Research plan for evaluating service quality of public art museums through on-site survey using IAM scale of three question groups

Momone Iwakiri  
Hiroshima University  
https://orcid.org/0000-0003-0622-8017

Yasutoshi Moteki (✉ moteki@hiroshima-u.ac.jp)  
Hiroshima University  
https://orcid.org/0000-0001-7763-670X

Method Article

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Abstract

We examine the methods for evaluating service quality in public art museums. Specifically, we will conduct a multi-group questionnaire survey of museum users on their satisfaction with the services provided by public museums. Using selective multigroup principal component regression analysis—which combines principal component analysis and multiple regression analysis—we will statistically examine the factors that public art museums should emphasize when providing services to their users. The four-page questionnaire will comprise three groups: hardware (building and interior), software (staff responses), and exhibition content. Each question will be rated on a 7-point Likert scale. We named the survey scale the indicators for art museums' service quality scale. The scale comprises three question groups. The eventual survey will be conducted at the Higashihiroshima City Museum of Art for six business days on the third week of August 2022. Self-administered questionnaires will be distributed to visitors to the special exhibition. We are disclosing our research methods and data analysis procedures prior to conducting the research to prevent hypothesizing after the results are known, and to ensure the transparency of the research. In addition, presenting the details of the research implementation and data analysis methods can promote the accuracy of follow-up and replication experiments. Our proposed scale has the following advantages. First, it is simpler than the existing SERVQUAL-based survey framework, which is a 5-group scale, and is expected to reduce the burden on respondents and increase the response rate in actual surveys. Second, the fact that the opinions of those in charge of art museums were heard from the very beginning of the formulation of the research framework, makes the explanatory power of the analytical model, as expressed in the coefficient of determination of the multiple regression analysis, high for a scale targeting public art museums.

Introduction

Rapid population aging in Japan is slowing the country’s economic growth, and both national and local governments are witnessing a period of economic decline as a result. In response to this crisis, the Ministry of Internal Affairs and Communications has made it mandatory for each local government to formulate a comprehensive management plan for public facilities in a ministerial notice dated April 22, 2014 [1]. Under these circumstances, a review and an active debate have arisen on how museums, libraries, and community centers, including those run by local governments, should be operated in Japan.

We aimed to develop a scale for understanding service quality and customer satisfaction in public and private museums using information from existing research frameworks such as HISTOQUAL and MUSQUAL. The Higashihiroshima City Museum of Art first opened in 1979 on the shore of Nanatsuike ponds in Hachihonmatsu town, Higashihiroshima City. In November 2020, it was moved to its current location in the town of Saio near the city’s central park and City Hall (for the history of the museum, see Higashihiroshima City Museum’s [2]). During its time in Hachihonmatsu, the exhibitions at the art museum were organized by public administrative offices with curatorial qualifications. After its move to Saio, the city government began planning exhibitions, and a designated administrator was assigned to handle public relations and facility management. Currently, there are two general curators at the museum. The relocation of the museum brought it closer the JR-West train station, thus allowing the city to invite traveling exhibitions, including exhibitions by internationally renowned artists.

According to City Hall, the museum receives about 30 visitors to the collection exhibition on weekdays, 50 visitors to the collection exhibition on weekends, 50 visitors to the special exhibition on weekdays, and 150 to 200 visitors to the special exhibition on weekends. The demographics of visitors to the special exhibition and the collection exhibition seem to be dictated by the contents of the exhibitions. For example, according to museum officials, parents and children are more likely to visit the summer special exhibition, while older visitors prefer to see the collection exhibition.

The Higashihiroshima City Museum of Art has been able to receive some feedback to ensure that its offerings are relevant for visitors. Izumi Techno, the designated administrator of the museum, conducted a visitor survey that included an anonymous questionnaire in which the free-text section was emphasized; the staff and management shared their complaints and other information to improve museum operation. A second questionnaire is being developed and aims to focus on lectures and workshops. In addition, the museum’s staff often receive feedback directly from visitors and via the museum’s logbooks.

