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Importance performance analysis for sustainability of reused historical building: Mardin Sabanci City Museum and art gallery

İrem Bekar
Department of Interior Architecture, Karadeniz Technical University, Trabzon, Turkey
Izzettin Kutlu
Department of Architecture, Mardin Artuklu University, Mardin, Turkey, and
Ruşen Ergün
Department of Architecture, Dicle Universitesi, Diyarbakir, Turkey

Abstract

Purpose – This study aimed to design a user-participatory methodology to investigate the post-occupancy sustainability of reused historical buildings and to apply it to a case study.

Design/methodology/approach – This study was designed in four stages. In the first stage, the sustainability parameters and sub-parameters were determined in the reused historical buildings based on the literature. The second stage included a field study in which the current situation of the study area was analysed, and the users were reached using the survey technique. In the third stage, the data obtained from the user participation were analysed with importance performance analysis (IPA) and an IPA matrix was created. The fourth stage included an evaluation of the results of the analysis and the development of recommendations.

Findings – IPA is a supportive method for ensuring the sustainable use of historic buildings. According to the data obtained from the IPA, it was seen that the functional sustainability of the building was achieved to a great extent. At the same time, there were deficiencies in technical and environmental sustainability. In terms of aesthetic sustainability, it was observed that the importance and performance values given by the users were generally consistent with each other.

Originality/value – The originality of this study is that the performance of the reused historical buildings in the process of use was monitored with appropriate parameters, and a user-participated method was proposed that allows improvement suggestions to be developed in line with the results obtained.

Keywords IPA, Sustainability, Historical building, Reuse, Museum

Paper type Research paper

1. Introduction

Historical buildings are cultural heritage values. These buildings are an indicator of the social identity of society, its interaction with climate and geographical features and cultural diversity in the world (ICOMOS, 2011). Historical buildings have hosted different cultures and civilisations and serve as a bridge between the past and the future. The preservation of historical buildings enables the development of a sense of belonging and taking lessons from the past by transferring information about the characteristics of previous societies to next generations (Guerrero Baca and Soria López, 2018). The design of historical buildings is a representation of contemporary culture and lifestyle, as culture impacts the design of an architectural artefact and the surrounding context as a set of beliefs, ethical behaviour, methods and a series of human knowledge. Focussing on historical buildings is essential to understand its impact on the sustainability of cultural identity, indigenous material and craftsmanship expression (Moscatelli, 2022; Mahgoub, 2007; Postalcı and Atay, 2019). Some of these buildings, which cannot meet today's needs over time, may be out of use. For this

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reason, preserving historical buildings without losing their originality in line with the internal and external factors they are exposed to is amongst the most important requirements to ensure their sustainability (Hong and Chen, 2017; Soyluk and Tuna, 2011). It is a universal acceptance that historical buildings, which are an important identity element of the place where they are located, should be protected and that these environments should be reused whilst they are being preserved (Fuentes, 2010; Shehata *et al.*, 2015; Bekar and Kutlu, 2022; Yildirim and Turan, 2012). Reusing also contributes to economic, social and environmental sustainability by preventing the construction of new buildings (Bullen and Love, 2010; Latham, 2016).

The cost of reuse of a historical building is significantly cheaper than the cost of demolition and reconstruction (Kohler and Yang, 2007). Shipley, Utz and Parsons (2006) stated that the adaptive reuse of historic buildings is sometimes more expensive. However, when cultural heritage enhancement and benefits are considered, adaptive reuse is often more cost-effective. Furthermore, the use of historical heritage in touristic functions can be a significant advantage for economic sustainability (Nasr and Khalil, 2022). Johnson (1996) stated that reuse can be achieved in a shorter period of time than the construction of a new building with the same area and similar characteristics. The time savings also benefit economic sustainability. Additionally, the restoration of traditional architecture for reuse increases the demand for local labour, thus contributing to the local economy (Philokyprou and Michael, 2021). Demolition and reconstruction of a historic building instead of reuse can cause various environmental problems. Firstly, demolition of the building causes the generation of various solid wastes. The segregation and transport of solid waste increases energy consumption and greenhouse gas production. The construction of new building elements also causes similar effects. These negatively affect environmental sustainability (Mohamed *et al.*, 2017). The reusing of historical buildings reduces the amount of energy spent on waste materials, material production and transport and also the amount of greenhouse gases produced. Therefore, it contributes positively to environmental sustainability (Langston, 2011; Bullen, 2007). Another contribution of the reusing of historical buildings is sociocultural sustainability. Reusing ensures the continuity of the sense of belonging to the cultural values of the society (Büyükçam and Eyüboğlu, 2022; Takva *et al.*, 2023; Arfa *et al.*, 2022). Historical residential areas provide locals a sense of place, preserve their collective memories and represent both their cultural and individual identities (Butina-Watson and Bentley, 2007). According to UNESCO (2007), reusing historical buildings might guarantee the continuation of social life, which enhances the area's cultural importance and variety. Adaptive reuse strategies that can be adopted by locals would pass the significance of historical buildings on to future generations, increase society identification and contribute to local culture (Wang and Zeng, 2010; Amit-Cohen, 2005; Rudan, 2023; The NARA document on authenticity, 1994). As stated by Chandrakar and Sandeep (2022), adaptive reuse is especially significant since it preserves cultural heritage (otherwise, the buildings would be demolished) and provides novel value and quality living to the local population. However, reusing historical buildings can help preserve a location's social significance to some extent, whilst it may not always stop the displacement of the initial residents of the area (Hong and Chen, 2017).

