most visitors. Some participants suggested the museum could develop a second, simpler map for general visitors, to be made available alongside the existing map for more experienced visitors. The researchers concluded that the complex nature of the map put people off rather than encouraging them to explore.[74]

Research into museum map design

Falk and Dierking state that, despite the fact that maps are widely provided by museums, "many visitors find them only marginally useful", either because they are poorly designed, or because people have difficulty relating the two-dimensional diagram to the actual museum.[75] Nevertheless, they say that, for first-time visitors to a museum, looking at the map "often... decreases visitors' confusion".[76] While seemingly contradictory, both these statements may well be true. But visitor research that focuses on map design (rather than just frequency of take-up or use) is rare, and published (or publicly available) research into map design in museums is rarer. This may be because maps are just part (and in some cases, a small part) of a museum's wayfinding and orientation strategy. For museums, whose research budgets are inevitably limited, there are likely to be aspects of the visitor experience that are deemed more important.

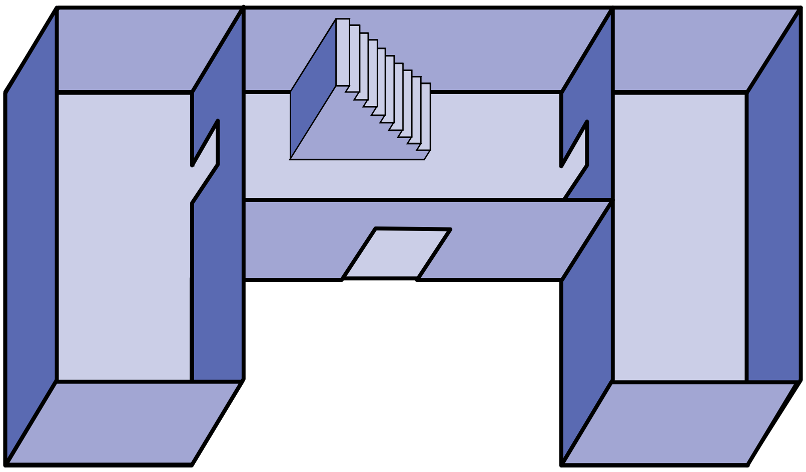
Nevertheless, two studies relating specifically to museum map design were identified: a 1978 study to compare visitor responses to two designs of a map of part of the Natural History Museum (NHM), London; and a 2003 study to test visitor responses to a proposed new design of map of the Victoria & Albert (V&A) Museum, London.

73 ibid. **19**.

74 ibid. **24-25**, **32**.

75 Falk, J.H. and Dierking, L.D. (2013). *The Museum Experience Revisited*. Walnut Creek: West Coast Press. **183**.

76 ibid. **135**.



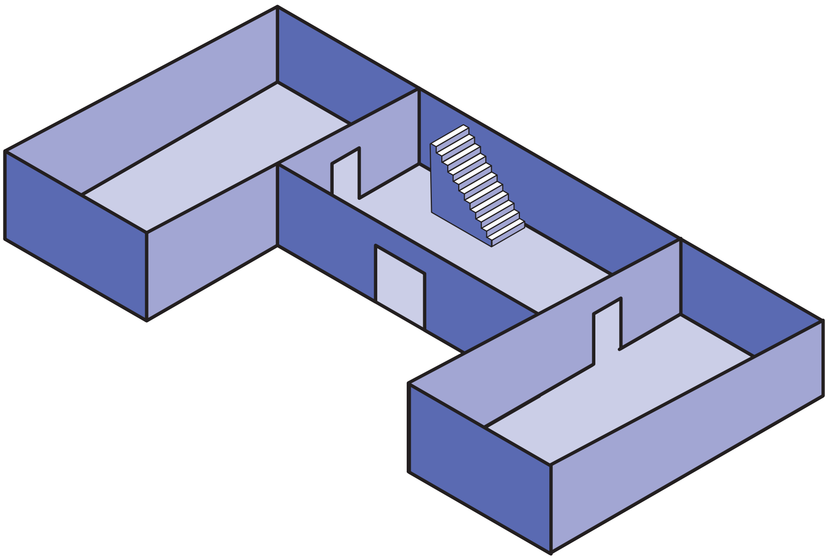


Fig 1. An example of top-down oblique projection of the type used in Morris and Alt's study (top), and an example of axonometric projection most commonly used in 3D museum maps (below)

Comparing a floor plan and an axonometric map

Morris and Alt's study at the NHM sought to find out which of two types of map – a three-dimensional (3D) axonometric diagram and a two-dimensional (2D) floor plan – were preferred by visitors, and seen to be most helpful in identification their location within the space.[77] (Strictly speaking, the axonometric map in the study was an oblique projection, but is referred to in the study as axonometric.) They conducted an experiment in which a group of 32 randomly-chosen museum visitors were shown the 2D map, and asked to mark on it where they thought they were currently standing, while they were timed in the task; another group of 32 undertook the same task using the 3D map. A third group were shown both maps, and in this case, asked to mark their location on whichever map they chose. In a second part of the task, the participants were asked to trace on the map a route from the gallery entrance to their current location, as marked on the map. Finally, they were asked for their comments about the maps.

Morris and Alt found that overall, fewer than half (45%) of participants could locate themselves on the map completely correctly. There were no significant differences between the two maps, though those participants who were shown both maps did better (though they took longer to decide on their location). The most important finding in the study was that there was a "striking preference" for the 3D map, particularly among the younger participants. The authors conclude that this alone is an important consideration for future map design, since a more appealing map may encourage more visitors to visit the museum and explore it in greater depth.

While the preference finding is interesting, there are a number of characteristics of this study which limit its usefulness in relation to the effectiveness of 2D and 3D maps more generally.

- The study area covered just one gallery, not a whole museum (or even a wing of a museum), and so provides no insight into the relative success of the maps in facilitating wayfinding (ie, devising and following a route from one point in the museum to another).
- The particular type of projection chosen for the test map – top-down oblique – is rarely used in museum maps, and has different characteristics from the other widely used 3D projections – see Chapter 3 for more about this. (Only one map from the corpus of maps used a top-down oblique projection.) A simplified illustration of a top-down oblique projection used can be seen in Fig 1, alongside an example of the widely-used axonometric projection.

77 Morris, R. and Alt, M. (1978). An Experiment to Help Design a Map for a Large Museum. *Museums Journal*. 77:4. **179-180**.

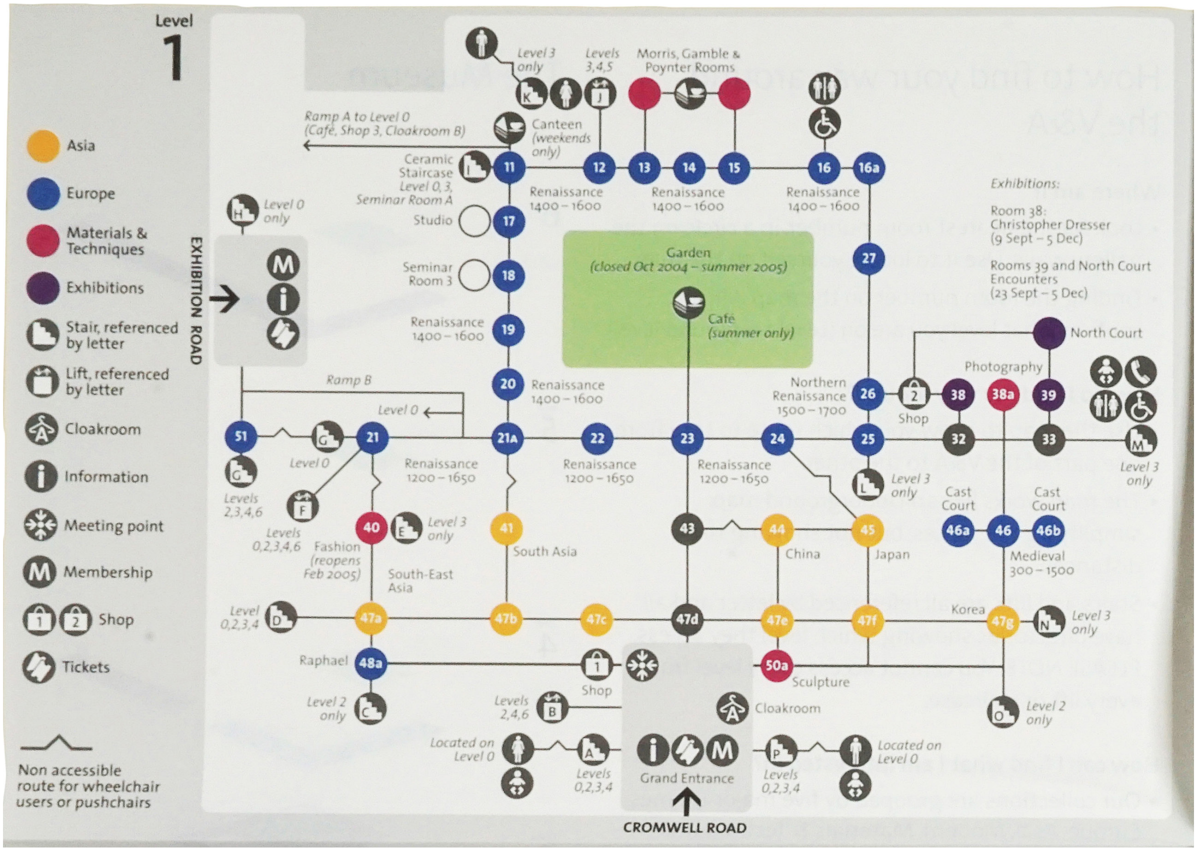


Fig 2. Level 1, *V&A Map* (2004). (at 75% actual size: 210 × 150mm)

- The task that was set for participants – to locate themselves on the map – is not necessarily focused enough to be able to draw conclusions about the relative effectiveness of the two types of map. Although locating oneself on a map is important, this can often best be achieved via a you-are-here map, which museums use widely, alongside printed visitor maps. But self-location is only a starting point: aiding wayfinding and conceptual orientation are the main aims of such maps; wayfinding effectiveness could not be explored, because the study covered only one room, and conceptual orientation effectiveness is revealed only through participants' spontaneous comments.
- The two types of map differ in more ways than just the projection type, limiting the validity of comparisons. The 3D map is more pictorial, including 3D renderings of larger exhibits (animal specimens). This could affect both participants' ability to locate themselves (since the larger exhibits act as landmarks), and also their preference of map. The authors of the study admit that "visitors favouring the axonometric [3D] map referred to the pictures of the specimens more often than to the representation of the architecture".

The "tube-style" map at the V&A

McManus's research into a proposed new map for the V&A was different from Morris and Alt's study, in both the type of research and its aims, and in the aspect of the map design that was being investigated. The map was part of a proposed new wayfinding system devised by Holmes Wood Consultancy that also included signage and a colour-coding system for the themed areas (called quarters) of the museum. The research, for the museum's use, aimed to "test key components of the system".[78] The research involved researchers accompanying 20 visitor groups (comprising a total of 36 adults and three children) through areas of the museum that had been mocked up with the new wayfinding system components. Researchers observed and questioned study participants about their experience of using the wayfinding system and map.

For the purposes of this thesis – and possibly also the reason it was subjected to testing – the map is significant because of its unusual design. The proposed map, described as a "tube-style" map by McManus, instead of being based on a floor plan of the building, was a schematic diagram that "describes and navigates the building by acting as a journey-planner rather than trying to replicate the complex architecture"[79] (see Fig 2). The detailed design of this map is discussed in Chapter 3, where there are also examples of other maps of the V&A, for comparison.

78 McManus, P. (2003). *A Formative Evaluation of Plans for a Sign Scheme and Map.*[Unpublished report]. London: Victoria & Albert Museum.

79 Victoria & Albert Museum: Development of the Signage, 2004. [online] Available at: <http://www.vam.ac.uk/content/articles/d/development-of-the-signage/>. [Accessed 22 September 2016].

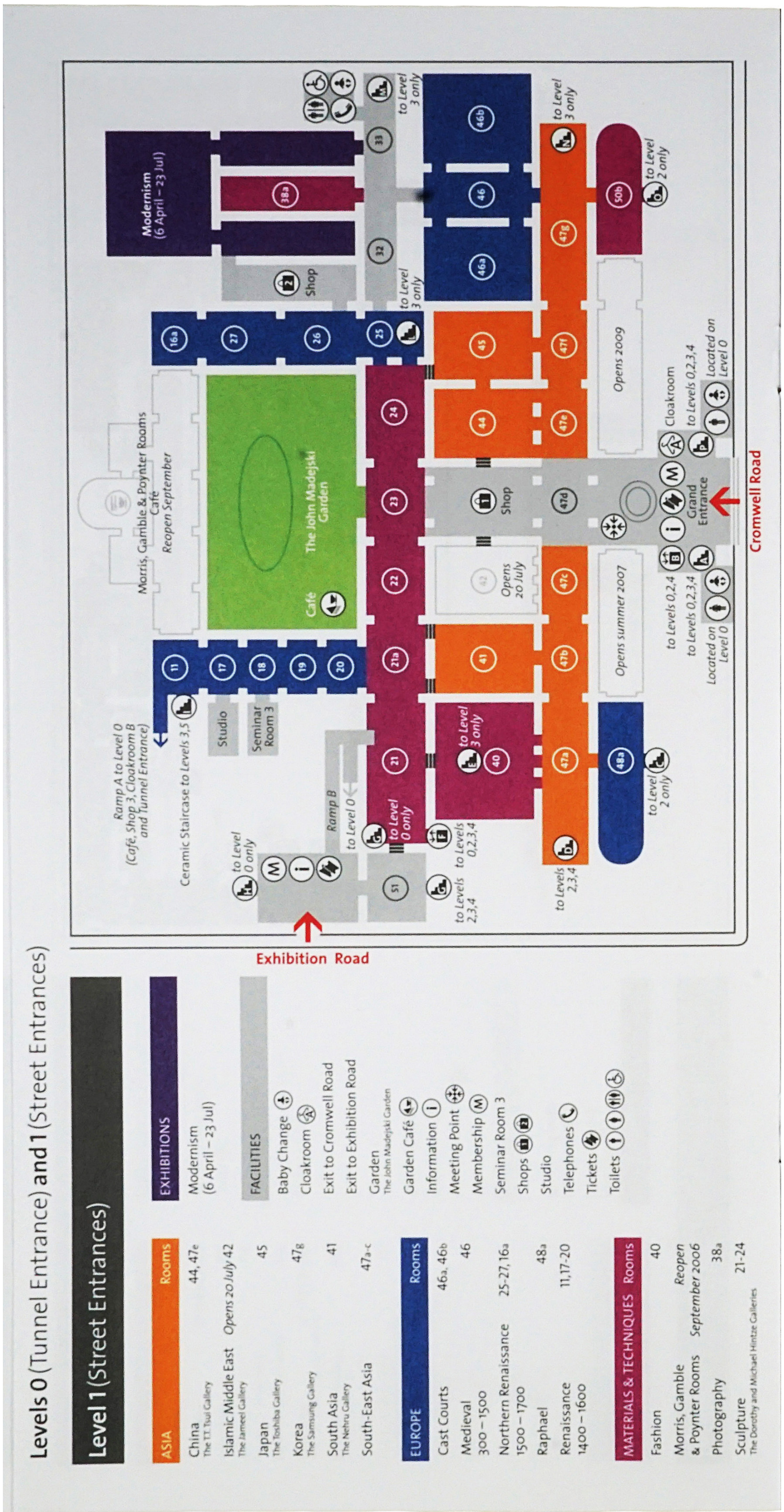


Fig 3. Level 1, *V&A Map* (2006) (at 75% actual size: 290 × 147mm)

McManus says that "many people find reading maps very difficult… and museum buildings are very complex, so museum maps can be difficult". She found that "topographical markers" (distinctive exhibits or parts of the building, which may also be described as landmarks) are important, and used by people more than "conceptual or semantic markers" (signs, for example). For example, many participants looked for the garden space on the map and used this to locate themselves.

In the research, responses to the map were mostly positive: all 20 visitor groups agreed that the map was easy to read and, when asked whether it was a "good" map, 11 participants said yes, five said it was "OK", three said it was "very good" and one said it was "legible". Twelve of the 20 were able to locate their position in the museum on the map. McManus concluded that the "tube map" design was "approved [of]" by the study participants.

The new wayfinding system and the new map were introduced to the museum in 2004. However, although the other elements of the wayfinding system were apparently successful, and in use in the museum for more than ten years, it appears that the map was not a success among visitors. An article in the Daily Telegraph newspaper in November 2004 described the map as "very hard to follow" and stated that the museum was "already looking at ways to improve or replace it".[80]

In 2006, a revised leaflet with a new map was published (see Fig 3), dispensing with the "tube map"-style representation of the floor plans, in favour of a layout based on simplified floor plans of the building. This map was presumably more successful, since it was in still use in the museum (with minor revisions, mostly related to changes within the museum) 12 years later.

The failure of the original "tube-map"-style map is somewhat surprising, given that, unlike most museum maps, this map was subject to user testing before it was published. However, there are flaws in both the design of the map and the nature of the user testing that may have contributed to the museum publishing a map which did not meet users' needs.

First, it can be assumed that the problem with the map is that users did not find the schematic representation of the building useful or helpful when visiting the museum. Although the graphic simplicity of the connected roundels has some appeal (as evidenced by the positive user research findings), the parallel between it and the tube map may be false. This is because the tube map is solely about connections, not about the destinations, as the museum map is; tube map users do not use the map to discover anything about the tube stations or where they are located, unlike a museum map.

The map designers may have been misguided about the primary purpose

80 Trend, N. (2004). London: How to Visit the Victoria and Albert Museum. *Daily Telegraph*. 20 November 2004. Available at <http://www.telegraph.co.uk/travel/artsandculture/731714/London-How-to-visit-the-Victoria-and-Albert-Museum.html>. [Accessed 20 January 2015].

of a museum map. The designers stated that the map is designed to act as a "journey planner", ie, for wayfinding. However, other research suggests that conceptual orientation is at least as important a role of museum maps as a wayfinding resource (for example, Wolf and Cohen et al – page 235 and page 239) and this design may not fulfil that role well. Second, McManus herself points out that her research found that people used distinctive parts of the building and exhibits to orientate themselves when navigating the museum, and yet the map has removed all architectural detail and includes no indication of distinctive exhibits, thus not allowing users to use the map in this way.

The user research may have been inadequate to reveal the problems with the map that were apparently found when it was published and made available to visitors. The number of participants may not have been sufficiently large to be able to reveal the problems with the design. The test maps may have also had a positive bias effect since they were reproduced at a significantly larger size than the final published maps.

The nature of the research process may have also created more positively skewed responses. This included informing participants that they were assessing a proposed new wayfinding system. Perhaps more importantly, during the process, the participants were accompanied by researchers; even if the researchers limited the help they gave to participants, the experience is not the same as a visitor navigating a museum unaccompanied. Participants may have also been subject to the "good-subject effect", in which they tend to say what they believe the researcher wants to hear.[81] This effect must be considered in any research where there is interaction between researcher and participant, but it may have been more marked in this study since the researcher was apparently interacting with the participant for the duration of the task.

81 Nichols, A.L. and Maner, J.K. (2008). The Good-Subject Effect: Investigating Participant Demand Characteristics. *The Journal of General Psychology*. 135:2. **151-166**.

Conclusion and discussion

In terms of the built environment in general, there has been much research into how people understand, relate to and navigate their way around. It has provided insight into how the way buildings are designed and configured has an effect on how easily people can find their way around them. There are many good reasons to ease wayfinding for building users, be they patients, passengers, shoppers, visitors or workers: it saves time, avoids undue stress, can save money (if staff in the building are able to spend less time helping people who are lost) and – in extreme situations – even save lives.

In this respect, a building that needs no wayfinding aids, such as signs and maps, might be considered the ideal building. But this is an unrealistic (and probably unrealised) goal; there are simply too many other requirements of buildings that architects must consider for this to be attainable.

However, much of this research has only limited applicability to museums. Much indoor wayfinding research has been undertaken either in laboratory conditions (for example, in "virtual" buildings seen on computer screens) or in buildings that are quite different from museums (campus buildings, offices, hospitals, for example). This type of research often focuses on wayfinding "performance", ie, how quickly and efficiently users can reach a desired destination within a building. This is of limited interest in a museum environment because few people conduct their visit to a museum in this way (and in the way they would in a hospital or airport, for example). Where there has been research specifically into the way visitors navigate museums, this suggests that many people undertake different types of behaviours, such as browsing. This does not mean that wayfinding resources are redundant, but it gives them a different context and purpose. Visitor research suggests that maps and signs in particular are widely used and appreciated by museum visitors. However, detailed research into the design of museum maps is very limited: relatively little is known about how well museum visitors can read and follow maps, how much they enhance their visit – if at all, and whether there are design features that museums could incorporate (or avoid) in their maps that would improve visitors' experiences. In some circumstances, a complicated map could actually add to a visitor's confusion, rather than reduce it.

The following chapter describes a study of interviews with visitors to the V&A, London, to gain further insight into their use of and attitudes towards museum maps, and of digital and electronic alternatives to printed maps. This is followed by study to compare the effectiveness and appeal of two map designs.

Chapter 5: Investigating museum visitor use of maps

Contents

Visitor use of and attitude towards maps

Chapter 4 considered, among other things, research into visitor behaviour in museums, including how people navigate museums, and the information and resources they use to do so, such as signs, maps and people (museum staff and volunteers). Chapter 2 considered the forms and formats of museum maps, and looked at the digital and electronic alternatives to printed maps, of which there are many types that include combinations of audio content, and screen-based text, static images, interactive mapping and video. The chapter described research and data on the development and use of those types of resource.

However, research for these chapters revealed gaps in knowledge about visitors' use of and attitudes towards museum maps and their digital equivalents. First, in some cases, the research cited in Chapter 4 and elsewhere is narrow in its scope, having been undertaken by (or for) a museum in relation to a particular project (notably those of the Natural History Museum and the V&A "tube-style" maps, which were discussed in detail), so the findings make have limited broader application or relevance. Second, much of the research may be out of date – in particular, that relating to digital and electronic alternatives to maps. The development of such devices and systems has been very rapid. Related to this is the growth in the use of digital mapping software and devices (including, for example, Google Maps on smartphones, and GPS devices in cars). But several studies (for example, at the Natural History Museum,[1] V&A[2] and the British Museum[3]) suggest that the general increase in the use of digital devices, notably smartphones and tablets, has not translated into a rise in their use in museums as discussed in Chapter 2, and printed maps are seemingly still popular with museum visitors.

In order to better understand how widely used printed maps and their digital alternatives are, and why – or in what circumstances – people choose to use one type over the other (or neither), a study was undertaken to probe this. This chapter describes a survey, in which visitors to the Victoria & Albert Museum (V&A) were interviewed about their museum-visiting habits and their experience of using printed maps and digital alternatives.

1 Fusion Research & Analytics (2013). *Natural History Museum: Understanding the Mobile Visitor*. [pdf]. Available at: <http://www.nhm.ac.uk/about-us/visitor-research-evaluation.html>. [Accessed 27 January 2016]. **44**.

2 Fusion Research & Analytics and Frankly, Green & Webb (2012). *Understanding the Mobile V&A Visitor: Autumn 2012*. [pdf] Available at: <http://www.vam.ac.uk/__data/assets/pdf_file/0009/236439/Visitor_Use_Mobile_Devices.pdf> [Accessed 20 July 2015]. **6, 13, 21.**

3 Mannion, S., Sabiescu, A. and Robinson, W. (2015). An Audio State of Mind: Understanding Behaviour Around Audio Guides and Visitor Media. In: *Museums and the Web 2015*. Chicago, USA, 8-11 April 2015. Silver Springs, MD: Museums and the Web LLC. Available at: <https://mw2015.museumsandtheweb.com/paper/an-audio-state-of-mind-understanding-behviour-around-audio-guides-and-visitor-media/>. [Accessed 28 August 2017].

Study aims and outline

The aim of this research was to investigate more closely issues relating to map use and design that have been raised in the previous three chapters, through interviews with museum visitors. It aims to widen the research focus of Shettel-Neuber and O'Reilly,[4] Heady[5] and Morris Hargreaves McIntryre,[6] who each looked at the use of maps in specific museums; this study probes museum visitors' map-using habits more generally. It also aims to expand on research into the use of digital alternatives to maps. For example, La Placa Cohen questioned museum visitors' about their preferences for a "digital/non-digital experience" in a museum, but did not probe the reasons for their answers.[7] Other studies, such as those by Hayward and Brydon-Miller[8], and Morris Hargreaves McIntyre[9] include data on visitors' satisfaction with maps at particular museums, but provide little insight into the reasons behind the responses, or exactly what visit-related tasks and activities visitors used (or wanted to use) the maps for (such as the information roles described in Chapter 3).

Since the aim of this study was not just to gather data on museum visitors' use of maps and other wayfinding resources, but also to probe why they use or do not use them, individual face-to-face interviews were considered the most effective approach. Recruiting participants in a large, popular museum was considered an effective way to include a diverse range of museum visitors.

Research procedure

The research for this study was carried out over three days during December 2015/January 2016. The researcher approached adult visitors in the museum and asked them to take part in the study. The participants were chosen randomly from visitors passing through a circulation space close to the main entrance to the museum. There was no systematic attempt to have the sample match any particular population (of the UK population at large, of regular museum-goers, or of visitors to the V&A). Limited demographic information was collected as part of the research, but there was a general attempt to include a mix of men and women, and people of different ages. Forty people, 20 men and 20 women agreed to participate. The participants were given an information sheet, which explained the purpose, topic and format of the study. Participants were then

4 Shettel-Neuber, J. and O'Reilly, J. (1987). *"Now Where?" A Study of Visitor Orientation and Circulation at the Arizona-Sonora Desert Museum.* Jacksonville, AL: Center for Social Design.

5 Heady, P. (1984), *Visiting Museums: a Report of a Survey to Visitors to the Victoria and Albert, Science and National Railway Museums for the Office of Arts and Libraries*. London: Office of Population Censuses and Surveys.

6 Morris Hargreaves McIntyre (2012). [Unpublished report]. *Navigation at the V&A: Current and Future Wayfinding*.

7 LaPlaca Cohen (2017). *Culture Track '17: Supporting Data*. New York: LaPlaca Cohen Advertising Inc. Available at <https://culturetrack.com/research/reports/>. [Accessed 15 December 2017].

8 Hayward, D.G. and Brydon-Miller, M. (1984). Spatial Conceptual Aspects of Orientation: Visitor Experiences at an Outdoor History Museum. *Journal of Environmental Systems*. 13:4. 317-332.

9 Morris Hargreaves McIntyre (2012).

interviewed for approximately 5 to 15 minutes (depending on how expansive their answers were).

The questionnaire can be seen in Appendix 2. The study procedure was given ethical approval by the University of Reading Ethics Committee and participants gave signed consent to their participation.

Limitation of procedure

One limitation of this study is that, because the study was structured around individual interviews, potential participants approached to take part were mostly visiting the museum on their own (or appeared to be doing so). Although a few of those who took part stated that they were visiting the museum with other people (but had separated temporarily), the majority of participants were solo visitors, whose responses may be different from people visiting in pairs or groups.

Profile of participants

Around half of the participants (19) stated that they were not UK residents (coming from 13 different countries). This is broadly in line with the museum's official visitor statistics, which reveal that, in 2015-16, 42% of its visitors were from outside the UK.[10] Visitors who did not have a reasonable standard of spoken English were excluded from the study (several visitors who were approached to take part clearly did not have adequate English language skills, and therefore did not participate). Around half (18) of the participants said they were on their first visit to the museum; this is in line with other visitor research at the museum, which, in 2012, found that 57% of visitors were first-time visitors.[11]

10 Department for Culture, Media & Sport (2017). *Sponsored Museums Performance Indicators 2015/16 – Statistical Release January 2017*. London: Department for Culture, Media & Sport. Available at: <https://www.gov.uk/government/statistics/sponsored-museums-annual-performance-indicators-2015-16>. [Accessed 3 February 2017].

11 Morris Hargreaves McIntyre (2012). *Navigation at the V&A: Current and Future Wayfinding*. [Unpublished report]. **8**

Participants' museum visiting habits

Participants were asked about their frequency of museum visiting in general (ie, not their frequency of visiting the V&A). Of the 40 participants:

- **3** (7.5%) said they visited museums **less than once a year**
- **7** (17.5%) said they visited museums **once or twice a year**
- **17** (42.5%) said they visited museums **every few months**
- **5** (12.5%) said they visited museums **every month**, and
- **8** (20%) said they visited museums **more often** than that.

Most could therefore be considered relatively keen museum-goers, compared with the general population. Research by the UK Department of Culture, Media and Sport (DCMS) has found that only around half of people have visited a museum or gallery in the previous year; and only around 3% visited a museum at least once a month.[12] To some extent, these differences are to be expected, since the DCMS research respondents were drawn from the general public, whereas the participants in this study were already in a museum, and therefore could not be considered "non museum-goers".

12 Department for Digital, Culture, Media & Sport (2016). *Taking Part 2015/16 Quarter 2 Statistical Release*. London: Department for Culture, Media & Sport. [pdf] Available at: <https://www.gov.uk/government/statistics/taking-part-201516-quarter-2-statistical-release>. [Accessed 23 May 2018].

Table 1. Participants' frequency of use of printed maps in museums

	Never		Sometimes		Always	
	No.	%	No.	%	No.	%
'When you visit a museum do you use printed guide maps, if they are available?'	4	10%	17	42.5%	19	47.5%

n=40

Findings and discussion: printed maps

Participants were asked: "When you visit museums, do you use printed guide maps, if they are available?". The responses can be seen in Table 1.

The incidence of map use in this study is higher than the figures from the studies cited in Chapter 2. This may be related to the different sample populations, but also because the cited studies all related to map use at a particular museum (ie, the subject of the study) on a particular visit, rather than asking about habitual map use. However, for comparison, in this study, just over half of the participants (21) said they had used the V&A map during their visit or intended to do so, which is broadly in line with the 42% figure for map usage from a 2012 study at the museum.[13]

Reasons for map use

Participants were then asked about why, or in what circumstances, they would use or not use a printed map during a museum visit. The question was an open one and participants' answers were noted down by the researcher.

Reasons for *not* using maps were generally pragmatic and related to the circumstances of a particular museum visit, rather than related to the perceived usefulness of a museum map as a wayfinding and orientation aid. For example, some participants said they would not use a map if they felt they were familiar with the museum they were visiting, or if they had a clear and known destination within the museum (often, a temporary or special exhibition). A small number of people (three) also said they would not or might not use a map if they had to pay for it.

However, for a minority of participants who said they did not use museum maps, it seemed that using a map was not consistent with what they want to achieve and experience in a visit. For example, one participant said "I like to get lost" and another, "I like to find things by chance rather than to look for things. I am not worried about getting lost". The implication of these responses is that, for some people, a map may interfere with the possibility of a serendipitous experience in a museum. This attitude is closely related to visitor types or visiting "modes" (visitor behaviour that is based on the type of museum and the circumstances of the visit, not just the psychological profile of the visitor), as described by Morris Hargreaves McIntyre,[14] Falk and Dierking,[15] Rounds[16] and Tzortzi,[17] and discussed in Chapter 4.

13 Morris Hargreaves McIntyre (2012). *Navigation at the V&A: Current and Future Wayfinding*. [Unpublished report]. **18**

14 Morris Hargreaves McIntyre (2016). *Culture Segments*. Manchester: Morris Hargreaves McIntyre. [online] Available at <https://mhminsight.com/articles/culture-segments-1179>. [Accessed 28 August 2017]

15 Falk, J.H. and Dierking, L.D. (1992). *The Museum Experience*. Washington, DC: Whalesback Books

16 Rounds, J. (2004). Strategies for the Curiosity-Driven Museum Visitor. *Curator: The Museum Journal*. 47:4. **391**

17 Tzortzi, K. (2007). *The Interaction Between Building Layout and Display Layout in Museums*. PhD thesis. University College London. **160**

Table 2. Tasks that participants use maps for

'What would you use a museum map for?'

	Equivalent map role	Number agreeing	As % of participants[1]
'To find out what sorts of displays and exhibitions are in the museum'	Visual directory	30	77%
'To find out where things like the toilets, café and shop are'	Locator (facility)	27	69%
'To keep as a souvenir of my visit or pass on to a friend or relative'	Souvenir	25	64%
'To locate a particular object, for example, a painting'	Locator (exhibit)	24	62%
'To plan a route through the museum that takes in everything I want to see'	Trail	20	51%

n=39, as one of the 40 participants stated they did not and would not use museum maps

Purpose of map use

In the second part of this section of the interview, participants were asked about the ways they would use a map and what task they would use the map for. They were read five statements about how people use museum maps, and asked whether they would personally use a map for this purpose when visiting a museum. The five statements mirrored as much as possible the "roles" of museum maps, as described in Chapter 3, but they were expressed in everyday language, so that participants would better understand them. (One of the roles, Highlighter, was not included as a task type, as it is a design feature, included only on some maps, and cannot be related to a task on maps on which it does not appear).

The responses are shown in Table 2. They indicate first that most people use maps for a range of tasks (though not necessarily the same map, or in the same museum): more than three-quarters of participants said they would use a museum map for at least three of the stated tasks. Table 2 also shows the numbers of participants who said they would use a map for each task. There were differences in the frequency of use for each task: the most frequent was the task that related to the visual digest role of a map, chosen by more than three-quarters of participants. Interestingly, even three of the four participants who said they never use museum maps agreed that they would use a map for at least one of the tasks, suggesting perhaps that they could foresee a situation where they may, in fact, want to use a map. (The fourth participant who had said they had never used museum maps and would not do so said they could not answer this question for that reason, and were excluded from the sample here.)

The task that was the least frequent was the one that related to the trail role of the map, chosen by around half of participants. The results suggest what others have found (as discussed, in particular, in Chapter 4; for example, Wolf[18] and Cohen et al[19]) that museum maps are considered most useful as aids to conceptual orientation, rather than wayfinding.

18 Wolf, R. (1982). *Visitor Information at the Metropolitan Museum of Art: a Conceptual Analysis*. [Unpublished report]. Cited in Loomis, R. J. (1987) *Museum Visitor Evaluation: New Tool for Management*. Nashville: The American Association for State and Local History. **163**

19 Cohen, S., Winkel, G.H., Olsen, R. and Wheeler, F. (1977). Orientation in a Museum – an Experimental Visitor Study. *Curator: the Museum Journal*. 20:2. **86**

Table 3. Participants' frequency of use of museum apps and digital maps

	Never		Occasionally		Often	
	No.	%	No.	%	No.	%
'Have you used a museum app for a smartphone or tablet, or a digital map on a museum website?'	31	77.4%	8	20%	1	2.4%

n=40

Findings and discussion: digital maps and apps

Chapter 2 included a discussion and analysis of research into museum visitors' use of digital equivalents of printed maps. This study included questions covering this topic, in part to provide up-to-date data. As explained in Chapter 4, in the last decade in particular the use of personal portable devices (such as smartphones and tablets) has increased, and there has been a corresponding greater use of digitally delivered information more generally. Also, museums continue to expand and improve their digital offerings. Therefore, visitor research data in such areas that even just a few years old may not reflect current use patterns or user attitudes.

Frequency of digital map/app use

In this section of the interview, participants were first asked: Have you used a museum app for a smartphone or tablet, or a digital map on a museum website in addition to or instead of a printed map?. The responses are shown in Table 3. Clearly, a large majority of participants said they had never used such digital alternatives to printed maps – the inverse of the situation with printed maps, in which a large majority of participants said they *did* use, at least sometimes. The studies that questioned museum visitors about digital guide use cited in Chapter 2 all found that only a minority of museum visitors used a digital guide. However, it is difficult to make any meaningful detailed comparisons between findings from those studies and the findings from this one. Apart from the timeframe issue, the available technology, contexts and aims of the studies varied significantly (for example, the 2012 V&A study[20] relates to audioguides and multimedia guides, while this study relates to apps and websites).

It is also worth noting that those participants in this study who said they never use paper maps also said that they never use museums' apps or online maps, which indicates that the medium (ie, hard copy or digital) is not significant in their decision not to use maps.

