TripAdvisor Reviews of London Museums:
A New Approach to Understanding Visitors

by Victoria D. Alexander, Grant Blank, and Scott A. Hale

Abstract

The digital revolution has affected museums in many ways, both directly and indirectly. A major external change is the rise of user-written reviews; that is, reviews written by museum visitors and posted on the Internet. User-generated reviews pose challenges to museums, as they are publicly available and largely outside the control of museums. This article discusses research on reviews of accredited museums in London. The authors' data set consists of all reviews written about 88 museums that were posted on TripAdvisor during 2014, a total of 22,940 reviews. Using a technique called topic modelling, they describe 19 themes in reviewers' stories of their visits. The authors find that museum visitors pay attention to the ancillary aspects of their visit: queues, cost, food service, toilets, and activities for children. They make fewer comments on the cultural side of the museum experience. However, these cultural aspects do matter and are associated with positive reviews. The authors argue that reviewers consider museums as part of a wider leisure sector. They close with a discussion of the implications of their study for museum management and assess the usefulness of user-generated content as a source of data on museum visitors.

Keywords

Audience research, customer review, museum experience, leisure sector, topic model, TripAdvisor, visitor studies.

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The digital revolution has affected museums in many ways, both directly and indirectly. A major external change is the rise of user-written reviews; that is, reviews written by museum visitors and posted on the Internet. Prior to this, most reviews of museums were written by professionals, such as travel writers or journalists, who look at cultural organisations with very different goals than the amateur reviewers who post content to the Internet. User-generated reviews pose challenges to museums, as they are publicly available and to a great extent outside the control of museums. As the British Museum's Cuau and Pim (2018 n.p.)[1] write,

> If you are a brand or an institution, people talk about you. That's a fact.
> If you happen to be a museum which welcomes around 17,000 visitors per day, 365 days a year,
> then lots of people talk about you. They talk about you all the time, in all languages, in ways you

can't control. They'll talk about your new exhibition, your audio guides, your security procedures and the coffee you serve in your restaurants.

Some of these people will talk to you directly […]. However, most of the people talking about you will do so behind your back.

One place that people talk behind your back is TripAdvisor, where visitors can post a review of their experience with your museum.

We believe that TripAdvisor reviews provide very useful sources of information that could be added to museum evaluation toolboxes. In this article, we discuss our research on TripAdvisor reviews of museums in London as an example of how this can be done and what might be learned. Our data set consists of all reviews that were posted during 2014 about any accredited museum in London, a total of 22,940 reviews of 88 museums. Using a technique called topic modelling, we uncover themes in reviewers' stories of their visits. After providing some background, we briefly explain our method and then describe our findings. We discuss 19 themes that are common in reviews and then show how the themes relate to reviewers' star-ratings. We find that museum visitors pay attention to all aspects of their visit including queues, cost, food service, toilets, and people in their visiting party, especially children. Though they make fewer comments on the cultural side of the experience, the cultural aspects of museum visits do matter, and are noted more frequently in positive reviews. The experience of being 'inspired' has the highest association with 5-star reviews, for instance. We then quote reviews to show how the topics appear in the context of reviewers' descriptions of their experiences. We close with a discussion of the implications of our findings, pointing to the usefulness of social media as a source of data on museum visitors. Overall, many visitors appear to consider museums as part of a wider leisure sector, and we suggest that it may be valuable to consider the museum experience in terms of that wider context.

The Museum Experience

Most museum staff have recognised for some time that the 'museum experience' extends beyond the collections and exhibitions (Hooper-Greenhill 1992), stretching to include 'ice creams,' 'kitchens,' and 'lavatories' (Tusa 2000: 199). Falk and Dierking (2016: 17) argue that 'the museum experience begins long before and continues long after the actual visit.' Their 'before, during and after' model of the museum experience is useful for understanding TripAdvisor reviews. In the first instance, the post-visit experience has been amplified in the digital age, as visitors write about their reactions in visible, public outlets.

Before a visit, the museum experience can include researching the museum to discover opening times, locations, and ticket prices, or how it will meet audience needs such as activities for children. Much of this investigation now occurs online, including reading reviews written by previous visitors. Visitors choose who to go with, how to get there, and even what to wear. After arriving, the experience continues with the visitor's physical presence in the museum, where the visitor encounters objects, exhibits, wall

text and the like, often in the company of friends or family. The physical experience also includes orienting to the museum space, the temperature in the galleries, the experience of crowding or emptiness, and, often, the shop and/or the café. Falk and Dierking (2016: 185) note that about half of museum visitors buy something in the shop and about three-quarters buy refreshments. These days, many museums contract out food service, but despite this, visitors consider their experiences in the café as reflecting on the museum, not the food contractor.