We are disclosing our research methods and data analysis procedures prior to conducting the research to prevent hypothesizing after the results are known, or HARKing, [3] and to ensure the transparency of the research. In addition, presenting the details of the research implementation and data analysis methods can promote the accuracy of follow-up and replication experiments. We have named the scale the Indicators for Art Museums’ Service Quality Scale, or the IAM Scale. Our proposed scale has the following advantages. First, it is simpler than the existing SERVQUAL-based survey framework, which is a 5-group scale, and is expected to reduce the burden on respondents and increase the response rate in actual surveys. Second, the fact that the opinions of those in charge of public art museums were heard from the very beginning of the formulation of the research framework, makes the explanatory power of the analytical model, as expressed in the coefficient of determination of the multiple regression analysis, high for a scale targeting public art museums’ service quality.

Dissemination plan

After conducting the survey, we aim to disseminate the research results to practitioners and researchers around the world who are interested in evaluating the service quality of art museums. First, we hope to publish the results in an academic peer-reviewed journal. By publishing the results in an open-access online journal indexed in databases such as Web of Science and Scopus, they can be made available for free via the Internet to government practitioners, local residents, and users of facilities that cooperated in the research. In addition, we plan to share the results via press releases in Japanese and English.

Research questions

In this study, we aimed to create a survey that can answer the following research questions:

- The SERVQUAL, which consists of five groups of questions, has been conventionally used to evaluate the service quality of art museums. Yet, the authors wonder if the original three-group questionnaire used for the survey of satisfaction with counter services in Japanese local government offices can
adequately measure the satisfaction of museum users. The three groups of questions are “A. Facilities of the building,” “B. Responsiveness of the staff,” and “C. Contents of the exhibition.”

- By applying the three groups of questionnaires as described, we conducted a service satisfaction survey targeting public art museum users after their visit. We then employed a multiple regression analysis using the synthetic variables calculated (through principal component analysis) from each group to examine which group has the greatest effect on service satisfaction.

- In the survey, questions from the three main groups and questions about variables (e.g., access to transportation, address of users, and age group) are asked. These additional variables will be tabulated and statistically analyzed for their association with the main explanatory variables for satisfaction, as described above. Specifically, these additional variables will be used as the stratification factors.

### Literature Review

The SERVQUAL model, which is widely used in the evaluation of service goods in the private sector, has recently been used to evaluate service quality and customer satisfaction in museums. For example, Parasuraman et al. used the SERVQUAL model’s five dimensions (tangibles, reliability, responsiveness, assurance, and empathy) of service quality determinants to understand service quality and improve customer satisfaction. Buttle [5] notes that the SERVQUAL first appeared in academic articles in 1985. Wilson et al. [6], who recently published the latest edition of a service goods-oriented text on marketing, also mention this technique. From the perspective of creating customer value in marketing, De Ruyter et al. [7] decomposed the service delivery of museums into various stages and argued that the events faced by museum visitors in each stage affect overall customer satisfaction. Moreover, they discussed the effect of each stage on overall customer satisfaction.

In the literature on museums, including art museums, there is a growing body of research on the evaluation of service quality with reference to SERVQUAL. Markovic et al. [8], for example, used a modified version of Frochot and Hughes’s [9] technique to distribute questionnaires to visitors of the Krapina Neandertal Museum, Croatia. They concluded that tangibles, accessibility, exhibition presentation, empathy, and communication are the five dimensions of service quality determinants that can explain perceived service quality of a historical museum. Frochot and Hughes [9] modified SERVQUAL further; their new “HISTOQUAL” research framework was used to assess the service quality of facilities in historic buildings. Hsieh et al. [10] conducted a study of the National Museum of Natural Science in Taiwan by dividing 405 paid visitors into two groups, each with two questionnaires, one before and one after the visit, using a five dimensions survey framework from Frochot’s HISTOQUAL (2001) and Allen’s [11] unpublished work on MUSQUAL scales. They examined the relationships among customer motivation, service loyalty, and museum service quality. Cheng and Wan [12] studied museums in Macao using the HISTOQUAL questions scale. They found that users’ knowledge of art and the type of museum influenced their evaluation of service quality. Maher et al. [13] tabulated examples of SERVQUAL applications in service quality assessment in various fields, including for-profit and non-profit; they also conducted a study applying SERVQUAL to a children’s museum. Kim et al. [14] conducted a survey at a robot museum in South Korea that consisted of multiple questions from four groups of items from the SERVQUAL model—reliability, empathy, tangibility, and responsiveness—in addition to the feelings and attitudes of museum visitors about robots before and after their visit.