Physical, economic, technological, functional, or social obsolescence in buildings may require their repurposing (Langston *et al.*, 2008; Kutlu and Ergün, 2021). The choice of the function to be given to building cultural heritage value is very difficult as it requires considering many parameters. Whilst making this decision, the economic, social and physical sustainability of the building should be ensured (Mısırlısoy and Günçe, 2016). The effects of the function given to a building on building sustainability can be analysed using various criteria. Lützkendorf *et al.* (2005) define them as functional performance, technical performance, economic performance, social performance and process performance. Preiser

(2001) groups performance criteria as environmental, economic, functional, physical and service performance. Sanoff (1977) mentions 4 different performance levels: functional, economic, symbolic and structural. Preiser *et al.* (1988) stated that performance dimensions consist of 3 components: technical, functional and behavioural. Aydın and Uysal (2009), on the other hand, discussed the performance dimensions under 3 headings: technical, functional and aesthetic. Whilst all of these criteria are important in determining building sustainability, the sustainability of the reused building is only possible by serving its users (Büyükarslan and Güney, 2013; Bullen and Love, 2010).

The repurposing approach is based on preserving the historic building by using it. At this point, the "user" factor in reusing historic buildings should be considered one of the most decisive factors in ensuring sustainability (Preiser, 2001; Leaman *et al.*, 2010). In fact, the statement "*The conservation of monuments can always be facilitated by using them for any useful purpose* . . ." in Article 5 of the Venice Charter shows that the sustainability of the reused building is only possible with public use. As long as the function given to the building meets the users' needs, it is possible to talk about the sustainability of the building. All the features that reveal the ability of the historic building's cultural, social, physical and spatial characteristics to meet user expectations affect the sustainability of the new function of the building. Historical buildings can be reused for various functions such as educational buildings, commercial spaces or museums (Md Ali *et al.*, 2019; Kutlu and Eray, 2021).

Today, historical buildings are proposed to be used with a new function, but their post-use performance is not monitored. For this reason, it is important to identify and evaluate the low-performance points of the building in terms of its sustainability use of the building. The study proposes a user-participatory method that allows the performance of the reused historical buildings to be monitored with appropriate parameters and improvement suggestions to be developed in line with the results obtained. Thus, a mechanism is created in which the building can be self-monitored and evaluated by the relevant government units or administrators. In this way, it will be possible to take measures against the problems that arise over time before it is too late. In this direction, in this study, importance performance analysis (IPA) method, which has strong advantages in revealing the relationship between user and service, is designed for reused historical buildings. This method was applied to determine the sustainability of the Mardin Sabancı City Museum and Art Gallery with its new function.

IPA was first developed in 1977 as a marketing research technique (Martilla and James, 1977). When the keyword IPA was searched in the Web of Science (WoS) database, it was determined that approximately 25% of the 1,287 studies were related to tourism and 20% to the business. When the search was limited to the field of Architecture, only 7 studies using this method were identified. The full text of the study by Gan *et al.* (2022) could not be accessed and other studies were examined. Kim *et al.* (2018) aimed to analyse and improve the service quality of facilities within the university campus. In line with this purpose, the IPA method examined the service quality of the facilities within the scope of finance, customer, learning and growth and internal process. In the study by Patandianan and Shibusawa (2020), the IPA method analysed the importance and performance of the landscape area in the tourism destination. Yushu *et al.* (2021) aimed to analyse and evaluate the cultural ecosystem services of rural water spaces in Suzhou, China, with the IPA method. Gai *et al.* (2022) aimed to analyse and evaluate the cultural ecosystem service of a park area in Beijing with the IPA method. Roychansyah and Felasari (2018) used IPA to determine the smart city application's city friendliness level and readiness level. Tanyer and Pembegül (2010) evaluated Lütfi Kırdar Congress and Exhibition Centre with an IPA matrix in line with the criteria of "location features, spatial and functional features and technical features." The study area is a place that was transformed from a sports and exhibition area into a congress and exhibition palace. This is the only study that uses the IPA technique for reused buildings.

When researched through the WoS database, one of the most popular multidisciplinary databases used in the scientific research community, it is seen that the frequency of use of the IPA method has gradually increased since 2012. In the data obtained through the research in architecture, planning and design-based disciplines where the IPA method is used, it is seen that the IPA is mostly addressed through the keywords "innovation, sustainable development, sustainability, corporate social responsibility and regional development" (Figure 1). One of the reasons for choosing the IPA method in this study is that the keywords are concentrated especially on the studies conducted in the field of sustainability.

This study applied the IPA method to the Mardin Sabancı City Museum and Art Gallery case to determine the sustainability of reused historical buildings. The original function of the Mardin Sabancı City Museum and Art Gallery building is military barracks. The study aims to reveal the sustainability of the harmony between the museum function and the original military barracks function of the building through user-participatory analysis. The analysis results coincided with the sustainability parameters of historical buildings and suggestions for improvement were made by revealing the strong and weak features of the new function of the building. With this study, it is thought that the IPA method will enable the analysis and evaluation of the sustainability of reused buildings with user participation. In this context, it is thought that the gap between IPA, sustainability and historical building disciplines in the literature can be partially overcome with an integrated method proposal. With this method, user-participatory analyses and repurposing processes, especially for historic buildings whose repurposing process has been completed, will be addressed and arrangements that can increase spatial use values will be possible. It is thought that evaluating the repurposing process of historical buildings with IPA and presenting new arrangements by revealing the deficiencies will increase the sustainability of the use of historical buildings and ensure their efficient use.