The museum experience continues after the visit in memories, and now, when visitors discuss their visits on social media, post photographs on Instagram, or write reviews on TripAdvisor. This material is public and may then become part of the 'before' experience for other readers. We know that online reviews are very important for the reputations and business of hotels and restaurants (O'Connor 2010; Ganzaroli, De Noni and van Baalen 2017). TripAdvisor (2018a) states that a majority of customers say TripAdvisor ratings are important for deciding which attractions to visit.[2] Social media are already an important part of the museum experience, and likely to grow in importance. Indeed, TripAdvisor is often on the first page of Google results. For example, a Google search for the British Museum (the top London attraction on TripAdvisor) turns up the BM's own website and Twitter feeds first, followed by its Wikipedia page, but after this is TripAdvisor. This pattern occurs for many other London museums.

Academics have begun to use TripAdvisor reviews of museums as a source of insight into visitor experience. For instance, Carter (2016) examined 200 TripAdvisor reviews of plantation museums in the American south, Ferguson, Piché and Walby (2015) looked at 671 TripAdvisor reviews of seven penal history museums in Canada, and Souto (2018) studied 1007 TripAdvisor reviews of two Berlin museums. Ramírez-Gutiérrez, Fernández-Betancort and Santana-Talavera (2018) took a broader look at tourist experiences, comparing 198 reviews of a Spanish art museum, two house museums, and a heritage site with two Spanish tourist destinations. Su and Teng (2018) looked at 301 negative reviews of 15 museums in a variety of countries to learn about service failure. These studies show the usefulness of TripAdvisor as a data source, but current studies tend to be relatively small-scale and qualitative.

Visitors' Stories on TripAdvisor
Vásquez (2012) describes TripAdvisor reviews as narratives, specifically as 'small stories' about visitors' experiences. Or as Carter (2016: 235) puts it, 'Reviews, posted on TripAdvisor…constitute narrative appraisals of tourist sites, that is, visitor-authored stories about places.' Most reviews include first-person narrative about the reviewer's experience, often coupled with second-person advice to an assumed reader (Alexander, Blank and Hale 2018a). In this paper, we demonstrate a new way of learning about visitors' experiences through the stories they tell online.

TripAdvisor calls itself the 'world's largest travel website.' When we collected our data in 2014, it logged 315 million unique monthly visitors and contained more than 200 million reviews of more than 4.5 million accommodations, restaurants, and attractions in 45 countries worldwide (TripAdvisor 2014).[3] A

TripAdvisor reviewer provides a title, a short review, and a ranking, from one star (low) to five stars (high) based on the reviewer's perception of the quality of the hotel, restaurant, or attraction.[4]

Our study of London museums is part of a larger study of TripAdvisor reviews of attractions (Alexander, Blank and Hale 2018a, 2018b; Hale, Blank and Alexander 2017). We collected reviews ourselves, using a computer script that we wrote specifically for the task.[5] We only gathered reviews of 'attractions' (not hotel or restaurant reviews). We then selected all reviews of London museums accredited by Arts Council England (ACE). In November 2017, ACE listed 134 fully or provisionally accredited museums in London (ACE 2017). Of these, 88 museums received reviews on TripAdvisor in 2014, and are therefore included in our dataset. We were interested in *themes* that are *common across reviews of all London museums*, in order to understand what TripAdvisor reviewers consider important to write about.

How we analysed more than 20,000 reviews
As our data set includes 22,940 reviews, it was not feasible to use typical qualitative techniques that require hand coding of the themes in each text. Instead, we used topic modelling, a technique from computational social science. This technique can handle very large amounts of textual data to discover 'topics', which are groups of words that commonly appear together. This technique is well-adapted to the online world, where the volume of text is much too large to be handled by methods that require categorizing by hand methods.

Our procedure began with the full text of the reviews. We then 'cleaned' the reviews by removing common words (called 'stop words') such as *a*, *and*, or *the*, collapsing synonyms into a single word, 'stemming' some words (i.e. *entertaining*, *entertains*, and the like all became *entertain*), expanding contractions such as *can't* and *didn't*, and transforming some phrases—for instance, all variations on N-year-old (e.g. '10 year old') to *year_old*, a constructed word that, in our data, usually refers to children. Following this process, we used QDA Miner version 7 to extract the topics. From the cleaned text QDA Miner generated a correlation matrix of words, where each correlation represented the likelihood of the word-pair co-occurring in a review. We did a principal components analysis on this correlation matrix and extracted 19 components with varimax rotation and Kaiser normalization. The words that loaded most strongly on each component form the topic (see Alexander, Blank and Hale 2018b).