Reasons for using or not using digital maps/apps

As with printed maps, participants were asked why or when they would choose to use or not use a digital map or app. Since most participants in all the studies said they used paper maps at least some of the time, while conversely, the majority said they never used apps or online maps, the types of response are different.

Participants' stated reasons for not using apps and online maps were often connected with their lack of experience of them. Lack of awareness of their existence was one reason widely cited by participants; unlike printed maps provided at museum information or ticket desks, or on prominent display,

20 Fusion Research & Analytics and Frankly, Green & Webb (2012). *Understanding the Mobile V&A Visitor: Autumn 2012*. [pdf] Available at: <http://www.vam.ac.uk/__data/assets/pdf_file/0009/236439/Visitor_Use_Mobile_Devices.pdf> [Accessed 20 July 2015].

digital content is either invisible (in the case of an app to be used on visitors' own smartphones), or possibly not as prominently displayed as a printed map (in the case of a museum multimedia guide). Some participants said they had not thought to look for them, although they also said they assumed they existed.

The types of response in relation to web-based online maps are different from app-based maps because they are mostly designed for use on a larger-screen device, ie, a computer, and therefore very unlikely to be used during an actual museum visit. Very few participants said they had looked at or would look at an online museum map ahead of a visit, even though most were clearly aware that the museums had websites, and some said they would look at a website for other information, such as events or exhibitions at the museum, opening times and directions to the museum.

Many of the reasons given for not using an app or online map related to practical issues with or limitations of the technology or technologies employed, namely:

- the cost of mobile phone data needed to download and/or run an app
- the reliability or speed of a mobile phone data connection needed to download or run an app
- the amount of digital storage required to store an app on their phone
- the fact that using an app would drain their smartphone's battery too much, and
- the small screen size would mean that a map would be difficult to use or not very effective.

Given the widespread lack of experience of museum apps and online maps, many of these reasons were speculative, relating to perceived or potential practical problems that may have been experienced in a different context (for example, using a different type of map on a mobile phone). These issues have been raised in other studies of visitors' use of and attitudes towards mobile and digital information services in museums (for example, McDaid et al[21] and Lewis[22]).

The general resistance among smartphone owners to downloading apps was a finding in a 2016 industry research report, which questioned whether (in 2016) the world was reaching a stage of "peak app"; the study, of US smartphone use, found that, in a given month, half of the smartphone users had not downloaded any apps, and 24% had downloaded only one or two.[23]

21 McDaid, S., Filippini-Fantoni, S. and Cock, M. (2011). *Handheld Handholding: Small-Screen Support for Museum Visitors*. In: *Proceedings of the 2011 International Conference on Electronic Visualisation and the Arts*. London, UK, 6-8 July 2011. Swindon: BCS Learning & Development Ltd. Available at: <https://pdfs.semanticscholar.org/1fd9/9f78db7c95b0378a039cee42eace6797eeea.pdf>[accessed 9 February 2014]

22 Lewis, A. (2013). *The V&A Digital Map Beta Testing User Survey: Analysis of Responses*. [Unpublished report]. London: Victoria & Albert Museum.

23 Lella, A. (2016). *The 2016 U.S. ComScore Mobile App Report*. Reston: ComScore, Inc. [pdf] Available at: <http://www.comscore.com/Insights/Presentations-and-Whitepapers/2016/The-2016-US-Mobile-App-Report> [accessed 17 April 2017].

There were also comments from participants relating to less specific resistance to using apps and digital maps. These were expressed either as:

- a general lack of self-confidence with digital devices and interfaces (for example, "I'm not a computer person; paper maps work fine enough for me", "I'm technologically incompetent"), or
- a perception of the time or effort required to learn how to use the app or digital interface (for example, "You have to download an app – it's faster and easier to pick up a paper map", "Any app takes time to fathom; you need to spend time to understand it").

These comments are in line with the view of the V&A digital media experts; in discussing the development of a new wayfinding and orientation system, the museum's Head of Digital Media said they had learnt that uptake of museum apps generally had been lower than expected, commenting:

> Picture yourself on a tourist trip, Are you going to fill up your phone with a new app that you'll use once, and reducing the battery life you might prefer to save for tourist snaps later on?[24]

Finally, there was a resistance among some participants to using mobile phones in museums. They were seen as intrusive or incompatible with the experience of visiting a museum ("Generally you go to a museum to get away from your phone", "You're in the museum and you're looking at a screen – I want to be aware of everything around me"). A few participants even objected to other people using such devices in a museum ("I don't really believe in having phones in museums: they are distracting, they shouldn't be allowed in semi-public spaces", "It really annoys me, people looking at their screens all the time"). These comments are similar to some received by the British Museum during a study it undertook in 2014 of attitudes of visitors towards audioguides.[25]

It is not possible to be certain about the true motivations for some of these types of resistance to apps and digital devices. For example, if a mobile phone app was easy to use, perhaps it would not be any more distracting than a paper map. However, since apps provide access to much more information than a paper map, the potential for distraction is far greater. This phenomenon has been noted in other studies. Reynolds et al, in considering the use of museum multimedia guides for university students, found that the technology could distract from the learning experience, with study participants commenting that they felt engaged with the device to the exclusion of the museum's objects and

24 Price, K. (2018). Designing a New Welcome Experience at the V&A. *V&A Blog*. [blog] 9 March. Available at <https://www.vam.ac.uk/blog/digital-media/designing-a-new-welcome-experience-at-the-va>. [Accessed 29 May 2018].

25 Mannion, S., Sabiescu, A. and Robinson, W. (2015). An Audio State of Mind: Understanding Behaviour Around Audio Guides and Visitor Media. In: *MW2015: Museums and the Web 2015*. Chicago, USA, 8-11 April 2015. Silver Springs, MD: Museums and the Web LLC. Available at: <https://mw2015.museumsandtheweb.com/paper/an-audio-state-of-mind-understanding-behviour-around-audio-guides-and-visitor-media/>. [Accessed 28 August 2017].

displays.[26] In a related finding, Laurillard found that students using digital devices in a museum were often more engaged with the device and how it worked than in the information it was providing (and therefore the museum).[27] And LaPlaca Cohen's study of cultural engagement listed "more focus on the activity" and "better connection to the content" as two of the four top reasons why audiences find cultural experiences without digital media appealing, compared with those that have digital integration.[28]

Another potential basis for a general resistance to using mobile devices in museums is that they are, or are perceived to be, too didactic or too directive about how to visit the museum and/or how to interpret its displays. Thom-Santelli et al, for example, found that handheld guides dictate particular ways of navigating and experiencing a museum to the exclusion of other ways.[29] Printed maps, on the other hand, may be seen as relatively "objective" or "passive" pieces of information. However, even the most basic types of map, showing the layout of the museum with little accompanying text, are not completely objective, because the museum or the map designer has chosen what to include or describe, which will influence how museum visitors are likely to visit the museum. More complex maps may indicate "highlight" objects or displays in the museum, or a trail through the museum, which have also required curatorial judgement to produce. But these are more likely to be seen as suggestions, and are perhaps more easily ignored by visitors if they choose to than the equivalent kind of information provided on a digital device or in an app.

26 Reynolds, R., Walker, K. and Speight, C. (2010). Web-based Museum Trails on PDAs for University-level Design Students: Design and Evaluation. *Computers & Education*. 55. **1013**

27 Laurillard, D. (2002). *Rethinking University Teaching: a Framework for the Effective Use of Learning Technologies*. London: Routledge Falmer: **111**

28 LaPlaca Cohen (2017). *Culture Track '17*. New York: LaPlaca Cohen Advertising Inc. **23**. [pdf] Available at: <https://culturetrack.com/research/reports/>. [Accessed 15 December 2017].

29 Thom-Santelli, J., Toma, C., Boehner, K., and Gay, G. (2005). Beyond just the facts: Museum Detective guides, In *Proceedings of the International Workshop Re-thinking Technology in Museums: Towards a New Understanding of People's Experience in Museums*. Limerick: University of Limerick Interaction Design Centre. **99-107**

Conclusion and discussion

This chapter described a visitor research study undertaken in response to a range of studies described in the previous chapter. In terms of comparing findings of this study with other studies cited, it is possible to make only broad points. This study did not aim to replicate any particular study, and all the cited studies were different in various respects, including the type of research, the location of the research, the aims of the research and the research population.

That said, this study found that printed museum maps continue to be widely used and appreciated as an aid to discovering and navigating museums; only a small minority of participants said they never used maps on a museum visit. Printed maps are also considered, in at least some cases, as worth keeping as a keepsake or souvenir. The study found that visitors use museum maps for a variety of specific visit-related tasks, as described in Chapter 3. But, in line with some earlier research, this study found that maps are considered most useful for conceptual orientation, rather than as a wayfinding aid.

In relation to digital maps and digital orientation systems, such as apps, there appears to be either little interest or, in some cases, actual resistance, to their use. The reasons behind this are multifaceted and complex – a combination of the practical (such as data connection and cost concerns) and what might be called attitudinal (such as believing a museum is a place where using mobile devices is inappropriate). However, the findings are significant because, unlike earlier research, this study was undertaken at a time when the ownership level of devices such as smartphones or tablets (at least in the developed world) is near universal. Therefore, lack of access to or familiarity with digital platforms is no longer a factor (or, if so, a very minor one). This was evident in the comments made by participants, virtually all of whom volunteered that they owned a smartphone – those who expressed negative views about using digital devices in museums were as users of smartphones and apps in other circumstances.

The situation is, of course, still changing: new technologies continue to be developed, as do user interfaces, as more is learnt about how people engage with such systems. Wider acceptance of them in the future is likely, though there is little evidence to date to suggest the demise of printed maps.

The following two chapters describe more detailed studies of museum maps, focusing on and testing particular design features. As a preliminary part of these two studies, some of the key questions from this study were asked of the participants in those studies, in part to test the validity of the findings of this study. The findings and discussion of these two further studies in relation to this one are described in the next two chapters.

Limitations of the study

There are limitations to the study described in this chapter, arising from the fact that participants were recruited and interviewed at the V&A, and were being asked questions about museum visiting habits and experiences generally, not just at the V&A. First, V&A visitors may not by typical of all museum visitors. Also, since they were being asked about general museum-visiting experiences, they were being asked to both remember past museum-visiting experiences and to imagine other museum environments (for example, a science museum, rather than an art museum).

In order to help compensate for these limitations, some of the questions in this study were also asked in two subsequent studies undertaken for this thesis, which had different study populations and locations. These studies are described in detail in Chapters 6 and 7, and the participants' responses to questions that mirror those in this study are included in those chapters.

Chapter 6: Comparing use and perception of two-dimensional and three-dimensional maps

Contents

Rationale for comparing 2D and 3D maps

As discussed previously (see Chapter 3), one fundamental graphic feature of a museum map is the type of building projection, which are most represented as two-dimensional (2D) floor plans or a three-dimensional (3D) diagram. 2D maps have advantages for production and updating but there are some suggestions of advantages of 3D maps arising from previous research.

Cohen concluded in her survey of a range of American museums that "ideally, [visitor] maps would be drawn in three dimensions"[1], and Morris and Alt, in their study comparing a 2D and a 3D map concluded that museums should consider using 3D maps (described in detail in Chapter 4). However, Cohen's findings were not based on empirical research, and Morris and Alt's were largely based on the fact that the 3D test map in their study was considered more aesthetically appealing than the 2D one, rather than, for example, that it was easier to use or interpret by visitors.[2]

There is little evidence regarding how well 2D and 3D maps of buildings can be understood, and therefore how effective they are. A study by Gobert suggests that 2D maps may be easier to interpret. This study compared the ability of "experts" (experienced, practising architects) and "sub-experts" (undergraduate students) to interpret (accurately describe) a building from 2D floor plans, and found that experts' ability was superior.[3] This suggests that museum visitors (who can, in the main, be presumed to be "sub-experts") may not be very skilled at interpreting 2D museum maps and, by extension, that 3D diagrams may be more effective. However, one must be cautious about drawing parallels between Gobert's results and the relative usefulness of 2D and 3D plans. First, Gobert did not investigate ability to comprehend 3D maps. Second, interpreting floor plans in order to accurately visualise the space they represent is not necessarily the same as interpreting a map in order to plan or undertake a visit to a museum. Finally, the test materials Gobert used are not described or illustrated in the published study, so it is not known how similar they may be to a typical museum map.

There is a clearly a lack of research in this area (in particular, well-focused and recent research). There is no apparent clear consensus among museums and map designers, of whether 2D museum maps are better than 3D ones, or vice versa. This chapter describes a study among museum visitors to examine this issue.

1 Cohen, S. (1974). *The State of the Art of Museum Visitor Orientation: a Survey of Selected Institutions*. Unpublished paper. Washington D.C.: Smithsonian Institution, Office of Museum Programs, cited in Loomis, R. J. (1987) *Museum Visitor Evaluation: New Tool for Management*. Nashville: The American Association for State and Local History. **180**

2 Morris, R. and Alt, M. (1978). An Experiment to Help Design a Map for a Large Museum. *Museums Journal*. 77:4. **179-180**.

3 Gobert, J. D. (1999). Expertise in the Comprehension of Architectural Plans. In J. Gero and B. Tversky (eds). *Visual and Spatial Reasoning in Design*. **185-205**. Sydney: Key Centre of Design Computing and Cognition.

Fig 1. Interior of National Maritime Museum, Greenwich

Fig 2. Royal Museums Greenwich Map leaflet (148.5 × 210mm)

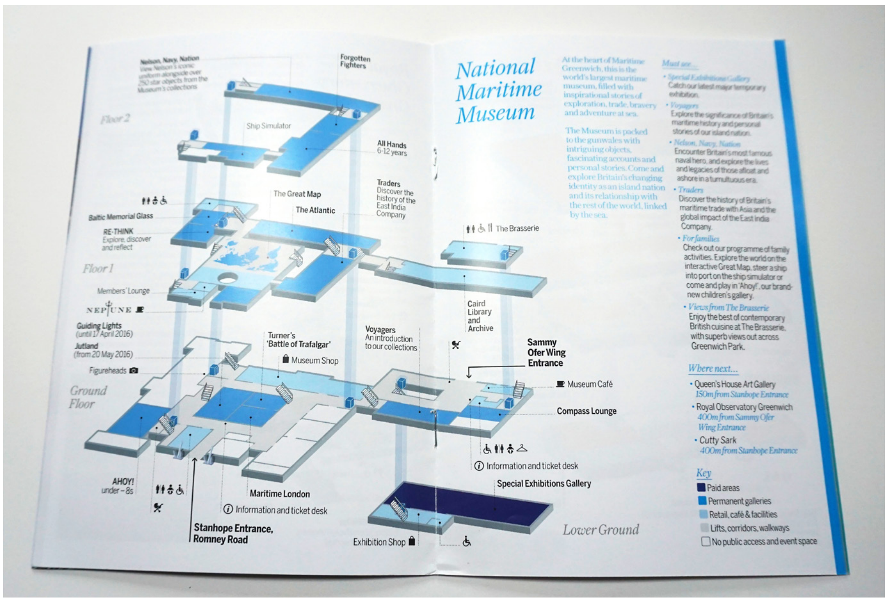


Fig 3. Map of National Maritime Museum within Map leaflet (297 × 210mm)

The study also formed the basis of an article published in the journal *Visible Language*.[4] A reproduction of the article can be seen in Appendix 6.

Purpose of research

This primary aim of this study is to investigate the relative **effectiveness** and **appeal** of a 2D and a 3D museum map at a medium-sized multi-level museum. In this context "effectiveness" means the ability of users (museum visitors) to navigate the building and "appeal" means how much users felt it helped them understand the layout of the building, the extent of its contents, and how to plan their visit.

This study was undertaken by preparing a 2D and a 3D map of a particular museum, and having a range of people use one of these maps to undertake a wayfinding task in the museum. Their ability to find a destination in the museum was assessed, and they were interviewed about their experience of using the map. The process of choosing the test location and the test material is explained below; the design of the research is explained starting on page 297.

Study context

The museum chosen as the location for testing was the National Maritime Museum, Greenwich, London. This was chosen in part because it contains many of the strong characteristics that determine the need for a museum map, as described in Chapter 1:

- It is a relatively large building, in a complex environment (partly a historic building originally built for a different purpose, with the addition of a modern wing – Fig 1 is an interior image showing contemporary and historic parts of the building).
- It has a varied collection that includes interactive displays and static artefacts; It has a non-sequential layout (ie, there is no pre-determined route for visiting the museum).
- Most visitors make self-guided visits.

The museum is also designed to appeal to a range of visitor types (with, for example, special displays and areas for children of different ages).

The National Maritime Museum provides users with a map, within an A5-sized booklet (costing £1, in 2015) at the museum (Fig 2, Fig 3) that also includes details and maps of three other museums in Greenwich that are run by Royal Museums Greenwich. The map (seen in Fig 4) has the following characteristics:

- It depicts four floor levels, each a different shape and size, in an axonometric projection (see Chapter 3, "Three-dimensional floor plan representations", for more about this).
- The levels are depicted as 2.5D, that is, each floor is rendered

4 McIlwraith, A.(2018). Two-Dimensional vs Three-Dimensional Guide Maps: Which Work Best for Museum Visitors? *Visible Language*. 52:3. **52-73.**

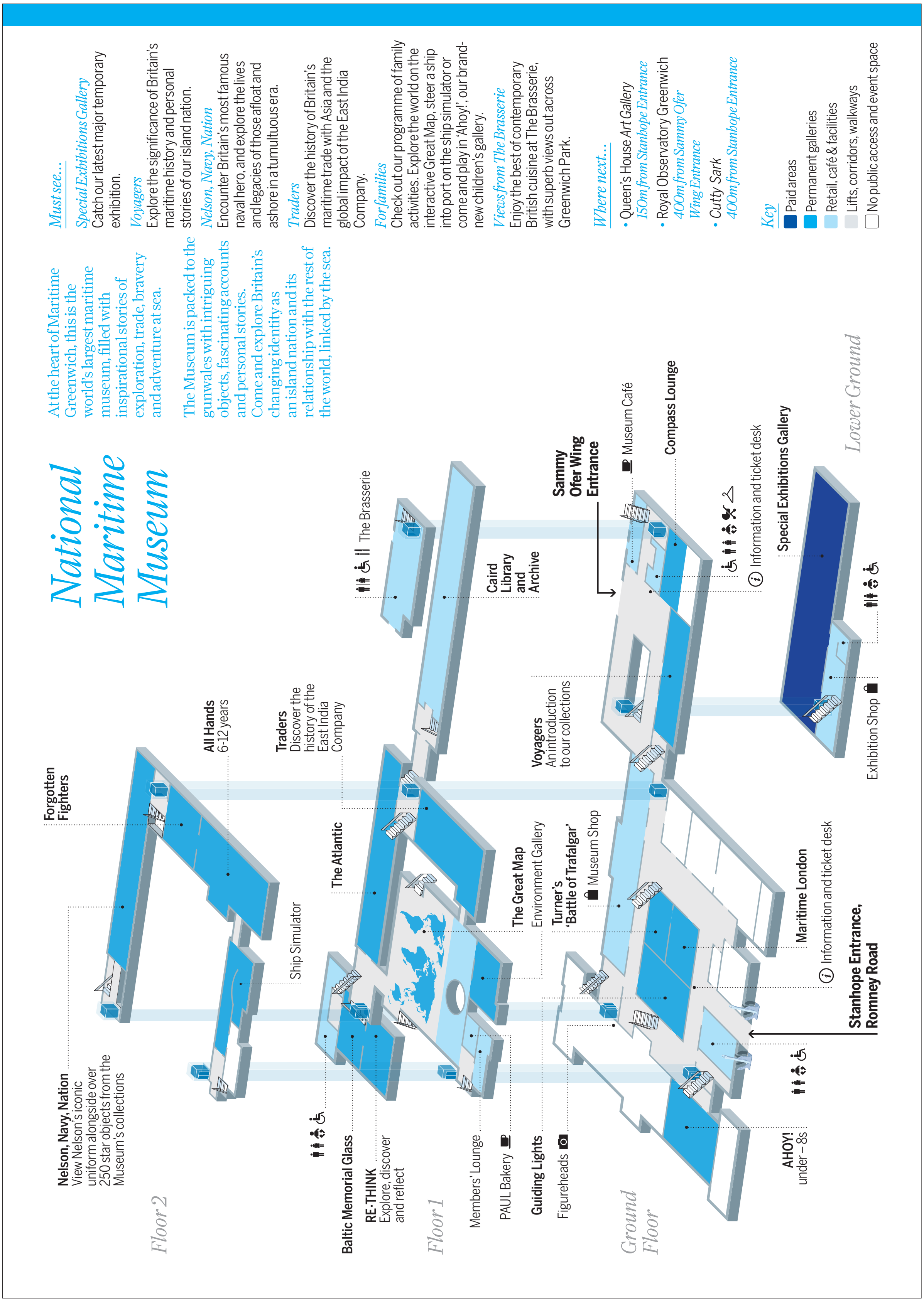


Fig 4. Map of National Maritime Museum, pdf from Royal Museums Greenwich website (https://www.rmg.co.uk/sites/default/files/rmg_map_2015_-_nmm.pdf), (at 75% actual size, page size: 297 × 210mm)

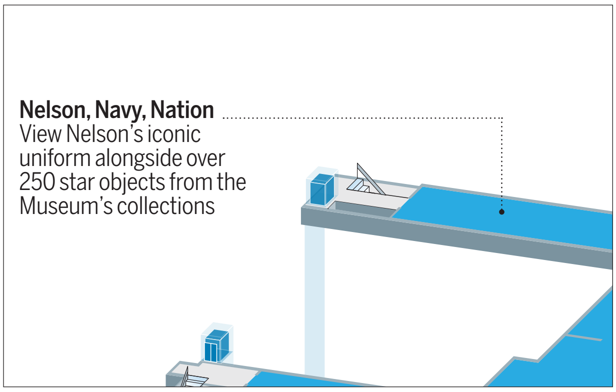


Fig 5. Nelson, Navy, Nation label and description, Map of National Maritime Museum (detail, actual size)

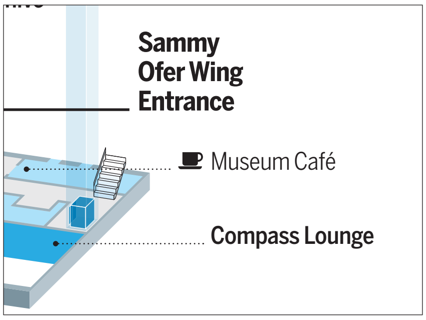


Fig 6. Indication of location of Museum Café, Map of National Maritime Museum (detail, actual size)

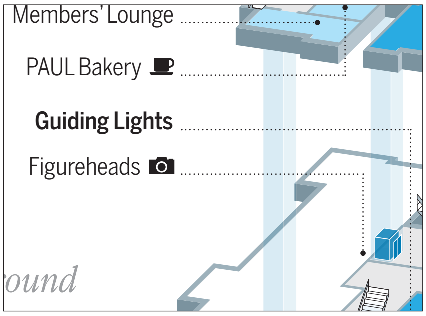


Fig 7. Camera pictogram, Map of National Maritime Museum (detail, 150% actual size)

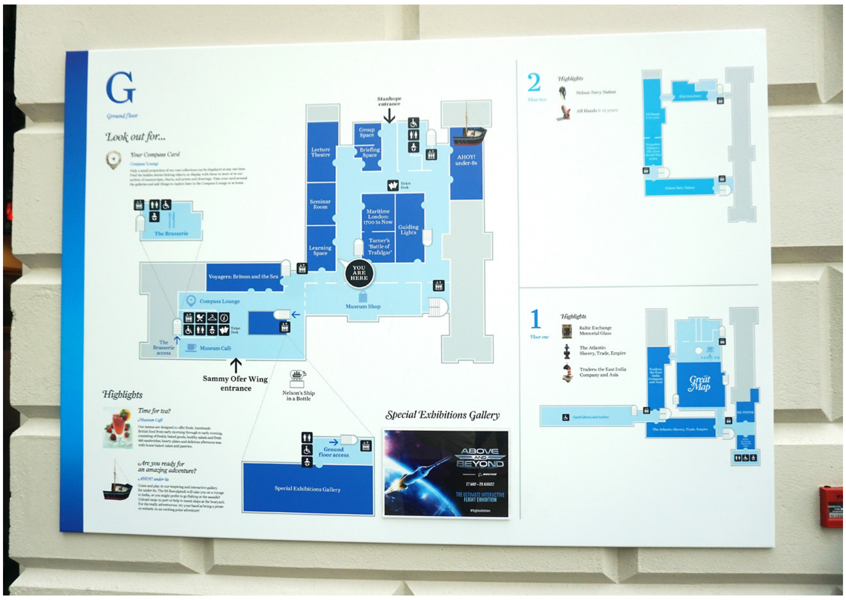


Fig 8. Wall-mounted "you-are-here" map at the National Maritime Museum

independently, rather than as a complete 3D rendering of the entire building, with elements such as walls, windows and doors. However, the floors are aligned vertically as they are in the building.

- A five-colour colour-coding system is used to denote different types of space function: paid areas; permanent galleries; retail, café and facilities; lifts, corridors, walkways; and no public access and event space.
- There are 3D diagrammatic renderings of stairways and lifts, and translucent vertical strips that describe the path of travel of each lift.
- Text labels are used for particular galleries, displays, facilities and entrances. Some of the gallery labels also include some descriptive text – see, for example, Fig 5. Different type weights are utilised for different types of label (though there is no key to describe this).
- Pictograms are used to denote the location of facilities, including: toilets, restaurant, café, shop, baby-change area, information, pram/pushchair storage and cloakroom. No key is provided to these pictograms, though some are accompanied by a text label – see, for example, Fig 6. A wheelchair pictogram is used ambiguously: it is presumed to indicate the location of disabled toilets, but may alternatively (or also) indicate disabled access. Further, a camera pictogram is used to indicate a point of a photo opportunity (see Fig 7).
- The map page also includes a brief description of the museum, with descriptions of some of the exhibition areas, and information about other attractions within walking distance of the museum.

Other wayfinding and orientation resources within the museum

The printed museum map is supplemented within the museum by wayfinding and orientation aids in the form of wall-mounted “you-are-here” maps (see Fig 8) and wall-mounted directories (see Fig 9).

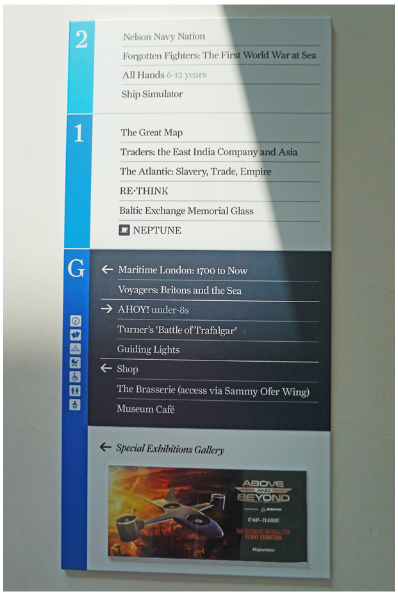


Fig 9. Wall-mounted directory at the National Maritime Museum,

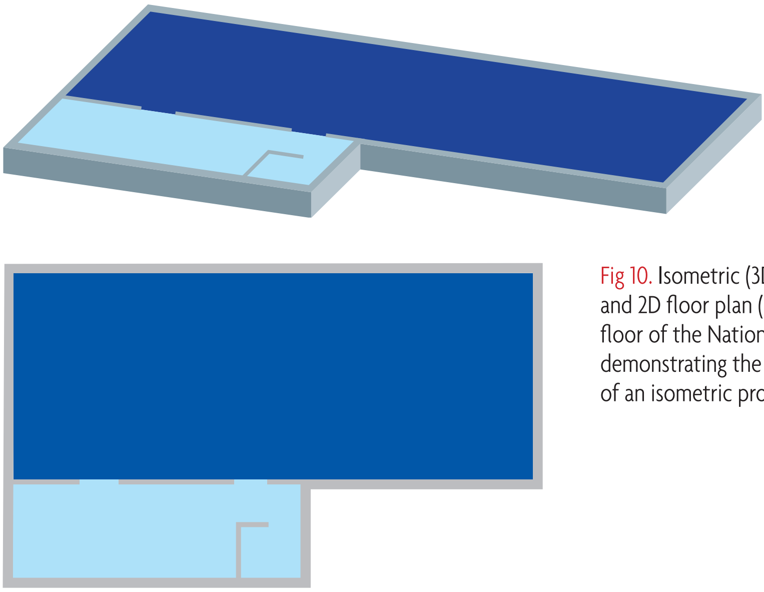


Fig 10. Isometric (3D) projection (above) and 2D floor plan (left) of Lower Ground floor of the National Maritime Museum, demonstrating the different proportions of an isometric projection

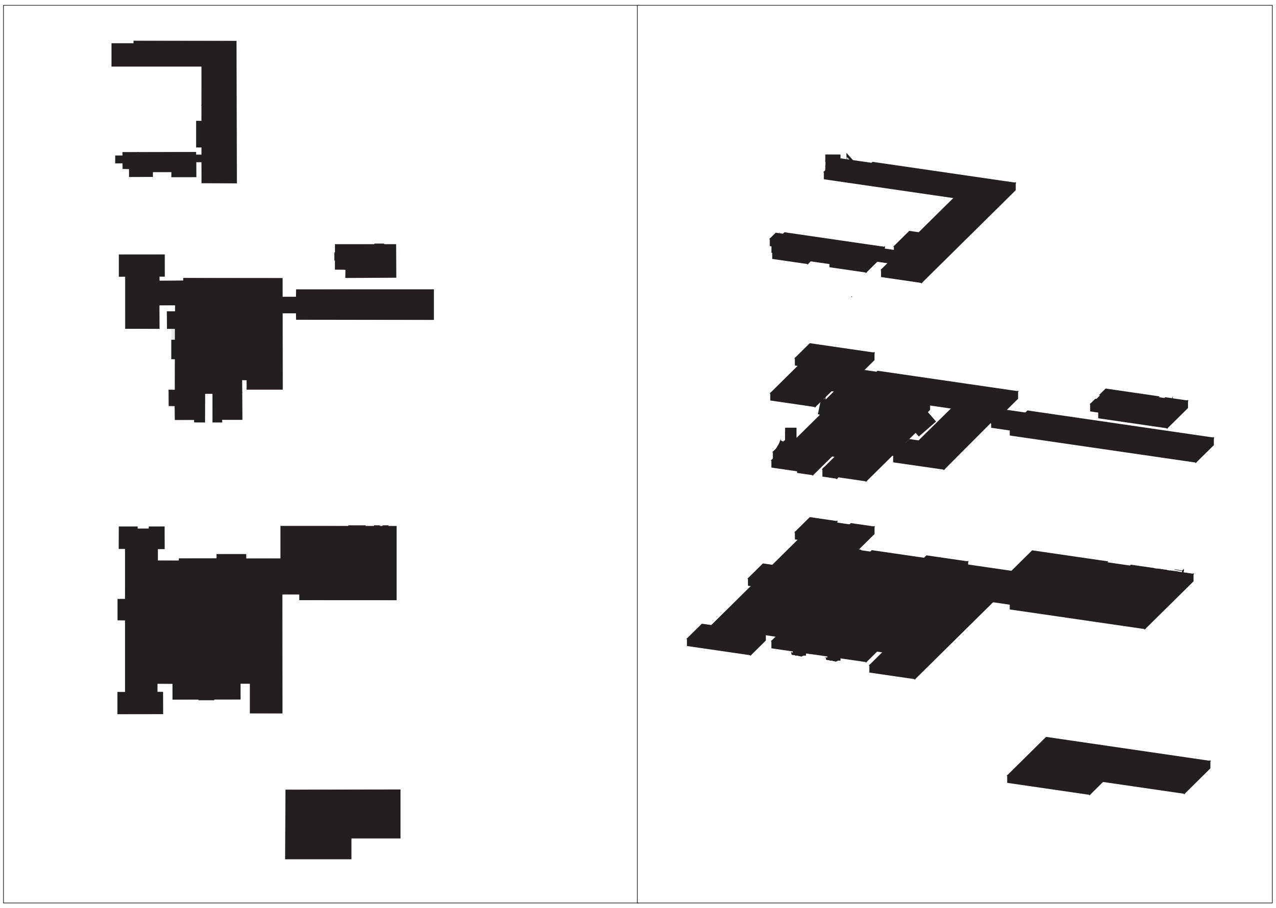


Fig 11. Surface area diagrams of 2D (left) and 3D (right) maps of the National Maritime Museum (40% actual size)

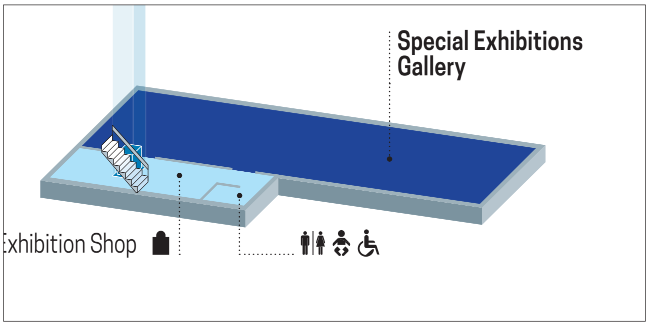
Study materials

The design of the existing (3D) map was used as the basis of the design of the 2D map, mindful of maintaining an "equivalence of information", ie, adding or substituting graphic elements only where they would be necessary for the map to provide a similar type of information. The two maps used for testing can be seen in Appendix 3. The process of developing the maps is described below.

Shape, size and orientation of map

In producing a 2D map, for consistency and clarity, it was considered important that the vertical relationships between each floor be maintained on the 2D map in the same way they are for the 3D one, that is, that the top floor of the museum (Floor 2) be at the top of the page and the lowest floor (Lower Ground) at the bottom. For this reason, it was necessary to have both maps in a portrait format, instead of the landscape format used in the existing 3D map (which was only possible because of the foreshortening of the depth dimension that is a characteristic of axonometric projections – see Fig 10).

The size and shape of the maps were controlled as far as possible, to limit the chance that one or other map could be easier to read due to being, or appearing to be, larger. Since an axonometric projection is not a scaled projection, the most effective way to prepare comparable maps was to ensure equivalent perceived size. This was done by scaling each map relatively to ensure the surface area of each on the page (the "ink area") was similar. This can be seen in Fig 11.



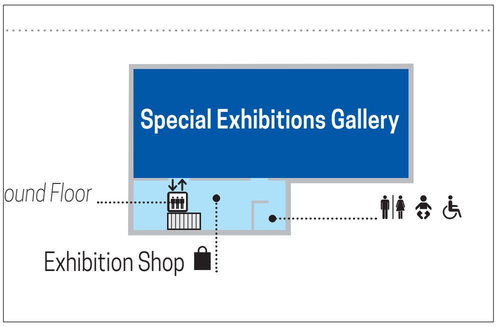


Fig 12. Labelling of the Special Exhibitions Gallery, in the 3D map (above) and 2D map (left) of the National Maritime Museum (detail, actual size)

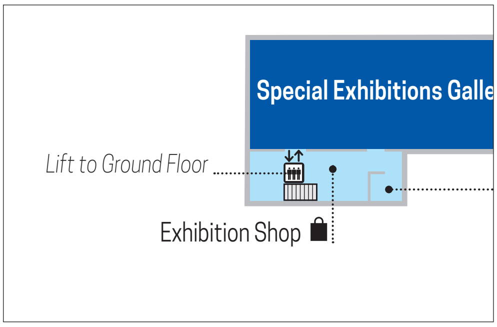


Fig 13. Pictogram and label of the lift that travels between the Lower Ground floor and the Ground Floor on the 2D map of the National Maritime Museum (detail, actual size)

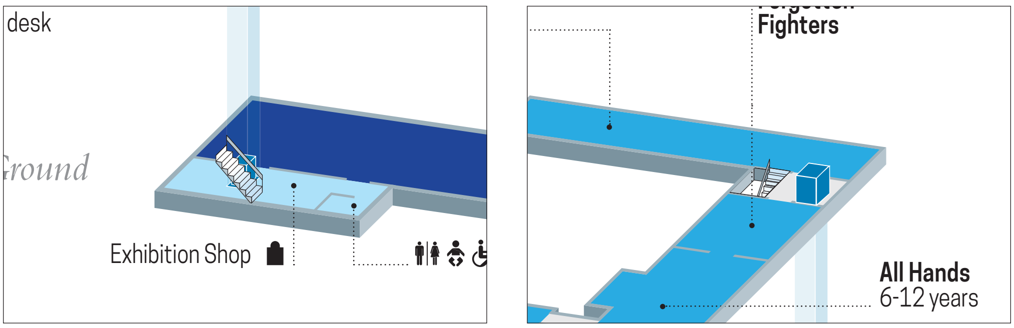


Fig 14. Use of the 3D symbol to denote “up” stairs (left) and “down” stairs (right), on the 3D map of the National Maritime Museum (detail, actual size)

Map labelling

The labelling on the existing 3D map was reproduced on the 2D one. However, the different proportion and shape of the spaces in the 2D floor plan allowed for some of the labelling to be placed directly on the spaces they were describing, rather than with the dotted-line callout used for all the labels on the 3D map (see Fig 12). Although this does introduce a stylistic difference between the maps, it was considered a logical and acceptable variation.

