

The Ghost in the Museum Website: Investigating the General Public's Interactions with Museum Websites

David Walsh^{1,2} , Mark Hall² , Paul Clough¹ , and Jonathan Foster¹ 

¹ University of Sheffield, Sheffield, UK

² Edge Hill University, Ormskirk, Lancashire, UK

david.walsh@edgehill.ac.uk

Abstract. Museums are increasing access to their collections via web-based interfaces, but are seeing high numbers of users looking at only one or two pages within 10 s and then leaving. To decrease this rate, a better understanding of the type of user who visits a museum web-site is required. Existing models for museum web-site users tend to focus on a small number of groups or provide little detail in their definitions of the groups. This paper presents the results of a large scale museum user survey in which data on a wide range of user characteristics was collected to provide well founded definitions for the user group's motivations, tasks, engagement, and domain knowledge. The results highlight that the general public and non-professional users make up the majority of users and allow us to clearly define these two groups.

Keywords: Digital cultural heritage · Museum web-site · Users · Survey

1 Introduction

Museums have expanded their web-based offerings, providing access not only to general information about the museums, but also direct access to their holdings. This has opened up museums to a wider public and led to a significant rise in the number of visitors to museum websites [1]. However, museums have been struggling with large numbers (more than 50%) of users visiting their sites, looking at one or two pages, and then leaving within a very short period of time (generally less than 10 s) [2,3].

This raises two questions: who are these users and what could be done to keep them on the museum's site for longer? Where digital cultural heritage (DCH) users have been studied in the past, the focus has primarily been on user groups that are easier to access, such as experts, researchers, and museum staff. The general user and the non-professional user generally receive less attention, but we hypothesise that it is from these groups that the majority of users that bounce off museum websites come. Understanding these user groups and how their needs and behaviours differ from the user groups that have been studied

more frequently will enable museum web-sites to adapt their content and style of presentation to better support them.

To this end we present the first large-scale study of users from the National Museums Liverpool's web-site. National Museums Liverpool (NML) is a collection of seven museums that cover a wide range of areas from art galleries to natural history and slavery. Similar to the studies previously cited data from their transaction logs indicates that approximately 60% of their users leave within 10 s. They thus form an appropriate case study, particularly as their wide spread of subject areas leads to wide range of museum visitors. Within this context the study addresses the following research questions:

RQ1 Which user groups use NML's web-site?

RQ2 How can we define the general public/non-professional user groups?

RQ3 Is there a difference between the general public and non-professional groups?

The remainder of this paper is structured as follows: in Sect. 2 we discuss existing work to understand and classify digital cultural heritage users. Section 3 describes the study we undertook; Sects. 4 and 5 present and discuss the results; and Sect. 6 presents our conclusions and directions for future work.

2 Background

Visitors to physical museums have been studied for a long time. Indeed one of the first studies was conducted in 1884 in Liverpool Museum, identifying four groups of users: students, observers, loungers, and German and Scandinavian immigrants [4]. Following on from this, studies have investigated museum visitors in various contexts including their motivations [5], who they visited with [6,7], the role taken [5], and their engagement with the museum [8]. While it is tempting to apply physical visitor models to the digital world, there is no certainty that the two entirely overlap [9] and on-line visitors should be studied in their own context [10,11].

2.1 User Expertise

The user's expertise is one of the most common facets for distinguishing different user groups. The simplest distinction here is between generic groups, such as *novice* and *expert* [1]. Vilar et. al [12, p.150] define professional users as those who act within the formal part of a profession, having good knowledge of the task, being trained and usually having experience with it and deep understanding of its context. More generally [13] defines *experts* as "specialists in the field of cultural heritage.", while [14] introduces the *Museum Information Professional* as someone working with information resources and a desire for meeting user needs whether users are inside or outside the museum.

In contrast the *lay user*, *non-expert*, or *novice* are typified as having no formal or only limited training [12, 15] in relation to DCH or as being completely new to

the entire environment [13]. [16] list “knowledge of the task, information needs and system expectations” as the main distinction from the *expert*.