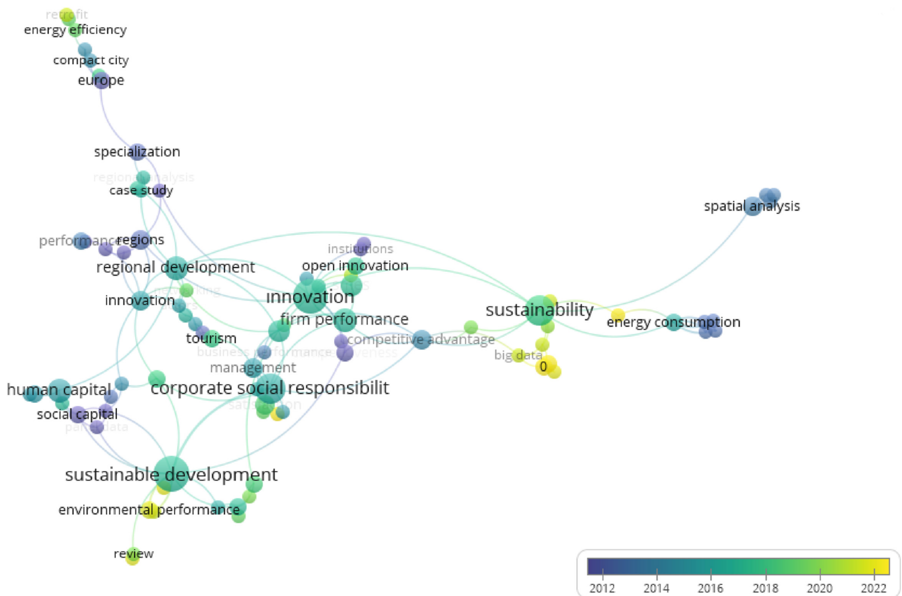

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Figure 1.
Keyword network map

2. Material and method

2.1 Material: Mardin Sabanci City Museum and art gallery

During the reign of Abdulhamid II in the Ottoman administrative system, the innovation of gathering and elaborating the state bureaucracy in a single structure was introduced (Güngör, 2021). This innovation required the construction of structures belonging to the state administration. Government mansions, military barracks, bank buildings and state hospitals were constructed. As a result of this situation, "Mardin Government Square" was formed in the Gül Neighbourhood of the Artuklu District of Mardin, where buildings such as a school, government mansion, hospital and military barracks are located (Figure 2).

Mardin historical barracks building is the first historical building restored in Mardin Government Square in the twenty-first century. It was reopened for use as the Sabancı City Museum and Art Gallery. With this transformation that started revitalising the square, the old government mansion in the Historic Government Square was reused as Mardin Artuklu University Faculty of Architecture. In addition, the governor's mansion in the square was restored to be used for the same function. Reinforced concrete buildings around the square that was not in use and did not reflect the characteristics of the period were demolished from 2005 to 2010. In this context, the restoration of the barracks building is the first historical building that took an important step in making the square what it is today.

Strategically located in the centre of the most important square in the Mardin fabric, the architect of the present museum is said to be Architect Lole, an architect of Armenian origin, who has a significant number of works amongst the historical buildings of Mardin (Olgaç, 2002). In the Ottoman period, military barracks were generally rectangular in plan, arranged around a long corridor, with rooms facing the outside. It is observed that windows of the same number and size were placed on the facades to maintain symmetry (Doğdu, 2002; Bekin, 2010). The old military barracks of Mardin also reflect these generalised characteristics of the barracks built during the Ottoman period. In its original condition, it is a masonry building with a rectangular plan, a two-story main building with a basement and a single-story outbuilding, in the form of an L building, with a flat roof, a main entrance with a portico, built with smooth cut Mardin stone (Figure 3). The main building has a rectangular plan and extends east and west. There are two entrance gates. The door to the north provides access to the upper floor of the two-story main building, which the soldiers used as a dormitory and administration. The door on the south side of the basement provides access to the barn.

Kutlu *et al.* (2022) documented that the building was used as a military barracks between 1880–1991, a tax office between 1994–2003 and a museum after 2009. During this period, the porticoed section and the first floor of the building were demolished and have not survived to the present day. In 2009, the main building was reused as a museum and art gallery (Figure 4).

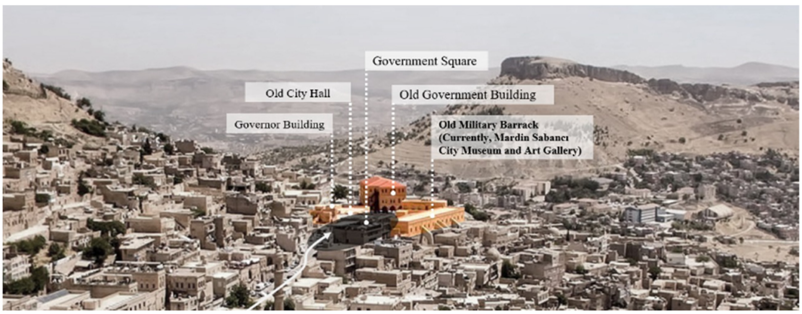

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Figure 2.
Old government square and public buildings surrounding the square

The old outbuilding in its original condition was demolished. A new reinforced concrete building was constructed for the museum's administration and service departments, preserving the outbuildings' boundaries. The spaces allocated to the museum's heating-ventilation centre, services, toilets and storage rooms were designed in the basement of the new reinforced concrete structure.