There is no sense in which the software interprets words or syntax, it simply groups meaning-rich words that co-occur into topics. We then use the words in each topic, along with inspection of a sample of reviews, to infer the central theme that links the words together and to assign a name to each topic. Like similar reduction of dimensionality techniques (e.g. cluster analysis or multi-dimensional scaling) the key criterion for identifying the common theme underlying a topic is the substantive interpretability of the topic. We decided on the number of topics, using an interactive approach in which we sought topics that were internally consistent, sufficiently specific, and distinct from other topics. An individual review may contain more than one topic or no topics. Similarly, some words appear in more than one topic. As you can see from this description, topic models simply generate groups of co-occurring words;

there is considerable art required to identify and name each topic. Topic modelling is therefore an exploratory technique useful for generating ideas.

This combination of computational methods and human interpretation allows us to analyze a very large data set. We are able to take advantage of two complementary strengths. The strength of a computer is that it can sort large quantities of information (such as the words included in nearly 23,000 reviews) into categories, but it has no understanding of the meaning of what it is processing. People cannot process such large quantities of information quickly. Through examining the topics and looking at a selection of associated reviews, however, researchers can identify a common meaning or consistent pattern in a group of objects, such as those words that are categorized by a computer. By combining these strengths we are able to extract meaningful information from the very large bodies of text that comprise our data.

Themes in reviews

For this study, we settled on 19 topics as appropriate to interpret the data. Table 1 shows the results of the topic model. In the left-hand column is the **topic name**. The middle column shows the *keywords* associated with the topic, and the right-hand column shows the percentage of reviews in which the topic appears. As mentioned, we chose the topic names, based on the keywords along with our understanding of the reviews from our experience in studying them.

Table 1 about here

The topics fall into three groups: descriptive topics, evaluative topics, and topics about specific museums. Some of the topics are interpretable just by looking at the keywords. For instance, **Children** is a topic that appears in nearly half the reviews of London museums. People often visit museums in *family* groups and reviewers are clearly interested in how children fared in the museum – are there *activities* or *interactive* displays; did the children *play*? Other topics may need some explanation, and we provide brief descriptions now as we turn to the three groups of topics.

<u>Descriptive</u> topics include: **Children**, **Hours** (the length of visits, how many hours were or could be spent in the museum), **Queue** (waiting for entry, either to the museum or to a special exhibition), **Early** (advice to readers that it is useful to arrive early, at opening time, to avoid crowds or queues), **Location** (where the museum is in London and how easy it is to get there, by following a map or taking the Underground, and whether street signs directing visitors to the museum are confusing), **Cost** (value for money on entry charges, including special exhibitions, as well as at shops and cafés), **Meal** (in museum cafés and restaurants), **Staff** (often helpful and friendly), **Asked** (questions about the museum), **Toilets** (self-explanatory), and **Exhibition** (permanent or temporary exhibitions in the museum).

<u>Evaluative</u> topics include: **Difficult** (reviewers found the display cases to be poorly lit, textual material hard to read, or were disappointed by displays), **Confusing** (reviewers found the layout confusing or

the museum to be hot and crowded), **Surprised** (reviewers who attended the museum with friends or family did not expect to enjoy it as much as they did, so were pleasantly surprised), **Longer** (reviewers wished they could have spent longer), and **Inspiring** (reviewers were inspired or experienced awe).

Museum-specific topics include: **Beefeaters** (which refers to the entertaining and educational tours given by Yeoman Warders, or Beefeaters, at the Tower of London), **Poppies** (which also refers to the Tower of London, and specifically to *Blood Swept Lands and Seas of Red*, an installation commemorating the start of WWI which was mounted in 2014), and **Fashion** (which refers to 2014 special exhibitions in the Victoria and Albert Museum, notably *The Glamour of Italian Fashion 1945– 2014* and *Wedding Dresses 1775–2014*). Museums with a large number of reviews and a consistent experience generated their own topics.[6]

This set of 19 topics gives a good overview of general issues. It is clear that reviewers' needs are important, as they write about their children, the queues, their meals, the costs, their experience of finding the museum, the loos and the museum staff. When reviewers make evaluative comments, negative comments (**Difficult**, **Confusing**) are more common than positive ones (**Surprised**, **Longer** and **Inspiring**). This analysis contributes to research on the museum experience, as briefly sketched above, by showing that the entire experience of the visit, and not just the objects on display, are important to visitors.

Topics and Star Ratings

An important issue is how the topics are related to visitors' overall evaluations of their experiences. We compared the star-rating given by reviewers with the topics in the review. Figure 1 shows what is called a 'multiple correspondence analysis' (MCA) map. It shows the relative association of topics with each star ranking. Looking at the horizontal axis, we can see that the topics range from left to right in terms of quality. The further to the left a topic is, the stronger association it has with a high star ranking. This map shows a clear evaluative dimension to the TripAdvisor reviews, and the nearly linear mapping of the rankings on the horizontal axis demonstrate that there is a very strong association among the topics and the ratings. Most reviews of museums on TripAdvisor are positive, with about 64 per cent of reviews in the dataset awarding 5 stars. (In contrast, less than 2 per cent of reviews award one star.) This is why most topics fall on the MCA map to the left-hand side, with the majority placed to the left of the 4-star marker.