Between these two extremes lies the *hobbyist* or *non-professional* user [7, 17–20] who shares with the *expert* the knowledge of DCH, but has the *lay user’s* focus on personal reasons. Related to both the *novice* and *hobbyist* are the *casual leisure users* who are often “first- and short-time visitors” [21, p.74], who have “just stumbled across [the digital] collection in the same way that they would wander into the CH institution’s physical space” [22, p.1].

2.2 Information Needs, Motivation, and Role

An analysis of the London Science Museum’s physical and virtual visitors defined three groups based on their information needs [23]: *general visitors* who require general information, such as opening hours or prices; *educational visitors* who require additional, detailed information to plan their visit; and *specialist visitors* who require more detailed information on collections and offer more expertise.

Similarly, [24] describe Library of Congress’ National Digital Library users: groups were defined by combining their motivations, domain knowledge, system knowledge, task focus, and time allocation. This led to nine different groups: staff, hobbyists, scholars, professional researchers, rummagers (browsers), object seekers, surfers, Teachers K-16, Students K-16. Similarly, the CULTURA project identified the following groups: professional researchers, apprentice investigators, informed users, and the general public [25].

2.3 Definitions of User Groups and the General Public

As this brief review shows, there are a large number of potential classification systems, which in some cases overlap; in some use different terminology for equivalent or very similar groups; and in some cases use the same terminology very differently. Additionally, many of the user groups identified above are defined via a single sentence or phrase, such as “specialists in the field of cultural heritage.” When it comes to deciding how to support these user groups, this low level of detail in the definition limits the usefulness of the groupings.

Additionally, the closer the user group is to the *general public*, the less clearly defined the user groups become. Frequently, the *general public* or *general visitor* are treated as catch-alls for those users who do not fit into any of the more well-defined groups. However, it is our hypothesis that these groups are actually the most common type of visitor to museum web-sites and thus require closer attention than they have received so far.

The study reported in this paper addresses these shortcomings by acquiring on-line museum visitor responses for a wide range of criteria derived from the literature and in particular provides a detailed view onto the general public/non-professional user.

3 Methodology

To study visitors of the NML web-site an on-line survey was created based on user group definitions identified in the existing literature. The on-line survey consisted of 22 questions and was delivered via the PollDaddy system¹. Six questions covered standard demographics (age, gender, education, employment status). The remaining questions were derived from user group definitions, or surveys, found in the literature. These were grouped into seven categories around aspects previously used to define groups: motivation [7], task [19,26–28], content types, sharing [28], engagement [26,29,30], domain knowledge [19], usage [31], and technical expertise [30]. Table 1 shows those questions where significant differences between the “general public”, “non-professional” and other user groups were found.

Table 1. Survey questions that show significant differences between the “general public”, “non-professional” and other user groups. Question #7 allowed the participant to select multiple responses.

#	Category	Question
1	Motivation	Today I am visiting the NML website: [personal, study, pass time, work]
2	Task	What is the primary purpose of your visit to the NML website today?
3	Engagement	How frequently do you visit the NML website?
4	Domain knowledge	In the context of cultural heritage and your current visit to the NML website please select the appropriate statement: [novice, some experience, highly experienced, don’t know]
5	Domain knowledge	Rate your general Cultural Heritage knowledge
6	Demographics	Where in the world are you at the moment?
7	User group	Which of the following groups would you place yourself in for this visit to the NML website?

3.1 Recruitment of Participants

Participants were recruited from NML’s web-sites via a small banner pop-up, which appeared after a 10s delay. Visitors were only invited once, regardless of whether they chose to participate or ignore the pop-up.

In the survey, visitors first had to confirm that they agreed to participate. They then answered the 14 questions focusing on the aspects defining user

¹ <https://polldaddy.com/>.

groups, before providing demographics data. Finally, on the last page they self-classified into a set of user groups identified from the literature (question #7). Participants were then thanked and provided with a link back to the NML site.

The survey was available for a four week period (1/2/2017 to 14/2/2017) on the Museum-focused areas (World Museum², International Slavery Museum³, Sudley House⁴, and the Maritime Museum⁵) and (15/2/2017 to 1/3/2017) on the Gallery areas (Walker Art Gallery⁶ and Lady Lever Art Gallery⁷).