Research into service quality in museums has expanded beyond the five defining factors common to SERVQUAL. For instance, Geissler et al. [15] conducted a study in the United States using the focus group method to examine service convenience in museums. They found that perception of service convenience comprises decision, access, and transaction convenience. Caldwell [16] studied 11 major art museums in London, including the British Museum and Tate Gallery, using the repertory grid method in order to grasp the image of museums. In this method, the researcher conducts an interview in front of each museum; the positioning of several museums is recorded and contrasting expressions on their characteristics and nature are cited. The positioning of each museum is entered into a table grid for each interviewee, which is later tabulated. The results of their study showed that users decide whether to visit a museum based on their perception of the museum’s functions and features, and that their perceived image of the museum may differ from the museum’s own self-image and self-perceived features. In other words, their research focused on the gap between users’ perception and the museum’s self-perception, which is usually left unexplored in museum studies focusing on service quality.

### Research Methods

In this study, we plan to conduct an on-site survey by modifying Moteki’s [17] three-group question scale of the on-site survey and Moteki’s [18] online survey, both of which are surveys of governmental institutions; we also use our own three-group question framework of facilities and equipment, staff response, and exhibition content. The self-administered questionnaire survey at the Higashihiroshima City Museum of Art in Summer 2022 will target visitors after they have viewed the special collection. The survey period will be six business days.

Researchers will wait at desks near the exit of the art museum and give visitors an envelope with (1) a letter requesting survey participation, explaining the cooperation agreement between the Higashihiroshima City Government and the affiliated university to create an international research center in Higashihiroshima. The letter will also include a telephone number, the response times for questions during the weekday, and e-mail address of the author as the principal investigator; so that the visitors can inquire about any unclear points in the survey; (2) a questionnaire; (3) an envelope for returning the completed questionnaire; and (4) a ballpoint pen. We can plan to distribute 1,000 questionnaires. The envelopes will be returned immediately after the visitors leave the exhibition room. We do not wish to have visitors answer the questions on the spot to avoid disturbing the lingering atmosphere of the exhibition and to avoid inconveniencing them. Further, the envelopes are returned just outside the exhibition room, instead of the lobby on the first floor, to avoid confusion, as not all visitors to the museum are exhibition visitors. The lobby of the museum is free of charge, and because the museum is located near a park, 30–40% of visitors only use the restroom and do not enter the gallery or pay the entrance fee. We will consider using museum-related goods such as clear files as souvenirs.
An analytical model with the question items for the explanatory variables classified into three groups is shown in Fig 1. The specific questions for Groups A to C and Y are shown in Table 1. Group A has five items about the equipment and interior of the facility. For example, AQ2, "the atmosphere of the building" refers to the atmosphere that visitors feel from the architectural design of the museum facility itself, and AQ3, "the lighting in the building" refers to whether the lighting at the entrance is too bright or too dark, and whether the lighting in the exhibition rooms is bright enough to allow visitors to view the artworks without stress. Group B includes four items about the staff at the museum. Group Y includes three items about overall satisfaction, including whether the visitors learned from their experience at the museum.

Fig 1. Research analysis model.

Data processing and analysis

The authors plan to use confirmatory factor analysis to examine the appropriateness of the grouping of questions and then analyze the main determinants of customer satisfaction by principal component regression analysis, as in Moteki [17].

First, to measure the appropriateness of the questions grouping, factor analysis will be conducted to confirm that the research framework of the three groups is appropriate; this is done based on eigenvalues and scree plots. Then, principal component analysis and multiple regression analysis will be conducted on each question category to examine the determinants of art museum service customer satisfaction.