Figure 1 about here

We see the topics as falling into four vertical 'bands' on the map. In the first, left-most band, reviews that include the topics **Inspiring**, **Beefeaters**, **Fashion**, **Longer**, **Exhibition**, **Hours**, **Surprised**, and **Poppies** are strongly associated with 5-star reviews.[7] These topics are about the substance of the museum, the exhibitions (in general, and specifically the display of ceramic poppies at the Tower of London and the special shows on fashion at the V&A), or positive evaluations of an experience (which

was inspiring, or where you spent hours and could have spent longer). These topics and the association with 5-star reviews suggests that London museums are doing well with their core activities. People come to museums in the first instance to have a cultural experience, to see exhibitions, hear Beefeaters, and to be inspired by the collections, and most reviewers' expectations have been met.

In the next band over, still to the left of the vertical axis, are **Children**, **Asked**, **Location**, **Meal**, and **Staff**. These are associated with positive reviews, but less strongly so than with the substantive and positive-evaluative topics just discussed. The topics in the band describe ancillary aspects of museums, rather than their cultural features, but still aspects that are crucial to a successful visit. Visitors appreciate friendly, helpful staff, who know the answers to questions they asked. They appreciate a convenient location and a good place to eat. Importantly, this cluster discusses the experiences of children.

A third band, now toward the right of the map, and slightly more dispersed, includes **Cost**, **Queue**, **Toilets**, **Early**, and **Difficult**, which are associated with more mid-ranked reviews. A fourth band includes just one topic, **Confusing**, which stands alone as strongly associated with negative reviews. These topics suggest that reviewers are price-sensitive and would prefer not to spend time waiting to get into the museum or its exhibitions. The two negative evaluative categories, **Difficult** and **Confusing** are, not surprisingly, associated with negative reviews. Although only a small proportion of reviewers give one-star reviews, 21 per cent of reviews contain the topic **Confusing**, suggesting that negative aspects of the experience are tempered by positive ones, such that the reviewer gives a good star-rating. However, this also suggests that there may be room for improvement in visitor experience.

The evaluations that are highlighted through the MCA remind us of Herzberg's (1964) 'two-factor' theory. Herzberg argued that employees are affected by positive 'motivation' factors in the workplace, such as responsibility, opportunity, recognition, and interesting work. They can also be separately affected by negative or 'hygiene' factors, such as unsafe working conditions or bad pay. Importantly, hygiene factors become salient when they are present, but do not provide a positive benefit when they are absent. In other words, hygiene factors create dissatisfaction, and must be removed to remove the dissatisfaction. In museums, the exhibitions and the positive experiences they create are *motivation* factors – these generate 5-star reviews. Friendly staff, good meals and happy children seem also to be motivation factors. Other ancillary aspects, such as the toilets or staff are hygiene factors, which can lower the star-rating when there are problems with them, such as lack of restroom facilities or rude staff.

For this exercise, we have put reviews of all London accredited museums together in one topic model. The reason for doing so is to look at *general characteristics* of museum reviews, and to show the potential for large-scale analysis of review data. Clearly, museums will differ as they have unique exhibitions and collections and offer different kinds of experiences to their visitors, but we did not feel it was appropriate in this context to cover a specific museum and its issues. Topic models work well on reviews for individual attractions, which we have done previously (Alexander, Blank, and Hale 2017).

Many of the same themes emerge, although there is, not surprisingly, more specificity about objects and exhibitions. An advantage of topic models is that they do not rely on prior assumptions about museum visitors.

At the present moment, topic modelling may be challenging for museums that lack access to data science expertise. Specialist skills are needed for downloading and cleaning large-scale Internet data, and experience with the art of topic modelling helps to avoid pitfalls that can influence results. However, automated packages are developing very quickly and we anticipate that in just a few years, topic models of Internet content will be available through point-and-click tools. The British Museum is embarking on a project for using natural-language-processing of reviews, the code for which will eventually be available on an open source basis (Cuau and Pim 2018). In the meantime, it may be worth analysing reviews by hand, and it is certainly worth reading at least a sample of reviews, as the narratives can be engaging as well as informative.