3.2 Participants

1118 participants were recruited, of which 573 completed the survey (51% completion rate). Of these, 9 were aged below 18 and subsequently filtered out (to avoid safeguarding issues), resulting in a final data-set of 564 participants.

348 participants were female (61%) and 211 male (37%) (14 unspecified). The majority of participants (204, 36%) were in the 35–54 age group, 147 (26%) were between 55 and 64, 110 (20%) between 18 and 34, 84 (15%) between 65 and 74, and 19 (3%) over 75. 61 (11%) were educated to secondary school level, 134 (24%) to further-education level, 193 (34%) had a degree, 116 (21%) had a masters-level qualification and 33 (6%) held a doctoral qualification, 21 (4%) participants chose no standard qualifications. Additionally 170 held a professional certification.

The majority (55%) of participants were employed, either full-time (208, 37%) or part-time (107, 19%). 122 (22%) were retired, 56 (10%) students, and the remainder not in employment. Participants were recruited from across the globe: 196 (35%) from the Liverpool/Merseyside area, 129 (23%) from the north-west of England, 102 (18%) from the rest of England, 35 (6%) from the rest of the UK, and 102 (18%) from the rest of the world.

The wide range and distribution of participants indicates that while participants self-selected for participation, the data-set is highly likely to be representative of the range of users of the NML web-sites.

4 Results

To address the first research question we look at how participants self-classified themselves for question #7. Participants could select any number of responses and were provided with an free-text “other” option as well. Table 2 shows the ten most frequently selected responses, which cover 90% of the participant responses. The remaining 10% are covered by multiple-selection responses, where no individual set of responses covers more than 1%. The majority of

² www.liverpoolmuseums.org.uk/wml.

³ www.liverpoolmuseums.org.uk/ism.

⁴ www.liverpoolmuseums.org.uk/sudley.

⁵ www.liverpoolmuseums.org.uk/maritime.

⁶ <http://www.liverpoolmuseums.org.uk/walker>.

⁷ <http://www.liverpoolmuseums.org.uk/ladylever/>.

responses are for a single group only, strongly supporting the idea that participants had clearly defined views on how the groups were delineated and where they saw themselves. The exceptions to this are participants who classified themselves as “non-professional/general public”, “academic/teacher”, and “non-professional/teacher/general public”.

To simplify further analysis we first investigated whether these multi-selection groups could be merged into the single selection groups. Our hypothesis was that “non-professional/general public” should be merged with “non-professional”, “academic/teacher” with “academic”, and “non-professional/teacher/general public” with “teacher”. The multi-selection groups were compared to each of the single-selection groups using χ^2 tests. For the “non-professional/general public” group there were significant differences to the “general public” group ($p < 0.05$)⁸ and no significant differences to the “non-professional” group. Likewise the “academic/teacher” showed no differences from “academic”, but differed from the “teacher” group ($p < 0.05$). For the “non-professional/teacher/general public” group there were no differences to the “teacher” group, but significant differences ($p < 0.05$) to “non-professional” and “general public” groups. The multi-select groups have thus been merged following the hypothesis, resulting in the set of seven primary user groups (Table 2), which will be used for the further analysis (the “other” group has not yet been analysed in more detail and is not taken into account for the further analysis).

Table 2. Most frequently selected user groups, before applying the rules merging the multi-selection responses (**pre-merging**) and after (**merged**). In both cases the “Other” group has not been subjected to further analysis.

Group	Pre-merging	Merged
General Public	253	253
Non-professional	89	137
Non-professional/General public	48	-
Student	33	33
Other	26	26
Teacher	18	25
Academic	16	25
Museum staff	10	10
Academic/Teacher	9	-
Non-professional/Teacher/General public	7	-

To investigate research questions 2 and 3, a series of χ^2 tests were used to compare the merged groups’ responses to all questions. Based on these the

⁸ reporting individual p-values and detailed χ^2 statistics for grouped results exceeds the available space, but we intend to report them in detail in a future publication.