The method of using factor and principal regression analyses together follows Takahashi's [19] suggestion, who explains how factor analysis can be conducted separately to examine the characterisation of each question item within a group, for a questionnaire on customer satisfaction consisting of multiple groups, and then finally analyzed by principal component and multiple regression analyses. The difference between this paper's method and Takahashi [19] is the purpose and scope of the factor analysis. Similarly, Talib and Shukor [20] conducted a factor analysis for all questions using the same set of questions as SERVQUAL and found that it was appropriate to divide the questionnaire into three groups. In our study, we will use the maximum likelihood method for the factoring method, and the Varimax method for factor rotation. We will also use the Kaiser–Guttman criteria to select eigenvalues greater than or equal to 1. The number of factors determined according to both the Kaiser–Guttman criteria and the scree plot criterion will be compared with the initial assumed number of groups, which is three.

After performing confirmatory factor analysis, we will implement a principal component regression analysis using the three main groups of questions confirmed by the preceding factor analysis. If the confirmatory factor analysis results in a different grouping from the assumed grouping, subsequent analyses will be conducted using both the new and the original grouping.

First, the principal component analysis for each question in category Y will be performed. We will examine the configuration figure showing the positioning of the three questions of the Y category with respect to the first and second components of overall customer satisfaction. The dataset acquires ZY1 and ZY2 of the principal component scores as new variables. Then, we will conduct a correlation analysis between the composite variable of ZY1 and each of the explanatory variables from Groups A to C. The principal components analysis for groups A–C will use the question items with a correlation coefficient of 0.4 or higher. For the question items selected here, principal component analysis will be performed for each group from Group A to Group C. Two composite variables will be calculated for each group and added to the data set.

We will finish with a multiple regression analysis with the principal component scores of the three groups A–C. We will use the variable increasing and decreasing method with synthetic variables generated from the categories of explanatory variable questions (ZA1, ZA2, ZB1, ZB2, ZC1, and ZC2) and then examine the adjusted R-squared value of the model's coefficient of determination and the standardized partial regression coefficients of each explanatory variable. The significance levels for the rejection range of the null hypothesis will be set to 1% and 5%. The value of the variance inflation factor will then determine the risk of multicollinearity for each standardized coefficient. The criteria for these factors, in order of strictness, are 2.0, 5.0, 10.0, etc. We will use 2.0 as our criterion for judgment. A variance inflation factor of the compound variables valued at 2.00 will indicate possible multicollinearity, that is, overlap between the explanatory variables in the questions group.

Table 1. Outline of basic question items in the survey.
| Concept Groups | Question Items |
|----------------|----------------|
| A) Museum equipment (buildings, lighting, and others) | AQ1 (Q3_1) Location (access from home) |
| | AQ2 (Q3_2) Tables and chairs in the building |
| | AQ3 (Q3_3) Lighting in the building |
| | AQ4 (Q3_4) Air conditioning in the building |
| | AQ5 (Q3_5) Ease of understanding the buildings' locations and entrances at the site of the museum |
| B) Software (staff responses) | BQ1 (Q3_6) Politeness of the staff's response |
| | BQ2 (Q3_7) Ease of asking questions to the staff |
| | BQ3 (Q3_8) Ease of understanding oral explanations from the officer in charge |
| | BQ4 (Q3_9) Security guard's response |
| C) Exhibits | CQ1 (Q4_1) I was moved by the exhibits |
| | CQ2 (Q4_2) The exhibits were beautiful |
| | CQ3 (Q4_3) The exhibits were easy to see |
| | CQ4 (Q4_4) The explanatory text on the exhibits was easy to understand |
| | CQ5 (Q4_5) The explanatory text on the exhibits was easy to understand |
| Y) Degree of customer satisfaction with the museum services provided | YQ1 (Q5_1) I am satisfied with my experience at the museum |
| | YQ2 (Q5_2) I was able to learn from my visit to the museum |
| | YQ3 (Q5_3) I would recommend the Higashihiroshima City Museum of Art to others |

**Procedures for conducting research on human participants**

This study is not biomedical research directly covered by the Declaration of Helsinki. However, it will undergo an elective ethical review at our institution in order to ensure that a more appropriate research execution is accomplished before the actual research is implemented. It is to be noted that the affiliated department did not have a research ethics review committee until FY2021 because it specializes in the humanities and social sciences, especially law and political sciences. Any research subject to the Declaration of Helsinki in a strict sense has not been conducted. A pan-university reorganization of departments, however, led to the Graduate School of Human Sciences and Social Sciences being integrated into a larger group; in this group, departments that had traditionally conducted research ethics reviews, such as psychology, were thus included. Beginning FY2022, it will be possible to conduct an ethical review of research that affects society or the subject, such as questionnaire surveys, even if the research topic is not covered by the Declaration of Helsinki. Therefore, this study will apply for ethical review by the research ethics committee of the department to which the researcher belongs, with all research subcontractors as applicants.