Small Stories about Museums

The topic model results are abstract and, therefore, lack context. Some examples of reviews illustrate the stories people tell about their visits and how these relate to the results from the topic models. During analysis, we examined individual reviews in order to understand the topics generated by the topic model. Here, we chose a random sample of 10 reviews from each of the 88 museums, yielding 880 reviews. We did not analyse these formally, but instead read through and chose interesting quotations that were typical or that illustrated a key point. (In these examples, the title given by the reviewer is in bold and the museum reviewed and the reviewer's rating are in brackets at the end. We have not corrected spelling or punctuation, but we have elided some reviews for length, indicated by an ellipsis in square brackets, […]; other ellipses are original to the review.) Here is a fairly typical positive review:

> ***A small treasure in North London***
> *This delightful little gallery of very interesting Italian futurist art, near Highbury & Islington tube station, is well worth visiting. As one of your reviewers said, it is possible to enjoy the pictures in a pleasant and tranquil atmosphere without hordes of chattering schoolchildren. The house, cafe and garden setting added to the charm of the experience which could not be said, alas, of the Italian chef who seemed unnecessarily grumpy on the day of our visit. It is closed on Mondays & Tuesdays. (Estorick Collection of Modern Italian Art, 5 stars)*

This review shows how reviewers weave multiple topics together in a review. After describing how the motivation for visiting the gallery was the collection, the review goes on to provide information on the location, the physical set up, including mention of the café, as well as a comment on the staff (grumpy!), and the days the museum is closed. All of these aspects relate to themes found in our topic model, although this reviewer is interested in avoiding other people's children, rather than entertaining their own. This reviewer also mentions other reviews. In our sample, a small proportion of reviews mention previous reviews (473, or about 2 percent), though many more may read the reviews—and be

influenced by them—without mentioning them (Muchnik, Aral, and Taylor 2013). Though this reviewer gave top marks, the experience was not satisfactory in every respect, and the museum could consider whether the café (described by another reviewer as 'small, somewhat chaotic') might need some attention.

A positive review that focuses on the benefits to children, and is tolerant of crowds, states:

> **Fantastic place for enquiring minds**
>
> *Yes it's busy and full of children but it's free, it's half term and it's in London, so you have to expect crowds and queues. My 2 kids aged 10 and 6 could happily have spent a whole day here, there is so much to see and do. Launchpad is all hands on and teaches some simple scientific laws in a really engaging way - the water rocket demo especially was great fun and the explainers (staff) were really enthusiastic. The new 'Who am I' area is also really interesting and led to many questions about genes and babies ! I didn't think the cafe was overpriced considering you're a sitting market. All in all a great place to take the kids on a rainy day - just don't be surprised if thousands of families have the same idea ! (Science Museum, 5 stars)*

This review provides a list of criteria that are important to the reviewer, such as happy children, hands-on, educational exhibits, enthusiastic staff and a café that is not terribly overpriced. Advice is given explicitly, to 'expect crowds and queues' and also implicitly, to expect that the café will not be cheap, because 'you're a sitting market'.

In contrast, here is a review typical of a more negative experience. We have quoted this one in full to illustrate how many reviewers provide a compelling narrative about their experience and why, in this case, it was so frustrating:

> **Great exhibits, but back-up services are dire.**
>
> *This is an excellent museum from a curatorial point of view, but heaven help you if you need to find and use a locker, or a lift, or get a cafeteria meal in your lifetime. I've had good experiences here in the past, but this time I arrived with two small children, a push-chair and a heavy rucksack. My first goal was to unload the baggage and push-chair, but a volunteer student gave me incorrect directions to the lockers downstairs and, when I finally found them, I discovered I needed a special token, available from the student volunteer (!) or over-subscribed front desk. We slogged back upstairs to the volunteer who now revealed she did have tokens but couldn't give me change for £5 (they required a deposit of £1). She sent me to a change machine downstairs somewhere and, by this time, with the rucksack etc. finally stored, the children were hungry and I was frazzled. The cafe on the main floor was packed to the gills, so we went to the cafeteria in the basement where it literally took two staff members half an hour to serve the five people ahead of us. Once we'd made it through this gauntlet, we had only about an hour left to look at the wonderful exhibits. We're not going back. (Museum of London, 3 stars)*

This review also illustrates many of the themes from our topic model. The museum's collections are given top marks and the exhibits were noted as the motivation for attending. Children, food service, crowds and unhelpful staff play a major role in the experience. Though the reviewer found the experience so frustrating as to assert, 'We're not going back', the reviewer nevertheless gave the museum three stars. This shows the anchoring effect of the collections: one-star reviews are very uncommon, even when reviewers report decidedly negative experiences.