Showing vertical circulation: lifts

The museum contains four lifts, only three of which connect the main three floors (Ground Floor, Floor 1 and Floor 2). The fourth travels only between the Ground Floor and The Brasserie (which is on Floor 1, but not directly connected to the rest of the Floor 1 spaces). This arrangement, where all the lifts do not connect all the floors, is not unusual in complicated buildings, but it nevertheless creates problems for visitors, who, in the absence of visual cues, will often assume that lifts will visit all floor levels.

In the 3D map, lifts are denoted with a simple 3D box-shaped symbol, and partially transparent coloured bands to indicate the journey each lift makes (and therefore the floors that they connect) – see Fig 4. It is not possible to use this system with a 2D map, because the floors are discrete graphic elements. The box device was therefore replaced by a pictogram for a lift in each case (as in Fig 13). The pictogram used was similar to that widely used in building plans, and based on that in the International Organization for Standardization's standard on public information symbols.[5] Further, the two lifts that have limited travel (that is, between only two floors) are labelled with text explaining this, in order to avoid map users mistakenly attempting to use those lifts to travel to other floors.

Showing vertical circulation: stairs

The 3D map uses a 3D rendered symbol to indicate the location of staircases. This is a stronger visual representation of stairs than the simple ladder-type stair symbol on the 2D map. It also provides more information (indicating which floors the stairs connect), but it can be problematic at some points, where the symbol is partially concealed (see Fig 14). Also, the 3D stairs symbol does not always accurately represent the size, shape or orientation of each stairway. In one case, the orientation of the stairway is incorrect, which is likely to arise from the difficulty in rendering the stairway in the correct orientation at that particular point – this is discussed further in "Research findings: wayfinding", on page 305.

5 International Organization for Standardization (2007). ISO 7001:2007(E). *Graphical Symbols – Public Information Symbols*. Geneva: ISO.

Another problem is that the 3D stair style does not render staircases that run through more than two levels. The part of the museum depicted in Fig 15, for example, has a staircase that links the three upper levels, though it is represented as three unconnected sets of stairs, which may confuse visitors.

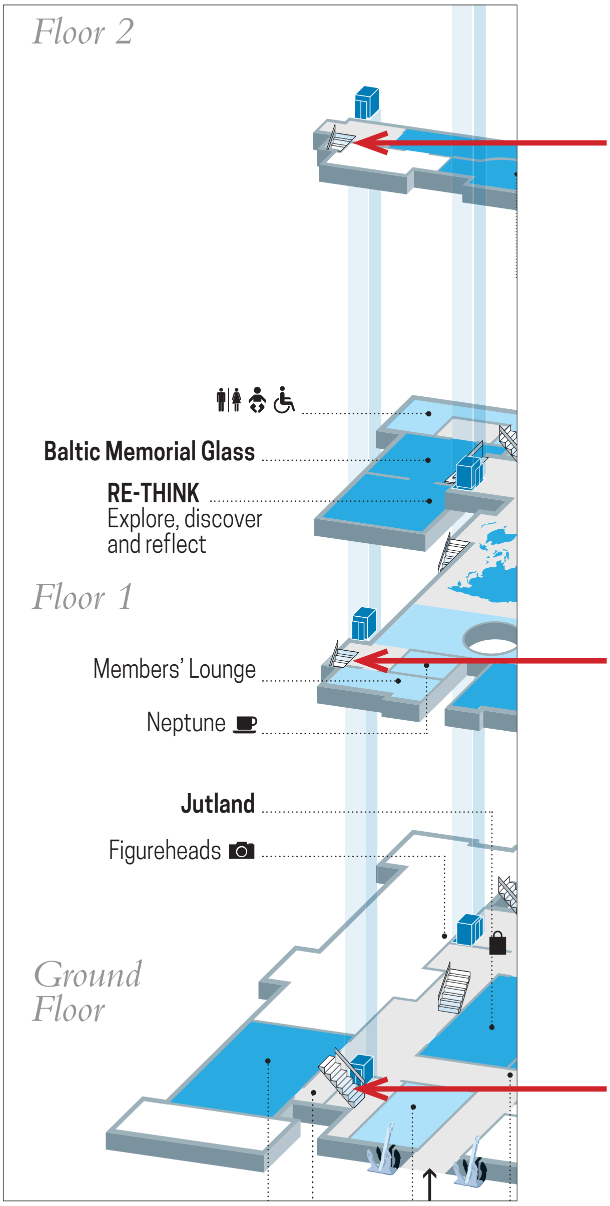


Fig 15. Detail of 3D map of the National Maritime Museum, showing how the staircase that links the Ground Floor with Floor 1 and Floor 2 is indicated as three unconnected stairs (detail, actual size, with annotations)

Research questions

The aim of the user research was to investigate:

- is either map projection better at helping museum visitors plan and follow a route to a particular point in the museum on the map (**wayfinding**)?, and
- is either map projection preferred by museum visitors in terms of overall usefulness before or during a visit, by helping them understand the layout of the museum building, its contents and how they are arranged (**conceptual orientation**)?

Study design

The study was reminiscent of the timing and tracking research discussed in Chapter 4, although the focus in this case was the materials participants used rather than the museum displays. Such research often uses a combination of quantitative research (timing, for example, how long visitors spend at particular locations in the museum) and qualitative research (interviewing visitors to understand how and why they moved through the museum as they did, or stopped at particular displays or points in the museum).[6]

Participants were first asked preliminary questions about their museum-visiting and map use experiences and habits. They then undertook a timed wayfinding task. Two groups each saw one version of the map; half the participants in each group were asked to find destination 1 (the Forgotten Fighters gallery), and half destination 2 (the Baltic Memorial Glass gallery). (Two test destinations were used, because each had different issues relating to representation of key points on the map.) The starting point for the task, and the two destinations on the maps can be seen in Fig 16 and Fig 17. The participants were then questioned about their experience of using the map to undertake this task, and also about their general impressions of the map and how useful it would be on a visit to the museum. Participants were then shown the alternative map (that is, the one they had not used in the wayfinding task), and asked how their impressions of it compared with the one they had been using.

The study was approved by the University of Reading's Research Ethics Committee.

Participants

Twenty adult participants were recruited via the researcher's personal network to attend the museum for approximately an hour to take part in a research project, as outlined in the Information Sheet (see Appendix 2). The sample was not restricted to those who matched the profile of visitors to the National Maritime Museum, or to museum-goers generally. However, since potential

6 Yalowitz, S. and Bronnenkant, K. (2009) Timing and Tracking: Unlocking Visitor Behavior. *Visitor Studies*. 12:1. **48**.

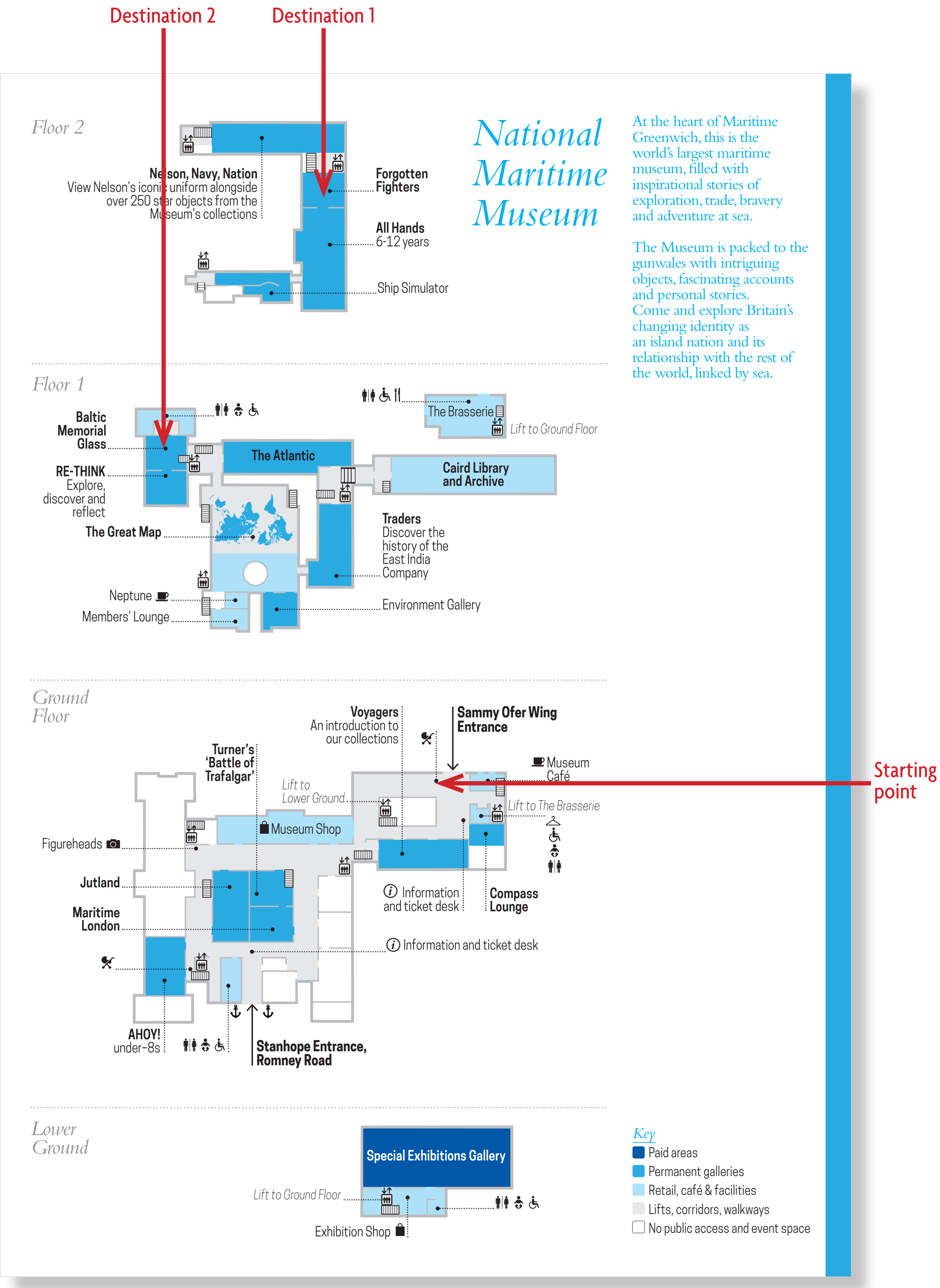


Fig 16. Location of starting point and Destinations 1 and 2 for wayfinding task on 2D map of the National Maritime Museum (67% actual size, with annotations)

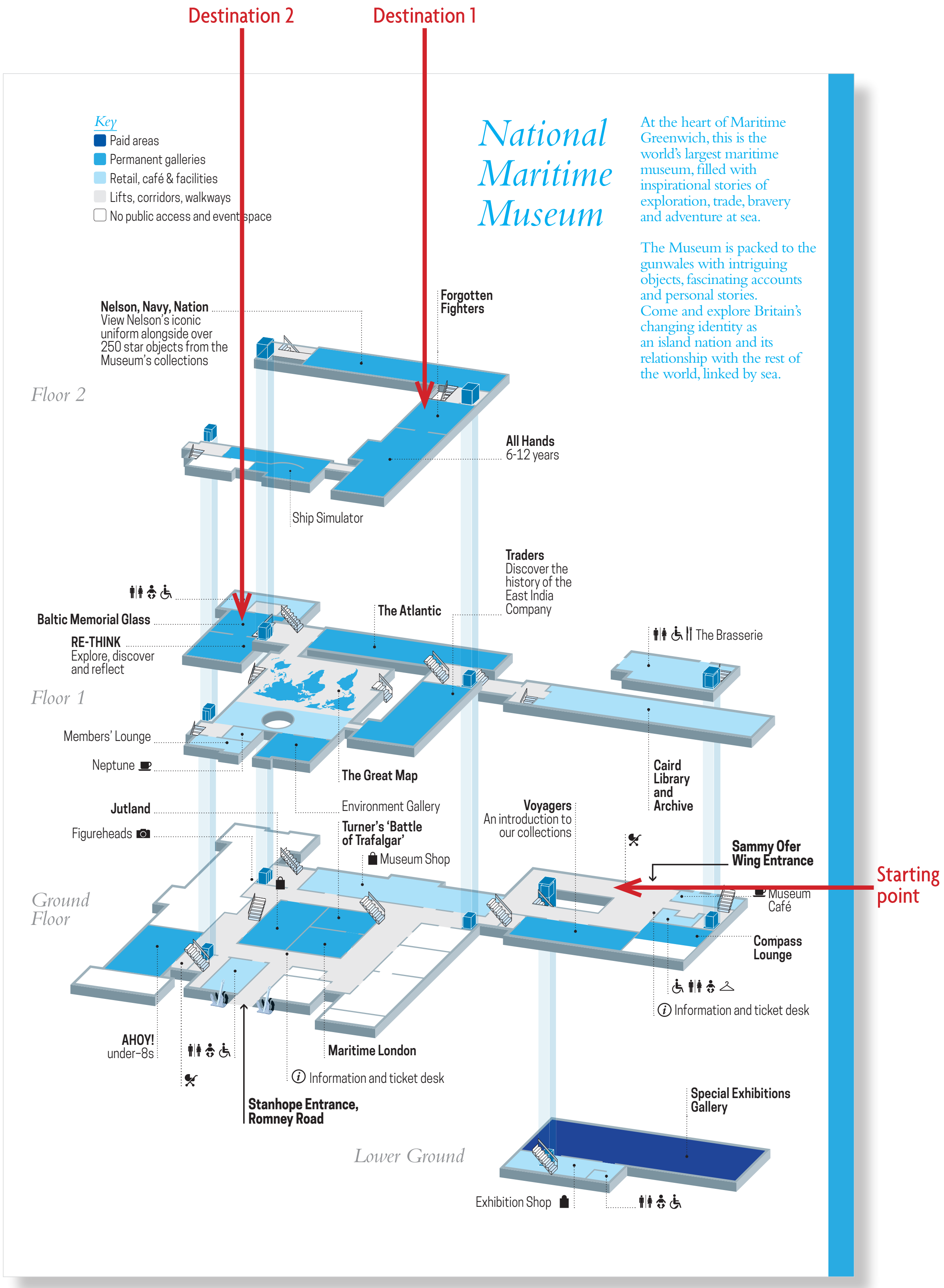


Fig 17. Location of starting point and Destinations 1 and 2 for wayfinding task on 3D map of the National Maritime Museum (67% actual size, with annotations)

participants were made aware of the nature of the research (and no financial incentive was provided), it was expected that those who agreed to participate had at least some interest in museums and experience of visiting them. In this respect, during preliminary questioning of participants immediately prior to briefing on the wayfinding task, all indicated that they were occasional or regular museum-goers.

Potential participants were excluded from the research if they did not have English as their first language; were museum professionals (working for a museum, or as a curator, museum or exhibition designer, or a professional guide); or professionally involved in graphic design, information design, or map-making. Some participants had visited the National Maritime Museum previously, but complete unfamiliarity was not considered a prerequisite, not least since the museum had undergone various internal changes in recent years, including the addition of an entirely new wing in 2011.[7]

Limitations of this aspect of the research include:

- No attempt was made to include or take account of people with disabilities or special needs, be they mobility-related or perceptual (such as colour-blindness or dyslexia).
- Research was undertaken by participants individually, which may not be their typical manner of visiting a museum (that is, that they are more likely to visit with family members or companions), which may affect their visiting, map-use and wayfinding behaviour.

Research procedure

All participants were briefed and started the task from the same point in the museum (see Fig 16 and Fig 17).

1. The participant was asked a series of preliminary questions about their museum-visiting habits and behaviour, based on those in the visitor survey undertaken at the Victoria & Albert Museum that is described in Chapter 5.
2. The participant was then shown either the 2D or the 3D map, and shown their current location in the museum on the map. They were asked to spend a few minutes familiarising themselves with the map, and to then locate and mark on the map either the Forgotten Fighters gallery (Destination 1) or the Baltic Memorial Glass gallery (Destination 2). They were then given a pencil and asked to trace the route on the map from their current location to the destination. The most direct routes in each case are shown in Appendix 3.
3. Once the participant had indicated that they had finalised their route on the map, they were told that they should make their way to the destination.

7 National Maritime Museum, 2011. *The National Maritime Museum's Sammy Ofer Wing opens 14 July 2011*. [press release] 15 April 2011. Available at: http://www.rmg.co.uk/work-services/news-press/press-release/national-maritime-museum%E2%80%99s-sammy-ofer-wing-opens-14-july-2011

They were told that this task would also be timed, but they should not run or rush there, because the time taken for the task was not of prime importance. They were told that they may divert from the route they had traced if they felt they wanted to or needed to. They were also able to make use of any signs in the museum that they came across, but they were instructed not to seek or accept any offered help from gallery staff. The participant was asked to call the researcher's mobile phone on reaching the gallery, but to hang up immediately, and that the researcher would know they had reached their destination and would meet them there.

4. After contacting the researcher to confirm they had reached their destination, the participant was then questioned about their experience of getting there, in particular about how well the route they had planned had worked, whether they had followed it and, if not, why not. They were then asked about how useful, in general, they felt the map would be for a visit for a visit to the museum, their reasons for this, and any features or aspects of the map they felt were particularly useful or helpful or not useful or helpful.
5. The participant was then shown the alternative map to the one they had used, asked whether they thought it would be better or worse than the first map for planning a visit to or visiting the museum, their reasons for this, and for any particular features or aspects of this map that they thought were more or less useful than the first map.

Table 1. Participants' frequency of use of printed maps in museums

'When you visit a museum do you use printed guide maps, if they are available?'

	Never		Sometimes		Always	
	No.	%	No.	%	No.	%
National Maritime Museum study (n=20)	2	10%	15	75%	3	15%
Victoria & Albert Museum study (n=40)	4	10%	17	42.5%	19	47.5%

Table 2. Tasks that participants use maps for

'What would you use a museum map for?'

		National Maritime Museum study (n=20)		Victoria & Albert Museum study (n=39)[1]	
	Equivalent map role	Number agreeing	As % of participants	Number agreeing	As % of participants[1]
'To find out what sorts of displays and exhibitions are in the museum'	Visual directory	16	80%	30	77%
'To find out where things like the toilets, café and shop are'	Locator (facility)	19	95%	27	69%
'To keep as a souvenir of my visit or pass on to a friend or relative'	Souvenir	7	35%	25	64%
'To locate a particular object, for example, a painting'	Locator (exhibit)	19	95%	24	62%
'To plan a route through the museum that takes in everything I want to see'	Trail	14	70%	20	51%

1. one of the 40 study participants stated they did not and would not use museum maps

Table 3. Participants' frequency of use of museum apps and digital maps

'Have you used a museum app for a smartphone or tablet, or a digital map on a museum website?'

	Never		Occasionally		Often	
	No.	%	No.	%	No.	%
National Maritime Museum study (n=20)	16	80%	3	15%	1	5%
Victoria & Albert Museum study (n=40)	31	77.5%	8	20%	1	2.5%

Research findings: preliminary questions

Table 1 shows the frequency of map use by this group compared to those reported in Chapter 5 (from the survey undertaken at the V&A). In both cases, a clear majority of participants use maps on at least some of their visits to museums. The proportion of participants saying they never use maps is the same, but there were differences across the two studies in the proportions of people saying they “sometimes” or “always” used maps. This may be due to relatively small sample sizes in each, or the different characteristics of the study populations; for example, all participants in this study were UK residents, while around half of those in the V&A study were visiting from abroad, participants in this study were more frequent museum goers (more than half said they visited a museum at least every month, compared with around a third in the earlier study).

As with the earlier study, participants were read five statements about specific ways museum maps can be used, and asked which ones (if any) they used maps for. The results are in Table 2. There were greater differences in the proportions of responses in these studies, with a higher proportion of participants in this study using maps for each of the tasks, apart from keeping the map as a souvenir. Again, the differences could be due to the sample sizes and study populations. Participants’ use of digital alternatives to maps (via a smartphone or tablet app, or a digital map on a museum website) is shown in Table 3. As with the previous study, a majority of participants had never used them, and only one participant in each study said they had often used them.

Research findings: wayfinding

In the route-plotting part of the task, 15 of the 20 participants were able to plot a feasible route to the given destinations. In this context, feasible means a route that would by physically possible; it need not be a direct or efficient route. Four participants plotted routes that were not feasible (for example, they misunderstood where stairs led or how spaces were connected); two each for the 2D and 3D maps. One participant stated that he could not plot a route because could not work out where the stairs were on the map (the 2D map). Most participants (16) plotted their route – feasible or not – in less than a minute. Two people (one each testing each type of map) took more than three minutes to plot a route; only one of these produced a feasible route.

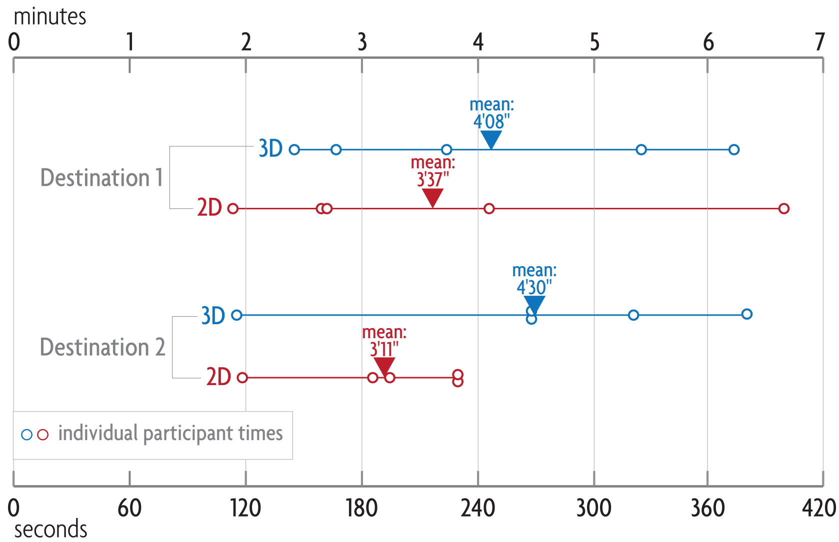


Fig 18. Individual participant times and mean times taken to complete wayfinding task using the 2D and 3D maps

Following a route: time

All of the participants – including the one who was unable to plot a route on the map – found their way to their destinations in less than seven minutes. On average, the journey time was around four minutes. As can be seen in Fig 18, for both maps for Destination 1 (the Forgotten Fighters gallery), the mean times and the fastest and slowest times appeared not to differ greatly. There were greater differences in journey times for Destination 2 (the Baltic Memorial Glass gallery). This may be because of a particular issue with the depiction of the space immediately outside the Baltic Memorial Glass gallery in the 3D map, which was noted by some participants. This issue is discussed in detail on page 323 and illustrated in Fig 22 and Fig 25.

However, these results do not provide enough grounds to conclude that either the 2D or 3D map is more effective than the other in facilitating efficient wayfinding. This is partly because of the relatively small numbers of participants for each route and each map, and partly because of factors associated with the structure of the task, in particular:

- Participants undertook the task at various times of day and on various days of the week; visitor congestion in the museum was variable, and this could have an effect on the speed and ease at which participants could move through the museum.
- For those participants who chose to take a lift (instead of stairs) on their route, waiting times for lifts would be variable, which could have an impact, given that task times overall were relatively brief. This may be significant because the graphic representation of lifts and stairs differed between the 2D and 3D maps, and therefore may have resulted in participants testing one type or the other being more or less inclined to use the lift.

Following a route: accuracy

Although all participants found their way to their destination, and within an acceptable time, 13 of the 19 participants who had plotted a route on the map did not follow their plotted route exactly. The numbers for each map were broadly similar. In itself, not following a plotted route may not be significant in practical terms – for example, if it does not cause undue delay. However, feeling lost can evoke feelings of confusion, frustration or anxiety.[8] These kinds of feelings can potentially reduce a visitor's enjoyment of the space they are visiting (the museum).[9]

Looking more closely at those participants who did not follow the route they had plotted, five who tested the 3D map and two who tested the 2D map

8 Carpman, J.R. and Grant, M.A. (2002). Wayfinding: a Broad View. In Bechtel, R. and Churchman, A. (eds). (2002). *Handbook of Environmental Psychology*. New York: John Wiley & Sons. **428**

9 Passini, R. (1996). Wayfinding Design: Logic, Application and Some Thoughts on Universality. *Design Studies*. 17:3. **319**

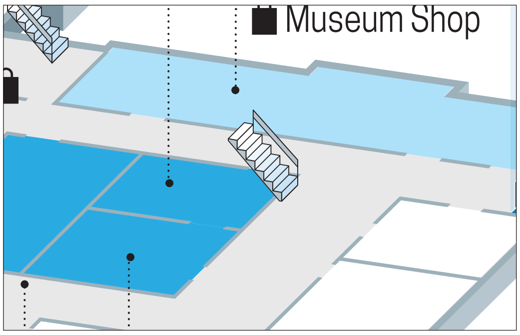


Fig 19. Incorrect orientation of stair symbol from Ground Floor to Floor 1 on the 3D map of the National Maritime Museum (detail, 150% actual size)

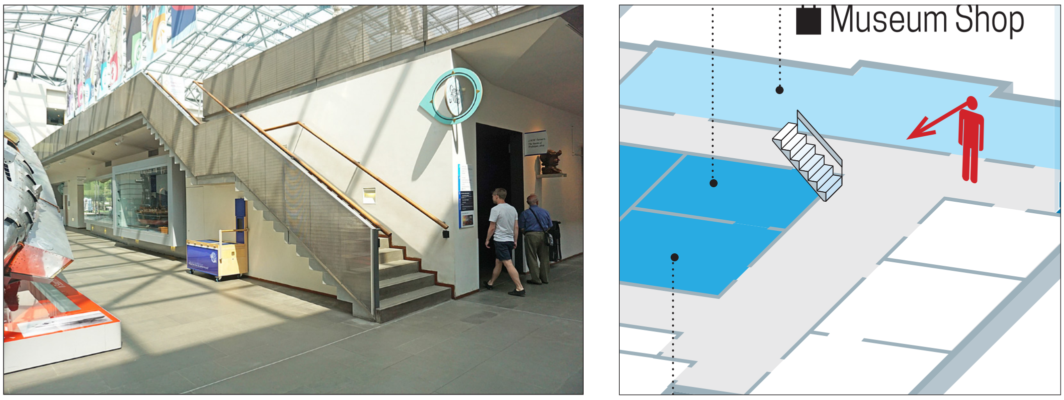


Fig 20. Photograph of the staircase depicted in Fig 17, and detail of 3D map with annotation indicating location and orientation of photograph

can be considered to have had serious problems following their route. This is because they made lengthy deviations from their plotted route or, when explaining the route they actually took, expressed concern about feeling lost, confused or being disoriented, and having to take remedial steps to find a route to the destination. For example, one participant who tested the 3D map said:

> I couldn't orientate myself to begin with, I was confused. I couldn't find the "Traders" gallery on the map. When I started in the wrong direction, I thought any stairs would do, and then realised, when I reached the bistro [Brasserie], that they didn't.

Another participant, who also tested the 3D map, said:

> I found a lift past the toilets and took it, but it went only to the first floor, so I came back down and walked back through the shop and saw another lift and took that one, which went to the second floor. I thought I knew what I was doing but I didn't.

Two of the five participants who tested the 3D map for Destination 2 (Baltic Memorial Glass) included a set of stairs as part of their route that were incorrectly oriented on the map (Fig 19). The way these stairs are represented on the map suggests a direction that is in fact at right angles to the actual stairs (Fig 20). This way of rendering may have been chosen because of the difficulty in (or unacceptable result of) rendering the stairway in the correct orientation, but it has the potential for creating disorientation in map users. Both of the participants who used these stairs in their route made deviations from their plotted routes because they could not orient themselves at the top of the stairs. Both said they felt confused during the task, but neither articulated that they had identified the error in the depiction of the stairs.

Participants' impressions of the task

It is worth noting that feelings of confusion or disorientation were expressed by some participants who made only minor diversions from their plotted route, and even by some who had followed their plotted route exactly. This was generally due to participants finding that parts of the museum did not match their expectations of how it would appear, based on its representation on the map. For example, one participant who had followed her route said:

> When I got to the shop, wasn't sure if I had to go through the doors or around the corner to find the lift.

Another (who had also followed her route) said:

> I followed the route exactly, but I didn't know [the parts of the museum I passed through] would look like that – I didn't realise the lift would be where it was.

Fig 21. The Great Map at the National Maritime Museum

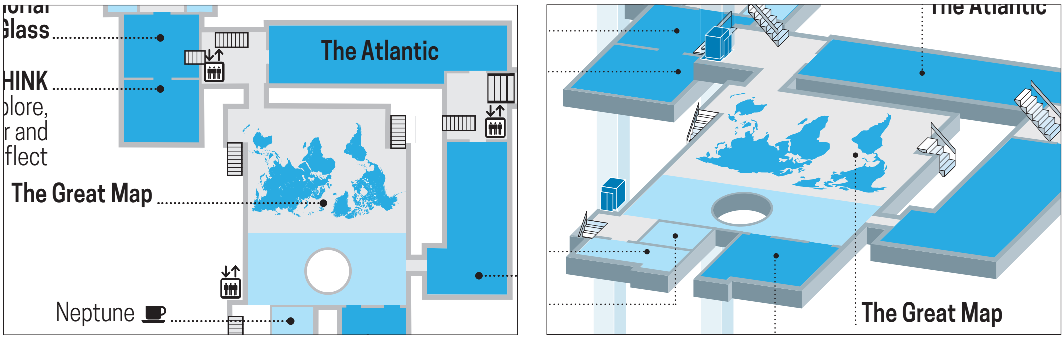


Fig 22. The Great Map as shown on the 2D (left) and 3D (right) maps (detail, at actual size)

A participant who also felt the map did not match her expectations of how the museum would look said:

> I followed down the [stairs] next to the Forgotten Fighters gallery and it goes around the edge, not the way it is shown [on the map]. You can't match the illustration with what you're seeing – it makes you feel insecure.

Some participants, as expected, used other wayfinding devices within the museum to aid them. Two participants spontaneously mentioned having used signs, and one mentioned having used the wall map (as shown in Fig 8). Several participants also stated that they had had problems with signs: either not finding signs when they felt they needed them, or not finding signs that gave them the information they wanted.

Some participants also spontaneously mentioned having used landmarks within the building to orientate themselves. Eight participants mentioned having used The Great Map (Fig 21 and Fig 22) and one mentioned having used the Figureheads (Fig 23 and Fig 24) to help orientate themselves. The use of landmarks on the museum map is discussed further on page 325. Other people mentioned using recognisable facilities (the shop and café) as orientation aids.

Fig 23. The Figureheads at the National Maritime Museum

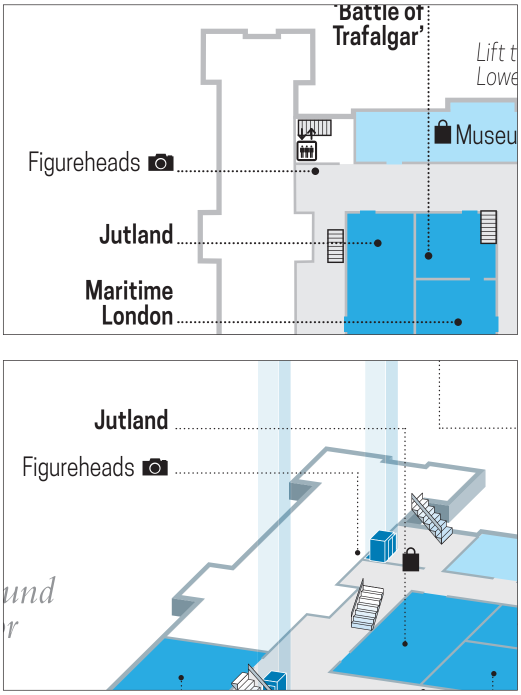


Fig 24. The Figureheads as indicated on the 2D (top) and 3D (bottom) maps (detail, at actual size)

Conclusions

Both types of map proved useful and largely effective at facilitating wayfinding. Most of the participants managed to use the map they tested to plot a route to a destination within the museum without great difficulty. Even where participants plotted routes that contained errors (ie, the route was not physically possible), those errors were overcome when actually undertaking a journey to reach the planned destination. All participants found their way to the destination, though in a few cases participants had some difficulties, and had to rely on other wayfinding devices (signage and landmarks primarily) to complete their journeys. These results are in line with a broadly similar study: Cheng and Pérez-Kris's study of effectiveness of maps as wayfinding devices in two medical clinics.[10] The findings, in terms of apparent different wayfinding abilities, regardless of the particular map being used, would also fit with the findings of studies by Kozlowski and Bryant,[11] and Kato and Takeuchi,[12] as discussed in Chapter 4 (see "Research into indoor wayfinding and orientation").

Furthermore, although some participants took longer than others to reach their destination, in the context of visiting a museum, reaching a chosen destination is rarely very time critical, so this is not considered problematic in practical terms. Several participants pointed out that they considered the task theoretical or artificial, because when visiting a museum they would rarely be focused on reaching a particular destination without delay, and would, for example, be likely to stop to look at something on the way that caught their attention.

10 Cheng, K. and Pérez-Kriz, S. (2014). Map Design for Complex Architecture: a User Study of Maps & Wayfinding. *Visible Language*. 28. **6-33**.

11 Kozlowski, L.T. and Bryant, K.J. (1977). Sense of Direction, Spatial Orientation, and Cognitive Maps. *Journal of Experimental Psychology: Human Perception and Performance*. 3:4. **590**.

12 Kato, Y. and Takeuchi, Y. (2003). Individual Differences in Wayfinding Strategies. *Journal of Environmental Psychology*. 23:2. **171**.

Table 4. Participants' usefulness ratings of 2D and 3D test maps

'How useful do you think the map is in helping you make the most of your visit?'

	3D map testers	2D map testers	All testers
Very useful	2	2	4
Fairly useful	3	7	10
Not very useful	4	1	5
Not at all useful	1	0	1

Table 5. Participants' ratings of alternative maps to those tested

'Do you think this new map would be better or worse for visiting the museum?'

	3D map testers' rating of 2D map	2D map testers' rating of 3D map
Much better	2	5
Slightly better	4	2
Neither better nor worse	0	1
Slightly worse	4	1
Much worse	0	1

Research findings: conceptual orientation

When asked about how useful the map would be for planning or undertaking a visit to the museum, 14 of the 20 participants said the map they tested would be "very" or "fairly" useful. Table 4 shows the spread of ratings for the two types of map. Overall, the 2D map was rated higher for usefulness than the 3D one. Only one participant who tested the 2D map gave it a negative rating, while the higher number of negative ratings by testers of the 3D map to a large degree effectively offset the positive ratings. So a more pertinent conclusion is that opinions are more divided over the 3D map than the 2D one. However, the sample sizes, and the nature of the testing, in particular that it was done in only one museum, do not allow for a conclusion that 2D museum maps are considered more useful generally than 3D ones.

Comparative ratings of the two types of map

After participants had rated the map they had tested, they were asked to consider and then decide whether they thought the alternative map to the one they had tested would be better for planning or visiting the museum. The results can be seen in Table 5.