Table 3. Responses to the question “Today I am visiting the NML website:”

	Personal	Pass time	Study	Work
General public	200	43	6	4
Non-professional	112	15	5	5
Student	7	2	23	1
Academic	8	1	9	7
Teacher	11	4	2	8
Museum staff	2	2	0	6

Table 4. Responses to the question “What is the primary purpose of your visit to the NML web-site today?”. MO - Museum Overview (gain an overview over the museums’ content), CO - Collection Overview (gain an overview over a collection), KC - Known Collection (look at the content of a known collection), KI - Known Item (look for a known item).

	Pre-Visit	MO	CO	KC	KI	Shop	News	Unknown	Other
General public	154	23	13	4	8	12	1	1	37
Non-professional	49	17	9	1	12	0	2	3	35
Student	11	6	6	3	1	0	0	1	5
Academic	5	0	2	3	5	1	1	0	8
Teacher	15	3	1	0	1	0	2	0	3
Museum staff	4	1	1	2	0	0	0	0	2

questions that provide significant differences between the “general public” and “non-professional” were identified (see Table 1).

For question #1 (motivation) Table 3 clearly shows that the main distinction is the focus on personal reasons for the visit (differences to all groups are significant at $p < 0.001$). Interestingly, there is a significant number of “general public” users who have visited the web-site purely to pass some time; a group that is commonly identified in the physical museum.

For question #2 (Table 4), results show a slightly different picture. Preparation for a visit is a major characteristic for both the “general public” and the “non-professional” groups. However, here the “general public” group is significantly different to both the “academic” ($p < 0.001, \chi^2 = 41.3, df = 8$) and “museum staff” ($p = 0.04, \chi^2 = 16.5, df = 7$) groups but the “non-professional” group is only significantly different ($p = 0.03, \chi^2 = 16.7, df = 8$) to the “academic” group. In fact the “teacher” group is almost identical in its purpose to the “general public” group. At the same time there is a significant difference ($p < 0.001, \chi^2 = 32.1, df = 7$) between the “general public” and “non-professional” groups.

Table 5. Responses to the question “How frequently do you visit the NML website?”

	First visit	Yearly	Monthly	Weekly	Daily
General public	133	82	32	6	2
Non-professional	78	40	13	6	0
Student	22	7	2	2	0
Academic	10	10	2	1	2
Teacher	11	8	3	3	0
Museum staff	0	2	5	1	2
Professional	5	0	0	0	0

Table 6. Responses to the question “In the context of cultural heritage and your current visit to the NML website, please select the appropriate statement”

	Novice	Intermediate	Expert	Unknown
General public	78	153	16	6
Non-professional	29	98	10	0
Student	14	15	3	1
Academic	0	10	15	0
Teacher	5	10	8	2
Museum staff	0	5	5	0

A similar picture emerges for the frequency of visit (Table 5), with significant differences to the “academic” and “museum staff” groups ($p < 0.001$), but no significant differences to the “teacher” and “student” groups.

While in the previous questions the “general public” and “non-professional” groups have been similar, when it comes to domain knowledge, there are some differences between the two. For the domain knowledge about NML (Table 6) the “general public” is significantly different to all other groups at $p < 0.001$, except for the “student” group where there is no significant difference. On the other hand, the “non-professional” group is significantly different at $p < 0.01$ to all groups including the “student” group and the “general public” group.

For general CH knowledge (Table 7), the pattern is the same for the “general public”, but here the “non-professional” group is only significantly different from the “academic” and “museum staff” groups ($p < 0.05$). The difference to the “general public” is borderline, but not significant ($p = 0.66$).

Finally, the results for location (Table 8) show some differences. The “general public” is significantly different from the “academic” and “student” groups ($p < 0.03$), while the “non-professional” group also differs significantly from the “teacher” group ($p = 0.05$, $\chi^2 = 8.83$, $df = 4$). The difference clearly being that both the “general public” and “non-professional” groups are much more local than the other groups.

Table 7. Responses to the question “Rate your general Cultural Heritage knowledge” (Likert-like scale, 1 - low, 5 - high)

	Low	2	3	4	High
General public	8	47	112	70	16
Non-professional	3	14	56	49	15
Student	1	7	15	7	3
Academic	1	0	2	10	15
Teacher	0	1	11	6	7
Museum staff	0	0	1	5	4

Table 8. Location: Distance from the physical museum.