This review also shows a common rhetorical strategy in reviews: in asserting past experience with the museum, the reviewer suggests a degree of knowledge, and also sets up a contrast between expectations (in this case positive) and the actual experience. This contrast was an element in many of the reviews that contained the **Surprised** topic, for example:

> ***Quaint, interesting, local museum***
> *Visiting my girlfriends parents, long time residents of the area, and they recommended a visit. […] I wasn't sure, but was pleasantly surprised. It's an unusual little museum, not like I've experienced before, but a great attraction none the less (Vestry House Museum, 3 stars)*

Reviewers' expectations can often be inferred from reviews. For instance, there should be something to occupy them on the visit, with 'lots to see and do' which makes a museum 'well worth the visit' as part of a 'good day out'. As the keywords for the topic **Staff** suggests, many reviewers expect staff to be helpful and friendly. The presence of helpful, friendly staff is very commonly noted:

> ***Impressionism***
> *lovely interior with many impressionist paintings by artists like Van Gogh, Manet, Gauguin etc. The staffs are so friendly always have a smile on their face. […] (Courtauld Gallery, 5 stars)*

Many reviewers make their points in clever or humorous ways. For instance, a 3-star review of Jewel House, in which the reviewer told a story about the lack of toilet facilities, started, 'Whilst this English Heritage property does have evidence of its Medieval latrines, they are not available to the public!' Others evaluate value for money in a more straightforward way, including advice for saving money (e.g., using a two for one offer):

> ***Good, but overpriced***
> *Plenty to see and do here for a couple of hours. Cafe is VERY nice. Good for kids and plenty for adults too. It is expensive... Too expensive! We had a two for one offer which brought the price down to something reasonable. The price includes a "voluntary" donation. Don't pay it if you don't want to! (London Transport Museum, 3 stars)*

This reviewer suggests to other reviewers that they should not feel obliged to make additional voluntary donations, perhaps not what the museum's accountant would want to read. Other reviewers noted that

they were glad to make a donation: 'Fantastic afternoon and I spent last night laughing and learning by reading the 'specimen of the week' blog - check this out too!. We made a donation there, but will adopt a specimen too, as in one visit we have fallen in love with the place' (Grant Museum of Zoology, 5 stars), and 'The museum was free and we were very happy to make a donation for the sake of helping the volunteers keep this fascinating story alive' (Crystal Palace Museum, 4 stars).

Looking at individual reviews helped clarify some questions. For instance, *board* was a keyword for two topics, **Difficult** and **Confusing**, but we were unsure what the word meant in context. Certainly, some reviewers might misspell 'bored', but this could not explain its presence as a significant keyword. We initially wondered if this had to do with ship-based museums, such as Cutty Sark or HMS Belfast; however, inspection of reviews proved that 'board' was related to how interpretive material was handled:

> ### A ruined sunday
> *The natural history museum is full [of interesting] artefacts. However, they are completely ruined for the viewer as you are forced to view them in stuffy, hot, overcrowded rooms. Once you enter an area you cannot escape, you are funnelled round like sardines in above comfortable temperatures forced to painstakingly view the overloaded garish display boards which completely distract and overshadow the objects you came to view […] (Natural History Museum, 2 stars)[8]*

> ### A Sunday afternoon visit
> *Having visited the museum at varying points in the last 20 years, it was with high hopes that I arrived today. It was with great sadness then that I saw a poor layout with no flowing routes to see the exhibits and sparsely placed descriptions where the hordes must crowd around small boards with poorly written information containing multiple spelling mistakes. […] (Imperial War Museum, 2 stars)*

> ### Very interesting and needed more time
> *[…] very interesting with so much to see and well laid out with exhibits showing from each floor but I didn't like the way that the various displays were only described on one board and not at each exhibit, which meant you were constantly going back to see what something was or looking for the description again […] (Imperial War Museum, 4 stars)*

All three of these visitors came on a weekend, as indicated in the titles for the first two reviewers and a mention of the weekend which came later in the third review. As weekends tend to be busy, this suggests that crowding in the galleries may be a complicating factor.

Conclusion

Our aim here has been to sketch out the usefulness of TripAdvisor data and new data analysis techniques that can bring out themes across a large amount of text. We have illustrated the themes

with quotations from reviews, both positive and negative. We show that, for a generalised museum reviewer, the exhibitions and displays, along with the experience of being inspired, are motivational factors for visiting a museum. But so too are helpful staff, good food in the café, and things to interest children. Some ancillary aspects of museums, such as crowds, costs, or queues, may reduce reviewers' ratings, as can loos when they are absent, dirty, or hard to find. The lowest ratings connect back to more core issues, since reviewers who felt that the displays or exhibitions were difficult or who were confused were more likely to give a low score.