Overall, participants who had tested the 2D map rated the 3D one more highly than vice versa. This would appear to be at odds with the usefulness ratings of the tested maps, as described above, where the 2D map was scored as more useful overall. However, there are several possible contributory explanations for this apparent discrepancy. First, in both cases, there was a spread of ratings from positive to negative, indicating that preferences vary from individual to individual. Second, the assessments were not symmetrical and directly comparable, since, of course, the alternative map was being rated only in comparison to a different map that they had used to undertake a wayfinding exercise without prior knowledge of the map, the route, or the museum.

There are two particular possible consequences of this, in relation to the ratings given. First, the 3D projection of the building might be considered to have a more "sophisticated" design, and thus may have been more novel or appealing to those participants who had tested the 2D map; conversely the 2D map may be seen as "simplistic" or more basic than the 3D map, to those participants who had tested the latter. In Laakso's study comparing a digital 3D map of an urban area with a 2D paper map, she found that the 2D map was more effective for navigation, but users found the 3D map more "fun" to use.[13]

Second, having already (successfully) used a map that had many similarities to navigate the museum, and having also familiarised themselves with the museum, those participants who tested the 2D map may have felt more

13 Laakso, K. (2002). *Evaluating the Use of Navigable Three-Dimensional Maps in Mobile Devices*. Master's Thesis. Helsinki University of Technology.

confident and positive about the graphically more sophisticated and (possibly) more complex 3D map than they otherwise would have.

These are just two possibilities about how participants may have reached their judgments. But, as Nisbett and Wilson have reported, there is much evidence to suggest that people are often unaware of how stimuli in controlled situations affect responses.[14] Participants were not necessarily making the rational judgments they might be presumed to be making. Also, Hegarty et al found that, in a study in which participants rated the desirability and effectiveness of particular designs or features of maps (such as animations or realistic depictions of features), there was little correlation between effectiveness (in terms of measured accuracy of interpretation) and desirability – ie, the features participants actually said they liked and thought would work well often did not aid understanding of the map.[15] This study was not on built-environment maps, though the conclusions may well apply, at least to some extent.

Participant comments about 2D and 3D maps

Further participant comments related to perceived complexity or complication in the maps. Balancing clarity with detail is a challenge of museum map design (and other maps). For example, in a 2012 report on the effectiveness of wayfinding materials and systems at the Victoria & Albert Museum, one of the key issues identified was that the museum's visitor map was "very detailed and can be overwhelming".[16] It concluded that the complexity of the map meant that it could be "putting people off", rather than encouraging them to explore the museum,[17] and included the suggestion that a second, simpler map for "general" visitors could be developed, with the existing map being available for "experienced" visitors, or those with specific interests.[18]

Comments relating to complexity in the 2D map included:

> It's pretty muddy to me. I think it has all the information I need. But I think you would need to study it for five minutes to begin with, I don't think it's very clear at all.
>
> It's a bit 'bitty'. There are lots of little bits of information and it looks a bit incoherent.
>
> I think there is too much in it. The two-dimensional map looks a bit cramped, but maybe that's just an optical illusion.

14 Nisbett, R.E. and Wilson, T.D. (1977). Telling More Than We Can Know: Verbal Reports on Mental Processes. *Psychological Review*. **84:3**. 231-259

15 Hegarty, M., Smallman, H.S., Stull, A.T. and Canham, M.S. (2009). Naïve Cartography: How Intuitions about Display Configuration Can Hurt Performance. *Cartographica*. 44:3. 171-186. DOI: 10.3138/carto.44.3.171

16 Morris Hargreaves McIntyre (2012). *Navigation at the V&A: Current and Future Wayfinding*. [Unpublished report]. **8**

17 ibid. **32**

18 ibid. **25**

Comments about the 3D map included:

> It's quite busy – it's a random series of headings, and why would you choose one over the other?

> The three-dimensional map has added complications that are confusing. Also, the labels on the three-dimensional one are more complicated.

> I just find it easier to locate things on a flat plan – I don't know why. [The three-dimensional map] looks too much like an engineering diagram to me… it just looks so busy.

There was no observable trend in the comments to suggest one type of map was perceived as more complex than the other. In describing the differences between the two maps, some participants characterised this in terms of being able to take in the whole museum in one view with the 3D map, while the 2D one could only be considered one level at a time. However, there were divergent views about whether one type was better than another – reflecting the ratings given by participants, as shown in Table 5.

> I could work with the 2D one, but it's easier to grasp the overall layout of the place with the 3D one

> I feel like you can interact more with the 3D one, and imagine yourself walking through the different floors.

> I think it depends on your brain. In my head, I can compartmentalise the bottom floor, top floor, but [the 3D] map tries to make me think in three dimensions

Other comments related to the relative amount of effort required to interpret or use the maps:

> The 2D map requires more interpretation – you have to do more work.

> I can only cope with so much information. [The 3D map] is asking me to cope with four lots at the same time.

> [The 2D map] seems a lot more user friendly. It's easier to orientate myself, and how to find my way around a particular floor.

Other participant comments

Participants were asked to explain any features of the map they had tested, and subsequently of the alternative map, that they thought were useful or not useful for planning or visiting the museum. Most comments fell into the following groups and themes.

Labelling and description of exhibition spaces

Nine participants were critical of aspects of the labelling of the exhibition spaces (which were the same in both map types). In many cases, only the name of the gallery is provided. Although these names are usually thematic (that is, related to the theme of the displays within the gallery), they do not generally reveal the nature of the displays, and therefore do not help the visitor decide whether to visit this space or not.

As a corollary to this, some of these participants noted inconsistencies in the labelling: some galleries, such as Traders, included an explanation ("Discover the history of the East India Company") but others, such as Forgotten Fighters, did not, even though this title was no more self-explanatory than Traders.

A few participants also noted what they considered typographic inconsistency: in particular, the fact that some exhibition spaces were in bold type, and others not, and some in all capital letters, for no reason that they could understand (and which was not explained in any legend).

Depiction of stairs and lifts

Ten of the 20 participants (using both types of map) made comments indicating that they had difficulty understanding how the stairs and/or the lifts connected the floor levels. One participant who had tested the 3D map was initially under the impression that there were no stairs, saying:

> My first thought was: 'where are the stairs?', but this is a museum that doesn't offer the opportunity to move between floors with stairs.

With the 2D map, some participants felt they did not always understand where the stairs led to (for example whether they went to a floor above, or one below, or to a different level on the same floor), because there was nor indication of this, for example, through text or an arrow.

The more sophisticated stair device used on the 3D map had different problems. Because of the 3D rendering, this could be interpreted (wrongly) as an accurate illustration of each set of stairs, rather than a symbolic representation. Four participants, for example, commented:

> I couldn't reconcile the stairs on the map with what I was seeing... They should say where the stairs are going. I can't tell whether they are going up to a different level or just a short flight.

> The stairs are at different angles; it doesn't make sense to me.

Fig 25. Photograph of the stairs and lift, seen from the Baltic Memorial Glass gallery, with location of photo indicated on the 2D and 3D maps

> I find the connections between the floors and how the floors fit together confusing. I wasn't sure why the same stairs were represented twice on different levels to fit them together.
>
> What are the stair symbols? They end mid-air

There was a particular problem around the entrance to the Baltic Memorial Glass gallery (which was, therefore, more noted by those participants who navigated their way there as part of the wayfinding exercise). Although this gallery is indicated as being on Floor 1, the Baltic Memorial Glass and adjoining RE-THINK galleries are in fact on a half level lower, reached by a short run of steps. The lift next to these stairs stops at both levels (the doors opening on one side to the lower level, and on the other side to the upper level). The depiction of this with each type of map, and a photograph of the area in Fig 25. However, the complexity of this arrangement is not well depicted in the 3D map, partly because the stairs are largely concealed by the lift, and partly because the particular point of view of the map does not permit a clear indication of how the Baltic Memorial Glass and RE-THINK galleries are on a slightly lower level. Two of the participants who had navigated their way to the Baltic Memorial Glass noted that this problem did not exist on the 2D map.

Some of the participants commented on the fact that when they reached this area, it did not appear as they had expected (for example, they did not anticipate the level change, and need to walk down the short run of stairs to reach the gallery). This was not considered a serious problem, but it is an illustration of the problems that 3D projections can create for designers.

The depiction of the lifts (see, for example, Fig 22) provoked fewer negative comments from participants than the depiction of stairs. Two testers of the 2D map said that they were initially unsure where the lifts were because the key did not explain the lift symbol that was used. And three participants said they did not initially understand the symbols denoting the lifts on the 3D map, commenting:

> I'd no idea the 3D lifts were lifts – it never occurred to me the vertical lines were lift shafts.

and

> I thought the lifts were cupboards initially.

Another said that she was initially unclear whether the lifts were service lifts, and therefore not for public use. Interestingly, in their study of a user map of a hospital, Wright et al, chose not to use a (widely-used) symbol for lifts on their test map because they believed it was not well understood by the general public, and used the word "Lift" instead.[19]

19 Wright, P., Lickorish, A. and Hull, A. (1990). The Importance of Iterative Procedures in the Design of Location Maps for the Built Environment. *Information Design Journal*. 6:1. **70**

However, some participants made favourable comments about the way the lifts, and their path of travel, were shown on the 3D map, for example:

> The translucent connecting columns on the 3D map make the relationship between the floors clear. With the 2D map, you can't tell what is directly above or below.
>
> You can see immediately how the floors relate to each other. I like the idea of holding it together with the lifts.

Vertical circulation in a multi-level building can be a major source of wayfinding problems. For example, in a study in which participants were given the task of finding locations in a complex, multi-level building, Hölscher et al found that staircases were the single most clearly identified cause of wayfinding problems,[20] and experiments by Mastrodonato et al found that directions of stairs play an important role in disorientation when navigating complex spaces.[21]

Landmarks

Landmarks have long been understood as an important element for orientation and, by extension, wayfinding – for example, as one of Lynch's five building blocks of cognitive mapping.[22] Evans found that landmarks facilitate orientation in real space, particularly for young children and newcomers to a location.[23] And Dudchenko states that, when landmarks are present, people use them instead of other sources of information to find their way.[24] In a museum building, landmarks can include objects or elements that are prominent and distinctive, ie, that they are easily recognised, and can be seen from a distance and/or a range of points in the museum. They can, therefore, be architectural elements or display objects.

Museum maps may include landmarks, although their inclusion may not necessarily be for orientation purposes. For example, a museum map may indicate the location of a large and significant sculpture because it is a highlight of the museum's collection, rather than as a point for visitors to orientate themselves. Also, some elements of the building may be considered landmarks by some visitors (for example, "the shop" or "the lift"), though their effectiveness as landmarks will depend on their prominence, and their uniqueness (many museums have more than one shop space, and more than one lift, which could reduce their value as a landmark).

20 Hölscher, C., Meilinger, T., Vrachliotis, G., Brösamle, M. and Knauff, M., (2006). Up the Down Staircase: Wayfinding Strategies in Multi-level Buildings. *Journal of Environmental Psychology*, 26:4. **298**.

21 Mastrodonato, G., Camarda, D., Borri, D. and De Lucia, C. (2016). Navigating in Multi-Level Buildings: the Effect of Rotation. *City, Territory and Architecture*. 3:1. **9**.

22 Lynch, K. (1960). *The Image of the City*. Harvard: Massachusetts Institute of Technology Press. 48

23 Evans, G.W. (1980). Environmental cognition. *Psychological Bulletin*. **88:2**. 259

24 Dudchenko, P. (2010). *Why People Get Lost: the Psychology and Neuroscience of Spatial cognition.* [ebook]. Oxford: Oxford University Press. Chapter 4: **25**.

Fig 26. Prince Frederick's Barge at the National Maritime Museum

Fig 27. The ship's propeller at the National Maritime Museum

The most significant landmark depicted on the map of the National Maritime Museum is The Great Map (see Fig 21 and Fig 22), which is clearly shown on the museum map. This is a slightly unusual landmark in that it is of a familiar image (a very large Mercator projection of the earth), so that, by linking the Great Map with its representation on the museum map, visitors can orientate themselves more accurately than with many other landmarks, in that they can tell which direction they are facing. Eight participants mentioned that they had used the Great Map as a point of reference during the wayfinding task, including three who specifically mentioned the orientation of the Great Map:

> When I was at The Great Map, I could understand my orientation, because of the orientation of the world map there on the museum map.

Another landmark, the Figureheads (see Fig 23 and Fig 24), consists of a display of 13 historic ship figureheads mounted on a wall. Its location is indicated on the map, with a camera symbol, which is not explained in a legend, but is an indication of the point at which visitors can best photograph the display. Only one participant mentioned having used the Figureheads as a reference point.

The museum map includes few distinctive architectural elements that could be considered landmarks, though one participant said that he had found the "hole" (a circular void in the first floor, adjacent to the Great Map, in Fig 21 and Fig 22) helpful as a reference point.

One participant mentioned that he considered the distinctive glass roof over the Great Map (in Fig 20) a useful orientation device, and suggested that it would be helpful to indicate this on the museum map. Another participant questioned why the Figureheads were indicated on the museum map, but not other prominent object displays, such as Prince Frederick's Barge (Fig 26) and the ship's propeller (Fig 27).

External landmarks can sometimes also aid orientation. The museum has two entrances, on opposite sides of the building: the Stanhope Entrance and the Sammy Ofer Wing Entrance. The museum itself sits between the River Thames and Greenwich Park; the Stanhope Entrance faces the river, and the Sammy Ofer Wing Entrance faces the park, and views of the river and the park are available from certain parts of the museum. One participant felt that it would have been helpful to include a reference to this on the map:

> It would help a lot to know where the park or river was, so I could see where I was.

Another participant more specifically thought this should be reflected in the names of the entrances, rather than the obtuse names used:

> I would have liked to know which entrance I came in. Maybe something that points to where people are coming from. It says Sammy Ofer Entrance, but who is that?

Fig 28. Anchors at the Stanhope Entrance to the National Maritime Museum

The map, however, does include one external landmark: a pair of ship's anchors flanking the Stanhope Entrance to the museum (Fig 28). None of the participants mentioned these. This is not surprising, since they would have been very unlikely to have encountered them during the wayfinding task. It is possible that their inclusion on the map is not for orientation reasons because, in that sense, they would not be helpful, since they sit outside the museum, and cannot be seen from inside. The symbol's purpose on the map would, therefore, appear to be for visitors who enter the museum from the Sammy Ofer Wing Entrance who wish to see the anchors, since those who enter from the Stanhope Entrance would have already seen them.

Orientation implications of map projection

When producing a map or diagram of a building, there are important considerations related to how the map is oriented. A 2D map provides an overhead view of the building so, on its own, it can be read from any angle, regardless of the orientation of the page on which it is printed. However, there are two aspects of the design that determine the orientation from which the map can best be read:

- the arrangement of the plan of different floors or levels in a multi-level building; by convention, the plans for each level are arranged with the uppermost floor at the top of the page and the lowermost at the bottom, as a metaphor for the actual arrangement of the floors in the building, and
- the orientation of labels, text, symbols and images that are on or relate to the plan, which are typically in only one orientation.

One widely accepted convention of orientation maps is that they should be "head up", ie, with an assumed starting point at the bottom of the map, and direction of travel from the bottom to the top of the map.[25] In the case of a building, this generally means the entrance. However, Wright et al state that designing a map so that the building entrance is at the bottom of the map may not be the best way to facilitate user orientation, and that it can be better to orient the map according to a space or area (such as a main corridor) from which most of a building user's (navigational) "problem solving" will be done.[26] Many buildings (including the National Maritime Museum) do not in any event have a single area or point from which such "problem solving" will be done. The National Maritime Museum has two entrances, with a ticket/information desk at each (which visitors may well bypass when they enter the museum); nor is there any clear or defined pathway through the museum, or particular destination within the building that all visitors will aim for.

25 Andrews, M. (2002-03). Upside down maps. *Information Design Journal.* 11:2/3. **243-245.**

26 Wright, P., Lickorish, A. and Hull, A. (1990). The Importance of Iterative Procedures in the Design of Location Maps for the Built Environment. *Information Design Journal.* 6:1**. 67.**

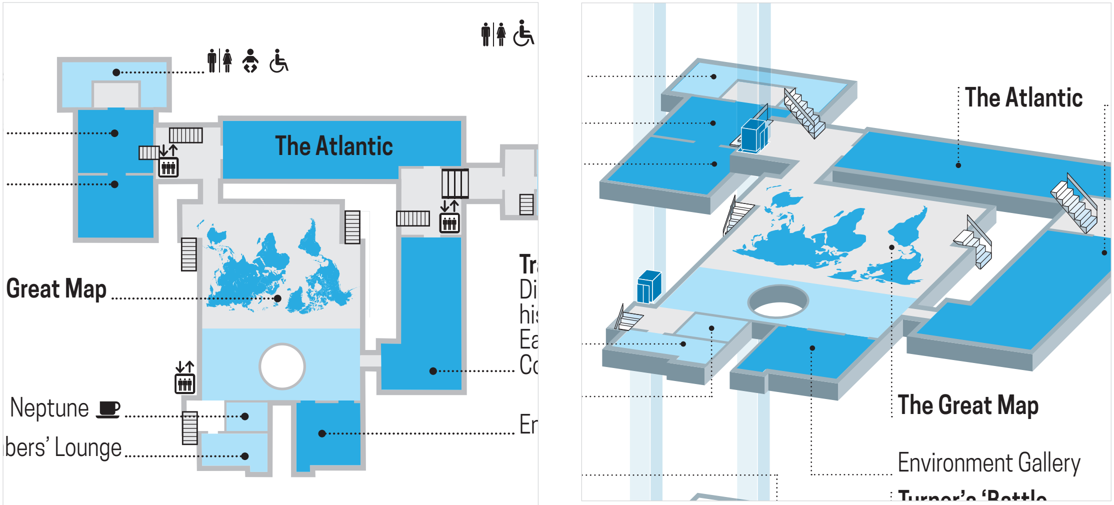


Fig 29. Detail of 2D and 3D maps of the National Maritime Museum (at actual size)

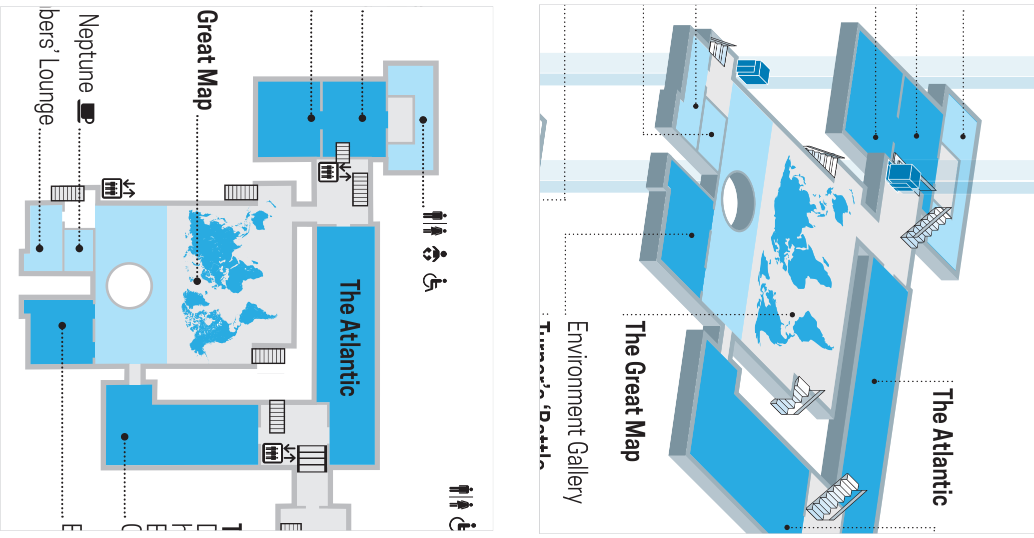


Fig 30. Detail of 2D and 3D maps of the National Maritime Museum, rotated 90° (at actual size)

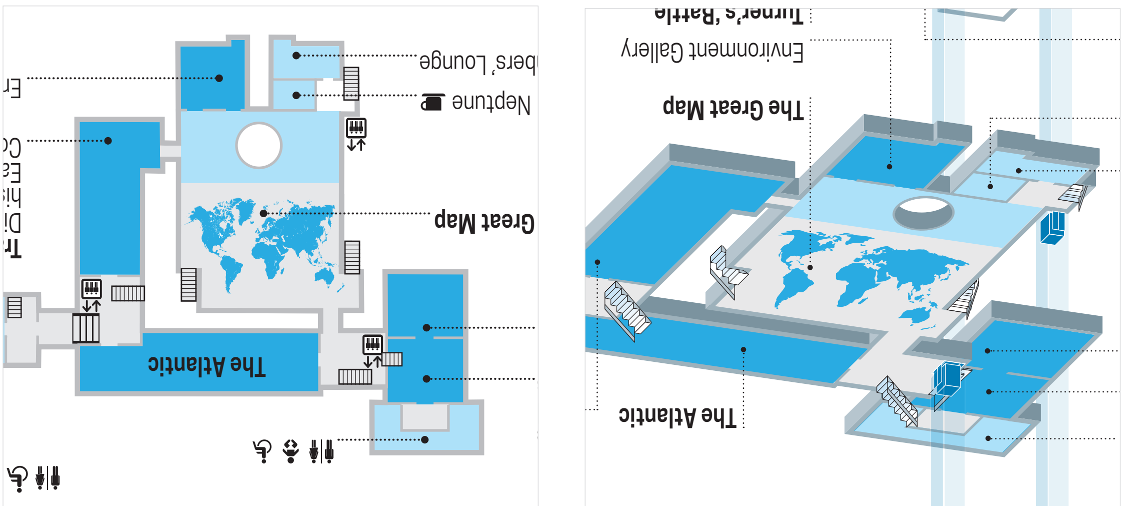


Fig 31. Detail of 2D and 3D maps of the National Maritime Museum, rotated 180° (at actual size)

A 3D map is more complicated, since it is constructed from a single viewpoint (see Chapter 3 for more about how this works with different types of 3D projection). In the case of the National Maritime Museum, this is the building's eastern corner. The museum's two entrances, which are on opposites sides of the building, create particular problems for 3D map. The viewpoint for the museum's 3D map means that the orientation is correct only for visitors who enter by the Stanhope Road Entrance. The other entrance, the Sammy Ofer Wing Entrance (the starting point for the wayfinding task), is in a "head down" direction, which can make orientation difficult, as one participant noted:

> If you come in the park [Sammy Ofer Wing] entrance, everything is upside-down – I find that confusing.

In order to counter this problem, some map users physically rotate the document to ensure a "heads up" orientation, even if this has the effect of rendering text and other elements less readable. But this much more difficult with a 3D map – as Fig 29, Fig 30 and Fig 31 show, it is much more difficult to read a rotated 3D map than a rotated 2D one.

Since participants were not observed when they were using the map, it is not known how many rotated maps during the wayfinding task. However, three participants mentioned it when questioned about aspects of the maps they liked or disliked. One participant who had tested the 3D map said:

> I found that easiest thing to do is to [orientate myself] from the entrance, so I turned the map around that way.

However, another participant who had tested the 3D map mentioned the difficulty of using it when rotated:

> It's the 3D nature that I find quite difficult to follow. If it were a flat two-dimensional map I would be able to turn it around. I found it quite difficult to get a concept of where I was at the start.

Use of colour

The National Maritime Museum maps use a three-colour scheme to distinguish the display and exhibition areas from other areas in the building (circulation, non-public areas, and shop/eating areas). Possibly because of its limited number of colours and range of hues, the colour-coding system appears not to have been noticed by many participants (as Monmonier states, contrasting hues can be better for indicating different types of feature on maps).[27] Seven participants spontaneously mentioned the colour-coding system, two making positive comments:

> It's quite useful to have the distinction made with the colour coding between the museum and non-museum [exhibition and non-exhibition] areas.

27 Monmonier, M. (1991). *How to Lie With Maps*. Chicago: University of Chicago Press. **150**

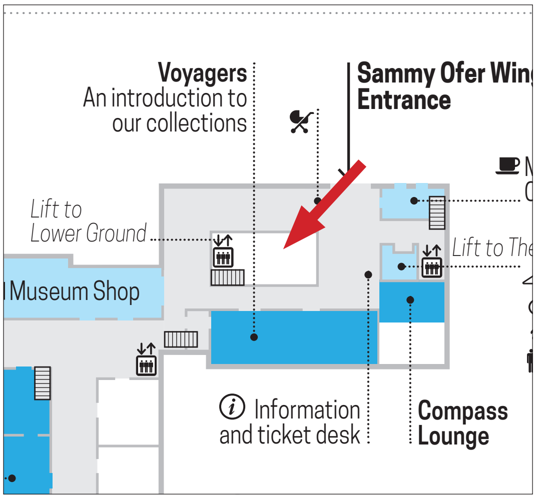


Fig 32. Detail of 2D map of the National Maritime Museum with annotation indicating Ground Floor void (actual size)

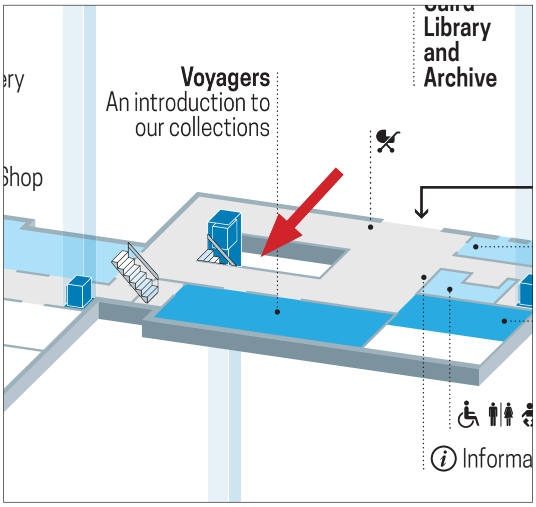


Fig 33. Detail of 3D map of the National Maritime Museum with annotation indicating Ground Floor void (actual size)

> The colour coding is helpful if you are looking for an exhibition, but I didn't notice the key.

Others made negative or neutral comments:

> The colour coding didn't mean anything until I looked at the key. In that context, is it helpful to know you can't visit the white spaces?

> In other museums, they use colour to denote different types of display, so I don't think this one is that helpful. It would be better colour coded for the subject matter.

> [The colour coding] gives you information you don't need.

These comments relate in part to the fact that colour-coding systems in museum maps tend to be thematic in nature, ie, they are used to explain the themes of different exhibition areas, for example, an era, an artist or a subject theme. The kind of colour coding on the National Maritime Museum map is relatively unusual. For more about colour coding, see Chapter 3.

One potentially confusing aspect of the colour-coding system was the ambiguous nature of white (or, strictly speaking, the colour of the paper on which the map is printed) in particular in the two-dimensional map. Although the description of this in the key ("no public access and event space") is technically correct, in fact, "white" spaces are of two different types:

- rooms within the building that are not accessible to the public (administration areas, for example), and
- architectural voids, that is, open space, with the floor below is two (or more) floors in height.

This ambiguity means that museum visitors may, for example, interpret the white rectangular-shaped space on the Ground Floor behind the information and ticket desk as an enclosed room with no public access, when in fact it is effectively a "hole" in the floor, through which the Lower Ground floor can be seen (Fig 32). This issue probably does not arise in the 3D map because of the depth effect of the floor levels, which makes the distinction been non-public spaces and voids clearer (Fig 33).

Conclusion and discussion: 2D vs 3D maps

Based on the experiences of 20 people who took part in a controlled assessment of 2D and 3D maps of the National Maritime Museum, both maps effectively supported route planning and reaching the destinations. Differences in people's ability to plan a route on a map, or follow a route on a map, suggest differences in people's general wayfinding and map-reading abilities and preferences.

There were specific details in the maps, some related to the 2D or 3D projections, that influenced people's efficiency at finding their way, and participants' comments about their experience in the task suggested differences in the experiences of using the maps. For example, the 3D map was seen as giving a better representation of the space, because it showed the entire building in a single diagram, and how the stairs and the lifts connect different floor levels; the 2D map, with its series of discrete floor plans for each level, did not indicate these connections as well. However, a minority of participants had some difficulty in interpreting the 3D map, and preferred the 2D one.

More importantly, from a practical point of view (ie, for consideration by those who design maps), for both types of rating, and for both maps, there was a range of responses, from positive to negative. Most participants had clear preferences for one type or the other of map (only one of the 20 expressed no preference). Participants' comments about the maps suggest that most considered the 3D map more complicated, though the ability to understand the building as a single entity, and to understand how the lifts connect the floors, was seen as an advantage by many. However, a minority of participants had a strongly expressed dislike of the 3D map, with two participants stating they would not use this map if it were given to them.

There is clearly a tension between the amount of detail that map users want from a map, and the readability issues that can result in having too much information on a map. Several participants expressed a desire for more explanation of the gallery themes and contents, but there were also many comments about complexity and inconsistency, in particular in relation to the labels that identify galleries and other spaces. Attention to the design and use of labels on a map may be able to mitigate a general sense of "complexity" in a map, and is a clear subject for further research. This aspect is addressed in a further study, which is described in the following chapter.

It is clear from participants' comments that map designers must take care, in particular, when using symbols on maps. Many symbols are clearly widely understood and quickly read, such as those for toilets. But others are not; in the case of the tested maps, the symbols for lifts on the 3D map, and the graphic device used to denote the path of travel of the maps, was not properly understood by some participants. Ideally, symbols should be understood without reference to a legend, but if they are not widely used one or from an accepted

standard (such as that of the ISO), this experience shows that they must be explained in a legend.

Limitations of the task

Limitations identified with this task include:

- The participants' manner of using the map, and their ability to understand it and to plan a route to a point in the museum, may have been affected by the fact that they knew they were being monitored and timed.
- Even though participants were told that the time taken to complete the wayfinding tasks was not of prime importance, participants may nevertheless have felt pressure to complete them in a timely manner that may have affected the ability to plot and then follow the best route.
- The wayfinding task may have been somewhat artificial and not natural to some participants because that is not the way they use maps in museums (though most participants did select from the list of potential uses of a map "to locate a particular object, for example, a painting").
- Although both maps were standardised such that the focus of difference between the two was their projection (that is, two-dimensional versus three-dimensional), other aspects of the design (for example, symbols, labelling and colour-coding) may have had a greater effect on the success and time taken to complete the wayfinding tasks. Similarly, these factors may have had more of an influence on the participants' judgement of the maps' general usefulness and helpfulness than the building projection used. Although participants in some cases were able to articulate in detail aspects they found useful/helpful or not useful/not helpful, it is not possible to be clear about the reasons behind their overall judgements or the relative roles that different aspects of the map design were playing in those judgements.

Chapter 7: Comparing perception of labels and directory lists on museum maps

Contents

Rationale for comparing labels and directory systems

This chapter considers the characteristics, advantages and disadvantages of labelling and directory list systems, and describes a study to investigate whether participants have a preference for a directory or location labels system used in 2D or 3D maps.

One of the issues that emerged from the study of 2D and 3D maps described in Chapter 6 was that, for some participants, the maps were perceived as being complex or "cluttered" in a way that made them difficult to use. A minority of participants said they might not use such a map if visiting the museum for this reason. In the 2D-3D map comparison study, some participants commented that the text labels on the maps identifying the exhibition spaces contributed to a sense of complexity. So one way to make the map appear less complex would be to reduce the amount of text. But this, of course, reduces the amount of information – and some participants also criticised the maps they had assessed for a lack of descriptive information. As Mollerup points out, balancing the amount of information provided with the clarity of the map is always a trade-off in map design.[1]

One possible solution to the problem is to remove the text labels from the map diagram, and place them in a directory list format, ie, in a separate list, with a key (such as a letter or a number) to locate the spaces described. This kind of device is widely used in museum maps (and maps of other buildings), including many of those in the corpus of contemporary museum maps examined for this thesis.

Devlin and Bernstein suggest, however, that labels may be more efficient in use than a directory list. They conducted a study to compare labels and a directory, in which participants had to locate marked landmarks on a map, and then plot a route to reach them.[2] The participants who used a labelled map were significantly quicker than those using a directory listing. However, their study was conducted using a static touchscreen, so their findings may not apply to printed maps in the same way.

How labelling is used on museum maps

Providing names and descriptions of the exhibition and display areas of museums is a key part of the "visual directory" information role of museum maps that is described in Chapter 3. There are a number of ways that gallery spaces and displays are labelled on maps, as discussed in Chapter 3. They are dictated in part by:

1 Mollerup, P. (2005). *Wayshowing: a Guide to Environmental Signage Principles & Practices*. Baden: Lars Muller Publishers. **155**.

2 Devlin, A.S. and Bernstein, J. (1997). Interactive Way-finding: Map Style and Effectiveness. *Journal of Environmental Psychology*. 17:2. **99-110**.

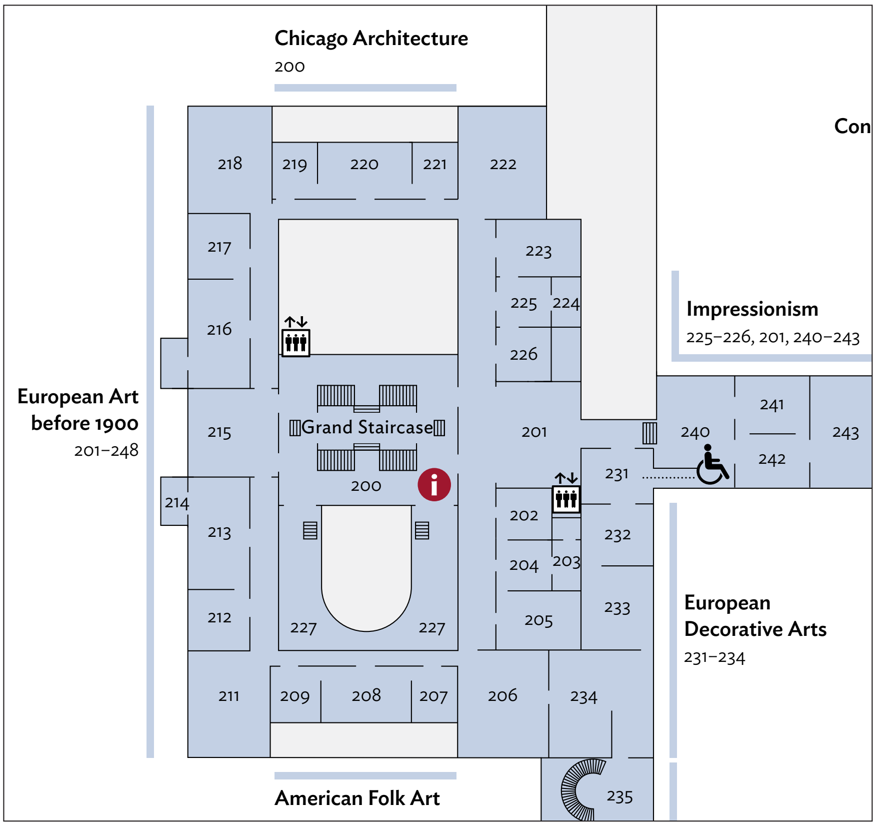


Fig 1. Map of Art Institute of Chicago, 2014, with labels for groups of galleries (detail, at 40% actual size)

Fig 2. Map of National Gallery of Art, Washington, DC, 2016, with colour-coded labels for groups of galleries (detail, at 50% actual size)

- the nature of the museum's objects (the number and the diversity of types) and the way they are arranged, and
- the nature of the building.

Consider the map of the Art Institute of Chicago in Fig 1: this is a large and complex building with dozens of exhibition rooms. Although each room on the map in numbered, the map does not describe what is in each room, but includes thematic labels for groups of rooms (for example, "European Art before 1900, Rooms 201-248").

The map of the National Gallery of Art, Washington DC, in Fig 2, takes a broadly similar approach: it uses colour coding for the themed areas, which has the advantage of better showing the physical extent of each themed area. This particular example, however, has a problem in that the system of 20 colours is way beyond the generally recommended number of colours that people can generally distinguish (as discussed in Chapter 3). More often, colours are used in a multi-level labelling system, ie, a relatively small number of colours are used to describe themed areas in a museum, while other labels are used for individual galleries or display areas within those themed areas. The map of National Museum of Scotland (Fig 3) is an example of such a system.

The National Maritime Museum, the museum in which this study was conducted, is relatively unusual in that virtually all of its gallery spaces have abstract names, which give few clues to the exact nature of the exhibits within.