The ground floor of the main building is used as the city museum exhibition section. Permanent exhibitions of the city museum take place in this space. To preserve the architectural character of the interior space, it was not deemed appropriate to pass the necessary installations for heating-cooling and lighting through the ceiling vaults whilst determining the design for the exhibition. The modular air conditioning units layout placed between the exhibition elements was considered a suitable solution for this building. The interior of the building, covered with high vaults, is planned to be heated homogeneously with the underfloor heating system. In front of the monumental door on the north side, which provides access to the main building, a steel-glass constructed entrance hall for the museum was added, referring to the proportions of the original entrance hall with portico. The entrance hall and the section with a windshield provide access to the stairs that give access to the lower floor. The traces of the old portico arches, including the monumental entrance door, have been preserved in their existing form. From the entrance hall on the north façade, two staircases symmetrical to the door provide access to the basement. In the central hall of the art gallery, a new staircase with a steel system leads down. The lighting system in the museum and art gallery was planned considering that the building is antiquity. In this direction, the lighting of the spaces and units is provided by spotlighting elements on the tension system

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Figure 3. Views of the museum when it was used as a military barracks

Source(s): ©Authors

Figure 4. Plans and images of the museum in its current use

suspended by steel tensioners on the stone arches between the units, extending along the exhibition axes of the museum and art gallery.

2.2 Method: importance performance analysis

The study consists of four stages. The first stage is determining the sustainability parameters and sub-parameters in the reused historical buildings through a literature review. The second stage includes reaching user groups by conducting field studies. In the third stage, the data obtained from the user-participatory approach is presented with IPA analysis. The fourth stage covers the evaluation of the results of the analysis and the development of recommendations. A graphic representation of the stages of the study is presented in Figure 5.

In the first stage, based on the data obtained from the literature, the parameters affecting the sustainability of reused historical buildings were determined. Within the scope of the study, the sustainability of reused historical buildings is discussed under 4 headings: functional, technical, aesthetic and environmental sustainability (Preiser, 1988; Van der Voordt and Van Wegen, 2005; Canbay Türkyılmaz and Polatoğlu, 2012; Yaldız and Asatekin, 2016; Fakıbaba Dedeoğlu, 2019; İlerisoy and Gökgöz, 2023). Sub-parameters for each parameter were then created based on the literature. In this context, there are 16 sub-parameters within the scope of functional sustainability, 9 sub-parameters within the scope of technical sustainability, 9 sub-parameters within the scope of aesthetic sustainability and 9 sub-parameters within the scope of environmental sustainability, totalling 43 sub-parameters (Table 1). All sub-parameters within the scope of functional sustainability, aesthetic sustainability, technical sustainability and environmental sustainability were categorised as parameters specific to museums and parameters for the reuse of all historical buildings (including museums). Museum-specific parameters were symbolised as "X^m" and general parameters were symbolised as "X^r". The X symbolised the notation in the table for functional sustainability F, aesthetic sustainability A, technical sustainability T and environmental sustainability E.

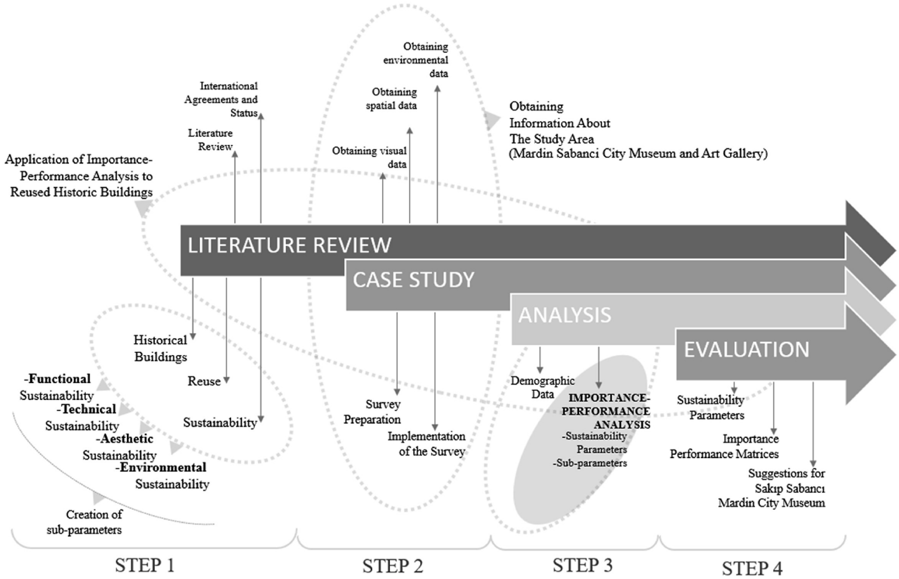

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Figure 5.
Representation of the stages of the study