TripAdvisor reviews pose challenges to museums, as they are an aspect of the museum experience that is largely outside of the control of museums. And yet, TripAdvisor reviews also offer them the opportunity to understand visitors' conceptions of the museum experience and possibly to use this knowledge to improve visitors' experiences. TripAdvisor reviewers actively appreciate friendly, helpful staff, for instance, whereas rude staff or poorly trained volunteers are problematic. The detailed, museum-specific feedback that TripAdvisor contains can be invaluable, both to individual museums and to the wider sector. Never before have museums had access to visitor research data on such a broad scale and at no direct cost. Museums should not consider major changes on the basis of one review, of course, and some possible solutions will be too expensive or otherwise unfeasible. But in the face of limited resources, data on visitor experience such as can be gleaned from TripAdvisor might help with planning and priorities for the visitor-facing sides of museum operations, or suggest problems that the museum may not have noticed. For instance, reviewers' opinions on labels, information, interpretive materials or display layout, as in comments on 'boards', could be useful when displays are reorganised. Of course, you cannot please everybody. This reviewer may possibly have enjoyed free entry to the publicly supported National Museums in London, and has engaged in some wishful thinking regarding other museums:

> **Great but should be free**
> *I recently viewed this museum. I found it fascinating and culturally monumental but I feel that there should not be a fee for this attraction. (Florence Nightingale Museum, 4 stars)*

TripAdvisor is hardly a perfect source of data. As with comment cards and visitor books (c.f. Macdonald, 2005), the data are not representative of the museum's visitors as a whole. They contain little or no demographic information. What we have provided here is an analysis of reviews, not an analysis of visitors. Nevertheless, we think reviews provide useful information. They are unobtrusive measures of reviewers' accounts of museum experience that can supplement other types of audience research. They are no less representative than comment cards, but more visible, and likely to become much more so in the future.

Museums should pay attention to online reviews for another reason: their intended audience is future visitors. Reviews are publicly accessible, and potential visitors may read (and be influenced by) reviews. Macdonald (2005) finds that museum visitor books are used differently depending on national culture,

which affects the understanding of these books. If they are seen as analogous to a guest book at a wedding, people tend to leave bland, polite comments, but if they are seen like a complaint book, people can be quite assertive with negative comments. TripAdvisor reviews are socially situated within the context of travel reviews. In this way, museum reviews on TripAdvisor may be orientated toward practicalities. However, practicalities are clearly important to a large number of people. TripAdvisor reviewers see London museums as 'attractions' that need to compete with other activities in the leisure economy in terms of value for money, entertainment or educational value, or—to use a phrase that is very common in reviews—that are 'a good day out'.

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Table 1. Topic Model – Themes in TripAdvisor Reviews of London Museums

| Topic Name	Keywords	% cases
Children	*children; adults; interactive; year_old; activity; hands; play; age; family; loved; like*	44.03%
Difficult	*difficult; read; light; small; describe; display; disappoint; signs; front; reviews; board; timed; bad; frustrating; visitors*	31.98%
Hours	*hours; spent; least; money*	23.28%
Queue	*queue; minute; wait; quickly; straight; terms; busy; arrived; year_old*	21.78%
Early	*early; avoid; arrived; crowded; opening; queue; straight; groups; timed*	21.02%
Confusing	*confusing; layout; bad; disappoint; frustrating; crowded; hot; board; busy*	20.79%
Location	*underground; easy; map; follow; bunker; signs; confusing*	13.44%
Beefeaters	*entertain; funny; yeoman; educational; beefeaters; knew*	13.28%
Cost	*cost; highly; fair; quality; service*	12.98%
Poppies	*poppies; ceramic; moat; views; moving; lost*	12.11%
Meal	*meal; hot; service; courtyard; seat; cool; cake*	9.77%
Staff	*staff; helpful; friendly*	8.70%
Asked	*asked; questions; knew; year_old*	7.17%
Fashion	*dress; fashion; courtyard*	3.69%
Surprised	*surprised; pleasant*	3.62%
Toilets	*toilets; clean; facilities*	3.13%
Longer	*stay; longer*	3.03%
Inspiring	*inspiring; awe*	2.99%
Exhibition	*temporary; permanent*	1.65%

Notes: The topics appear in the order of frequency – topics mentioned in more reviews are higher on the list.

This table is a summary of the topic model. (Full topic model is available from the authors).