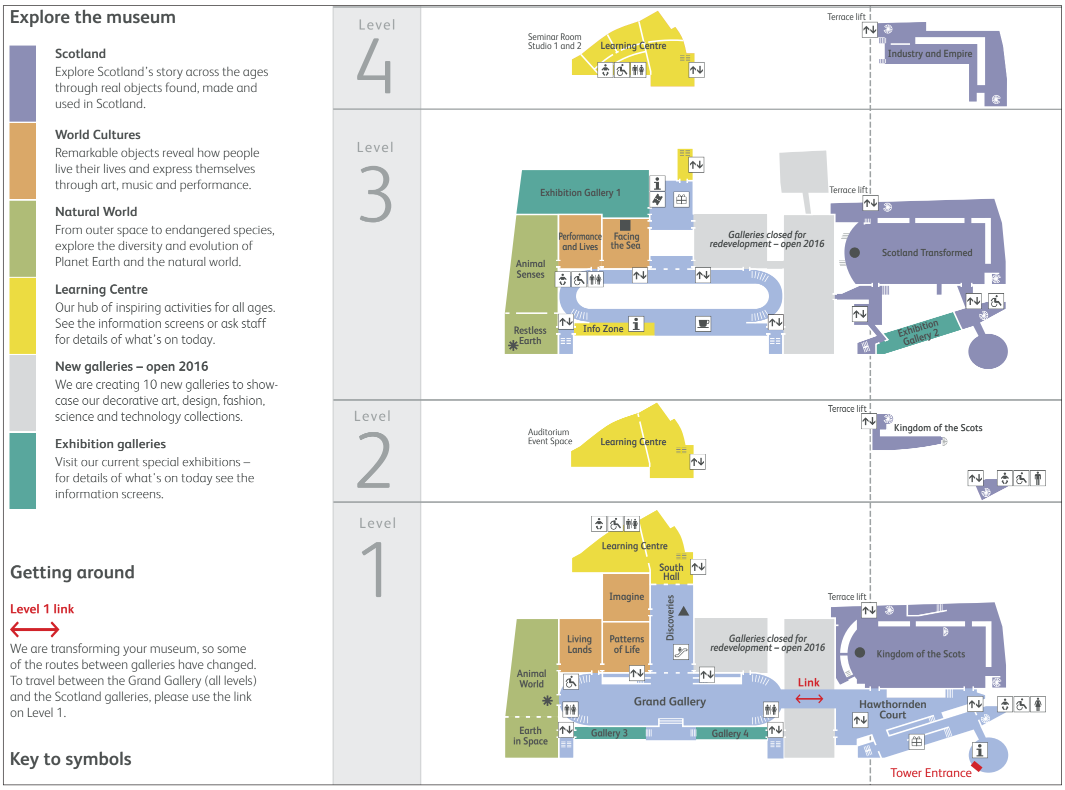


Fig 3. Map of National Museum of Scotland, 2014, showing colour-coded directory and location labels (detail, at 50% actual size)

The maps as tested in Chapter 6 included some descriptive text, which provided information about the subject matter, contents or theme of certain galleries. Study participants commented that this was applied inconsistently, however, and many commented that was a general lack of information.

How list directories and location labels work

When considering how to identify areas of a map, designers must consider how to physically arrange and place labels. Katz has described "generations" of labels on diagrams: first-generation labels are placed on or at the object being labelled; second-generation labels, which connect the label to the object, for example, with a call-out rule; and third-generation labels, which use an alphanumeric or symbolic code to connect labels with objects.[3] This study is concerned with the differences between two types of labelling systems:

- **Location labels** in which labels are either on the spaces being labelled, or with call-outs lines or arrows (first- and second-generation labels by Katz's definition)
- **Directories** in which labels are connected with a key which is either a letter, number, colour or pictogram (third-generation labels by Katz's definition).

The practical differences for users of maps are that:

- Location labels provide a direct, and therefore quicker, reference for spaces (though this may depend on the length and shape of any leader lines), while directories require users to relate the label to the key device (letter or number, for example) and then to the map.
- Location labels take up more space than the key device (a letter, number or symbol), and are therefore likely to create visual clutter on the map.
- Directories allow users to scan or look up a list (depending on how the list itself is ordered) for particular spaces more easily; with location labels, users looking for a particular space must scan the entire map.
- Directory labels may be easier to read, since they are listed separately from other elements of a map.

Labelling on the National Maritime Museum test maps

The test maps in the study described in Chapter 6 used a location-labelling system, with the following characteristics:

- The density of labelled exhibition spaces is high: in a medium-sized building, 27 of the building's 37 individual spaces are labelled.
- The display area names tend to be abstract, which is unusual for a museum. Therefore, some of them are accompanied by some explanatory text.
- There is no sequence, order or grouping of the display spaces (and therefore the labels).

3 Katz, J. (2012). *Designing Information: Human Factors and Common Sense in Information Design*. Hoboken: John Wiley & Sons. **59**

These aspects of the museum do not suggest any obvious optimum choice between location labels or a list directory. The fact that the labels have no sequence or order, and that they are abstract, would suggest a location label system (since there is no obvious structure to the directory). But the fact that all of the labels are abstract, and in need of explanatory text, and that the density is high (which increases the chances of unacceptable clutter) would suggest a directory system. However, the relative effectiveness of location labels and directories in helping museum visitors understand a museum's layout, plan a visit and navigate the spaces is largely unknown.

Purpose and design of research

This research aimed to investigate the relative **appeal and perceived usefulness** of museum maps that use a location-label system and a directory system to describe display spaces (galleries). It also aimed to investigate how much the projection of the map (2D and 3D) influenced appeal and perceived usefulness. In this context, "perceived usefulness" means the research participants' judgement of how useful they believe the map would be for planning and undertaking a visit to the museum. Appeal of maps is based on participants' stated preference of designs shown to them.

The research was undertaken by preparing four map designs of a museum: a 2D map with location labels, a 2D map with a list directory, a 3D map with location labels and a 3D map with a list directory (see Appendix 4 for the test designs and questionnaire for participants). Volunteer participants were provided first with either the two 2D maps or the two 3D ones and asked to rate them both for how useful they thought it was, and how easy it was to understand. They were then given a third map (depending on which of the first two they had said they preferred) and asked to rate this map. The process of designing test materials is explained below, followed by an explanation of the research process.

Test materials

The test maps were adapted from those used in the study described in Chapter 6. Four maps were developed:

- a 2D map with location labels
- a 3D map with location labels
- a 2D map with a directory, and
- a 3D map with a directory.

In the earlier test materials, only some of the gallery spaces included descriptive text in addition to the display space name or title. In this study, for consistency, descriptions (of between five and fifteen words) were provided for all the spaces.

Adding this extra text created "clutter" on the map, so in order to mitigate this, some other details and pieces of information were removed from the map

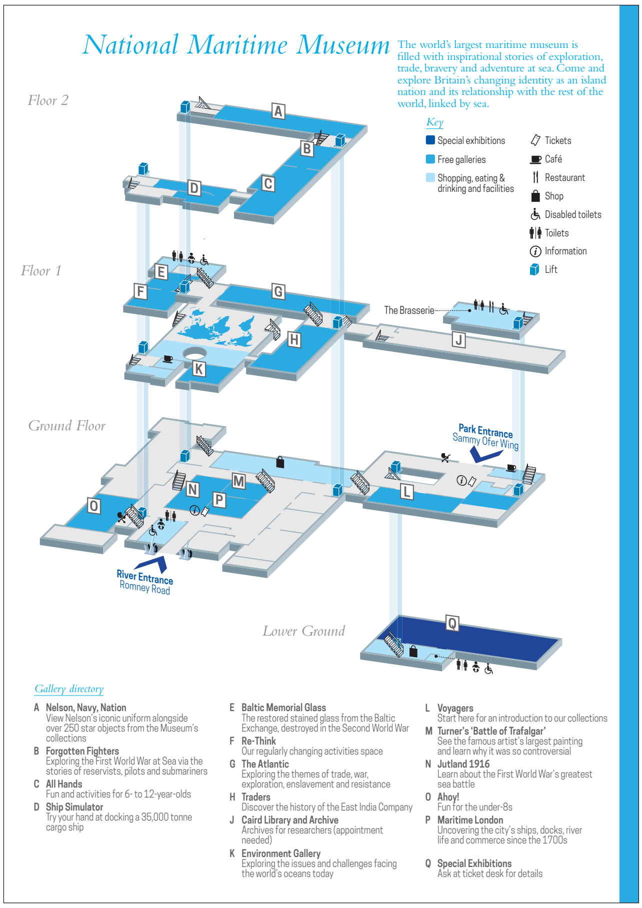


Fig 4. The 3D directory test map (at 40% actual size), with directory arranged in three columns below the map

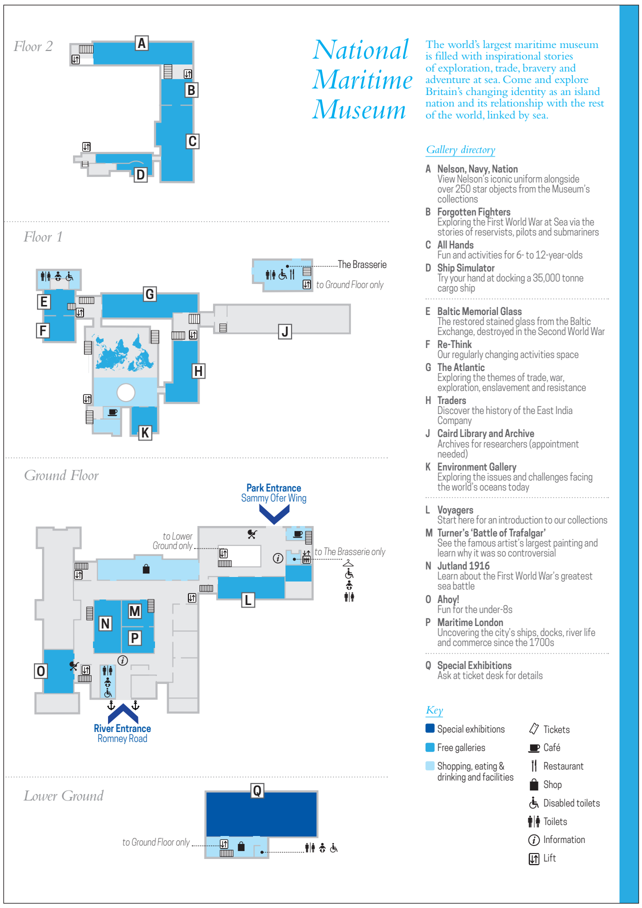


Fig 5. The 2D directory test map (at 40% actual size), with directory arranged in a single column to the right of the map

– though as much as possible without reducing the map's functionality. For example, certain facilities in the previous test maps included both a text label and a pictogram; in these cases, the text was removed.

Also, the colour-coding system was simplified: the white that had been used to indicate "no public access and event" space, was removed. This was partly because of an ambiguity in the maps where white also indicated void areas in the building (in particular on the 2D map – see "Use of colour", Chapter 6, for an explanation and illustration of this), and partly because the distinction between white areas and grey-coloured areas ("lifts, corridors and walkways") was considered unnecessary, since "white" and "grey" areas both identified non-exhibition spaces.

Other minor changes were made to the map in response to comments from participants in the earlier study. This was in order that these did not prove distracting to the participants in this study. For example, there were new arrow designs and text style to indicate the two entrances to the building, and also describing them as "Park Entrance" and "River Entrance", so that these points would be more useful for general orientation.

The directories in the directory maps used the same typography and wording as the labels, but were arranged in list form. The different proportions of the 2D and 3D maps meant that, for clarity and to preserve proportions and alignment of floor levels within the maps, it was necessary to position the directories for these two maps differently – see Fig 4 and Fig 5.

Designing the directory list

Directory entries on museum maps can be arranged in several ways, each with advantages and disadvantages according to how they will be used. Katz describes three methods:

- a legend in which the labels are alphabetical and the connecting numbers or letters are in alphabetical or numerical order, which means that the letters or numbers on the map are arbitrarily arranged
- a legend in which the labels are alphabetical, and the connecting numbers or letters are arranged in a sequence on the map (for example, top to bottom or left to right), which means these letters or numbers are not in order on the legend, and
- a legend in which the connecting numbers or letters are in order, and are also arranged in a sequence on the map, which means that the labels are not in order on the legend.[4]

No system is ideal, because their relative strengths and weaknesses depend on whether the user's starting point is the map or the legend, and also the familiarity of the user with the names of the points being labelled, and with the

4 ibid. **182**

location or venue the map covers.

In relation to the National Maritime Museum, it was felt that users would be unfamiliar with the thematic arrangement of the display areas or the names of the spaces, so a system was chosen in which the alphabetical code was in a sequence on the map. This sequence was broadly left to right within each floor, starting at the top floor and working down. Further, the directory is divided by floor level – so, for the 3D map, the directory of each floor is in a different text column (except for the Lower Ground Floor, which sits below the Ground Floor) (Fig 4), and for the 2D map, a dotted line separates the entries for each floor (Fig 5).

Directory key devices can be either letters, numbers, symbols or colours (or sometimes a combination, for example, symbols of different colours). Examples of these can be seen in Chapter 3. Each type was considered for the test material.

Symbols were not considered appropriate for this particular map, as the nature of the displays do not lend themselves to pictographic representation. Also, there was a need to avoid confusion between such symbols for gallery spaces and those used on the map for functional spaces (toilets, shops, restaurants and so on). Colours were also discounted because of the required number of colours is too great, and could compromise clarity (see "Visual directory", Chapter 3, for more about this). The type and arrangement of displays within the National Maritime Museum does not allow for larger thematic areas within the museum, as contiguous galleries have little or no relationship with each other (as discussed at the beginning of this chapter, and illustrated in Fig 3). A further consideration is that it is not generally feasible to have more than one colour-coding system on a map; it would therefore not be practically possible to create a colour coding system for a gallery directory at the National Maritime Museum without dispensing with the existing function-based colour coding.

Therefore, the remaining key options are letters or numbers. In deciding which to use, there are two main considerations: whether the map uses a numbering or lettering system in another way (for example, room numbers) that would create confusion; and the number of entries (more than 26 means that straightforward a-to-z lettering system would not be sufficient). The National Maritime Museum map uses a numbering system for two of the floor levels (1 and 2), so, to avoid any confusion, a lettering system was chosen, using the letters A to Q.

Overview of research process

This research was similar in form to the study described in Chapter 6 in that it investigates a group of people's assessments and preferences in relation to different designs of map. However, in this case, the aim was not to attempt to assess the effectiveness of the map designs, in terms of facilitating wayfinding, or for understanding the layout of the museum building and its contents. While

the earlier research focused on a fundamental aspect of the map design (the projection of the building), this research was on a more detailed aspect (the labelling of spaces).

This research therefore has a simpler design than the earlier research in that it is does not require participants to use the map in the museum; participants were required only to consider the maps presented to them (in an unrelated setting), and assess them by imagining planning a visit to the museum, or using them during a visit.

The study was approved by the University of Reading's Research Ethics Committee.

Participants

There were 24 participants in the study: 12 were post-graduate students at the University of Reading, and undertook the research on one of two days at the university's graduate school; 12 were members of the public known to the researcher, and undertook the research exercise in their own homes. Participants were not paid or given other incentives for undertaking the research. Potential participants were excluded if they had a professional interest in museums, museum design, or were professionally involved in graphic design, information design or map-making, or if they had participated in the previous experiment.

As with the earlier experiment, there was no attempt for the study population to match the profile of museum visitors.

Research procedure

After confirming that they had read and understood what would be required of them from the Information Sheet, the research process was begun.

1. The participant was asked a series of preliminary questions about their museum-visiting habits and behaviour, and, in particular, their use of printed museum maps and their digital equivalents (museum website and apps). These questions were similar to those that were part of the earlier studies described in Chapters 5 and 6.
2. The participant was told they would be shown a map of a museum. Though it was an actual museum, it did not matter whether or not the participant knew of this museum, or had visited it. They were shown one of the four designs, as described in "Test materials" on page 347, and shown in Appendix 4. The particular design shown to each participant was shown in a rotating order to ensure that an equal number of participants were initially shown each design.
3. The participant was asked to look at the map and imagine that they were making a visit to the museum. They were asked how much they agreed with two statements about the map: "This map would be useful for visiting or planning a visit to the museum", and "It is easy to read and understand

this map". They were given five possible answers for each: strongly disagree, slightly disagree, neither agree nor disagree, slightly agree, and strongly agree.

4. The participant was then told they would be shown an alternative design of map for the same museum. The design they were shown was of the same projection as they one they had first seen (that is, either 2D or 3D) but had the different label style (that is, directory or location label) and participants were asked how much they agreed with the same statements as with the first map.
5. They were then asked whether they preferred one design over the other (strongly, slightly or no preference), and asked for their reasons. The researcher took a note of their reasons, and any other observations they spontaneously made about the designs.
6. Finally, the participant was presented with a third design. The design they were shown depended on the one they had said they preferred in the previous stage of the process: for example, if they had been shown 2D maps and said they preferred the directory design, they would be shown the 3D directory design; if they had been shown the 3D maps and said they preferred the location label design, they would be shown the 2D location label design. (A matrix of the designs seen by each participant can be seen in Appendix 4.) For this final map, the participant was asked if they preferred the newly presented design to the one they had earlier said they preferred, or whether they preferred the design first chosen, according to the same five options as in the previous stage of the process. They were asked their reasons for their preference, and notes were taken of this, along with any other spontaneous observations participants made about the designs.

Table 1. Participants' ratings of usefulness of maps (24 participants each rating two maps)

<table>
<tr><th colspan="12">'This map would be useful for visiting or planning a visit to the museum'</th></tr>
<tr><th></th><th></th><th colspan="2">strongly disagree</th><th colspan="2">slightly disagree</th><th colspan="2">neither agree nor disagree</th><th colspan="2">slightly agree</th><th colspan="2">strongly agree</th></tr>
<tr><td rowspan="4">map type</td><td>3D location labels</td><td></td><td rowspan="2"></td><td></td><td rowspan="2">1</td><td>2</td><td rowspan="2">2</td><td>4</td><td rowspan="2">9</td><td>6</td><td rowspan="2">12</td></tr>
<tr><td>2D location labels</td><td></td><td>1</td><td></td><td>5</td><td>6</td></tr>
<tr><td>3D directory</td><td>1</td><td rowspan="2">2</td><td></td><td rowspan="2"></td><td></td><td rowspan="2"></td><td>3</td><td rowspan="2">9</td><td>8</td><td rowspan="2">13</td></tr>
<tr><td>2D directory</td><td>1</td><td></td><td></td><td>6</td><td>5</td></tr>
</table>

Table 2. Participants' ratings of ease of understanding maps (24 participants each rating two maps)

<table>
<tr><th colspan="12">'It is easy to read and understand this map'</th></tr>
<tr><th></th><th></th><th colspan="2">strongly disagree</th><th colspan="2">slightly disagree</th><th colspan="2">neither agree nor disagree</th><th colspan="2">slightly agree</th><th colspan="2">strongly agree</th></tr>
<tr><td rowspan="4">map type</td><td>3D location labels</td><td></td><td rowspan="2"></td><td>2</td><td rowspan="2">4</td><td>1</td><td rowspan="2">3</td><td>5</td><td rowspan="2">7</td><td>4</td><td rowspan="2">10</td></tr>
<tr><td>2D location labels</td><td></td><td>2</td><td>2</td><td>2</td><td>6</td></tr>
<tr><td>3D directory</td><td></td><td rowspan="2"></td><td>3</td><td rowspan="2">5</td><td>0</td><td rowspan="2">1</td><td>2</td><td rowspan="2">6</td><td>7</td><td rowspan="2">12</td></tr>
<tr><td>2D directory</td><td></td><td>2</td><td>1</td><td>4</td><td>5</td></tr>
</table>

Research findings: preliminary questions

In terms of frequency of museum map use, the results from this study were broadly similar to those from the earlier studies, though in this study there was an even smaller minority of participants saying they "never" used printed maps in museums (4.2%, compared with 10% in the other studies). Two-thirds of the participants (15 of the 20) said they "sometimes" use them and the remainder said they "always" did.

Participants were then asked about how they used maps, according to five statements about specific ways museum maps are used (see Chapter 5 for details of the statements). Findings in the study were broadly in line with those of the earlier ones: most participants said they used maps in multiple ways, and a large majority said they would use a museum map to find out what sorts of displays were in the museum, and to locate objects and facilities; only around half would use a map to plan a route through the museum. Although there were some small differences, these could be due to the sample size in this study, or to demographic differences within the study population.

Participants' experience of digital alternatives to maps (via a smartphone or tablet app, or a digital map on a museum website) was similarly limited; 15 of the 24 participants said they had "never" done so, and only two said they "often" had done so.

Research findings: usefulness and ease of reading map

Overall, most of the 24 participants found the designs they assessed to be useful, and easy to read and understand. This broadly mirrors the ratings given to the substantially similar designs used in the experiment described in Chapter 6.

Table 1 shows participants' responses to the statement "This map would be useful for visiting or planning a visit to the museum", and indicates largely positive responses. This table shows the 24 participants' judgements of the first two maps they were shown (either the two 2D maps or the two 3D ones). Although they were not asked to judge the usefulness of the second map they saw in comparison with the first one, of course it was not possible for them to rate the second map without being aware of the first map they saw. However, the differences overall between judgements of first-seen maps and second-seen ones are fairly minimal: six participants gave more positive ratings for the second map they saw, eleven gave the same rating, and seven gave a less positive rating. That said, all the negative ratings ("slightly disagree" or "strongly disagree") were given to second-seen maps.

Table 2 shows participants' responses to the statement "It is easy to understand this map", and also indicates mostly positive responses. However, as with the first statement, the positive and negative responses were fairly

Table 3. Participants' preferences for directory or location label map, excluding those who expressed no preference

map type		slightly prefer		strongly prefer	
map type	3D location labels	1	**4**	3	**7**
	2D location labels	3		4	
	3D directory	2	**3**	6	**8**
	2D directory	1		2	

n=22

evenly distributed among the four designs, so there is no indication that any one design is considered better or worse in this respect than any other. The order in which participants saw the two designs they assessed may have been more significant in relation to responses to this statement: 13 participants gave a more positive assessment of the second map they saw, while five gave a more negative assessment (seven gave the same assessment for each map). However, there was no discernible pattern in relation to location label and directory designs: the numbers of participants who gave a more positive response, the same response or a more negative response were very similar for those who saw a location label map first and a directory map second and for those who saw a directory map first and a location label map second.

Research findings: map preferences

Table 3 shows that most of the 24 participants expressed a preference for one map over the other, but that they were relatively evenly divided between the two. However, of the directory designs, the 3D map was preferred by eight participants, while the 2D one was preferred by only three participants; conversely, for the location label designs, the 2D map was preferred by seven participants, while the 3D map was preferred by only three. This suggests that there may be a relationship between the building projection type and labelling style.

There was no observed difference in preference according to the order of designs seen: 11 participants preferred the first map they were shown, 11 preferred the second map they were shown, and two stated no preference.

Participants were asked for their reasons for their preferred design. Of those participants who preferred the location label designs, some stated that more effort was required with the directory map:

> I like to have the information just there, as opposed to looking for the [key] letter and then find the information. It seems that there is a bit more effort involved [with the directory].

> In [the directory map], it is like a puzzle; I have to switch between the letter and where [the gallery] is. It is easier to get an overview when the text is alongside the location.

> With [the location labels], you can automatically see what's what and what's next to what. It is a bit of a pain to have to cross-reference, and there is no advantage [to this].

However, participants who preferred the directory designs felt that these were clearer, commenting that the location labels made the map design unclear or cluttered:

> [The location labels map] is a bit of a mess, because I don't know where to start.

> With [the location map], there is a lot going on. I like the simplicity of the diagram [on the directory map], and not having the text next to the plan I find more helpful.

Two participants said the location labels map was acceptable, but that it was close to becoming overloaded with information:

> In terms of planning a visit, the lines pointing to particular areas are well laid out; it's more immediately engaging. If there were more labels, the directory [design] would become preferable, but at this stage it is not too cluttered.

> Perhaps [the location labels map] is OK for this amount of information, but if there were any more, it would be confusing.

And one of the two participants who said they had no preference for one design over the other saw advantages and disadvantages in both:

> In [the location labels map], pointing out places seems nice, but it is a bit cluttered. But on the other hand, on [the directory map] you can't see directly where they are.

Some of the participants' comments revealed differences in the way they imagined themselves using the map, which may have been a factor in their assessments and stated preferences. Many of these differences related to whether participants imagined themselves planning a visit to the museum (that is, before they had actually started their visit), or using the map while their visit was underway, for example:

> Having to cross-reference [with the directory] makes it harder to read the map when you are walking around the museum.

When planning a visit or using a map during a visit, people's navigational needs can be different, for example when planning (ie, before the visit begins), visitors may be asking themselves "what do I want to see in this museum?" or "in what order should I see the areas I am interested in?"; during a visit, they may be asking "is the gallery next to the one I am in of interest to me, or should I walk past it?" or "where is the nearest space that looks interesting?". Two participants pointed out that the different designs may be more suitable in these different situations:

> I think that [the directory map] is possibly better before you arrive at the museum whereas [the location map] may be better when you are inside the museum because you are using it where you are as a jumping-off point.

> With [the directory map], it is easier to see the [galleries] and decide where to go. But when you are in the museum, I would prefer [the location labels map] because I don't have to keep cross-referencing. If I am not familiar with a museum, [the directory map] gives me a list of the contents, but if you have a lot of time and you can visit the whole museum, [the location labels map] is easier to navigate.

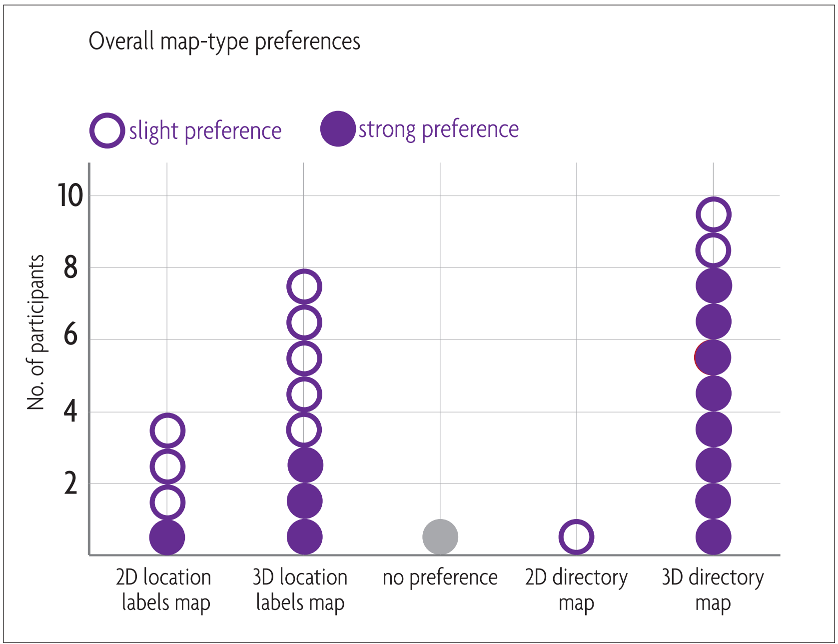


Fig 6. Numbers of participants who preferred each design of map at final point of study, with participants choosing between at least three designs of map

After participants had nominated their preferred design, they were shown a third map. The purpose of this part of the exercise was to investigate the effect of building projection in relation to the use of location label or directory system for describing the display spaces. Therefore, participants were shown the map that had the same labelling style they had preferred, but with a different building projection (2D or 3D). The two participants who had not expressed a preference for either map were shown both remaining designs.

Fig 6 shows the preferences expressed by participants, each having seen at least three of the four maps, and reveals some patterns:

- the 3D directory map was preferred by 10 participants, more than for any single other design
- the 2D directory map was preferred by only one participant, fewer than for any single other design
- the 3D designs were preferred by 18 participants; six participants preferred the 2D ones, and
- preference for directory designs and location label designs was split among participants (11 for directory, 12 for location label).

Having expressed their preference, participants were again asked for their reasons, and for any observations they had on the designs they had seen. Most comments related to the difference between the 2D and 3D maps, and many mirrored the comments made by the participants in the earlier 2D-3D comparison study. For example, some participants commented that the 3D map provided a better impression of the museum building as a whole, and how the different floor levels were connected:

> The 3D map contextualises spaces in relation to each other, so you can see the links; on the 2D map you don't see the links.
>
> The 3D map immediately give me a better sense of the whole museum – I can see the levels and the progression of one gallery to the next. It gives me a better feel for the overall structure of the building.

As with the participants in the previous experiment, some participants also commented that the 3D map was too complicated and could be confusing:

> I'm not sure about adding the connections [between floors] with the staircases [on the 3D map]. For me, it confuses the eye… I'm not sure the 3D aspect adds a great deal.
>
> [The 2D map] is clearer. I suppose I wouldn't necessarily need an overall picture [of the museum] when walking around, just a map of each floor.
>
> The 3D map is too cluttered. The vertical lines that show direction don't add anything to the information.

One participant felt that a 3D map was not necessary for this particular museum, but may be for a more complex building:

> I can imagine a situation where the 3D one was more useful if it was a more difficult type of building... If the building was more rambling, the 3D map may be better.

The higher number of participants stating a preference for one of the 3D designs does not necessarily lead to a conclusion that 3D maps are more effective than 2D ones at helping visitors understand and navigate the museum. First, the perceived aesthetic, as well as functional, qualities of the designs played a role. This can be subconsciously felt, as explained in the previous chapter (see "Comparative ratings of the two types of map"), but some participants also may comments in relation to this, saying that the 3D one was "modern", "interesting" or "innovative".

Second, the design of this research was such that participants were not making equivalent judgments, because they were seeing different designs in a sequence. Therefore the second and third designs were being judged in relation to the earlier ones they had seen. Participants may have been able to understand and appreciate the more complicated 3D designs better after having already seen the 2D ones, for example. Examination of the participants' initial preferences (comparing two designs with the same building projection) with their second preferences (after being introduced to a different building projection) gives some weight to this. The numbers of participants who changed their preference when shown a third map was roughly similar to those who retained their initial preference. But eight participants who had initially seen the 2D designs said they preferred the 3D one when shown it, while only two participants who had initially seen the 3D designs said they preferred the 2D one when shown it.

The effect of labelling styles on perceived complexity

In commenting on their preferences, some participants made particular reference to the style of the location labels on the 3D map, for example:

> You have to focus harder [on the location labels on the three-dimensional map] because of the lines; it breaks up the shape too much.
>
> I think the labelling on the 3D map is slightly less clear, because you have to follow the lines more closely to see where they're going, because the floors are essentially at an angle.
>
> Also, the dotted lines [for the labels] on [the 2D map] are easier to follow; they don't run over other bits of the map.

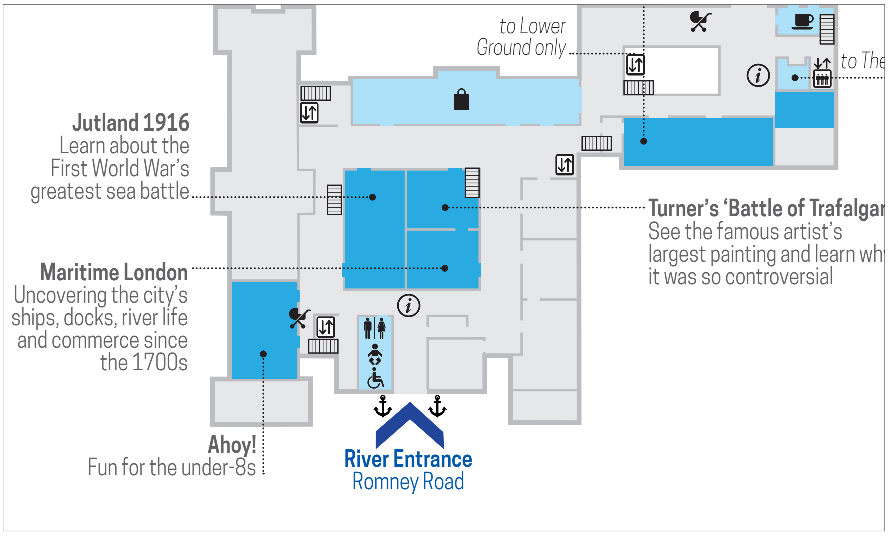


Fig 7. Detail of 2D location labels map, showing positioning of labels (at 90% actual size)

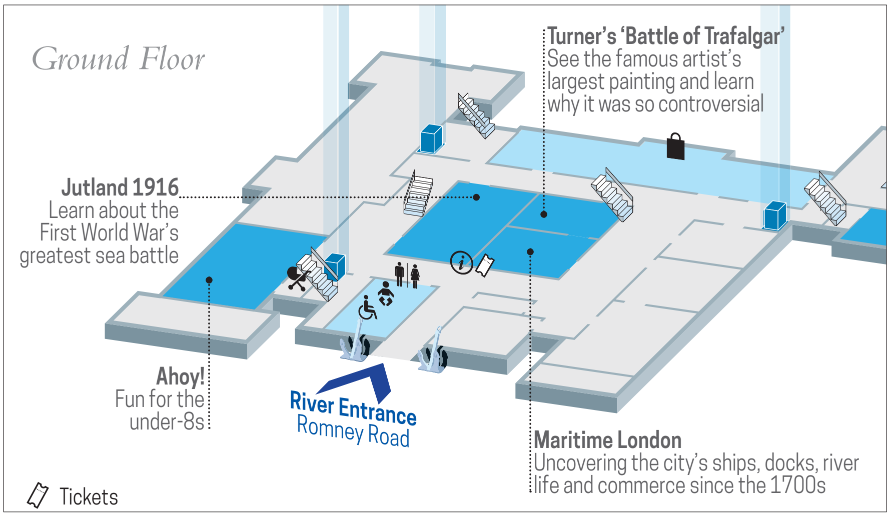


Fig 8. Detail of 3D location labels map, showing positioning/geometry of labels (at 90% actual size)

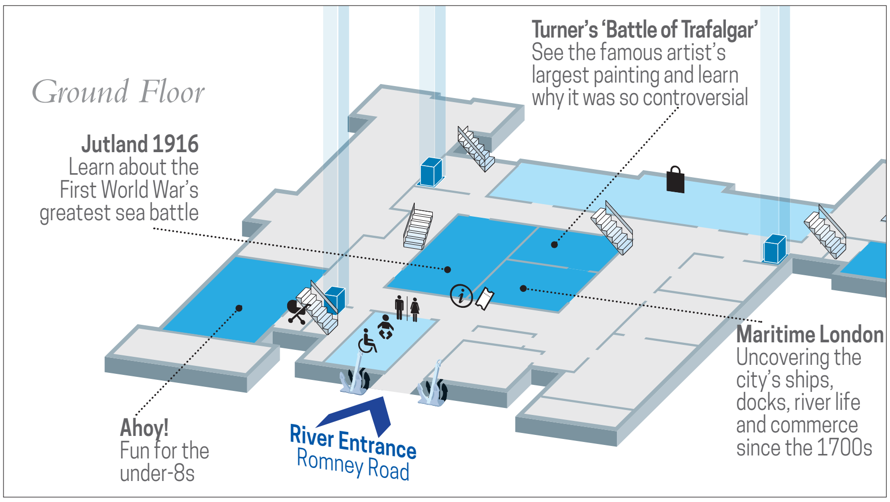


Fig 9. Possible alternative design and arrangement of labels on 3D map (at 90% actual size)

These comments suggest that there is a perception that the geometry of the labelling lines on the 3D map is an impediment to readability – see Fig 7 and Fig 8 of the labels on the 2D and 3D map. The third comment above suggests that the participant believed that the leader lines for the labels "ran over" only the 3D map, whereas they do so on both designs.

It is possible that the differing geometry of the building plan and the label leader lines (and possibly also that of the label text) creates readability difficulties. Fig 9 shows an alternative design, with the label leader lines at the same angles as the building plans, which may improve readability. Of course, there are other aspects to the labels that may improve readability, including the typeface, size of type, colour of type, and style, weight and colour of leader lines.

