Data in brief 25 (2019) 104067

Contents lists available at ScienceDirect

Data in brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Datasets from the evaluation of the adoption and use of digital technologies in China museums

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ARTICLE INFO

Article history:
Received 16 March 2019
Received in revised form 15 May 2019
Accepted 21 May 2019
Available online 2 June 2019

Keywords:
Museum technology
Digital technologies
Digital systems
Exhibits
User studies
Technology acceptance

ABSTRACT

The datasets described in this article were collected as a result of 5 months of funded study, carried out between 23rd January 2017 and 30th May 2017 within China. The study evaluated the adoption and use of digital technologies such as Augmented Reality (AR), Virtual Reality (VR), Projection Displays, Interactive 2D (i2D), Interactive 3D (i3D), Mobile Exhibits, and any unexpected interactive devices in the miscellaneous category. The datasets were collected from 22 sites and China's national and local museums across 15 different cities from which 807 samples of observations were obtained. In total, 36 separate digital systems were observed. 21 variables related to the use of digital technologies mapping the length of interaction, engagement, quality of contents and types of systems, age groups, sexes, and the number of participants and whether they were individuals or in groups were collated in the datasets reported here.

DOI of original article: https://doi.org/10.1016/j.culher.2018.11.016.
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https://doi.org/10.1016/j.dib.2019.104067

Specifications table

Subject area	*Museum Studies*
More specific subject area	*Technologies in museums, digital technology adoption and use, visitor studies, digital heritage, museum computing*
Type of data	*Tables, text files, graphs, figures*
How data was acquired	*Survey, non-participant observations, the use of iPads for recording observations*
Data format	*Filtered and analysed*
Experimental factors	The criteria for data collection were that systems are digital, interactive with the exception of projection systems with narratives. We observed a given digital system until we obtained 30 samples, or for up to 2 hours, whichever comes first. Museums containing multiple systems were recorded with 20 samples or up to 1 hour of observations.
Experimental features	*Data was collected via an iPad Air with sufficiently large screenspace for splitting between the data collection spreadsheet and a native timer. Observations were done at a distance so that we don't distract the users.*
Data source location	*Beijing, Chengdu, Guanghan, Guangzhou, Hangzhou, Nanjing, Ningbo, Shanghai, Shenzhen, Suzhou, Taipei, Tianjin, Xi'an, Yuyao, Zhengzhou*
Data accessibility	https://github.com/drecuk/DigitalSysBroadEvaluation
Related research article	Ch'ng, E., Cai, S., Leow, F.T., & Zhang, T. (2019). Adoption and Use of Emerging Cultural Technologies in China's Museums. *Journal of Cultural Heritage Vol.37 p.170-180*

Value of the data

- The datasets provided here is the first of its kind, the scale of which covers China's large geographical regions with national, local museums and sites and therefore represents a true breadth of evaluation of the adoption and use of digital technologies in China.
- The datasets provided a snapshot of an important intersection in time between China's 12th and 13th Five Year Plan when the cultural industry is to be made the pillar industry of China's economy. The datasets were collected at a juncture in time when China aims to closely integrate new technologies within the cultural heritage domains.
- The large datasets recorded the adoption and use of digital systems and visitor engagements with these systems. It can provide insights into challenges and opportunities for the future adoption and use of cultural technologies in museums.
- The datasets can provide a basis for future comparative studies of progressive digital technology adoption and use in China or with other countries.

1. Data

Data was collected from 22 sites over 15 cities (Fig. 1), covering 36 digital systems used by 807 visitors and they interacted and engaged with the systems (Table 1). A record of 21 variables related to the length of interaction, engagement, quality of contents and types of systems, age groups, sexes, and the number of participants and whether they were individuals or in groups was collated.

2. Experimental design, materials, and methods

The datasets provide a snapshot of both national and local museums and sites across China (Fig. 1). We targeted our observations in the weekends so that the yield of data is greater and thus have provided a good sample size for evaluation. Statistical methods and code used for evaluating the data can be accessed in a separate article [2].

Table 1 shows the corresponding sample size collected from each museum. Some museums did not adopt digital systems but are included as part of the study for the sake of recording their non-adoption of technologies. Others with zero samples recorded was due to the fact that digital systems within these museums were either under maintenance or had a sign saying that it was in development.

3. Targeted Digital systems

The criteria for the collection of data were that systems are digital and interactive. Projection systems with narratives were part of the evaluation. Videos used as documentaries were excluded from the data collection exercise.

Fig. 1. A map of China showing the location of the sites.

- Augmented Reality (AR) – any devices which augment virtual objects onto the real world using QR code, images, or spaces (e.g., HoloLens)
- Virtual Reality (VR) – any displays which completely immerses a user into a virtual world (e.g., headsets, CAVE), this includes 360 videos
- Projection Displays – displays which provide a narrative and are not only a video
- Interactive 2D – this includes 2D interactive systems and 1990s era multimedia systems or touch screens
- Multitouch2D - this includes multiuser, multitouch displays which supports at least two users within a single session of use.
- Interactive 3D – 3D interactive environments either with an interactive device (i.e., Mouse) or touch screens and gestures
- Mobile Exhibit – a mobile device (i.e., mobile phones, iPad, etc.)
- Miscellaneous – any unexpected interactive devices

4. Data collection, collation and processing

We observed a given digital system until we obtained 30 samples, or for up to 2 hours, whichever comes first. The intention was for us to collect at least 30 samples of observation at each system. However, given that visitor number varies across museums on top of time constraints, the collection of up to 30 samples for each system may not be possible. For museums having multiple digital systems we

Table 1
The table shows our list of sites and museums with the corresponding sample size.