The survey is within the scope of a normal social survey, and the question items in the questionnaire are not invasive. However, referring to the three principles outlined in the Declaration, we will prepare a detailed survey implementation plan and questionnaire for the ethical review by the research ethics committee of the graduate school. Before preparing the research plan, the detailed research design will be reviewed by the council's review committee, which includes government practitioners, for funding and evaluating the appropriateness of the overall design.

Finally, the name of the survey and the entity conducting the survey will be displayed on the first page of the questionnaire at two locations in the booth, and questionnaires will be distributed to willing art museum visitors. The enclosed request letter clearly states (1) the purpose of the survey; (2) that the responses are voluntary and that the aggregate results will be used only for academic purposes; (3) the name of the organization conducting the survey, person in charge, address, contact telephone number, and e-mail address; and (4) the procedures to be followed if participants wished to receive the survey results. Points (1) and (2) are clearly stated again at the beginning of the questionnaire, along with the name of the organization conducting the survey. We will also explain that the results of individual responses will not be shared with City Hall, and participants will not be inconvenienced because of the content of their responses. No independent written consent forms will be provided, and questionnaires will be distributed only at the survey booth. The responses will be mailed using enclosed stamped return envelopes. These measures will ensure that participation is voluntary throughout the survey process.

**Limitations**

Despite our measures, some limitations to the study design remain. Importantly, the museum under study is small, which limits the generalizability of the results. According to a Social Education Survey conducted by the Ministry of Education, Culture, Sports, Science and Technology [21], the total number of museums, including art galleries, in the country is 1,286, of which 169 are prefectural, 532 are municipal, 76 are town-based, and 6 are village-based (each includes operation by a designated manager). Municipal museums account for 86.6% of all museums by basic municipalities. The larger a municipality's financial scale, the more museums it has, and the larger the scale of those museums' operations (e.g., the amount of floor space). Ordinary cities that are not
However, the museum under study can serve as a reference for public art museums in other municipalities because the city of Higashihiroshima, which established the museum, is a suburb around a major city whose population has been growing because of municipal mergers and universities and factories. According to the results of the 2020 national census, the population of Higashihiroshima City was 196,608 (Higashihiroshima City Government, 2021), just short of the 200,000 required to qualify as a core city. Museums, including art museums, are one of the urban functions that residents seek in such cases; they are an important public service that local governments must provide in order to continue the growth of the city, which can be gauged by population growth and other factors.

Declarations

The town and gown relation office of an affiliated institution assisted the authors in preparing and formulating this research plan. The Higashihiroshima City Museum of Art provided extensive assistance in reviewing and giving advice on the contents and organizations of the planned survey questionnaire presented in this research protocol. An early draft of this paper was presented orally at the Discovery Summit Japan, held online on December 16, 2021. This work was supported by a subsidy for English editing services provided by the affiliated university.

Competing interests:

The authors declare no competing interests.