Limitations of the research

Limitations identified with the research process include:

- Participants did not visit the museum the test maps described, so were not able to relate the designs to the actual building, which may affect their ratings and preferences. Further, they did not have access to other orientation and wayfinding assistance (such as museum staff) and materials (such as signage) in addition to the map, as they would if using the map in the museum.
- Participants' assessment of maps was done as part of an in-person interview with the researcher. Having the researcher present may affect their assessment of the maps, and the opinions they expressed of them.

Limitations with the test materials include slight differences in the layout of the test maps, as described on page 349. Although this was considered unavoidable, in order to retain equivalence in other aspects across the four designs, it was clearly noticed by some participants and therefore may have affected their assessments of the maps.

Conclusion and discussion

The results of this research in the main confirm those of the study in Chapter 6. The four designs of map were considered by most participants to be useful and easy to read and understand. When asked to state whether they preferred a location labels or directory system of gallery names and descriptions, opinions were broadly equally divided. Participants articulated the disadvantage of having to connect a key letter identifying a space with where it was in the museum with the order and clarity of a list of spaces that was separate from the building diagram (and other information). Some also pointed out the different use modes of each, ie, using a map to *plan* a visit compared with using a map while *undertaking* a visit.

However, when presented with designs that combined two distinctive elements of difference – labelling systems and building projections – stronger preference patterns emerged. The 3D designs tended to be preferred, and in particular the 3D design with a directory. Least of all favoured was the 2D design with a directory. As with the study reported in Chapter 6, participant comments suggest that there is the possibility that they appreciated the extra functionality afforded by a 3D diagram, and were also (in most cases) able to read and understand it, even it if took more effort to do so. It is also possible that the directory system was chosen as a “least-bad” option: although it requires more effort by the reader than a location labels system, it is preferable because it is less visually cluttered.

This study concerned only one museum, and a similar exercise with other museums (using variations in a map design) would be needed to validate the findings here. More specifically, further research into some of the design details – for example, examining the geometry of diagram labelling vis-a-vis the geometry of the diagram itself – may provide some insight into methods of improving readability.

Conclusion and discussion

Contents

Conclusion and discussion

The aim of this thesis has been to provide insight into how the design of printed maps of museums may be improved as a means of helping museum visitors have more satisfying experiences. A range of methods were used to answer three key research questions:

1. What information do museum maps convey and how do visitors use them?
2. Are 2D maps better than 3D maps?
3. Do users prefer location labels to a directory system on museum map?

There were four elements to the investigation of the first question:

- An analysis of the material forms of museum maps, and their digital equivalents (Chapter 2)
- An analysis of a corpus of 251 contemporary museum maps, and an analysis of historic maps at two major museums (Chapter 3)
- An examination of published literature and museum visitor research about visitor behaviour, wayfinding and orientation in museums (Chapter 4), and
- A survey asking visitors at the Victoria & Albert Museum (V&A) about their use of museum maps and digital alternatives (Chapter 5).

The focus of the second question arose from the findings of the analysis of the corpus (which established that 2D and 3D projections were both widely used for museum maps, but that there was no clear pattern as to the reasons for or circumstances in which one was used over the other), and the examination of literature, which revealed a lack of research into effectiveness of or preference for one type or the other. The second question was investigated through a study in which participants compared 2D and 3D versions of a map of a museum by using the map to undertake a wayfinding task (Chapter 6), and were asked about their views on the map as an aid to a visit.

The focus of the third question arose from the findings of the study of 2D and 3D maps, in which the issue of visual "complexity" was considered a problem with the maps for some participants. One of the elements of the map that contributes to the sense of complexity is the labelling that describes the spaces and facilities in the museum. Another study was therefore developed to investigate two versions of a map of the same museum: one with labels on spaces they relate to, the other with a directory of the spaces in a list next to the map diagram, with a key letter indicating their location (Chapter 7).

Findings: how museum maps work

The examination of material forms considered the type of document in which museum maps are available. These range from ephemeral single-page documents, generally including little peripheral information about the museum, which are either free or sold at low cost, to substantial guidebooks in which the map is a less important element, and is like to be more used after a visit, rather than to be consulted during a visit. The simplest forms, the free or low-cost leaflets, are these days the most widely available forms of map (in many cases also made available in pdf form on museums' websites). It was decided, therefore, to focus on this type of document for the corpus that was used for analysis.

The examination of digital alternatives to maps was undertaken to establish what types of alternative were currently available, how their roles and functionality compared with maps, and how widely they were used compared with printed maps. This assessment found that the range of digital guide devices and systems has increased in recent decades. This is in part spurred by technological innovations, such as location awareness (which allows users to pinpoint their location in a museum) and "smart" technologies that can help direct visitors to the exhibits that may appeal to them, based on what they have taken an interest in. It is also linked to the rise in ownership of smartphones, which can run digital guide apps, therefore dispensing with the need for the museum to provide bespoke devices. Many museums have invested in innovative and sophisticated digital systems that provide functionality and a volume of information way beyond that of a printed map. Nevertheless, there is evidence that take-up of them by visitors is relatively low, compared with printed maps. The reasons for this are complex, and require further investigation, though familiarity with the printed form is undoubtedly one of them. This was explored in the survey of visitors at the V&A museum, discussed below.

The analysis of the corpus of maps identified four "information roles" of maps: visual directory, locator, highlighter and trail. The first two roles are virtually universal in museum maps, explaining what is in the museum and how it is arranged (visual directory), and indicating where key facilities and amenities are (locator). The second two, indicating the museum's key exhibits and where they are (highlighter), and a recommended or required route through the museum (trail) are only on some maps (within the corpus, a minority).

The analysis revealed a range of graphic techniques for conveying this information, including labels, symbols, lettered or numbered keys, and colour coding. The amount of detail provided about a museum's exhibits and the way they are displayed varies considerably. Although, inevitably, larger museums have more information to show, the diversity of a museum's exhibits is also an important determinant of the amount of information required. For example, a museum dedicated to one subject or type of object (such as cars) will be different

from one with exhibits that vary not only by type but subject (such as a science museum or a natural history museum). Nevertheless, the analysis of the corpus revealed that there is a large variation in the amount of information shown on maps, even between museums of a similar type, indicating decisions by the museum and/or map designers about how the role of the map can help visitors plan or undertake their visit. This can be seen clearly through the historical analysis of maps at the British Museum and the V&A – both large museums with complex buildings and diverse displays. The visitor maps produced by the British Museum have been of a largely similar design for more than 100 years; the V&A has been more adventurous, experimenting with different design approaches, particularly in the last 50 years, which reveal, among other things, the challenge of depicting a building with a complex multi-level layout and circulation system.

The examination of published literature covered research into general wayfinding and orientation behaviour in buildings, and provides some insight of relevance to museum visitors. However, museums have some unique aspects to them compared with other locations in which architects and designers invest in wayfinding solutions, including maps. To begin with, museums are destinations, rather than places that people pass through, such as transport hubs (airports and stations). Also, in those types of location, as well other well-studied environments such as hospitals and medical centres, providing resources to help people find their way is important because there can be serious consequences of getting lost (a missed train or plane, a being late for an appointment, or delayed critical medical treatment). This is not the case with a visit to a museum. The purpose of a map in a museum is less to facilitate wayfinding than to facilitate "conceptual orientation": understanding what is in the museum and how it is arranged. The visitor research that individual museums undertake in order to improve the visitor experience does in some cases include orientation and wayfinding. Some such research confirms that both can be a problem for visitors, while other research focuses on the effect of the arrangement of displays in museums on orientation and visitors' experiences. However, there is little available research specifically into the use or design of museum maps.

The survey of visitors to the V&A undertaken for this research provided insights into how, and how frequently, people use printed museum maps. It found that they were widely used and appreciated by people, with a majority of those surveyed (90%) saying they sometimes or always used a map when visiting a museum (if they were available). People were questioned on what tasks they used the maps for, using a list of tasks that were equivalent to the information roles discussed above. Most people said that they would use the map for more than one of these tasks, but that mentioned most related to the visual directory role (by 77% of participants) and the one least mentioned related to the trail role (by 51% of participants). This concurs with other research suggesting that maps in museums are most useful for conceptual orientation. The questions about map

use were also put to participants in the two studies to compare different map designs described below; the results were similar.

In relation to the use of digital alternatives to maps, participants' use levels were low, in line with other published research: 77% of participants in the V&A study said they had never used a digital map or app. This finding is significant because the survey (in late 2015/early 2016) was undertaken at a time when smartphone ownership (in the UK and other developed countries) was high; virtually all the participants in interview volunteered that they were regular users of smartphones. Much of the earlier research, even that done a few years ago, was at a time when smartphone ownership levels were much lower. The implication is that survey participants' resistance to digital guides in museums was less likely to have been due to technological inexperience. Questioning participants about their reasons for not using apps and digital maps revealed complicated reasons, often relating to a belief that a digital device was an unwelcome distraction from a museum visit, rather than an enhancement of it.

Findings: 2D and 3D maps

The study to compare 2D and 3D maps involved participants at the National Maritime Museum, Greenwich, being shown one of two maps of the museum: one with a series of 2D floor plans, and the other a 3D diagram of the museum. Each participant was given a task to plot a route on the map to a pre-determined destination, and then to use the map to find their way to the destination. This journey was timed, and immediately after the task, the participant was interviewed about the experience, and about their opinions of the map as an aid to visiting the museum.

As resources for aiding wayfinding, both maps appeared to be similarly effective. All participants reached their destination; some participants made errors during their journeys, for example requiring them to backtrack or rethink their route. But even in the worst cases, these did not cause serious delay; participants using both types of map made errors.

However, as explained, museum maps are more often used for conceptual orientation than they are for wayfinding, and the interviews with the participants following the task revealed some differences in how the two maps were perceived in terms of explaining the museum layout.

Overall, both types of map were considered useful by most participants for visiting the museum. However, the 3D map was seen as more sophisticated and more appealing by some participants. Even some of those who preferred the 2D map said that the 3D map showed more clearly how the lifts and stairs connected the building's floor levels than the 2D map. Against this, comments by participants suggested that designing 3D maps requires more care than 2D maps because there are potential problems with 3D projections that do not exist with 2D ones. First, in all but the most straightforward buildings, some areas

of a building may be difficult to render, because they may be concealed or at an awkward angle. Second, many map users will physically rotate a map so that the direction they are heading is to the top of the page, and doing this with a 3D map makes it much more difficult to read than doing so with a 2D map. Both these issues require a careful choice of the point-of-view of the map diagram, and of the type of 3D projection (for example, the angle of an axonometric diagram, or using a perspective projection) to minimise potential downsides as much as possible.

Findings: labels and directories

One issue mentioned by many participants in the study of 2D/3D maps was that the maps seemed complex or "cluttered", which made them less easy to use. The labels on the maps describing the exhibits were a noted as a major contributor to this sense of complexity or "clutter". To understand these issues in more depth, this study compared two ways of providing information about the exhibition spaces, in both the 2D and the 3D maps. Participants were asked which map they preferred, and why. Overall, of the four options, the 3D design with the directory tended to be preferred, and the 2D design with the directory least preferred. This suggests that there is a complex four-way trade-off between the extra effort of using a directory system (because the user must match the key letter with the label), the "clutter" associated with a labelling system, the usefulness of the 3D diagram (as found in the first study), and the relative clarity on the map diagram of the key letters over the labels.

It is important to note that the choice to use either a directory or labels on a map will depend on the specific nature and characteristics of the museum. For example, where the nature of the museum's exhibits means they do not easily fit within themes that can be easily described, labelling each one may make the map unacceptably confusing, and a directory would clearly be the best option. It must also be borne in mind that directories and labels are not exact equivalents in that they do not work in the same way for users. If the user is looking for a particular exhibit, or scanning a list of exhibits for something of interest, a directory works best; if they are scanning the map to see what is nearby their current location, a label system works best. Therefore, directories are likely to be most useful when *planning* a visit in a museum, and labels for use when *undertaking* a visit.

Contribution of this research

This research has provided insight into map design for museum visitors from a new perspective. Previous research that may inform museum map design has limited relevance either because it is focused on other indoor environments, which have different design aims (for example, because wayfinding rather than conceptual orientation is the prime concern); or because it is museum-conducted visitor research that is narrowly focused on a proposed design solution in a particular museum, with little wider application.

The research has first confirmed the ongoing popularity of printed museum maps with visitors, as many museums develop sophisticated digital guide and orientation systems. Many people still like and use museum maps, even when they are adept at using digital devices and when digital systems are available to them. This may be partly due to familiarity with the printed form, but other characteristics of a printed map – easy to carry and access during a visit, disposable (and therefore can be folded, written on, stuffed in a pocket), generally readily understood with relatively little learning time – make it appealing to many visitors. And for some, the associations with digital devices can be negative, and not compatible with a museum visit – for example, because a digital screen is seen as a distraction from viewing and appreciating physical displays (such as artefacts or works of art).

The research has identified the range of graphic elements and approaches that are used in contemporary museum maps, and also the ways in which people are most likely to use a map, and therefore provide map designers with an idea of the possibilities open to them when designing maps.

Finally, the two map studies have provided more focused insight than previously into museum visitors' responses to two particular aspects of map design: the building projection used (2D or 3D) and labelling systems. The findings from these studies, although they would benefit from further research, provide guidance for map designers in relation to the types of system that may work best in particular museums, and more specific insights into detailed design decisions relating to building projection and labelling.

Future research possibilities

The findings from this research suggest several avenues for future research. First, both the studies comparing 2D/3D maps and labels/directories could be repeated and expanded in a different museum, for example a larger museum than the National Maritime Museum, or one that has a more complicated layout (such as separate wings, more complex floor level arrangements, or non-rectilinear-shaped spaces). Both studies had relatively small sample sizes, and study designs using larger numbers of participants may provide a stronger evidence of the effectiveness of one type of map projection, or labelling system, over

the other. Furthermore, study populations with particular characteristics could probe whether there is a cultural aspect to map type preference or wayfinding performance – including, for example, whether writing directionality in different languages is a significant determinant.

Alternatively, it would be helpful to examine whether, in a museum in a straightforward building – in particular, a building on one level – there is any advantage in developing a 3D map, since building users do not need navigate journeys that necessitate moving between floor levels.

The study of 2D and 3D maps found that many visitors saw a clear advantage in the 3D design, in that it provided an image of the whole museum, including, crucially, how and where to move between floors. However, some participants had difficulty using the 3D maps and it would be useful to devise a study using 3D maps with different designs (for example, 2-point perspective) or with different design details (for example, including more architectural elements on the map to create a more realistic impression of the building) to investigate whether museum visitors find these types of map easier to read.

There are other design elements of museum maps that were not the subject of the studies for this thesis, but would warrant investigation. In particular, colour coding is widely used in museum maps as an alternative to a letter or number key for a directory of exhibits and spaces. It would be useful for map designers to know whether colour coding is more effective than letters, numbers, or labels in helping visitors understand what the museum has to offer. Further, there are other design elements of museum maps that were not the subject of the studies for this thesis, but would warrant investigation. In particular, colour coding is widely used in museum maps as an alternative to a letter or number key for a directory of exhibits and spaces. It would be useful for map designers to know whether colour coding is more effective than letters, numbers, or labels in helping visitors understand what the museum has to offer.

More broadly, it is clear from the research that much of the appeal of museum maps to visitors is as aids to conceptual orientation, ie, to understand in detail what the museum contains, to make a plan for a visit, or just to get a sense of what displays, themes or areas of the museum may be of most (or least) interest. Studies to gain more insight into how maps relate to conceptual orientation behaviour (the connection between maps, museums' curatorial concepts and visitors' understanding how such concepts are expressed in displays) could be extremely valuable to museum curators and designers.

Finally, the opinions expressed by participants in the three studies in relation to the use of digital guide material warrants further study, to consider in more depth why many people are apparently resistant to using digital devices in museums, even when they are evidently competent at using them, and apparently aware of the extra functionality they can offer over printed material.

Appendices

Appendix 1: Corpus of contemporary museum maps (paper)

Institution	Location		Publication date	Map projection		Roles				Graphic devices				
	Country	City/town		Primary	Secondary	Visual digest	Locator	High-lighter	Trail	colour	labels	key	picto-grams	images
Museum of London Docklands	UK	London	not stated	2D	3D isometric	•	•	•		functional	•		•	•
Imperial War Museum	UK	London	not stated	2D	cross-section	•	•			thematic	•		•	
Musée National Adrien Dubouché	France	Limoges	not stated	2D		•	•			functional	•			
Frans Hals Museum	Netherlands	Haarlem	not stated	2D		•	•			functional		•	•	•
Van Gogh Museum	Netherlands	Amsterdam	not stated	3D isometric		•	•						•	
Rijksmuseum	Netherlands	Amsterdam	not stated	2D	cross-section	•	•			thematic	•	•	•	•
Rijksmuseum	Netherlands	Amsterdam	not stated	Physical 3D		•	•			thematic	•		•	
MOU Museum	Belgium	Oudenaarde	not stated	2D		•	•			thematic	•	•	•	
Victoria & Albert Museum	UK	London	Autumn/Winter 2012, Autumn/Winter 2014, Autumn/Winter 2015, Autumn/Winter, 2017	2D		•	•			thematic	•	•	•	
Horniman Museum	UK	London	not stated	2D		•	•	•			•	•	•	•
National Gallery	UK	London	not stated	2D		•	•	•		thematic	•		•	•
National Portrait Gallery	UK	London	Sep 14-Mar15	2.5D 1-point perspective		•	•	•		thematic	•	•	•	•
British Museum	UK	London	Aug-14	2D		•	•	•			•	•	•	
Natural History Museum	UK	London	Sep-14	3D 1-point perspective		•	•			functional	•	•	•	•
Science Museum	UK	London	not stated	2D		•	•			functional	•		•	
Tate Britain	UK	London	Jan-15	2D		•	•				•		•	
Hampton Court Palace	UK	London	not stated	3D 1-point perspective	2D	•	•		•	thematic	•		•	•
Museo Nacional de Antropoligía	Mexico	Mexico DF	not stated	2.5D 1-point perspective		•	•				•	•	•	
The Wallace Collection	UK	London	c. Feb-15	2D		•	•				•		•	
Art Gallery of New South Wales	Australia	Sydney	Mar-15	cross-section		•	•			functional	•		•	

Appendix 1 Corpus of contemporary museum maps (paper)

Institution	Location		Publication date	Map projection		Roles				Graphic devices				
	Country	City/town		Primary	Secondary	Visual digest	Locator	High-lighter	Trail	colour	labels	key	picto-grams	images
Australian Centre for the Moving Image	Australia	Melbourne	not stated	2D		•	•				•	•		
National Gallery of Victoria	Australia	Melbourne	not stated	3D axonometric		•	•			functional	•	•	•	
Museum of Contemporary Art Australia	Australia	Sydney	Mar-May 15	3D 1-point perspective		•	•			functional	•		•	
Hong Kong Museum of History	Hong Kong SAR	Hong Kong	Feb-14	3D isometric		•	•		•	thematic	•	•	•	
Museo Nacional del Virreinato	Mexico	Tepotzotlán	not stated	3D 1-point perspective		•	•					•		
Museum of Almería	Spain	Almeria	not stated	2D		•				thematic		•		
La Casa del Poeta José Ángel	Spain	Almeria	not stated	2.5D axonometric		•	•			thematic		•		
Reina Sofia	Spain	Madrid	2015	2.5D axonometric	cross-section	•	•			functional	•		•	
The Cardiff Story	UK	Cardiff	not stated	2.5D axonmetric		•	•			functional	•		•	
National Museum Cardiff	UK	Cardiff	not stated	2D		•	•	•		functional		•	•	
Sam Tung Uk Museum	Hong Kong SAR	Hong Kong	not stated	2D		•	•				•			
Museum of Islamic Art	Qatar	Doha	not stated	2D	cross-section	•	•			thematic	•	•	•	
The Museum of Innocence	Turkey	Istanbul	not stated	cross section		•	•				•			
Royal Museums Greenwich	UK	London	2015	2.5D axonometric		•	•			functional	•		•	
The Museum of the City of Cologne	Germany	Cologne	not stated	2D		•	•	•			•			
Welterbe Zollverein	Germany	Essen	not stated	3D axonometric		•	•	•		functional	•	•	•	
Museo Diocesano Huesca	Spain	Huesca	not stated	2D		•	•	•				•		•
Fondation Louis Vuitton	France	Paris	2014	3D axonometric	cross-section	•	•			functional	•		•	
Museo d'Arte Orientale	Italy	Turin	not stated	2D	cross-section	•	•	•		functional	•		•	•

Institution	Location		Publication date	Map projection		Roles				Graphic devices				
	Country	City/town		Primary	Secondary	Visual digest	Locator	High-lighter	Trail	colour	labels	key	picto-grams	images
Palazzo Madama	Italy	Turin	not stated	1-point perspective	axonometric	•	•	•		functional	•	•	•	•
Musée d'Orsay	France	Paris	2015	axonometric	2-point perspective	•	•			functional	•	•	•	
Musée National Picasso-Paris	France	Paris	2015	2D		•	•				•		•	
Polo Reale Torino	Italy	Turin	not stated	2D		•	•			functional	•	•		
Pitt Rivers Museum	UK	Oxford	not stated	2D		•	•				•	•	•	•
Oxford Museum of Natural History	UK	Oxford	not stated	1-point perspective		•	•				•	•	•	
Ashmolean Museum of Art and Archaeology	UK	Oxford	not stated	2D	cross-section	•	•			functional	•	•	•	
National Gallery Singapore	Singapore	Singapore	not stated	2D	cross-section	•	•			functional	•	•	•	
Tower Bridge Exhibition	UK	London	not stated	3D axonometric		•	•			functional	•	•	•	•
Scottish National Gallery	UK	Edinburgh	not stated	2.5D 1-point perspective	cross-section	•	•			functional	•		•	
The Georgian House	UK	Edinburgh	Mar-16	2D		•	•			functional	•			
Sir John Soane's Museum	UK	London	2013	flat		•	•					•		
Kunstmuseum Basel	Switzerland	Basel	2016	2.5D axonometric		•	•				•		•	
Tate Modern	UK	London	2016	2D	cross-section	•	•			functional	•		•	•
Museum of Science and Industry	UK	Manchester	not stated	3D isometric		•	•			functional	•			
National Gallery of Art	USA	Washington, DC	2015	2D	cross-section	•	•			thematic	•	•	•	
Ightam Mote	UK	Sevenoaks, Kent	2016	2D		•	•		•		•			
The Salisbury Museum	UK	Salisbury	not stated	2.5D perspective		•	•	•		thematic	•	•	•	•
Musée Rodin Paris	France	Paris	not stated	2D		•	•	•			•		•	

Institution	Location		Publication date	Map projection		Roles				Graphic devices				
	Country	City/town		Primary	Secondary	Visual digest	Locator	High-lighter	Trail	colour	labels	key	picto-grams	images
Dulwich Picture Gallery	UK	London	not stated	2D		•	•	•		functional	•		•	•
Smithsonian National Muse-um of American History	USA	Washington, DC	not stated	2D		•	•			functional	•	•	•	
The Design Museum	UK	London	not stated	2.5D axonometric		•	•			thematic	•		•	
Milwaukee Art Museum	USA	Milwaukee, WI	not stated	2D		•	•			thematic	•	•	•	
Museo Oriental	Spain	Valladolid, Spain	not stated	2D		•	•					•		
Monticello	USA	Williams-burg, VA	not stated	cross-section	2D	•	•	•			•			•
Solomon R Guggenheim Museum	USA	New York	Feb-Apr 17	3D axonometric		•	•			functional	•	•	•	
Porsche Museum	Germany	Stuttgart	not stated	3D axonometric		•	•		•		•	•	•	
Mauritshuis	Belgium	The Hague	2017	cross-section	2D	•	•	•		functional	•	•	•	•
National Air and Space Museum	USA	Washington, DC	not stated	2D		•	•	•			•	•	•	•
British Library	UK	London	not stated	2D	2.5D isometric	•	•			thematic	•		•	
Newseum	USA	Washington, DC	2015	2D		•	•	•		functional	•	•	•	
Frederic Marès Museum	Spain	Barcelona	not stated	2D		•	•	•		functional	•	•	•	•
Art Gallery of Western Australia	Australia	Perth	not stated	3D 2-point perspective		•	•				•			

Appendix 1: Corpus of contemporary museum maps (pdf)

Institution	Location		Publication date	Map projection		Roles				Graphic devices				
	Country	City/town		Primary	Secondary	Visual digest	Locator	High-lighter	Trail	colour	labels	key	picto-grams	images
Art Institute of Chicago	USA	Chicago	Feb-14	2D		•	•			functional	•		•	
Art Institute of Chicago	USA	Chicago	Nov-14	2D		•	•			functional	•		•	•
The Field Museum	USA	Chicago	Sep-14	2.5D 1-point perspective		•	•	•		thematic	•		•	•
Australian Museum	Australia	Sydney	Apr-14	3D isometric		•	•			functional		•	•	
Australian Museum	Australia	Sydney	Sep-15	3D isometric		•	•			functional		•	•	
Tate Britain	UK	London	Sep-14	2D		•	•				•		•	
Tate Britain	UK	London	Jun-15	2D		•	•			thematic	•		•	
Tate Modern	UK	London	Aug-14	2D	cross-section	•	•	•		functional	•	•	•	•
Tate Liverpool	UK	Liverpool	Oct-14	2.5D 1-point perspective		•	•				•		•	
Manchester Art Gallery	UK	Manchester	Apr-14	2D		•	•				•		•	
National Gallery	UK	London	Sep-14	2D		•	•	•		thematic	•	•	•	•
National Gallery of Australia	Australia	Canberra	Jul-12	3D isometric		•	•			thematic	•	•	•	
Science Museum	UK	London	Jun-14	2D		•	•	•		functional	•	•	•	
Natural History Museum	UK	London	Jun-14	2.5D 1-point perspective		•	•			functional	•	•	•	
Long Museum Pudong	China	Shanghai	Nov-14	2D		•	•				•		•	
Museum Boijmans van Beuningen	Netherlands	Rotterdam	Apr-11	2D		•	•			thematic	•		•	
Smithsonian National Muse-um of Natural History	USA	Washington DC	Jun-14	3D 1-point perspective		•	•	•		thematic	•	•	•	
Smithsonian National Air and Space Museum	USA	Washington DC	Aug-14	2D		•	•	•			•	•	•	•
National Museum of Ameri-can History	USA	Washington DC	May-14	2D		•	•	•		functional	•	•	•	
American Museum of Natural History	USA	New York	Jun-11	2D		•	•			functional	•		•	

Institution	Location		Publication date	Map projection		Roles				Graphic devices				
	Country	City/town		Primary	Secondary	Visual digest	Locator	High-lighter	Trail	colour	labels	key	picto-grams	images
Vatican Museums	Vatican City	Vatican City	Apr-14	2D		•	•		•	thematic	•		•	
Cité des Sciences et de L'Industrie	France	Paris	Jul-14	2.5D isometric		•	•			thematic	•		•	
Metropolitan Museum of Art	USA	New York	Aug-14	2D		•	•			thematic	•		•	•
Art Gallery of Ontario	Canada	Toronto	Feb-13	2D	3D isometric	•	•			thematic	•		•	
Canada Aviation and Space Museum	Canada	Ottawa	Apr-13	2D		•	•	•			•	•	•	
Canadian Museum of Nature	Canada	Ottawa	Feb-14	2D		•	•				•		•	
Canadian Museum of History	Canada	Ottawa	Sep-14	2D		•	•			thematic	•	•	•	
Canadian War Museum	Canada	Ottawa	Feb-10	2D	2D	•	•		•	thematic	•		•	
Royal Ontario Museum Visitor Guide	Canada	Toronto	May-09	3d 2-point perspective		•	•				•		•	
Royal Ontario Museum Map Guide	Canada	Toronto	Jun-14	2D	cross-section	•	•				•		•	•
National Gallery of Canada	Canada	Ottawa	Nov-12	3D axonometric		•	•			thematic	•		•	
Melbourne Museum	Australia	Melbourne	Aug-14	2D		•	•			thematic	•		•	
Australian National Maritime Museum	Australia	Sydney	not stated	2D		•	•			thematic	•		•	
Dallas Museum of Art	USA	Dallas	May-17	2D	cross-section	•	•			functional	•		•	•
Museum of Old and New Art (MONA)	Australia	Hobart	Sep-14	2.5D axonometric		•	•	•			•		•	•
Museum of Old and New Art (MONA)	Australia	Hobart	Mar-18	2D		•	•	•			•		•	•
North Carolina Museum of Art	USA	Raleigh	Jul-11	2.5D axonometric		•	•			thematic	•		•	
Musée du Louvre	France	Paris	Oct-14	2D	3d axonometric	•	•	•		thematic	•	•	•	•

Institution	Location		Publication date	Map projection		Roles				Graphic devices				
	Country	City/town		Primary	Secondary	Visual digest	Locator	High-lighter	Trail	colour	labels	key	picto-grams	images
National Palace Museum	Taiwan	Taipei	Jul-14	3D 2-point perspective		•	•	•		functional	•	•	•	•
National Gallery of Art	USA	Washington, DC	Feb-14	2D	cross-section	•	•			thematic	•		•	
National Gallery of Art	USA	Washington, DC	Sep-16	2.5D axonometric	cross-section	•	•			thematic	•		•	
Reina Sofia	Spain	Madrid	Nov-14	2.5D isometric		•	•			functional	•		•	
Museum of Modern Art	USA	New York	May-13	2D		•	•			functional	•		•	
Kröller Müller Museum	Netherlands	Otterlo	Apr-14	2D		•	•	•			•	•	•	•
State Hermitage Museum	Russia	Moscow	Jul-14	2D		•	•			functional			•	
Museo Nacional del Prado	Spain	Madrid	Jan-13	2D		•	•	•		thematic	•		•	•
National Museum of Scotland	UK	Edinburgh	Sep-14	2D		•	•	•		thematic	•		•	•
Getty Villa	USA	Los Angeles	May-12	2D		•	•	•		functional	•	•	•	•
De Young Galleries	USA	San Francisco	Aug-14	3D 2-point perspective		•	•			thematic	•	•	•	
Legion of Honor	USA	San Francisco	Jul-13	3D 2-point perspective		•	•	•		thematic	•		•	•
Van Gogh Museum	Netherlands	Amsterdam	Mar-14	3D isometric	3D isometric	•	•						•	
Van Gogh Museum	Netherlands	Amsterdam	Mar-16	2D + section	cross-section	•	•			functional		•	•	
State Tretyakov Gallery	Russia	Moscow	Mar-13	2D		•	•	•		thematic	•	•	•	•
National Museum of the American Indian	USA	Washington, DC	Nov-13	3D axonometric		•	•				•		•	•
National Waterfront Museum	UK	Swansea	Aug-11	2.5D axonometric		•	•	•	•	thematic	•	•	•	•
Kelvingrove Art Gallery and Museum	UK	Glasgow	Nov-12	3D isometric		•	•	•		functional	•		•	•
Kelvingrove Art Gallery and Museum	UK	Glasgow	Aug-13	2D		•	•	•			•		•	•
Musée du Quai Branly	France	Paris	Apr-14	3D axonometric	2D	•	•			both	•		•	•
Zwinger	Germany	Dresden	Jun-14	2D		•	•	•			•	•	•	•

Institution	Location		Publication date	Map projection		Roles				Graphic devices				
	Country	City/town		Primary	Secondary	Visual digest	Locator	High-lighter	Trail	colour	labels	key	picto-grams	images
Kumu (Estonian National Art Gallery)	Estonia	Tallinn	Nov-09	2.5D axonometric		•	•			thematic		•	•	
Newseum	USA	Washington, DC	Sep-14	2D		•	•			functional	•	•	•	•
Charles de Gaulle Mémorial	France	La Boisserie	Apr-09	2D		•	•		•		•		•	•
The Newark Museum	USA	Newark	Aug-14	2D		•	•			functional	•		•	
Queensland Art Gallery/GOMA	Australia	Brisbane	Oct-13	2D		•	•			functional	•	•	•	
SAAM/Renwick Gallery	USA	Washington, DC	Nov-14	2D		•	•	•		thematic	•	•	•	•
Museum of Fine Arts Boston	USA	Boston	Nov-14	2D		•	•	•		thematic	•	•	•	•
National Portrait Gallery	USA	Washington, DC	May-14	2D		•	•			thematic	•		•	•
Israel Museum	Palestine	Jerusalem	Oct-13	3D isometric		•	•			thematic	•	•	•	•
Museo Thyssen-Bornemisza	Spain	Madrid	Feb-15	2D		•	•	•				•	•	•
Museum of Fine Arts	USA	Houston	May-13	3D axonometric		•	•	•		thematic	•	•	•	•
Ashmolean Musem	UK	Oxford	Nov-13	2D	cross-section	•	•			functional	•	•	•	
Art Gallery of South Australia	Australia	Adelaide	Jul-13	2D		•	•			functional	•	•	•	
National Gallery of Ireland	Ireland	Dublin	Feb-14	2D		•	•			functional	•	•	•	
National Gallery of Ireland	Ireland	Dublin	Mar-16	2D		•	•	•		functional	•		•	•
Freer Gallery of Art	USA	Washington, DC	Mar-12	2D		•	•			thematic			•	•
Freer Gallery of Art	USA	Washington, DC	Nov-13	2D		•	•			thematic		•	•	
Arthur M Sackler Gallery	USA	Washington, DC	Nov-13	2D		•	•			thematic		•	•	
Arthur M Sackler Gallery	USA	Washington, DC	Jul-13	2D		•	•				•		•	
Freer Gallery of Art	USA	Washington, DC	Jul-13	2D		•	•				•		•	
Musée National de la Renaissance	France	Écouen	Jan-10	2D		•	•	•				•		•

Institution	Location		Publication date	Map projection		Roles				Graphic devices				
	Country	City/town		Primary	Secondary	Visual digest	Locator	High-lighter	Trail	colour	labels	key	picto-grams	images
Exploratorium Museum	USA	San Francisco	Jul-14	2D		•	•				•	•		•
Royal Museums Greenwich	UK	London	Jul-14	3D axonometric		•	•			functional	•		•	
National Museum of Singapore	Singapore	Singapore	Jun-09	2D		•	•				•	•	•	
National Museum of Singapore	Singapore	Singapore	Sep-15	2D		•	•			thematic	•	•		•
Scienceworks	Australia	Melbourne	Jan-14	3D 1-point perspective		•	•			thematic	•		•	
Immigration Museum	Australia	Melbourne	Dec-14	2D		•	•		•	functional	•		•	
Cooper Hewitt, Smithsonian Design Museum	USA	New York	Dec-14	2D		•	•			thematic	•		•	
British Museum	UK	London	Oct-08	2D		•	•			thematic	•		•	
The Morgan Library & Museum	USA	New York	May-09	2D		•	•			functional	•		•	
National Museum of Rural Life Scotland	UK	East Kilbride	Oct-11	2.5D axonometric		•	•			thematic	•		•	
National Railway Museum	UK	York	Aug-14	2D		•	•			thematic	•		•	
National Museum of Science and Nature	Japan	Tokyo	Apr-14	2D	2.5D 1-point perspective	•	•	•		thematic	•	•	•	
Cleveland Museum of Art	USA	Cleveland	Jan-14	2D		•	•			functional	•	•	•	
Santa Barbara Museum of Art	USA	Santa Barbara, CA	Jun-08	2D		•	•				•		•	
Museum of the City of New York	USA	New York	Mar-15	2.5D axonometric		•	•			functional	•	•	•	•
Tokyo Metropolitan Art Museum	Japan	Tokyo	Mar-14	2.5D axonometric		•	•			functional	•	•		
Tokyo Metropolitan Art Museum	Japan	Tokyo	Mar-14	2.5D isometric		•	•			functional	•		•	
Mori Ogai Memorial Museum	Japan	Tokyo	Nov-12	2.5D axonometric		•	•	•			•			
Kyoto National Museum	Japan	Kyoto	Sep-14	2D		•	•				•	•	•	•