Date (2017)	Location	Museum	Samples
Mon 23 Jan – Wed 25 Jan	Taipei	National Palace Museum	71
		National Museum of History	22
Fri 3 Feb	Ningbo	Baoguo Temple	0
Wed 15 Feb – Fri 17 Feb	Shanghai	Shanghai Museum	61
Fri 10 Mar – Sun 12 Mar	Beijing	National Museum of China	41
		The Palace Museum	0
Fri 31 Mar – Tue 4 Apr	Chengdu	Jinsha Site Museum	62
	Guanghan	WuHou Shrine Museum	30
		Sanxingdui Museum	28
Fri 31 Mar – Mon 3 Apr	Nanjing	Nanjing Museum	86
	Suzhou	Suzhou Museum	84
Sat 8 April	Yuyao	Hemudu Site Museum	0
		Tianluoshan Site Museum	0
Mon 1 May	Ningbo	Ningbo Museum	62
Fri 5 May – Sun 7 May	Tianjin	Tianjin Museum	23
		Tianjin Natural History Museum	92
Fri 5 May – Mon 8 May	Shenzhen	Shenzhen Museum	41
	Guangzhou	Guangdong Museum	30
Fri 12 May – Mon 15 May	Xi'an	Emperor Qinshihuang's Mausoleum Museum	0
	Zhengzhou	Shaanxi History Museum,	0
		Henan Museum	0
Sat 28 May – Sun 30 May	Hangzhou	Zhejiang Museum (Gushan and Wulin)	74
Total	15	22	807

recorded at least 20 samples or for up to 1 hour of observations, whichever comes first. Data were recorded on Apple's iOS (operating system) in the Numbers spreadsheet (included with this article). iPad Airs with a sufficiently large screen size were used. Separate templates used for collecting data were later merged together into a single file and exported as a comma separated value (csv) file 'workingData.csv' provided in our GitHub repository.

Our data collection files were named with the following naming convention "[City].[CategoryofDigitalSystem][EvaluationPerson].numbers". Examples:

Beijing.i3D.Eugene.numbers and *Guangzhou.i2D.Evelyn.numbers.*

5. Evaluation variables for digital exhibits

These variables were directly relevant to each digital exhibit.

Exhibit ID – coding for identity, e.g., i2D.Beijing.Storytelling, i3D.Chengdu.HeroModels, and etc.

Location of Exhibit – name of museum and the city.

Length of Exhibit – The length of time it took to browse through all contents, including length of video, reading through texts, accessing links, interaction and etc.

Relevance to Contents – the system's use of contents and how it relates to the subject of the museum exhibition. If a system introduces superfluous, unnecessary contents or interfaces that do not contribute to the learning of the contents, the system is judged as not relevant [1], a score of 5 has highly relevant contents, but the contents may be purely informational.

Quality of Exhibit – the quality of the exhibit in terms of its overall design, user interface, system navigation, and 2D/3D contents. This is a subjective evaluation, however, we used the expert panel approach whereby evaluations were carried out by team members who have expertise in the design, development and use of interactive systems. Biases were minimised later and scores agreed upon via debriefing sessions. Our video recordings of digital systems provided a basis for discussions in the debriefing sessions.

Info – used for recording our thoughts and comments on the digital system.

6. Recorded variables for user demographics

Sex – In the case where visitors interacted as a group with digital systems, the sex of the primary user is recorded. Primary user refers to the person who is actively leading the use of the system, regardless of sex, age or social hierarchy.

Age – Age is difficult to judge without deliberately asking the user which we strictly refrained from. We therefore binned the age range: <=12, 12–17, 18–24, 25–34, 35–44, 45–54, 55–64, 65–74, >=75. As our users are predominantly Chinese visitors, the age of the primary user has not been difficult to estimate.

7. Recorded variables for social interaction

Family – ticked if the group appears to be a family, which are usually parents and children and occasionally relatives as determined by conversations.

Discussion – a binary value which records whether any discussions were taking place.

Teaching – if teaching and learning took place between the members of the group.

Guided Tour – is ticked if there is a tour guide leading a group, usually a large group of more than 5 persons.

Photo Taking – is ticked if the users took photos of the exhibit.

8. Recorded variables for engagement and interaction

Description – a record of occurrences during user interactions with as many details as possible for verifying our observations during our debriefing sessions. This includes discussions, user interactions and observed group behaviour.

Is Crowded – the space around the exhibit is crowded.

Queued – for describing situations in which the person intending to use the exhibit queued earlier and subsequently used the exhibit.

Attracts Queue –is observed when a person uses the exhibit and attracted other users to watch or wait.

Time at Exhibit – records the length of time a user spent on the exhibit.

Engagement/Interface – is a subjective observation of a user's or groups' engagement with the content/interface. The description variable provided the details but this variable ranks between 1 being weak and 5 as strong engagement. The TimeAtExhibit variable does not matter here; we were looking for deeper engagements with contents.

We decided that a combined measure is important for data analysis:

0: user did not touch the interface.

1: user touches the interface and quickly moves away.

2: user browses the contents but without further, deeper engagement.

3-4: intermediate engagement.

5: full engagement with contents, the user has accessed most aspects of the interface, reading into contents and engaging deeply with multiple contents within the system, e.g., reading texts, studying pictures, watching videos, interacting with the digital objects during the session.

Acknowledgment

The authors wish to express gratitude to the AHRC Centre for Digital Copyright and IP Research in China, the Ningbo Science and Technology Bureau for supporting the project (Grant References: AH/N504300/1 and 2017D10035).

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dib.2019.104067.

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