Functional sustainability	Aesthetic sustainability
F1^{r}: Comfort/suitability of entrance-exit areas	A1^{r}: Visual impact of entrance-exit areas
F2^{m}: Ticket sales area location	A2^{m}: Visual impact of exhibition spaces
F3^{r}: Functionality of the spatial organization of the building	A3^{r}: Occupancy and vacancy rate of spaces
F4^{m}: Suitability of the building for museum function	A4^{r}: View of reinforcements
F5^{r}: Accessibility of spaces	A5^{r}: Layout of equipment
F6^{r}: Dimensions of spaces	A6^{r}: Use and harmony of colour and texture
F7^{r}: Appropriateness of spaces for their purpose	A7^{r}: Visual impact of lighting on the facade
F8^{r}: Flexibility of use of spaces	A8^{r}: Visual effect of lighting on the space
F9^{r}: Adequacy of spaces	A9^{m}: Visual impact of lighting on exhibition elements
F10^{r}: Adequacy and suitability of circulation areas	
F11^{r}: Suitability of the building for disabled access	
F12^{r}: Location of spaces and their relationship with each other	
F13^{r}: Adequacy of equipment	
F14^{r}: Ergonomics of equipment	
F15^{r}: Spatial orientation	
F16^{r}: Adequacy of common areas	

Technical sustainability	Environmental sustainability
T1^{r}: Natural lighting	E1^{r}: Parking facilities
T2^{r}: Artificial lighting	E2^{r}: Suitability for pedestrian transportation
T3^{r}: Natural ventilation	E3^{r}: Availability of public transportation
T4^{r}: Artificial ventilation	E4^{r}: Suitability for private vehicle transportation
T5^{r}: Acoustic	E5^{r}: Functional harmony of the building with its surroundings
T6^{r}: Noise control	E6^{r}: Visual harmony of the building with its surroundings
T7^{r}: Temperature	E7^{r}: Having a reference/description tool in the area where it is located
T8^{r}: Humidity/moisture condition	E8^{r}: Compatibility with the economic environment within the urban fabric
T9^{r}: Safety	E9^{r}: Urban symbol value

X^{m}: Museum-specific parameters
X^{r}: Reused historical building-specific parameters

Note(s): Preiser (1988), Van der Voordt and Van Wegen (2005), International Council of Museums (2006), Canbay Türkyılmaz and Polatoğlu (2012), Yaldız (2013), Yaldız and Asatekin (2016), Fakıbaba Dedeoğlu (2019), Hamida and Hassain (2020), Kalyoncuoğlu *et al.* (2021) and Karaoğlu Can (2021)
Source(s): Created by the authors

Table 1. Sustainability parameters in reused historic buildings

The second stage consists of two parts: obtaining data on the study area and applying the questionnaire. In the data related to the study area, information about the location of the building, old and new functions and current uses of the spaces were collected and visuals of the building were obtained. Whilst creating the questionnaire form, the criteria in Table 1 were used. The questionnaire consists of two parts: demographic information and information on the sustainability of the historic building. Demographic information includes the age, gender and occupational group of the user. In the second section, which includes 43 statements about the sustainability of historic buildings, there is a scale in which the participants are asked to evaluate the importance and performance of the building. The answers to the scale items were graded on a 5-point Likert-type ordinal scale. In this context, a survey was conducted with 106 participants.

The third stage of the study is the analysis stage. In this section, the data obtained from the questionnaires are presented based on the IPA method organised in line with sustainability parameters. IPA is a business research technique developed by Martilla and

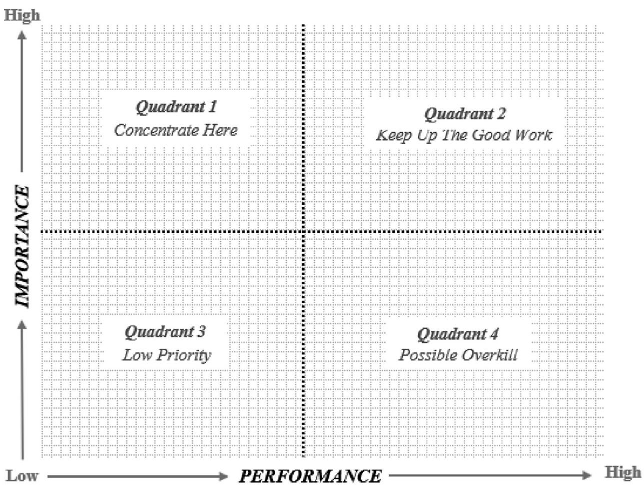
James (1977). The IPA method reveals the strengths and weaknesses of the case under study through the choices made by the users. The main purpose of IPA is to evaluate the relative importance of the features in the case and the performance of these features by the users. An important performance matrix is used to analyse the data. This matrix consists of an x-axis (horizontal) for "performance" and a y-axis (vertical) for "importance". The average of the importance and performance scores of each parameter is calculated by the users and distributed to the 4 cells of the matrix. The locations of the importance performance axes are determined by the averages obtained from the collected data (Martilla and James, 1977; Guadagnolo, 1985; Gonçalves *et al.*, 2014). The graph of the importanceperformance matrix is given in Figure 6.