Figure 1. The Relationship between the Topics and the Star-Ratings
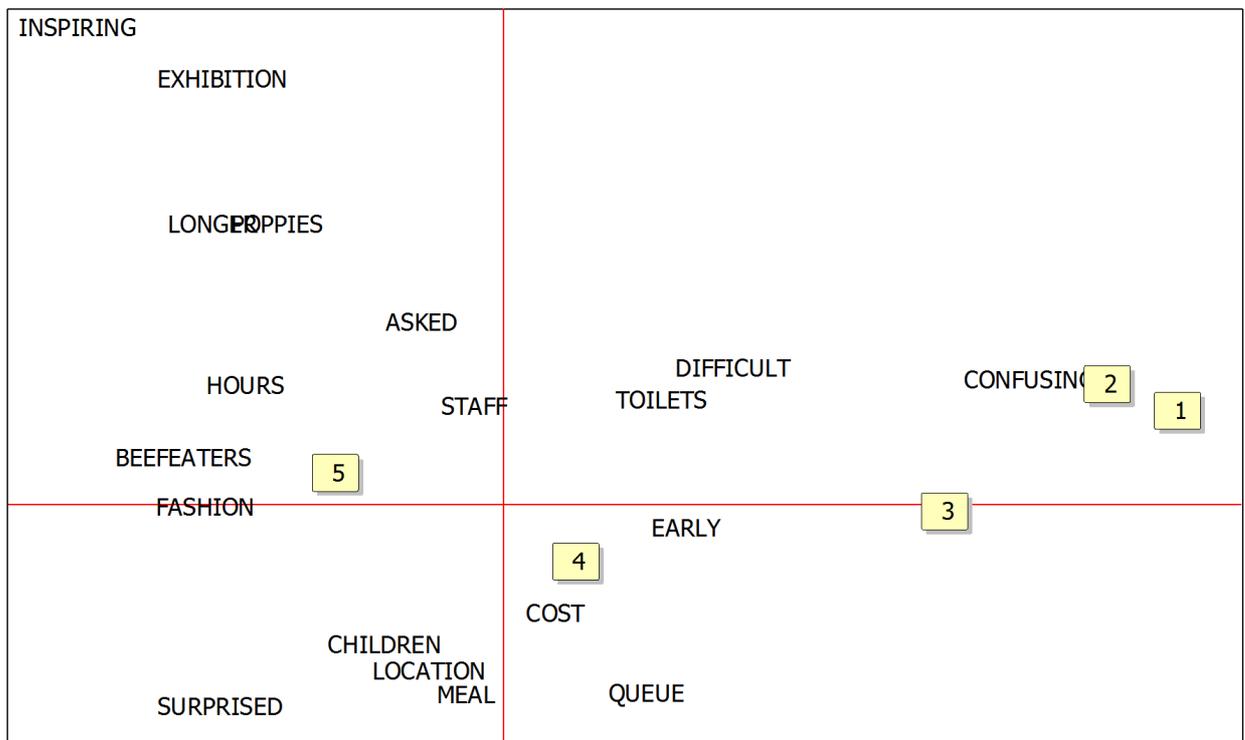
Notes: This figure is based on a Multiple Correspondence Analysis of the topics from the topic model analysis and the star ratings in the reviews that contain each topic.

The horizontal axis explains 91% of the variance in the data. The vertical axis is not clearly interpretable as it includes all residual variance. (Eigenvalues and co-ordinates of the topics are available from the authors.)

The overprinted text in the upper-left box are 'Longer' and 'Poppies'.

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Notes:

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[1] Cuau and Pim's (2018) blog post is very interesting, as they write about strategies to evaluate TripAdvisor reviews (natural language processing and machine learning techniques) that are similar to the ones we use, and their findings have changed practices at the British Museum.

[2] TripAdvisor (2018a, n.p.) cites a 2015 study of 'customers', which was commissioned by TripAdvisor. This study showed that '83% believe it is significant when choosing an accommodation, 70% when choosing a restaurant and 58% when deciding what attractions to do.' The webpage does not clarify who the customers are.

[3] TripAdvisor has grown since 2014, now claiming 630M reviews of 7.5M accommodations, restaurants and attractions which attract 455M monthly unique visitors (TripAdvisor 2018b).

[4] TripAdvisor calls these 'bubbles' rather than 'stars'.

[5] Before collecting data, we consulted the robots.txt file (http://www.tripadvisor.co.uk/robots.txt, last accessed on 29 March 2015), which indicated we could crawl the website. The robots.txt file also linked to sitemap files that enumerated all of the attractions listed on the website, which ensured we have a complete dataset. We wrote a custom web crawler in Python3 to fetch the HTML of all TripAdvisor reviews of attractions in London for the year 2014. TripAdvisor shows a limited amount of each review, with a link to expand the review and read further, if the review is longer than the preview space. We requested the full text of truncated reviews with another automated script. Not all requests were successful, however, so approximately 7% of our reviews remained truncated. Our full dataset contains 516,641 (99.98%) of the 516,764 reviews available in February 2015. We included only English-language reviews in the museums dataset, but note that there are many linguistic and cultural differences (Hale, 2016).

[6] The Tower of London, had the largest number of reviews in our dataset, 4415 reviews in 2014. The Victoria and Albert Museum, with 1692 reviews, has a consistent enough focus on fashion for this to be a separate topic. However, the British Museum (2683 reviews), National Gallery (2108) and Natural History Museum (1661) did not generate a specific topic in our analysis, although they obviously contributed to a number of the general topics.

[7] We have listed the topics in order of their coordinates on Axis 1.

[8] We have edited this review, which said, 'The natural history museum is full uninteresting artefacts.' We believe that this is a typo, and the reviewer meant 'full of interesting'. Reviews are often written quickly and reading between the lines is sometimes necessary.