Research plan for evaluating user satisfaction of public art museums through on-site survey using Indicators for Art Museums (IAM) scale with three question sections

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Method Article

Keywords: public administration, public art museums, customer experience, factor analysis, principal component analysis

Posted Date: June 30th, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1294097/v2>

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Abstract

We examine the methods for evaluating user satisfaction 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 sections: hardware (building and interior), software (staff responses), and exhibition content. We named the survey scale the Indicators for Art Museums' (IAM's) user satisfaction scale. 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. Our proposed scale is simpler than the existing SERVQUAL-based survey framework, which is a 5-section scale, and can reduce the burden on respondents and increase the response rate. Learning the opinions of those in charge of art museums from the very beginning of the formulation of the research framework also aids in the accuracy of the analytical model to be applied.

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, should be operated in Japan.

We aimed to develop a scale for understanding user 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 Saijo 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 officers with curatorial qualifications. After its move to Saijo, 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 exhibitions, while older visitors prefer to see the collection exhibitions.

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 open-ended 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' User Satisfaction 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-section 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, aids in the accuracy of the analytical model, as expressed in the coefficient of determination of the multiple regression analysis, high for a scale targeting public art museums' user satisfaction.

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 user satisfaction 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-section 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 sections in the questionnaires as mentioned above, we will conduct a service satisfaction survey targeting public art museum users after their visit. We will then employ a multiple regression analysis using the synthetic variables calculated (through principal component analysis) from each section, to examine which of them has the greatest effect on service satisfaction.

- In the survey, questions from the three main sections, and questions about variables (e.g., access to transportation, address of users, and age group) shall be 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 [4]. Buttle noted that the SERVQUAL first appeared in academic articles in 1985 [5]. Wilson et al., who recently published the latest edition of a service goods-oriented text on marketing, also mentioned this technique [6]. From the perspective of creating customer value in marketing, De Ruyter et al. 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 [7].

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 technique [9] to distribute questionnaires to visitors of the Krapina Neanderthal 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 modified SERVQUAL further; their new HISTOQUAL research framework was used to assess the service quality of facilities in historic buildings [9]. Hsieh et al. [10] conducted a study of the National Museum of Natural Science in Taiwan by dividing 405 paying visitors into two groups, each with two questionnaires, one before and one after the visit, using a five-dimension survey framework from Frochot's HISTOQUAL (2001) and Allen's unpublished work on MUSQUAL scales [11]. They examined the relationships among customer motivation, service loyalty, and museum service quality. Cheng and Wan studied museums in Macao using the HISTOQUAL questions scale [12]. They found that users' knowledge of art and the type of museum influenced their evaluation of service quality. Maher et al. 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 [13]. Kim et al. 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 [14].

Research into service quality in museums has expanded beyond the five defining factors in SERVQUAL. For instance, Geissler et al. conducted a study in the United States using the focus group method to examine service convenience in museums [15]. They found that perception of service convenience were comprised of decision, access, and transaction convenience. Caldwell 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 [16]. In this method, the researcher conducts an interview in front of each museum; the positioning of several museums is recorded and contrasting impressions 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 three-section question scale of the on-site survey[17], and Moteki's online survey[18], both of which are surveys of governmental institutions; we shall also use our own three-section 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.

This study is not biomedical research directly covered by the Declaration of Helsinki. This research plan is within the scope of ordinary social research, and the risk of physical harm to individuals who participate is extremely low. The high risk of informational or psychological harms, for which ethical review is especially required in social research, is not high [19]. As shown by the questions, all of which are presented in this manuscript, the questionnaire is not invasive. Regarding an elective ethical review at our institution to ensure that the research plan is appropriate, the department with which we are affiliated does not currently have a research ethics review committee because it specializes in the humanities and social sciences, especially law and political sciences. A pan-university reorganization of departments, however, has led to the Graduate School of Humanities and Social Sciences being integrated into a larger group; in this group, departments that traditionally conduct research ethics reviews, such as psychology, have been included. Beginning in April 2022, it became possible to conduct an ethical review of research that affects the society or participants, such as questionnaire surveys, even if the research topic is not covered by the Declaration of Helsinki. Therefore, this study will apply for elective ethical review by the research ethics committee of the department, to be established, in 2022.

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 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 atmosphere of the exhibition and to avoid inconveniencing the respondents. Further, the envelopes shall be 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.

The name of the survey and the entity conducting the survey will be displayed on the first page of the questionnaire and 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 wish 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 the 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.

An analytical model with the question items for the explanatory variables classified into three sections is shown in Figure 1. The specific questions for Sections A to C and Y are shown in Table 1. Section 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. Section B includes four items about the staff at the museum. Section Y includes three items about overall satisfaction, including whether the visitors learned from their experience at the museum.

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 done in Moteki's study [17].

First, to measure the appropriateness of the questions grouping, factor analysis will be conducted to confirm that the research framework of the three sections 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 suggestion, explaining how factor analysis can be conducted separately to examine the characterization of each question item within a section for a questionnaire on customer satisfaction consisting of multiple sections, and then finally analyzed by principal component and multiple regression analyses[20]. The difference between this paper's method and Takahashi's is the purpose and scope of the factor analysis. Similarly, Talib and Shukor 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 sections[21]. 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 sections, 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 sectioning from the assumed one, subsequent analyses will be conducted using both the new and the original sectioning.

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 sections 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 section, from Section A to Section C. Two composite variables will be calculated for each section and added to the data set.

We will finish with a multiple regression analysis with the principal component scores of the three sections 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, and so on. 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 sequence of steps in the exhibition room was easy to follow.
	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

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, 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)[22]. 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 ordinance-designated or core cities may not have museums, and the Higashihiroshima City Museum of Art, our subject of research, differs from many other municipal museums (operated by ordinance-designated cities or core cities) in terms of size and collections.

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 places; 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

Acknowledgments

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.

Conflicts of Interest. There are no conflicts of interest to declare.

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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 20	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.