The cells shown in the matrix are named as those that need to be focussed on, those that need to be protected, low priorities and possible extremes (Martilla and James, 1977). The services in the "must-protect" cell are highly prioritised by users and perform well. On the other hand, the services to be intensified cells are perceived as important by users, but their performance is perceived as low. Services in the low priorities cell are given relatively low importance by users and are perceived to perform poorly. Users perceive services in the possible extremes cell as relatively less important, but their performance is perceived as high. In the criteria in the second and third quadrants, it can be said that the importance given by the respondents to the relevant statements is consistent with the performance.

The fourth stage of the study was realised in three steps. In the first step, evaluations were made regarding the sustainability parameters based on the data obtained from IPA. In the second step, evaluations were made regarding the importance performance matrix. In the third step, based on all these data, suggestions for improving the performance of Sakıp Sabancı Mardin City Museum were proposed.

3. Findings

The findings of the study consist of 3 sections. The first section describes the demographic characteristics of the participants. The second and third sections are the sections where importance performance analyses were performed; in the second section, IPA was applied in



Source(s): ©Authors

Figure 6. Importance performance graph

line with the sustainability sub-parameters (43 sub-parameters), and in the third section, the IPA was applied in line with the sustainability parameters (functional, technical, aesthetic, environmental).

3.1 Demographic characteristics

One hundred six users participated in the study. The gender of the participants was 52.83% female and 47.17% male; the age of the participants was 57.55% between 18–25, 34.90% between 26–40 and 7.55% between 41–65. The participants' occupations were 22.65% public employees, 18.86% private employees, 49.05% students, 5.67% unemployed and 3.77% from other occupational groups (Table 2).

3.2 Importance performance analysis regarding sustainability sub-parameters

Based on the data obtained from the survey results, F3 (4.75), "The suitability of the spatial organisation of the building to the function" was considered the most important amongst the functional sustainability parameters by the users. In contrast, F16 (4.19) "The adequacy of the common areas" was considered the least important. In terms of performance, the highest level of satisfaction was F4 (3.87), "The suitability of the building for the museum function," and the lowest level of satisfaction was F16 (3.06), "The adequacy of the common areas." The highest difference between importance and performance in functional sustainability parameters was F11 (1.40), "Suitability of the building for disabled access," and the lowest difference was F6 (0.57), "Dimensions of the spaces" (Table 3). When the relationship between importance and performance in functional sustainability parameters was examined, all functional parameters demonstrated a performance below user expectations. As museums are spaces used by every user group, every user should be able to easily access this space and benefit from its facilities. However, based on the data obtained, it was observed that the satisfaction of the users was low especially in the issues of "suitability of the building for disabled access, adequacy of common use areas – F11" and "spatial orientation – F15", which have an importance-performance difference of 1 point and above. For this reason, it is clear that these points should be prioritised in order to achieve an importance-performance balance.

Amongst the technical sustainability parameters, T9 (4.81) "Safety" is considered the most important by the users, whilst T1 (4.11) "Natural lighting" is considered the least important. In terms of performance, the highest satisfaction level was T2 (3.62), "Artificial lighting," and the lowest satisfaction level was T1 (3.26), "Natural lighting." The highest difference between importance and performance in technical sustainability parameters was T9 (1.36) "Safety," and the lowest difference was T4 (0.74) "Security" (Table 4). When the relationship between importance and performance in technical sustainability parameters was examined, all technical parameters demonstrated a performance below the user expectation. The fact that five of the nine parameters have an importance-performance difference of 1 point or more indicated that the building cannot provide the expected performance in technical terms.

Participant profile		*N*	%	Participant profile		*N*	%
Gender	Female	56	52.83	Occupation	Public employees	24	22.65
	Male	50	47.17		Private employee	20	18.86
Age	18–25	61	57.55		Retired	–	–
	26–40	37	34.90		Student	52	49.05
	41–65	8	7.55		Unemployed	6	5.67
	66 and above	–	–		Other	4	3.77

Source(s): Created by the authors

Table 2. Demographic characteristics of the participants

Table 3.
Importance performance data for functional sustainability

	Code	Sub-parameters	Importance	Performance	Difference (I-P)
Functional sustainability	F1	▸ Comfort/suitability of entrance-exit areas	4.51	3.66	0.85
	F2	▸ Ticket sales area location	4.43	3.57	0.87
	F3	▸ Functionality of the spatial organization of the building	*4.75*	3.83	0.92
	F4	▸ Suitability of the building for museum function	4.57	*3.87*	0.70
	F5	▸ Accessibility of spaces	4.62	3.81	0.81
	F6	▸ Dimensions of spaces	4.30	3.74	*0.57*
	F7	▸ Appropriateness of spaces for their purpose	4.47	3.79	0.68
	F8	▸ Flexibility of use of spaces	4.43	3.62	0.81
	F9	▸ Adequacy of spaces	4.47	3.60	0.87
	F10	▸ Adequacy and suitability of circulation areas	4.64	3.79	0.85
	F11	▸ Suitability of the building for disabled access	4.70	3.30	*1.40*
	F12	▸ Location of spaces and their relationship with each other	4.43	3.60	0.83
	F13	▸ Adequacy of equipment	4.49	3.60	0.89
	F14	▸ Ergonomics of equipment	4.36	3.58	0.77
	F15	▸ Spatial orientation	4.49	3.43	1.06
	F16	▸ Adequacy of common areas	*4.19*	*3.02*	1.17

Note(s): Italics indicates the highest and lowest values
Source(s): Created by the authors