References

1. Ministry of Internal affairs and communications. Tokyo Shisetsu Sogo Kanri Keikaku Sararanu Suishin ni Mukete [Toward further promotion of comprehensive management plan for public facilities]. Available from: https://www.soumu.go.jp/main_content/000550090.pdf. 2018.
2. Higashihiroshima City Museum of art. Enkaku [History of the museum]; 2021. Available from: https://hhmoa.jp/facility/history/.
3. Kerr NL. HARKing: Hypothesizing after the results are known. Pers Soc Psychol Rev. 1998;2: 196–217. doi: 10.1207/s15327957pspr0203_4.
4. Parasuraman A, Zeithaml VA, Berry LL. A conceptual model of service quality and its implications for future research. J Mark. 1985;49: 41–50. doi: 10.1177/002224298504900404.
5. Servqual BF: Review, critique, research agenda. Eur J Mark. 1996;30: 8–32. doi: 10.1108/03090569610105762.
6. Wilson A, Zeithaml VA, Bitner MJ, Gremler DD. Services marketing: Integrating customer focus across the firm. 4th ed. UK: McGraw Hill; 2021.
7. De Ruyter K, Wetzels M, Lemmink J, Mattson J. The dynamics of the service delivery process: A value-based approach. Int J Res Mark. 1997;14: 231–243. doi: 10.1016/S0167-8116(97)00094-9.
8. Markovic S, Raspor S, Komsic J. Museum service quality measurement using the HISTOQUAL model. Tourism South East Eur. 2013;2: 201-216. Available from: https://ssrn.com/abstract=2289769.
9. Frochot I, Hughes HH. HISTOQUAL: The development of a historic houses assessment scale. Tourism Manag. 2000;21: 157–167. doi: 10.1016/S0261-5177(99)00045-X.
10. Hsieh CM, Park SH, Hitchcock M. Examining the relationships among motivation, service quality and loyalty: The case of the National Museum of Natural Science. Asia Pac J Tourism Res. 2015;20(sup 1): 1505–1526. doi: 10.1080/10941665.2015.1013143.
11. Allen E. Can the neglect of defining and evaluating service quality in museums be effectively addressed by SERVQUAL? Unpublished MA thesis. The Nottingham Trent University; 2001.
12. Cheng IM, Wan YKP. Service Quality of Macao museums. J Qual Assur Hosp Tourism. 2012;13: 37–60. doi: 10.1080/1528008X.2012.643188.
13. Maher JK, Clark J, Motley DG. Measuring museum service quality in relationship to visitor membership: The case of a children’s museum. Int J Arts Manag. 2011;13: 29. Available from: https://www.jstor.org/stable/41721096.
14. Kim MG, Lee H, Lee J, Kwak SS, Joo Y. Effectiveness and service quality of robot museum through visitors experience: A case study of RoboLife Museum in South Korea. In: 2015 International Symposium on Micro-NanoMechatronics and Human Science (MHS). IEEE Publications. 2015 Nov 23. pp. 1-5. doi: 10.1109/MHS.2015.7438289.
15. Geissler GL, Rucks CT, Edison SW. Understanding the role of service convenience in art museum marketing: An exploratory study. J Hosp Leis Mark. 2006;14: 69–87. doi: 10.1300/J150v14n04_05.
16. Caldwell N. (Rethinking) the measurement of service quality in museums and galleries. Int J Nonprofit Volunt Sect Mark. 2002;7: 161–171. doi: 10.1002/nvsm.176.
17. Moteki Y. Customer satisfaction with Tokyo Metropolitan Government ward office counter services: Confirmatory factor analysis of question grouping and principal component regression analysis. Research Square; 2021a. doi: 10.21203/rs.3.rs-1204123/v1.
18. Moteki Y. Factors determining customer satisfaction with counter services of Local Government offices: On-site survey examining service quality at Higashihiroshima city Hall, Japan. Research Square; 2021b. doi: 10.21203/rs.3.rs-1118972/v1.
19. Takahashi T. Shitsumon-su no ooi anketo chosa no tame no ryogawa inga bunseki [dual-sided causal analysis for questionnaire survey with large number of questions about cause and result]. Paper presented at the Discovery Summit, Japan on November 17, 2020.
Appendix

Appendix: Other Questions in the Questionnaire

Q1: How long did it take from the time you entered the museum to the time you left the exhibition room?

(  ) minutes

Q2: How many times have you visited the museum?

(  ) times

Q6: Please feel free to indicate any areas for improvement in the services provided by the museum.

Q7: Finally, please tell us about yourself.

| Age              | 1. under 10 | 2. 20s | 3. 30s | 4. 40s |
|------------------|-------------|--------|--------|--------|
|                  | 5. 50s      | 6. 60s | 7. 70s | 8. 80s or older |

| Gender           | Male || Female || Other (prefer not to answer) |
|------------------|------|----------|-----------------------------|

| Area of residence | In Higashihiroshima City |
|-------------------|---------------------------|
|                   | Outside Higashihiroshima City in Hiroshima Prefecture |
|                   | Outside Hiroshima Prefecture |

Figures
Figure 1
Research analysis model