Institution	Location		Publication date	Map projection		Roles				Graphic devices				
	Country	City/town		Primary	Secondary	Visual digest	Locator	High-lighter	Trail	colour	labels	key	picto-grams	images
Kyushu National Museum	Japan	Fukuoka	undated	2.5D axonometric		•	•			thematic	•	•	•	
Boston Children's Museum	USA	Boston	Jan-13	2D		•	•				•		•	
Port Discover Children's Museum	USA	Baltimore	Feb-15	2D		•	•				•		•	
The Strong National Museum of Play	USA	Rochester, NY	Mar-15	2D		•	•			functional	•		•	•
Lady Lever Art Gallery	UK	Liverpool	Jul-12	3D isometric		•	•				•	•	•	
Merseyside Maritime Museum	UK	Liverpool	Jun-15	2.5D axonometric		•	•			thematic	•		•	
Museum of Australian Democracy	Australia	Canberra	Apr-15	2D		•	•			unknown	•		•	
Jewish Museum Berlin	Germany	Berlin	Jan-15	2.5D axonometric		•	•		•	functional	•		•	
Walker Art Gallery	UK	Liverpool	Jan-13	3D isometric		•	•				•	•	•	
Kimbell Art Museum	USA	Fort Worth, TX	Sep-13	2D	cross-section	•	•			functional	•		•	•
Fort Worth Musuem of Science and History	USA	Fort Worth, TX	Mar-11	2D		•	•			thematic	•		•	
Glazer Children's Museum	USA	Tampa, FL	Mar-15	2D		•	•			thematic	•		•	
Imaginosity	Ireland	Dublin	Aug-14	2D		•	•			unknown	•			
Long Island Children's Museum	USA	Garden City, NY	Mar-15	2D		•	•				•		•	
New York Hall of Science (NYSCI)	USA	New York	Apr-14	2D		•	•				•		•	
Portland Children's Museum	USA	Portland, OR	Sep-14	2D		•	•				•	•	•	
Doseum	USA	San Antonio, TX	Mar-18	2D		•	•			functional	•		•	
The Hunterian	UK	Glasgow	Aug-14	2.5D isometric		•	•			functional	•	•	•	•
National Museum of Natural Science Taiwan	Taiwan	Taichung	Feb-09	2D		•	•			functional	•		•	
National Media Museum	UK	Bradford	Jun-14	2.5D isometric		•	•			functional	•		•	

Institution	Location		Publication date	Map projection		Roles				Graphic devices				
	Country	City/town		Primary	Secondary	Visual digest	Locator	High-lighter	Trail	colour	labels	key	picto-grams	images
California Science Center	USA	Los Angeles	Nov-14	3D top-down oblique		•	•				•		•	
Museum of London Docklands	UK	London	Dec-12	2D	2.5D axonometric	•	•	•		functional	•		•	•
Museum of London	UK	London	Mar-13	2D	2.5D axonometric	•	•	•		functional	•		•	•
Fitzwilliam Museum	UK	Cambridge	Mar-14	2D		•	•				•	•	•	
Minneapolis Institute of Art	USA	Minneapolis	Aug-15	2.5D axonometric		•	•			thematic	•		•	
Musée d'Art et d'Histoire Geneva	Switzerland	Geneva	Mar-15	2D	2.5D isometric	•	•	•		functional	•	•	•	•
Missouri History Museum	USA	St Louis	Sep-14	3D axonometric		•	•			functional	•		•	
Nottingham Contemporary	UK	Nottingham	Oct-09	2D		•	•			functional	•		•	
Oakland Museum of California	USA	Oakland, CA	Feb-13	3D axonometric		•	•			functional	•		•	
Nara National Museum	Japan	Nara	Sep-11	2D		•	•			functional	•		•	•
The Walters Art Museum	USA	Baltimore, MD	Apr-15	2D		•	•			functional	•		•	
Kunsthalle Bremen	Germany	Bremen	Feb-15	2D	cross-section	•	•			thematic	•	•	•	
Toledo Museum of Art	USA	Toledo, OH	Jan-14	2D		•	•			thematic	•		•	
Museum of Science and Industry	USA	Chicago	Jun-15	2.5D 1-point perspective		•	•			functional	•		•	
University of Michigan Museum of Natural History	USA	Ann Arbor, MI	Sep-15	2D		•	•			functional	•		•	
Oxford University Museum of Natural History	UK	Oxford	Feb-14	2.5D 1-point perspective		•	•					•	•	
Museum of the History of Science	UK	Oxford	Jul-09	2D		•	•	•		unknown	•			•
The Autry	USA	Los Angeles	Sep-15	2D		•	•			functional	•		•	•
The Franklin Institute	USA	Philadelphia	May-15	2.5D axonometric		•	•			functional	•	•	•	•
Museum of Science	USA	Boston	Jul-18	2D		•	•			functional	•		•	

Institution	Location		Publication date	Map projection		Roles				Graphic devices				
	Country	City/town		Primary	Secondary	Visual digest	Locator	High-lighter	Trail	colour	labels	key	picto-grams	imag-es
The National WWII Museum	USA	New Orleans	Jun-15	3D 3-point perspective		•	•			functional		•	•	•
Te Papa New Zealand National Museum	New Zealand	Wellington	Jul-15	2D		•	•	•		functional	•		•	•
Virginia Museum of Fine Arts	USA	Richmond, VA	Jul-15	2D		•	•			thematic	•		•	
Indianapolis Museum of Art	USA	Indianapolis	Jun-15	2D		•	•	•			•		•	•
Baltimore Museum of Art	USA	Baltimore	May-15	2D		•	•			functional	•		•	
Kunst Sammlung Nordrhein Westfalen	Germany	Düsseldorf	Jul-10	2D		•	•				•		•	
Kunsthaus Zürich	Switzerland	Zürich	Nov-15	2D		•	•			thematic	•		•	
Perez Art Museum Miami (PAMM)	USA	Miami	Dec-14	2D		•	•					•	•	
Perez Art Museum Miami (PAMM)	USA	Miami	Dec-15	2D		•	•					•	•	
Fondazione Prada Milano	Italy	Milan	Apr-15	2D		•	•				•		•	
Ca' Pesaro	Italy	Venice	Jun-14	2D		•	•					•		
Heard Museum	USA	Phoenix, AZ	Sep-15	2D		•	•			functional	•		•	
Museo Nazionale della Scienza e della Technologia Leonardo da Vinci	Italy	Milan	Jun-14	2.5D axonometric	cross-section	•	•	•			•	•	•	
Museum für Kunst und Gewerbe	Germany	Hamburg	Apr-16	2D		•	•			thematic	•	•	•	•
Hirschhorn Museum and Sculpture Garden	USA	Washington, DC	Jun-13	2D		•	•				•		•	
Peabody Essex Museum	USA	Salem, MA	Aug-15	2D		•	•				•		•	
Natural History Museum of Utah	USA	Salt Lake City	Sep-11	2.5D 1-point perspective		•	•			functional	•		•	
Udvar Hazy Center, Smithsonian National Air and Space Museum	USA	Chantilly, VA	Jul-12	2D		•	•	•			•	•	•	•
Petersen Automotive Museum	USA	Los Angeles	Jul-15	2D		•	•			unknown		•	•	
Berlinische Galerie	Germany	Berlin	Sep-16	2D		•	•			functional	•	•		

Institution	Location		Publication date	Map projection		Roles				Graphic devices				
	Country	City/town		Primary	Secondary	Visual digest	Locator	High-lighter	Trail	colour	labels	key	picto-grams	imag-es
The Israel Museum	Palestine	Jerusalem	Oct-13	3D		•	•			thematic	•	•	•	•
St Louis Art Museum	USA	St Louis	Sep-13	2D		•	•	•		thematic	•	•	•	•
Children's Museum Pittsburgh	USA	Pittsburgh, PA	Jan-15	2.5D axonometric		•	•			thematic	•		•	
Portland Art Museum	USA	Portland, OR	Mar-16	2D	cross-section	•	•			thematic	•	•	•	•
Carnegie Museum of Natural History	USA	Pittsburgh, PA	Feb-16	2D		•	•				•		•	
San Francisco Museum of Modern Art	USA	San Francisco	Sep-16	2.5D		•	•	•			•	•	•	•
Space Center Houston	USA	Houston	Jun-16	2D		•	•			thematic	•	•	•	
National Museum of African American History and Culture	USA	Washington, DC	Sep-16	2D	cross-section	•	•				•		•	
Solomon R Guggenheim Museum	USA	New York	Jun-16	cross-section		•	•					•		
Detroit Institute of Arts	USA	Detroit, MI	Feb-16	2D		•	•	•		functional	•		•	•
Deutsches Museum Verkehrszentrum	Germany	Munich	Mar-15	2D		•	•				•	•	•	
Queen Victoria Art Gallery	Australia	Launceston	Dec-15	2D		•	•			functional	•	•	•	
21st Century Museum of Contemporary Art	Japan	Kanazawa	Apr-14	2D		•	•	•		functional	•	•	•	
New York State Museum	USA	Albany, NY	Sep-13	2D		•	•	•		thematic	•		•	•
Institute of Russian Realist Art	Russia	Moscow	Dec-16	2D		•	•	•		thematic	•	•	•	•
Corning Museum of Glass	USA	Corning, NY	Mar-15	2D		•	•			thematic	•	•	•	
Upper Belvedere	Austria	Vienna	Nov-15	2.5D axonometric		•	•			functional	•		•	•
Queensland Museum	Australia	Brisbane	Dec-12	2D		•	•			functional	•	•	•	
The Phillips Collection	USA	Washington, DC	Nov-16	2.5D axonometric		•	•			functional	•	•	•	•
Royal BC Museum	Canada	Victoria, BC	Jun-17	2.5D axonometric		•	•	•		thematic	•	•	•	

Appendix 2: Victoria & Albert Museum visitor survey

Study information sheet

Information sheet

University of Reading

Department of Typography & Graphic Communication

University of Reading
Whiteknights
PO Box 239
Reading RG6 6AU

Researcher (principal): Professor Sue Walker
Email: s.f.walker@reading.ac.uk
Phone: 0118 378 7219

Researcher (role): Andrew McIlwraith, PhD researcher
Email: a.j.mcilwraith@pgr.reading.ac.uk

INFORMATION SHEET

Background

This research is aiming to investigate museum visitors' use and opinions of guide maps and plans of museums. It is part of a wider study of the design of museum maps and plans, and how they can be improved to enhance visitors' experience of museums

Why are we doing this study?

We want to find out how useful museum visitors find the guidemaps that are often provided in museum: whether they help them make the most of their visit, for example, and whether there are particular types of map, or designs of map, they particularly like or dislike

Who would we like to participate in the study? Why have I been invited?

We want to talk to all sorts of adult visitors to museums, including regular museum-goers and those who only rarely visit museums.

Do I have to take part?

You are under no obligation to participate in the study, and you are free to withdraw at any time you wish.

What will be involved if you take part?

The study will involve a researcher interviewing you for around 10 to 15 minutes about your museum visiting habits, and use of guidemaps, and taking notes of your answers. The interview may also be audio recorded, if you agree to this. There are no right or wrong answers to any of the questions, and you do not have to answer any question if you do not wish to.

Confidentiality, storage and disposal of information

The consent forms you sign will be stored securely by the University of Reading for five years, after which they will be destroyed. All the comments you make in response to interview questions will be stored anonymously.

What expenses and/or payment or equivalent be made for participation in the study?

You will not be paid for your participation, but your time and help is greatly appreciated.

What will the results of the study be used for?

The results of the study will be used to help inform and frame more detailed research on the design of museum guidemaps. At this stage, we are looking to understand general opinions on museum maps, and the issues that people may face when using them. No personal details, such as your name, will be included in the thesis of which this study is a part.

Who has reviewed the study?

This project has been reviewed by the University of Reading Research Ethics Committee and has been given a favourable opinion for conduct

Contact details for further questions, or in the event of a complaint

If you have any questions about the study, please contact Professor Sue Walker, whose details are at the top of this document.

Thank you for your help.

Appendix 2: Victoria & Albert Museum visitor survey

Questionnaire

Script and questions for participant interview

My name is Andrew McIlwraith. I am a PhD researcher at the University of Reading, investigating the design of museum guidemaps and plans. I'm talking to museum visitors today to find whether people use guidemaps when visiting a museum, and what they think of them in general.

I'd like to start by asking you a bit about yourself, and your visit to the V&A today.

Do you live in the UK or abroad?

How familiar are you with the V&A? How often have you visited the museum in the past three years?

This is my first visit

I have visited up to three times in the past three years

I have visited three to six times in the past three years

I have visited more than six times in the past three years

And thinking more broadly about visiting museums. Apart from the V&A, how often do you visit museums – any museum?

Less than once a year

Once or twice a year

Every few months

Every month

More often

And, on your visit today, are you:

At the beginning of your visit

Part-way through your visit

At the end of my visit

And thinking about how you [have spent/plan to spend] at the museum today, including any time spent in the shop or café, is it?

Less than an hour

Between one and three hours

More than three hours

Did you get a copy of the map for your visit [show map if not apparent]? *Yes/no/not yet*

If not, why not?

I wasn't aware of it/didn't see it

I didn't want to pay for it

I don't like using maps (probe why)

I don't need one (probe why)

Other (explain)

When you visit museums, do you use printed guidemaps, if they are available?

Never

Sometimes/usually/depends

Always

Can you tell me why that is?

[free response: if necessary, if explaining why maps are not used probe issues of availability, cost, physical barriers (eg unwieldy size/folding), complexity of information, legibility/readability, preference for personal advice or guidance, preference for freeform exploration, preference for digital guides: apps, websites]

What do you/would you use a museum guidemap for? (all that apply)

To find out what sorts of displays and exhibitions are in the museum

To locate a particular object, for example, a painting

To plan a route through the museum that takes in everything I want to see

To find out where things like the toilets, café and shop are

To keep as a souvenir of my visit/pass on to a friend or relative

Other (explain)

Of the maps that you have used, including this V&A map, are there any things about its design that you find particularly good or bad?

[free response; use V&A map as prompting material if necessary]

Finally, some museums, including the V&A, have apps for smartphones/tablets, and digital maps on their websites, which also help people find their way around the museum. Have you ever used these in the past in addition to or instead of a printed guidemap?

Never

Occasionally

Often

If you have used them, can you tell me which ones, and whether you prefer them to printed maps, and if so, why?

Free response

If you have not used them, can you tell me why?

Free response

Appendix 3: 2D/3D map study at National Maritime Museum

Study information sheet

University of Reading
Department of Typography & Graphic Communication

University of Reading
Whiteknights
PO Box 239
Reading RG6 6AU

Researcher (principal): Professor Sue Walker
Email: s.f.walker@reading.ac.uk
Researcher (role): Andrew McIlwraith, PhD researcher
Email: a.j.mcilwraith@pgr.reading.ac.uk

INFORMATION SHEET

Background

This research is aiming to investigate whether particular designs of printed museum map can better help people navigate and understand the layout of a museum. It is part of a study of the design of museum maps and plans, and how they can be improved to enhance visitors' experience of museums.

Why are we doing this study?

We want to find out how whether some designs of museum map are more useful to visitors: whether certain types of map are easier for visitors to follow and understand, and therefore improve their experience of the museum.

Who would we like to participate in the study? Why have I been invited?

We want to talk to all sorts of adult visitors to museums, including regular museum-goers and those who only rarely visit museums.

Do I have to take part?

You are under no obligation to participate in the study, and you are free to withdraw at any time you wish.

What will be involved if you take part?

The study will involve a researcher interviewing you briefly about your museum visiting habits, and use of guidemaps, and taking notes of your answers. You will then be given a printed museum map and asked to use the map to locate a particular place within the museum. After you have done this, the researcher will ask you some more questions about your experience. The interview may also be recorded, if you agree to this. There are no right or wrong answers to any of the questions, and you do not have to answer any question if you do not wish to.

Confidentiality, storage and disposal of information

The consent forms you sign will be stored securely by the University of Reading for five years, after which they will be destroyed. All the comments you make in response to interview questions will be stored anonymously.

What expenses and/or payment or equivalent be made for participation in the study?

You will not be paid for your participation, but your time and help is greatly appreciated. We will pay your travel expenses, if you have requested this and we have agreed to it ahead of your participation in the research.

What will the results of the study be used for?

The results of the study will be used to help us understand which design features of museum guide maps may be the most useful for museum visitors.

The study is part of the interviewer's PhD research at University of Reading and will be written up as part of his thesis. At a later date he may publish some of the studies from his thesis.

No personal details, such as your name, will be included in the thesis of which this study is a part.

Who has reviewed the study?

This project has been reviewed by the University of Reading Research Ethics Committee and has been given a favourable opinion for conduct

Contact details for further questions, or in the event of a complaint

If you have any questions about the study, please contact Professor Sue Walker at s.f.walker@reading.ac.uk

Thank you for your help.

Appendix 3: 2D/3D map study at National Maritime Museum

Questionnaire

Pre-task questionnaire:

My name is Andrew McIlwraith. I am a PhD researcher at the University of Reading, investigating the design of museum guidemaps and plans. I'm testing out different designs of a map of the National Maritime Museum to see whether there is any particular one that is easier to use, and allows visitors like yourself to make the most of their visit. Before we start with that, can I ask you a few questions about yourself and your museum-visiting habits and experience.

1. First, can I ask what age group you fit into?

☐ 18-24

☐ 25-44

☐ 45-64

☐ 65+

☐ prefer not to say

2. How familiar are you with the National Maritime Museum? How often have you visited the museum in the past three years?

☐ *This is my first visit*

☐ *I have visited up to three times in the past three years*

☐ *I have visited three to six times in the past three years*

☐ *I have visited more than six times in the past three years*

3. Thinking more broadly, about visiting museums in general. How often do you visit museums – any museum?

☐ *Less than once a year*

☐ *Once or twice a year*

☐ *Every few months*

☐ *Every month*

☐ *More often*

4. When you visit museums, do you use printed guidemaps, if they are available?

☐ *Never*

☐ *Sometimes/usually/depends*

☐ *Always*

5. Can you tell me why that is?

[free response: if necessary, if explaining why maps are not used probe issues of availability, cost, physical barriers (eg unwieldy size/folding), complexity of information, legibility/readability, preference for personal advice or guidance, preference for freeform exploration, preference for digital guides: apps, websites]

6. What do you/would you use a museum guidemap for? (all that apply)

☐ *To find out what sorts of displays and exhibitions are in the museum*

☐ *To locate a particular object, for example, a painting*

☐ *To plan a route through the museum that takes in everything I want to see*

☐ *To find out where things like the toilets, café and shop are*

☐ *To keep as a souvenir of my visit/pass on to a friend or relative*

7. Some museumshave apps for smartphones, and digital maps on their websites, which also help people find their way around the museum. Have you ever used these in the past as well as or instead of a printed guidemap?

2

5. Can you tell me why that is?

[free response: if necessary, if explaining why maps are not used probe issues of availability, cost, physical barriers (eg unwieldy size/folding), complexity of information, legibility/readability, preference for personal advice or guidance, preference for freeform exploration, preference for digital guides: apps, websites]

6. What do you/would you use a museum guidemap for? (all that apply)

☐ *To find out what sorts of displays and exhibitions are in the museum*

☐ *To locate a particular object, for example, a painting*

☐ *To plan a route through the museum that takes in everything I want to see*

☐ *To find out where things like the toilets, café and shop are*

☐ *To keep as a souvenir of my visit/pass on to a friend or relative*

7. Some museumshave apps for smartphones, and digital maps on their websites, which also help people find their way around the museum. Have you ever used these in the past as well as or instead of a printed guidemap?

2

	Web-based	*App*
Never	☐	☐
Occasionally	☐	☐
Often	☐	☐

8. If you have used them, can you tell me whether you prefer them to printed maps, and if so, why?

Free response

9. If you have not used them, can you tell me why?

Free response

3

Wayfinding briefing

Thank you for that information. Here is a guide map of the museum. Can you locate on it for me the **Forgotten Fighters** gallery? There's no hurry, and this is not a test, so take a few minutes to familiarise yourself with the map, if you wish.

[allow participant to identify the location]

I am now going to mark on the map where we are now. Can you take this pen and draw a line showing me how you would get from where we are now to the **Forgotten Fighters** gallery. I am going to start timing you when you start, but this is a test of the map, not a test of you, and there is no single correct answer, so take as much time as you need. If you make a mistake just cross the line out and carry on. If there's something on the map you don't understand, you can say so, but I cannot help you with the task at this point.

[*allow participant to mark the route*]

Thanks for doing that. I'm now going to ask you to walk to the **Forgotten Fighters** gallery using the map. Use the route you have marked up, but if you think you have made a mistake on it, you can take another route to get where you want using the map. I am going to give you my mobile phone number now; when you reach the **Forgotten Fighters** gallery please call the number straightaway. I will not answer the call (so you will not be charged for it) but I will come and meet you at the gallery. There is no need to race there as quickly as possible: this is not a test of you or how quickly you can follow a route, but of how effective the map is. While going through the museum, you may see signs and information on the walls, which may also help you. However, please do not ask any of the gallery staff for help (they will not be familiar with this map). And if you get completely stuck, and cannot find the location, call me twice and I will answer and come and find you.

Post-task questionnaire

I'd now like to ask you some questions about the experience of finding your way here, particularly in relation to how the map helped, or did not help, you.

1. In getting here, did you follow the route you had marked out on the map exactly?

☐ *Yes* ☐ *No*

2a If **yes**: How easy did you find it follow the route?

☐ *Very easy*

☐ *Fairly easy*

☐ *Fairly difficult*

☐ *Very difficult*

Why do you say this? [*free response*]

Do you think that the route you marked out was actually the easiest route to have taken?

☐ *Yes* ☐ *No*

If no, why not? [*free response*]

5

2b If **no**: Can you tell me or show me on the map where you did not follow the route? [*free response*]

Why did you divert from the route you marked on the map?

☐ *I could not match map/the route did not match the building or spaces I was walking through*

☐ *I realised that the route I had marked would not work*

☐ *I realised that the route I had marked was not the best way to go*

☐ *I make a mistake (I thought I was following the route but then realised I was not)*

☐ *Other:…*

3. Thinking about the map generally, how useful do you think it is in helping you make the most of your visit to the museum?

☐ *Very useful*

☐ *Fairly useful*

☐ *Not very useful*

☐ *Not at all useful*

Why do you say that? *[free response]*

6

4. Are there any particular features or points on the map that you found particularly helpful or particularly unhelpful? [*free response*]

5. I'm now going to show you an alternative design for a map for the museum. Can you just spend a few minutes looking at it, thinking about how it might help you understand the museum and find your way around, compared with the one you have been using.

Do you think this new map would be better or worse for visiting the museum?

☐ *Much better*

☐ *Slightly better*

☐ *Neither better nor worse*

☐ *Slightly worse*

☐ *Much worse*

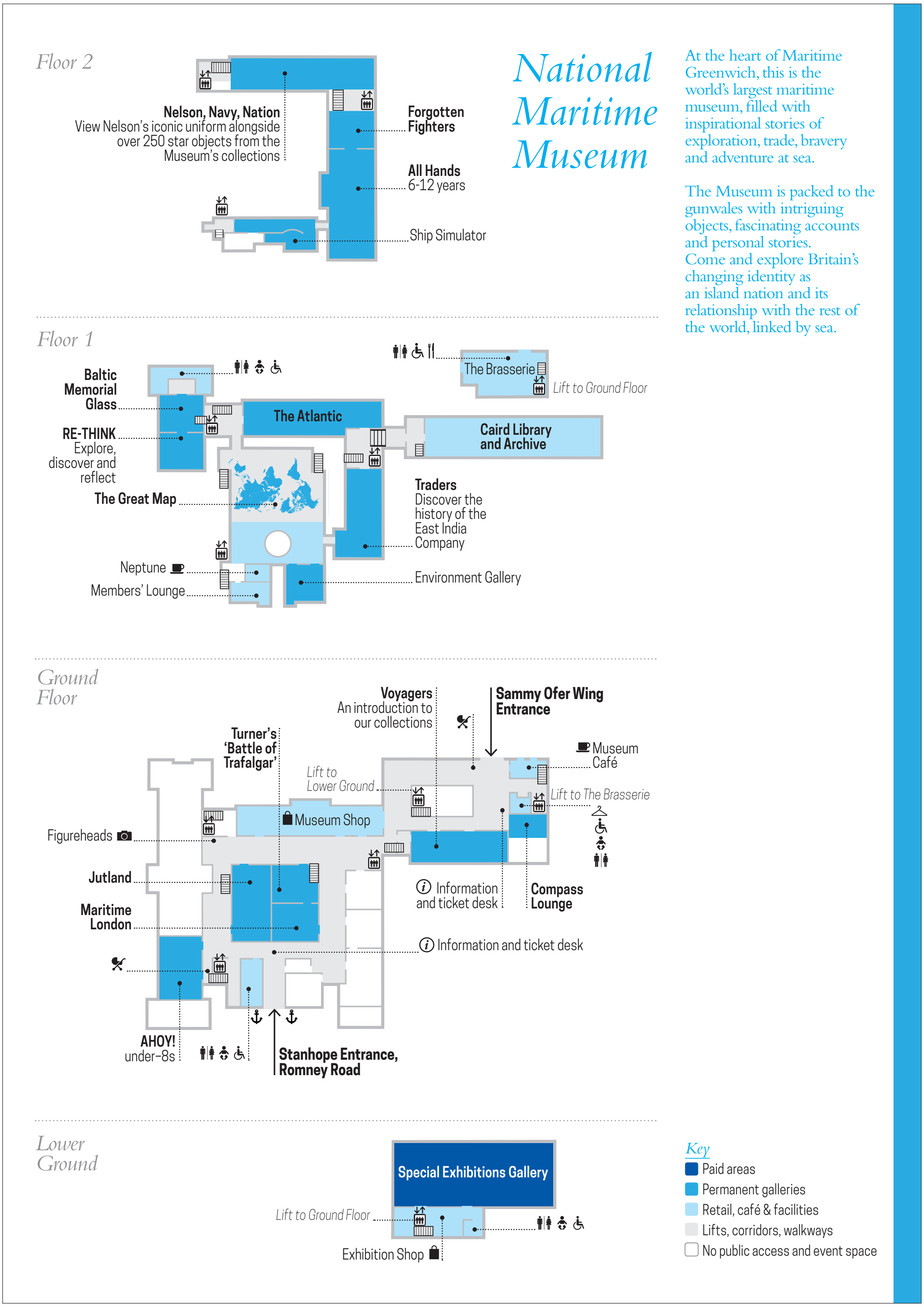
Why do you say that? [*free response]*

Thank you for your time.

7

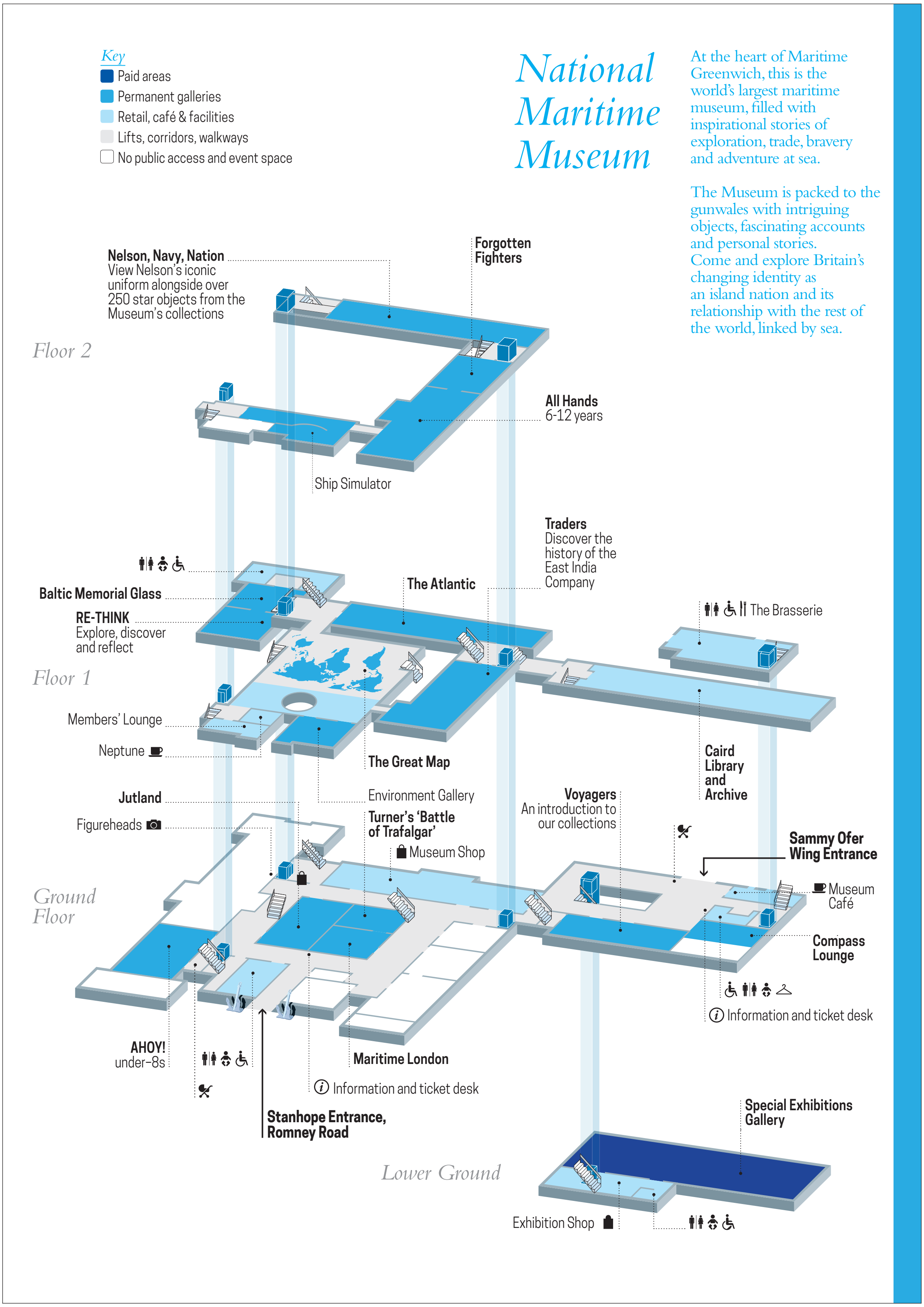
Appendix 3: 2D/3D map study at National Maritime Museum

Test materials: two-dimensional map at 75% actual size



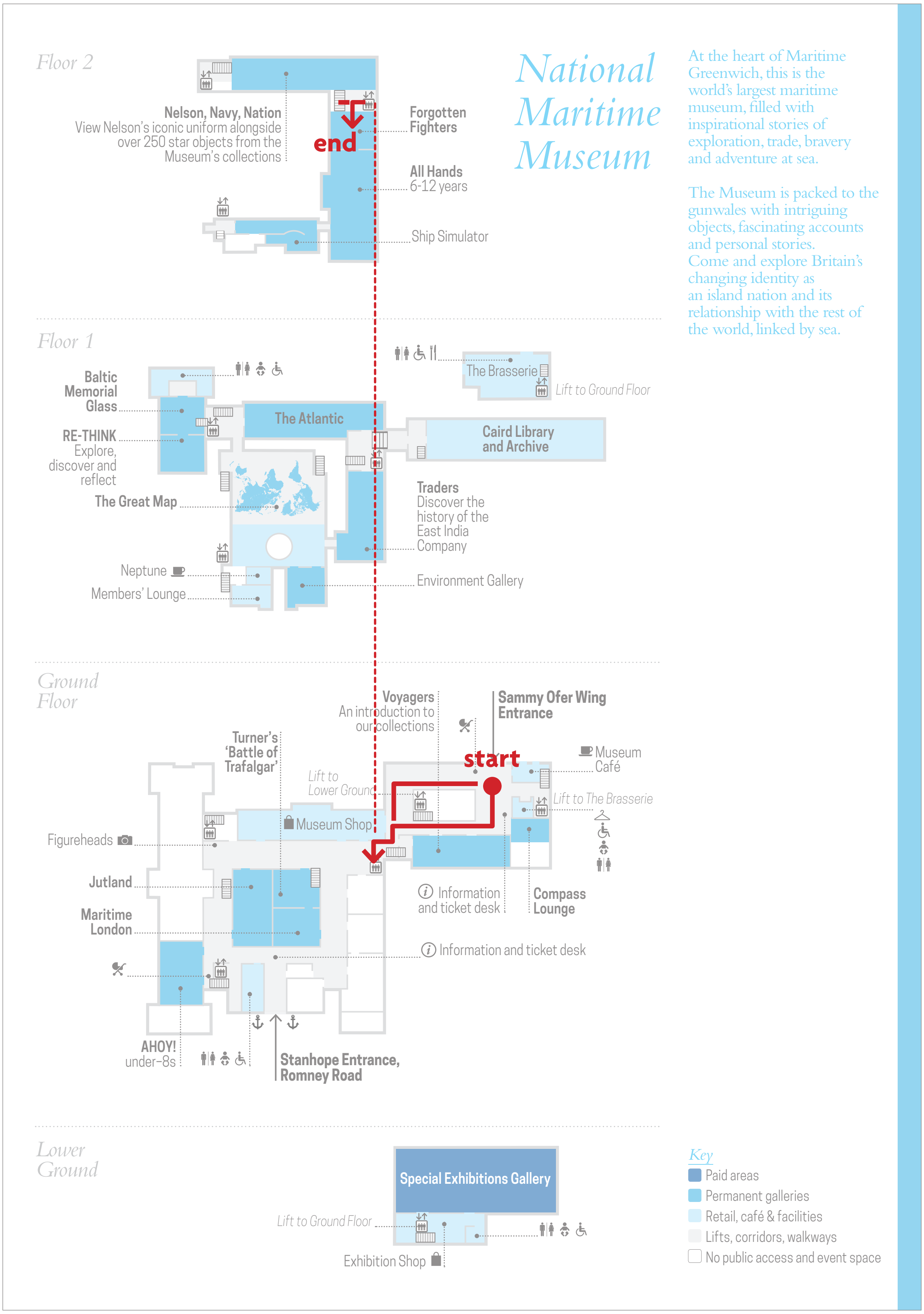
Appendix 3: 2D/3D map study at National Maritime Museum

Test materials: three-dimensional map at 75% actual size

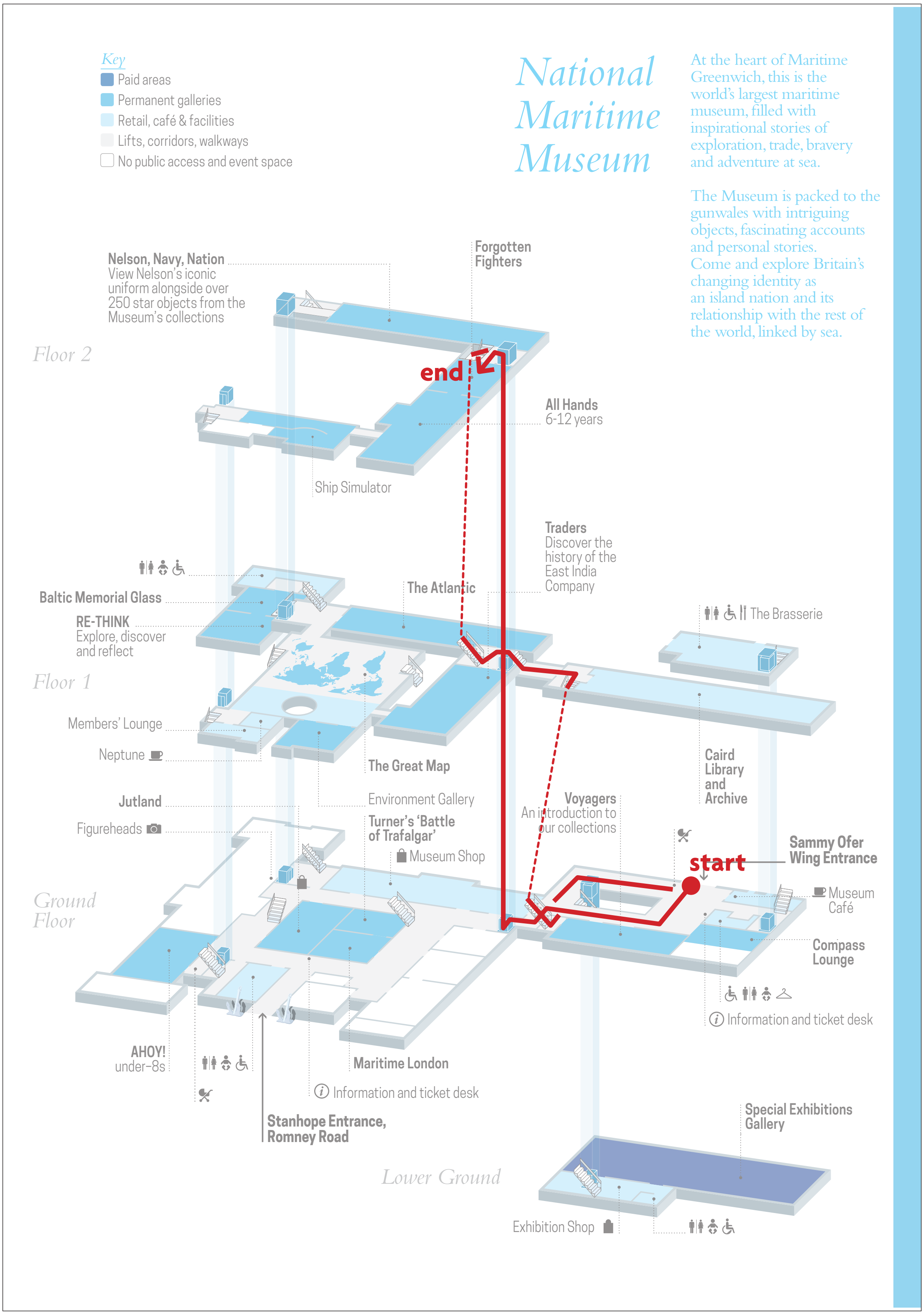


Appendix 3: 2D/3D map study at National Maritime Museum

Indication of the most direct routes to Destination 1 on the two-dimensional map at 75% actual size