Group	Merseyside	Northwest	England	UK	World
General public	95	73	44	18	23
Non-professionals	47	30	25	10	25
Students	8	8	7	1	9
Academics	4	3	4	1	13
Teachers	13	3	4	1	4
Museum staff	8	1	1	0	0

5 Discussion

The results clearly show that the “general public” and “non-professional” groups are the primary audience of NML’s web-sites. These two groups have significantly lower experience with DCH and an early analysis of their ‘other’ responses indicates that they are less likely to visit repeatedly and less likely to remain engaged with the web-site if they do not immediately find what they are looking for. Based on this, it is likely that a significant fraction of those 60% of users who bounce from the web-sites within 10s also belong to those two groups (particularly the “general public” group). A better understanding of these two groups, that a more detailed analysis of the survey responses will allow, should enable museums to provide more appropriate services and reduce the bounce rate.

Six questions have been identified that show significant differences between the “general public” and “non-professional” user groups and the other groups. From these four areas have been isolated that define the groups in relation to each other (Table 9). Both groups are generally more motivated by personal reasons and will have a lower amount of domain knowledge. The “general public” also has a strong interest in information for preparing a visit. However, there is also interest in the digital collections, where the personal focus and the lower domain knowledge might mean that current offerings, which are generally structured around the search box (requiring domain knowledge for the search terms), are not providing these user groups with the appropriate type of access and guidance.

Table 9. Defining characteristics for the main user groups. Characteristics marked “-” indicate no clear preference for that characteristic/group. P - Personal, PT - Pass Time, S - Study, W - Work, PV - Pre-Visit, C - Digital collections, N - Novice, I - Intermediate, E - Expert, L - Local, D - Distant. Defining differences between the “general public” and “non-professional” groups are in bold.

Group	Motivation	Task	Domain knowledge	Location
General public	P/PT	PV/C	N/I	L
Non-professionals	P	C	I	L/ D
Students	S	-	N/I	-
Academics	S/W	C	I/E	D
Teachers	-	PV	I	L
Museum staff	W	-	I/E	L

The responses also enable separating the “general public” from the “non-professional” users based on their task, domain knowledge, and location. While both groups primarily come for personal reasons and are mostly from the local area, “non-professional” users are also drawn from further afield, while the “general public” has a stronger pre-visit information need. However, the main distinction between the two is the amount of domain knowledge the two groups possess. While the “general public” contains a mix of novice and intermediate users, the “non-professional” users generally see themselves as intermediate users. Services to support the two groups will thus have to take into account and support these varying levels.

The results presented here are derived from NML’s visitors, but the wide distribution of study participants provides strong support that they will generalise to other DCH web-sites that have both a physical and virtual presence. To what degree they also apply to purely virtual DCH sites, such as Europeana, requires further study.

6 Conclusions and Future Work

The majority of research into the users of DCH web-sites has focused on those user groups that are easier to access (“academics”, “museum staff”, “students”, and “professionals”). However, as the results of the survey reported here show, they form only a small fraction of the total number of web-site visitor. The main user groups are the “general public” and “non-professional” visitors, who make up nearly 70% of all visitors. In addition to identifying these groups as the main user groups, the survey data also allowed us to define those criteria (motivation, task, engagement, domain knowledge, and location) that distinguish these two groups from the other groups and also the criteria (domain knowledge and location) that distinguish the two groups from each other.

Due to the lower degree to which these two groups have been studied, it is also highly likely that current DCH web-site offerings are not as suitable for

these groups as ideally desired. This would also explain why DCH web-sites suffer such high bounce rates, as based on the survey results, those users who leave immediately are more likely to belong to the “general public” and “non-professional” user groups, as the initial analysis of their responses indicates that they are more likely to give up quickly.

The analysis presented here provides an initial view onto the responses; however, significant work remains to investigate exactly how the different user groups interact with the site, whether patterns emerge and how users’ interactions can be better supported across a range of tasks and goals.

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