Table 4.
Importance performance data for technical sustainability

	Code	Sub-parameters	Importance	Performance	Difference (I-P)
Technical sustainability	T1	▸ Natural lighting	*4.11*	*3.26*	0.85
	T2	▸ Artificial lighting	4.53	*3.62*	0.91
	T3	▸ Natural ventilation	4.36	3.36	1.00
	T4	▸ Artificial ventilation	4.21	3.47	*0.74*
	T5	▸ Acoustic	4.26	3.43	0.83
	T6	▸ Noise control	4.60	3.28	1.32
	T7	▸ Temperature	4.58	3.57	1.02
	T8	▸ Humidity/moisture condition	4.70	3.45	1.25
	T9	▸ Safety	*4.81*	3.45	*1.36*

Note(s): Italics indicates the highest and lowest values
Source(s): Created by the authors

For this reason, it was clearly observed that precautions should be implemented especially regarding “noise control – T6, temperature – T7, humidity/moisture condition – T8 and safety – T9”. However, whilst conducting any interventions, the original character of the building should not be damaged.

A2 (4.66), “Visual effect of exhibition areas,” was seen as the most important by the users amongst the aesthetic sustainability parameters. At the same time, A3 (4.26), “The occupancy rate of the spaces,” and A4 (4.26), “The appearance of the fittings,” were the least important ones. In terms of performance, the highest level of satisfaction was A8 (3.68), “Visual impact of lighting in the space," and the lowest level of satisfaction was A1 (3.38), "Visual impact of entrance-exit areas." In terms of aesthetic sustainability parameters, the highest difference between importance and performance was A2 (1.15), "Visual effect of exhibition areas," and the lowest difference was A3 (0.60), "Occupancy space ratio of spaces." (Table 5). When the relationship between importance and performance in aesthetic sustainability parameters was examined, all aesthetic parameters demonstrated a performance below user expectations. Especially the fact that "visual impact of entrance-exit areas – A1" and "visual impact of exhibition spaces – A2" have the highest importance and performance difference indicates that the space does not satisfy the visual expectations of the user. At this point, a deeper research should be conducted on the visual expectations of the user from the space. It is believed that implementing organisations in this regard will be more beneficial in terms of the aesthetic sustainability of the building. Whilst conducting all these organisations, the original visual features of the space should not be damaged and interventions compatible with the original texture should be made.

Amongst the environmental sustainability parameters, E2 (4.60), "Suitability for pedestrian access," was considered the most important by the users. In contrast, E4 (4.04), "Suitability for pedestrian access," and E7 (4.04), "Having a survey/description tool in the area," were considered the least important. In terms of performance, the highest level of satisfaction was E6 (3.94), "Visual harmony of the building with its surroundings," and the lowest level of satisfaction was E1 (2.34), "Parking facilities." The highest difference between importance and performance in environmental sustainability parameters was E1 (2.02), "Parking facilities" and the lowest difference was E6 (0.30), "Visual harmony of the building with its surroundings" (Table 6). When the relationship between importance and performance in environmental sustainability parameters was examined, all environmental parameters demonstrated a performance below the user expectation. The fact that four of the nine parameters have an importance-performance difference of 1 point and above indicated that the building cannot provide the expected performance in environmental terms. It was obvious that the building has a significant performance deficit in terms of environmental aspects, especially in terms of transport and parking facilities. For this reason, in the interventions to be performed around the building, it is necessary to provide arrangements

	Code	Sub-parameters	Importance	Performance	Difference (I-P)
Aesthetics sustainability	A1	▸ Visual impact of entrance-exit areas	4.42	*3.38*	1.04
	A2	▸ Visual impact of exhibition spaces	*4.66*	3.51	*1.15*
	A3	▸ Occupancy and vacancy rate of spaces	*4.26*	3.66	*0.60*
	A4	▸ View of reinforcements	*4.26*	3.47	0.79
	A5	▸ Layout of equipment	4.30	3.57	0.74
	A6	▸ Use and harmony of colour and texture	4.57	3.66	0.91
	A7	▸ Visual impact of lighting on the facade	4.38	3.64	0.74
	A8	▸ Visual effect of lighting on the space	4.47	*3,68*	0.79
	A9	▸ Visual impact of lighting on exhibition elements	4.57	3.60	0.96

Note(s): Italics indicates the highest and lowest values
Source(s): Created by the authors

Table 5. Importance performance data for aesthetic sustainability

	Code	Sub-parameters	Importance	Performance	Difference (I-P)
Environmental sustainability	E1	▸ Parking facilities	4.36	*2.34*	*2.02*
	E2	▸ Suitability for pedestrian transportation	*4.60*	3.21	1.40
	E3	▸ Availability of public transportation	4.45	2.98	1.47
	E4	▸ Suitability for private vehicle transportation	*4.04*	2.74	1.30
	E5	▸ Functional harmony of the building with its surroundings	4.23	3.64	0.58
	E6	▸ Visual harmony of the building with its surroundings	4.25	*3.94*	*0.30*
	E7	▸ Having a reference/ description tool in the area where it is located	*4.04*	3.53	0.51
	E8	▸ Compatibility with the economic environment within the urban fabric	4.17	3.47	0.70
	E9	▸ Urban symbol value	4.34	3.77	0.57