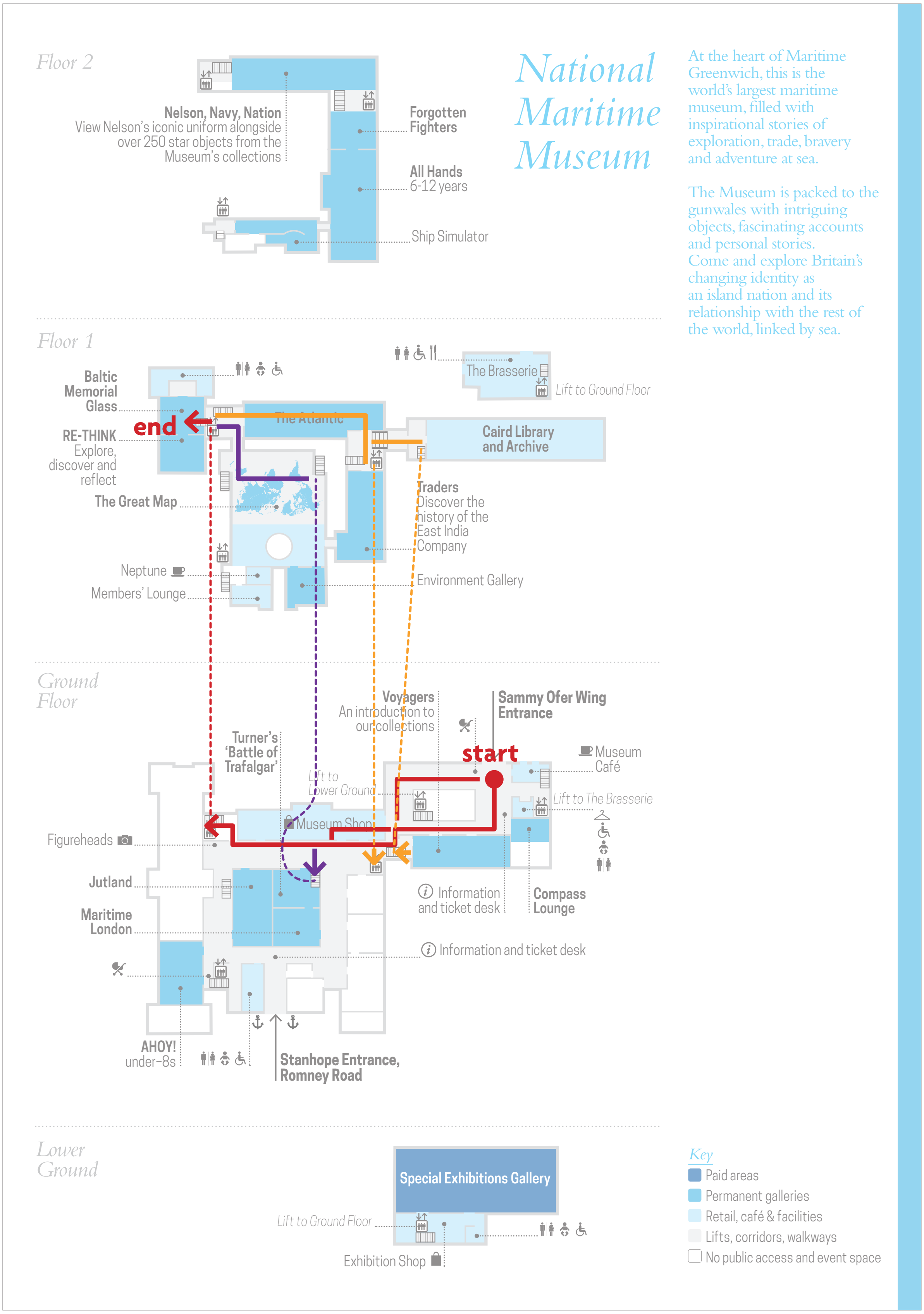


Appendix 3: 2D/3D map study at National Maritime Museum
Indication of the most direct routes to Destination 1 on the three-dimensional map at 75% actual size



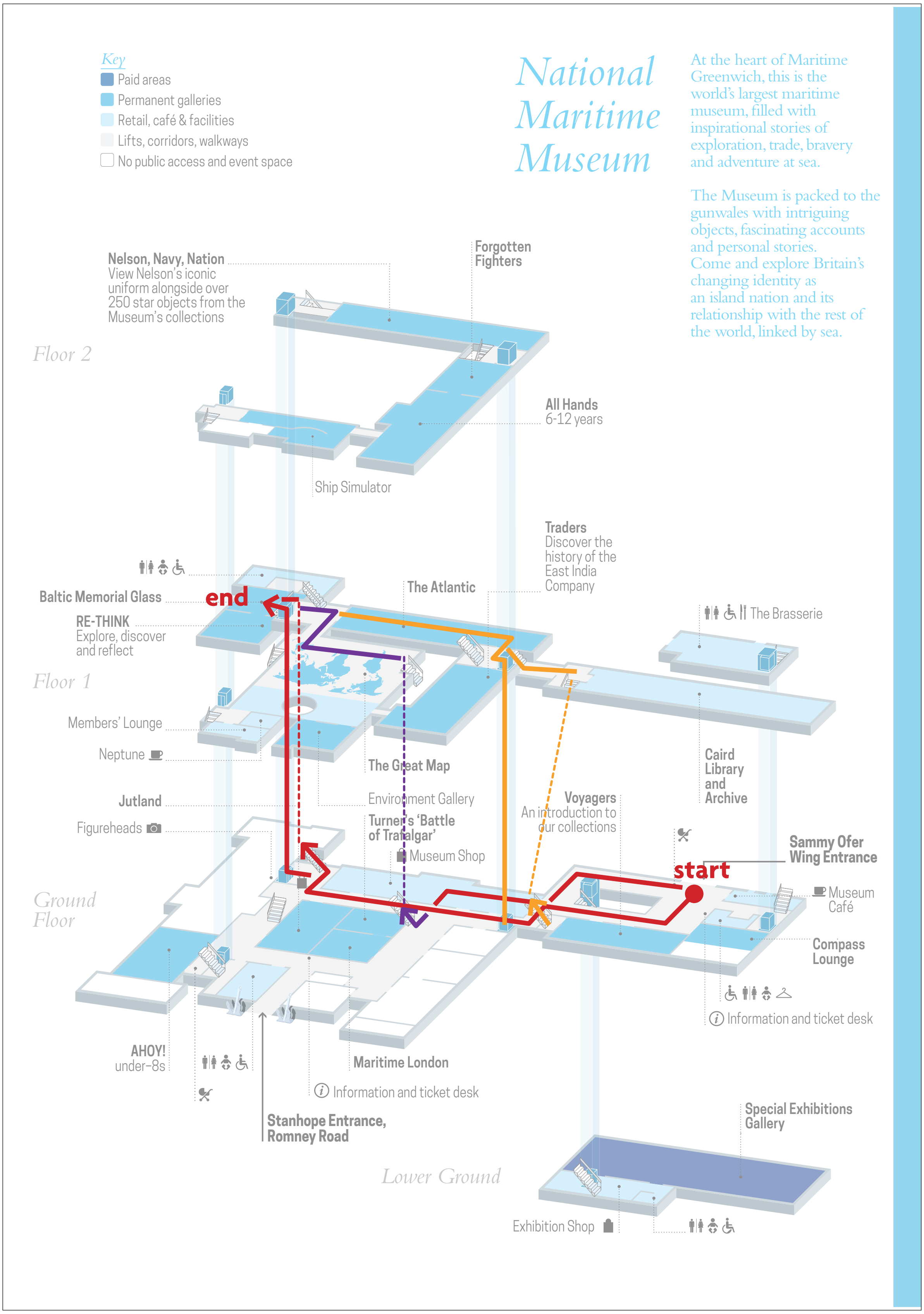
Appendix 3: 2D/3D map study at National Maritime Museum

Indication of the most direct routes to Destination 2 on the two-dimensional map at 75% actual size



Appendix 3: 2D/3D map study at National Maritime Museum

Indication of the most direct routes to Destination 2 on the three-dimensional map at 75% actual size



Appendix 4: Labels/directory study

Study information sheet

University of Reading

Department of Typography & Graphic Communication

University of Reading
Whiteknights
PO Box 239
Reading RG6 6AU

Researcher (principal): Professor Sue Walker
Email: s.f.walker@reading.ac.uk
Researcher (role): Andrew McIlwraith, PhD researcher
Email: a.j.mcilwraith@pgr.reading.ac.uk

INFORMATION SHEET

Background

This research is aiming to investigate whether particular designs of printed museum guide map can better help people navigate and understand the layout of a museum. It is part of a study of the design of museum maps and plans, and how they can be improved to enhance visitors' experience of museums.

Why are we doing this study?

We want to find out how whether some designs of museum map are more useful to visitors: whether certain types of map are easier for visitors to follow and understand, and therefore improve their experience of the museum.

Who would we like to participate in the study? Why have I been invited?

We want to talk to a sample of people, including regular museum-goers and those who only rarely visit museums.

Do I have to take part?

You are under no obligation to participate in the study, and you are free to withdraw at any time you wish.

What will be involved if you take part?

The study will involve a researcher interviewing you briefly about your museum visiting habits, and use of guide maps, and taking notes of your answers. You will then be shown two different printed museum maps and asked to examine them. You will be asked for your opinions of these maps. There are no right or wrong answers to any of the questions, and you do not have to answer any question if you do not wish to.

Confidentiality, storage and disposal of information

The consent forms you sign will be stored securely by the University of Reading for five years, after which they will be destroyed. All the comments you make in response to interview questions will be stored anonymously.

What expenses and/or payment or equivalent be made for participation in the study?

You will not be paid for your participation, but your time and help is greatly appreciated.

What will the results of the study be used for?

The results of the study will be used to help us understand which design features of museum guide maps may be the most useful for museum visitors.

The study is part of the interviewer's PhD research at University of Reading and will be written up as part of his thesis. At a later date he may publish some of the studies from his thesis.

No personal details, such as your name, will be included in the thesis of which this study is a part.

Who has reviewed the study?

This project has been reviewed by the University of Reading Research Ethics Committee and has been given a favourable opinion for conduct

Contact details for further questions, or in the event of a complaint

If you have any questions about the study, please contact Professor Sue Walker at s.f.walker@reading.ac.uk

Thank you for your help.

Appendix 4: Labels/directory study
Questionnaire

Participant No.

Script and questions for participant interview

My name is Andrew McIlwraith. I am a PhD researcher at the University of Reading's Department of Typography and Graphic Communication, investigating the design of museum guide maps and plans. I'm testing out different designs of a museum map to see whether there is any particular design that people who are in a museum or planning a visit to a museum find more useful. Before we start with that, can I ask you a few questions about yourself and your museum-visiting habits and experience.

1. First, can I ask what age group you fit into?

☐ 18-24

☐ 25-44

☐ 45-64

☐ 65+

☐ prefer not to say

2. How often do you visit museums?

☐ *Less than once a year*

☐ *Once or twice a year*

☐ *Every few months*

☐ *Every month*

☐ *More often*

4. When you visit museums, do you use printed guidemaps, if they are available?

☐ *Never*

☐ *Sometimes/usually/depends*

☐ *Always*

5. Can you tell me why that is?

[free response: if necessary, if explaining why maps are not used probe issues of availability, cost, physical barriers (eg unwieldy size/folding), complexity of information, legibility/readability, preference for personal advice or guidance, preference for freeform exploration, preference for digital guides: apps, websites]

6. What do you/would you use a museum guidemap for? (all that apply)

☐ *To find out what sorts of displays and exhibitions are in the museum*

☐ *To locate a particular object, for example, a painting*

☐ *To plan a route through the museum that takes in everything I want to see*

☐ *To find out where things like the toilets, café and shop are*

☐ *To keep as a souvenir of my visit/pass on to a friend or relative*

7. Some museums, have apps for smartphones, and digital maps on their websites, which also help people find their way around the museum. Have you ever used these in the past as well as or instead of a printed guidemap?

	Web-based	*App*
Never	☐	☐
Occasionally	☐	☐
Often	☐	☐

8. If you have used them, can you tell me whether you prefer them to printed maps, and if so, why?

Free response

9. If you have not used them, can you tell me why?

Free response

2

Briefing

Thank you for that information. Here are two designs of map of a museum. Can I ask you to look at them – take as long as you like – and imagine that you are making a visit to this museum. When you've finished looking at them, let me know.

OK, can I ask you a couple of questions about the maps? Can you let me know how much you agree or disagree with the following statements

[*Show first example* Code: [ ]]

10. This map would be useful for visiting or planning a visit to the museum

☐Strongly disagree

☐Slightly disagree

☐Neither agree nor disagree

☐Slightly agree

☐Strongly agree

11. It is easy to read and understand this map

☐Strongly disagree

☐Slightly disagree

☐Neither agree nor disagree

☐Slightly agree

☐Strongly agree

[*Show second example* Code: [ ]]

12. This map would be useful for visiting or planning a visit to the museum

☐Strongly disagree

☐Slightly disagree

☐Neither agree nor disagree

☐Slightly agree

☐Strongly agree

3

13. It is easy to read and understand this map

☐Strongly disagree

☐Slightly disagree

☐Neither agree nor disagree

☐Slightly agree

☐Strongly agree

14. Do you have a preference for one map over the other?

☐Strongly prefer first map [Code…..]

☐Slightly prefer first map [Code…..]

☐No preference

☐Slightly prefer second map [Code…..]

☐Strongly prefer second map [Code…..]

15. Can you tell my why you prefer map [x] over the other one? What is it about each map that you like or dislike that leads you to prefer map [x]

4

13. It is easy to read and understand this map

☐Strongly disagree

☐Slightly disagree

☐Neither agree nor disagree

☐Slightly agree

☐Strongly agree

14. Do you have a preference for one map over the other?

☐Strongly prefer first map [Code…..]

☐Slightly prefer first map [Code…..]

☐No preference

☐Slightly prefer second map [Code…..]

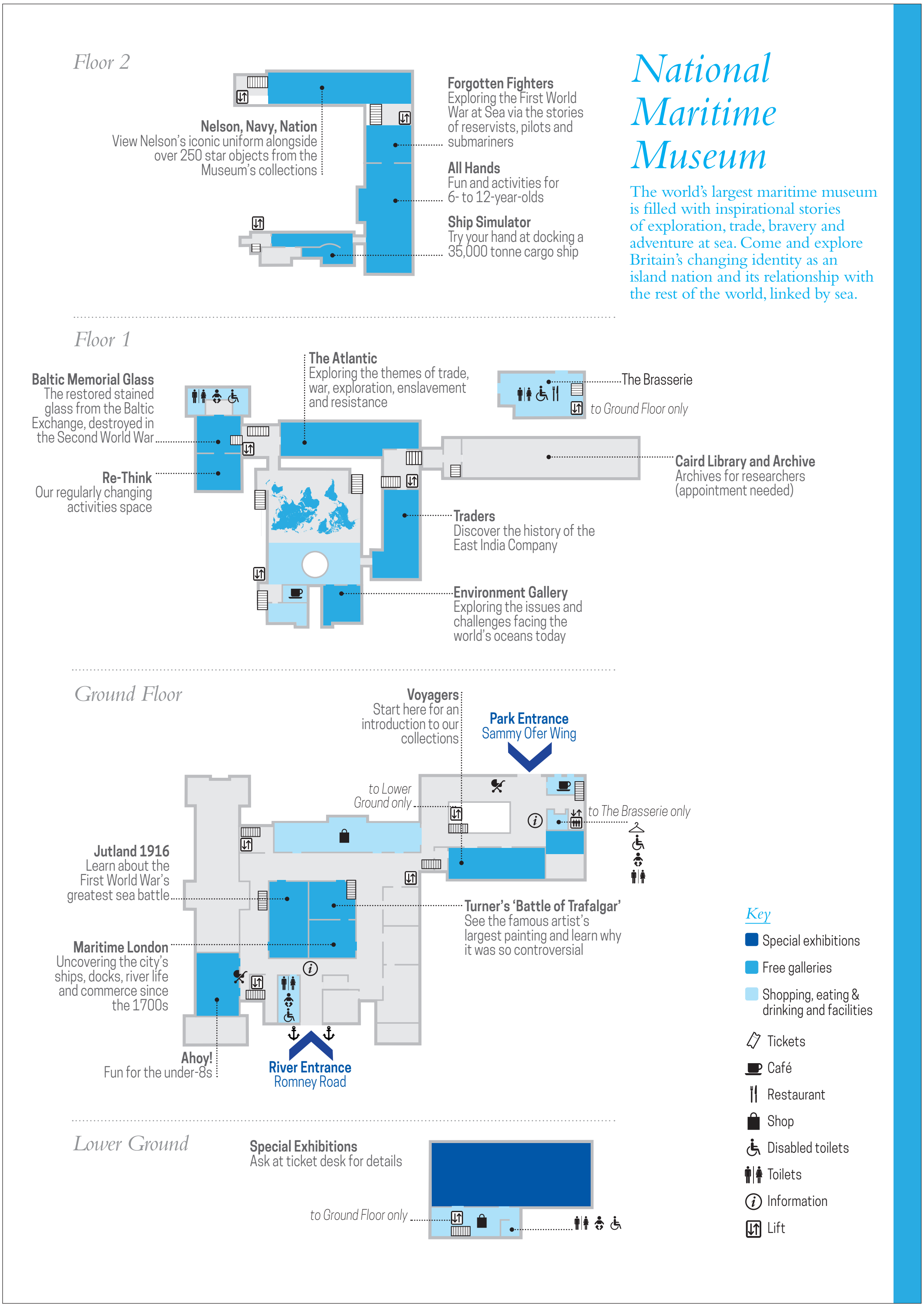
☐Strongly prefer second map [Code…..]

15. Can you tell my why you prefer map [x] over the other one? What is it about each map that you like or dislike that leads you to prefer map [x]

4

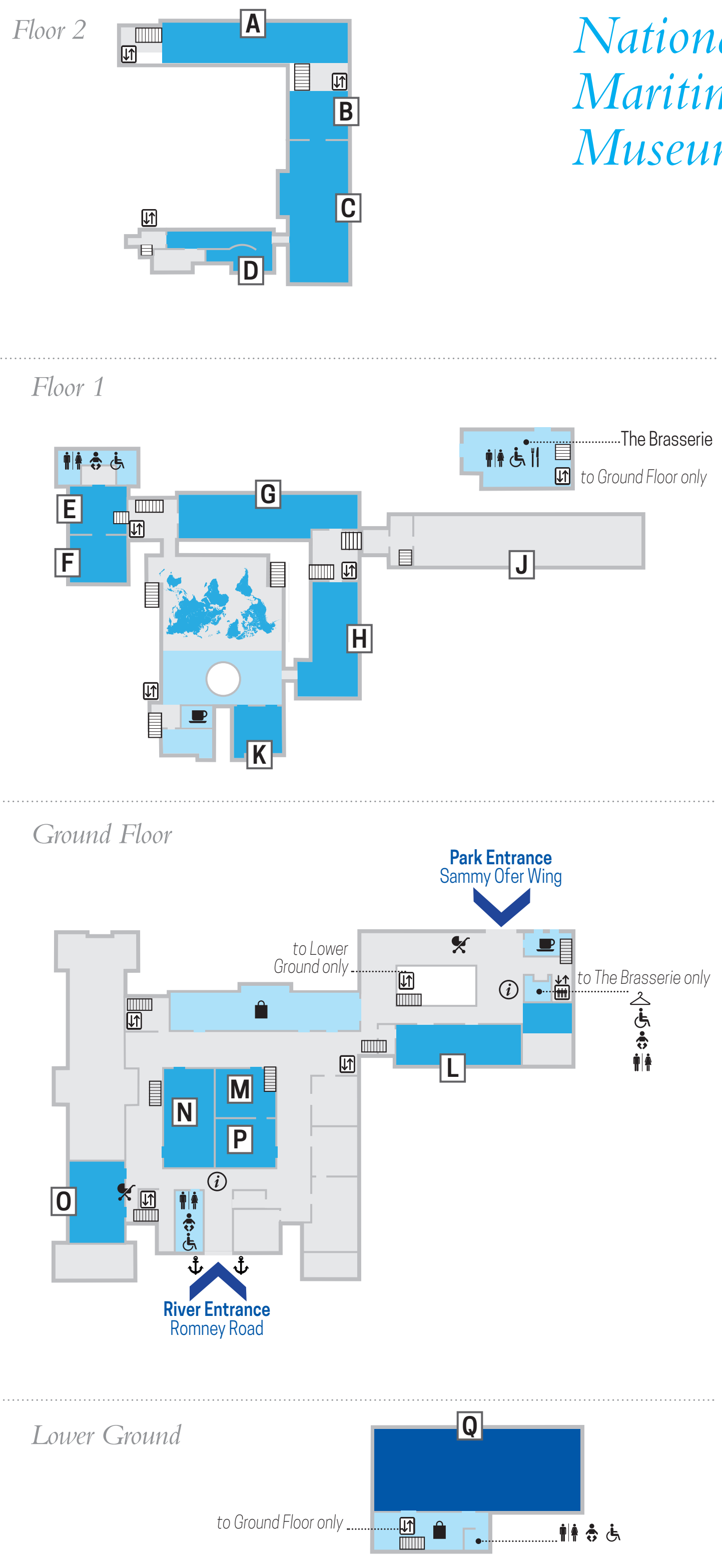
Appendix 4: Labels/directory study

Test materials: two-dimensional location labels map at 75% actual size



Appendix 4: Labels/directory study

Test materials: two-dimensional directory map at 75% actual size



National Maritime Museum

The world's largest maritime museum is filled with inspirational stories of exploration, trade, bravery and adventure at sea. Come and explore Britain's changing identity as an island nation and its relationship with the rest of the world, linked by sea.

Gallery directory

A Nelson, Navy, Nation
View Nelson's iconic uniform alongside over 250 star objects from the Museum's collections

B Forgotten Fighters
Exploring the First World War at Sea via the stories of reservists, pilots and submariners

C All Hands
Fun and activities for 6- to 12-year-olds

D Ship Simulator
Try your hand at docking a 35,000 tonne cargo ship

E Baltic Memorial Glass
The restored stained glass from the Baltic Exchange, destroyed in the Second World War

F Re-Think
Our regularly changing activities space

G The Atlantic
Exploring the themes of trade, war, exploration, enslavement and resistance

H Traders
Discover the history of the East India Company

J Caird Library and Archive
Archives for researchers (appointment needed)

K Environment Gallery
Exploring the issues and challenges facing the world's oceans today

L Voyagers
Start here for an introduction to our collections

M Turner's 'Battle of Trafalgar'
See the famous artist's largest painting and learn why it was so controversial

N Jutland 1916
Learn about the First World War's greatest sea battle

O Ahoy!
Fun for the under-8s

P Maritime London
Uncovering the city's ships, docks, river life and commerce since the 1700s

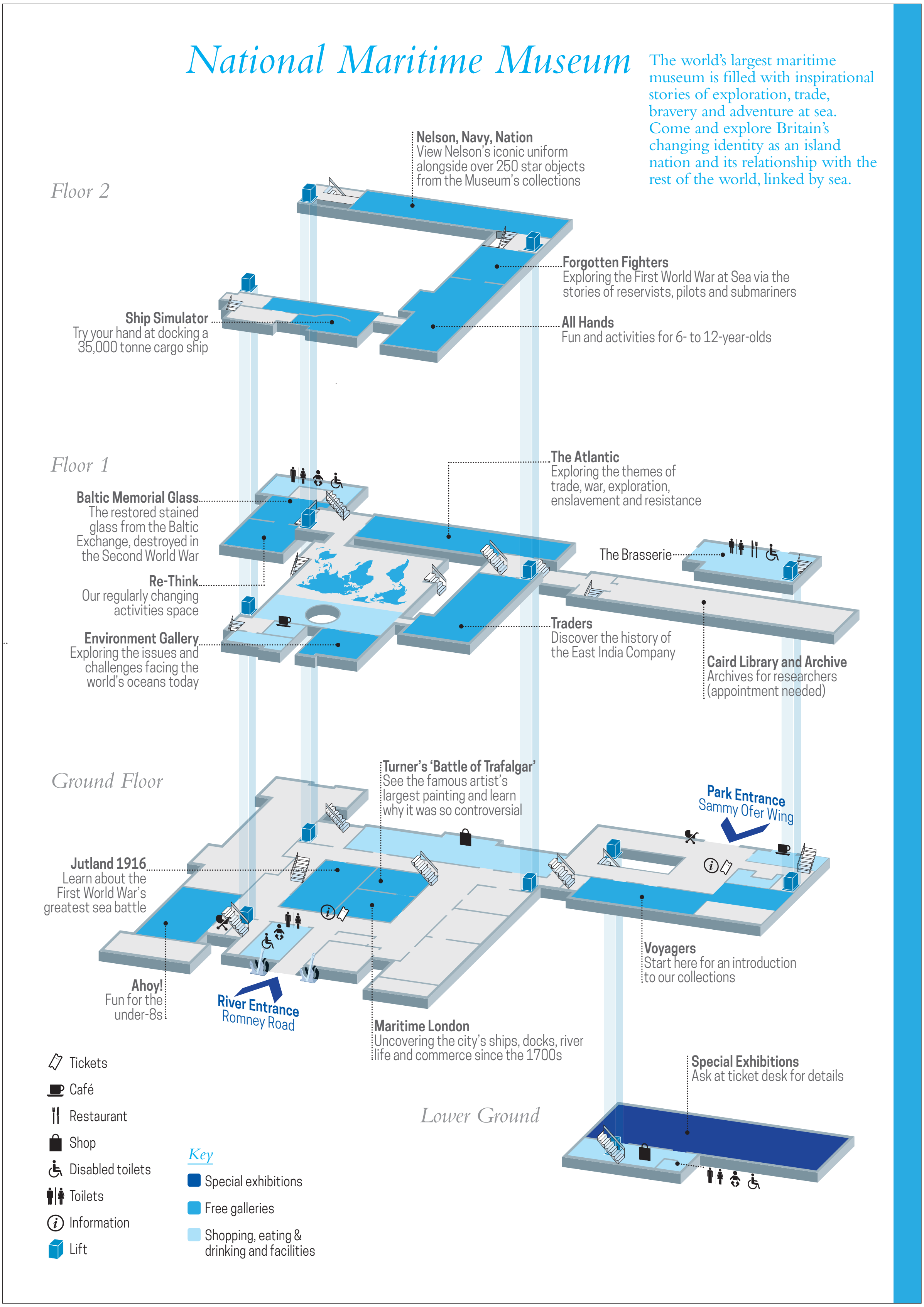
Q Special Exhibitions
Ask at ticket desk for details

Key

- Special exhibitions
- Free galleries
- Shopping, eating & drinking and facilities
- Tickets
- Café
- Restaurant
- Shop
- Disabled toilets
- Toilets
- Information
- Lift

Appendix 4: Labels/directory study

Test materials: three-dimensional location labels map at 75% actual size

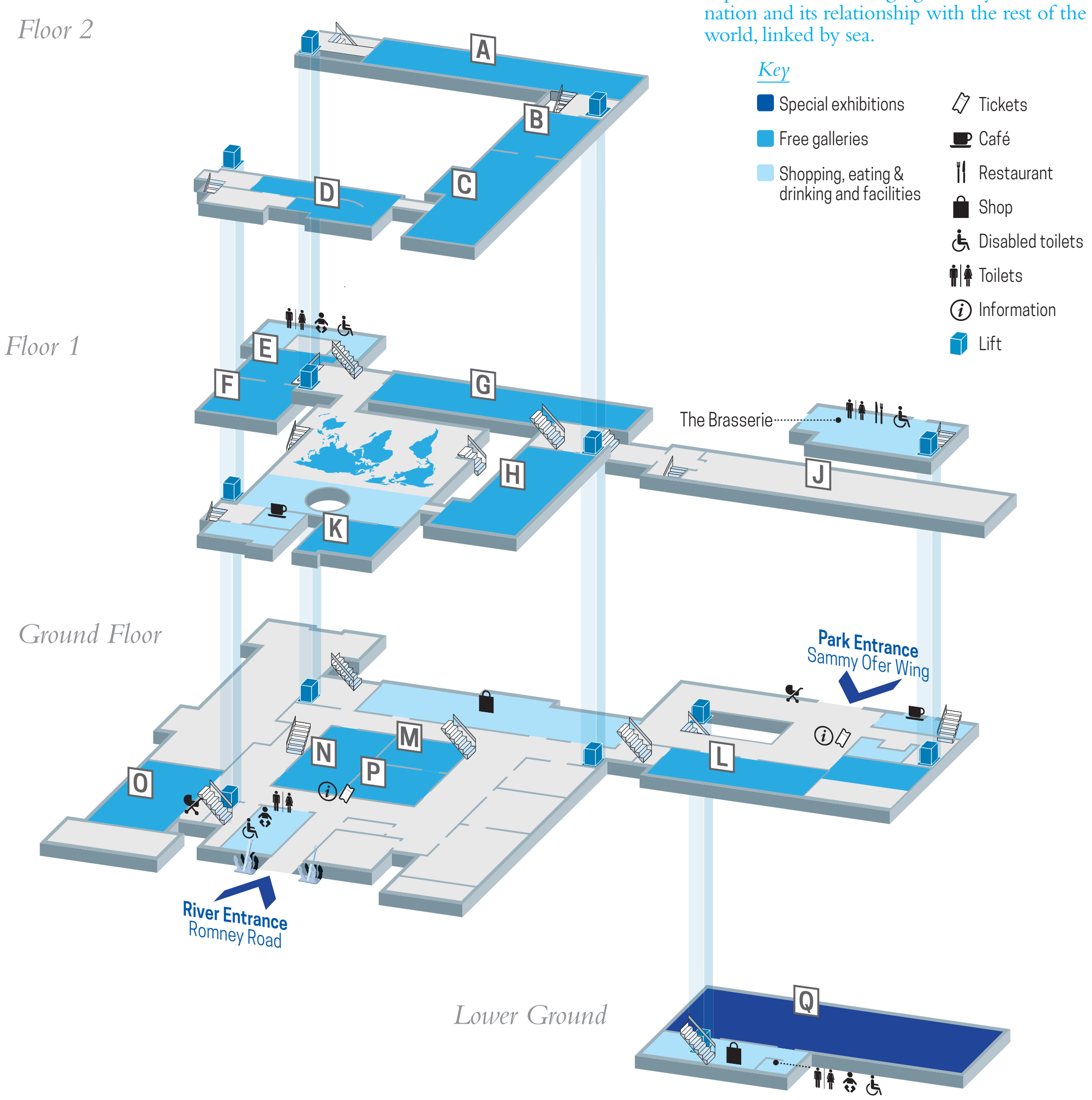


Appendix 4: Labels/directory study

Test materials: three-dimensional directory map at 75% actual size

National Maritime Museum

The world's largest maritime museum is filled with inspirational stories of exploration, trade, bravery and adventure at sea. Come and explore Britain's changing identity as an island nation and its relationship with the rest of the world, linked by sea.



Gallery directory

- **A Nelson, Navy, Nation** – View Nelson's iconic uniform alongside over 250 star objects from the Museum's collections
- **B Forgotten Fighters** – Exploring the First World War at Sea via the stories of reservists, pilots and submariners
- **C All Hands** – Fun and activities for 6- to 12-year-olds
- **D Ship Simulator** – Try your hand at docking a 35,000 tonne cargo ship
- **E Baltic Memorial Glass** – The restored stained glass from the Baltic Exchange, destroyed in the Second World War
- **F Re-Think** – Our regularly changing activities space
- **G The Atlantic** – Exploring the themes of trade, war, exploration, enslavement and resistance
- **H Traders** – Discover the history of the East India Company
- **J Caird Library and Archive** – Archives for researchers (appointment needed)
- **K Environment Gallery** – Exploring the issues and challenges facing the world's oceans today
- **L Voyagers** – Start here for an introduction to our collections
- **M Turner's 'Battle of Trafalgar'** – See the famous artist's largest painting and learn why it was so controversial
- **N Jutland 1916** – Learn about the First World War's greatest sea battle
- **O Ahoy!** – Fun for the under-8s
- **P Maritime London** – Uncovering the city's ships, docks, river life and commerce since the 1700s
- **Q Special Exhibitions** – Ask at ticket desk for details

Appendix 4: Labels/directory study

Test matrix

Participant number	1st test map	2nd test map	3rd test map
1	2loc	2dir	3dir
2	2dir	2loc	3dir
3	3loc	3dir	2loc
4	3loc	3dir	2loc
5	2loc	2dir	3loc
6	2dir	2loc	3loc
7	3dir	3loc	2loc
8	3dir	3loc	2dir
9	2loc	2dir	3loc
10	2dir	2loc	both [1]
11	3loc	3dir	2dir
12	3dir	3loc	2dir
13	2loc	2dir	3dir
14	2dir	2loc	3loc
15	3loc	3dir	2dir
16	3dir	3loc	2dir
17	2loc	2dir	3loc
18	2dir	2loc	2dir
19	3loc	3dir	2dir
20	3dir	3loc	2loc
21	2loc	2dir	both [1]
22	2dir	2loc	3loc
23	3loc	3dir	2dir
24	3dir	3loc	2dir

2loc=two-dimensional location label map

2dir=two-dimensional directory map

3loc=three-dimensional location label map

3dir=three-dimensional directory map

[1] Participant stated no preference of first two maps, so was shown both the alternatives

Appendix 5: Musée du Louvre guide apps

Apps for offer on the English-language Apple App Store that provide guides to the Musée du Louvre, as of 8 January 2018. Excludes the official app produced by the museum, and "virtual" guides to the museum that provide information on the museum's collection, but not guide information to the physical museum

Name	Publisher/producer	Price
Louvre Museum Visitor Guide	eTips Ltd	Free, with in-app purchases
Louvre Museum Guide	Museum Tour Guides Ltd	Free, with in-app purchases; Full Edition £2.99
Louvre Museum Guide and Maps	Nicolas Martinez	Free, with in-app purchases
The Louvre Museum Visitor Guide	Buddireddy Jyotsna	£2.99
Louvre Museum: Audio Guide	Jane Bin	Free, with in-app purchases
Louvre Museum Paris France Tourist Guide	Shailaja Bavikadi	£0.99
Louvre Museum Travel Guide	Avula Monika	£2.99

Appendix 6: Visible Language article

Reproduction of McIlwraith, A.(2018). Two-Dimensional vs Three-Dimensional Guide Maps: Which Work Best for Museum Visitors? *Visible Language*. 52:3. **52-73.**

5 1

6 3

67

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7 3

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