Note(s): Italics indicates the highest and lowest values
Source(s): Created by the authors

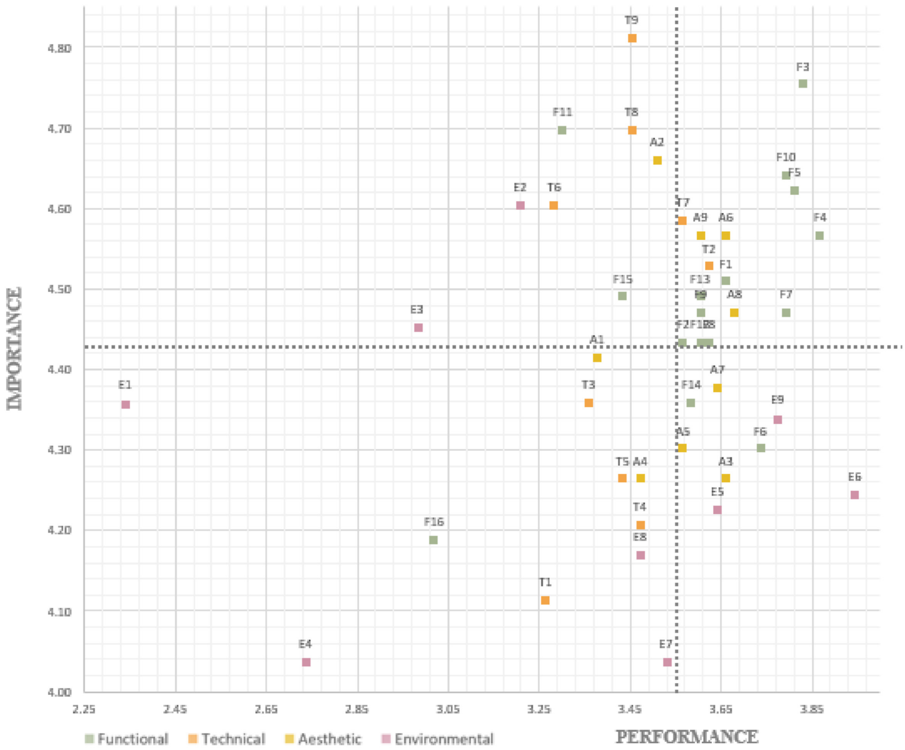
Table 6. Importance performance data for environmental sustainability

for transport conditions, especially parking facilities. Especially since the building has a museum function and historical value, it has a continuous visitor circulation. Failure to provide transport and parking problems has the risk of negative consequences for the sustainability of the building.

An importance performance matrix was created to reveal the sustainability of the reused historical buildings through the example of Sakıp Sabancı Mardin City Museum. According to the IPA matrix, there are 15 criteria in Q2 with both high importance and high performance, 8 criteria in Q1 with high importance and low performance, 11 criteria in Q3 with both low importance and low performance and 8 criteria in Q4 with low importance and high performance (Figure 7).

The comfort/suitability of the entrance-exit areas (F1), ticket sales area location (F2), the functionality of the spatial organisation of the building (F3), suitability of the building for museum function (F4), the accessibility of the spaces (F5), appropriateness of spaces for their purpose (F7), flexibility of use of spaces (F8), adequacy of spaces (F9), adequacy and suitability of circulation areas (F10), location of spaces and their relationship with each other (F12) and adequacy of equipment (F13) are amongst the functional sustainability parameters in the area of need to be protected. Technical sustainability parameters include artificial lighting (T2) and temperature (T7). Amongst the parameters of aesthetic sustainability, the use and harmony of colour and texture (A6), the visual effect of lighting in the space (A8) and the visual effect of lighting on the exhibition elements are amongst the parameters of aesthetic sustainability.

In the area of need to concentrate, there are functional sustainability parameters such as the suitability of the building for disabled access (F11) and spatial orientation (F15). Technical sustainability parameters include noise control (T6), humidity/moisture condition (T8) and safety (T9). There is one of the aesthetic sustainability parameters, the visual impact of exhibition spaces (A2). Amongst the environmental sustainability parameters, there are suitability for pedestrian transportation (E2) and availability of public transportation (E3) amongst the environmental sustainability parameters.



Source(s): ©Authors

Figure 7. Importance performance matrix for sustainability (sub-parameters) of Mardin Sabanci City Museum and art gallery

In the low-priority area, adequacy of common areas (F16), which is one of the functional sustainability parameters, is included. Amongst the technical sustainability parameters are natural lighting (T1), natural ventilation (T3), artificial ventilation (T4) and acoustics (T5). The visual impact of entrance-exit areas (A1) and the view of reinforcements (A4) are amongst the aesthetic sustainability parameters. Amongst the environmental sustainability parameters, there are parking facilities (E1), suitability for private vehicle transportation (E4), having a reference/description tool in the area where it is located (E7) and compatibility with the economic environment within the urban fabric (E8).

In the field of possible extremes, the dimensions of the spaces (F6) and the ergonomics of the equipment (F14) are amongst the functional sustainability parameters. Amongst the parameters of aesthetic sustainability are the occupancy and vacancy rate of spaces (A3), the L-layout of equipment (A5) and the visual impact of lighting on the facade exterior (A7). Environmental sustainability parameters include the functional harmony of the building with its surroundings (E5), the visual harmony of the building with its surroundings (E6) and the urban symbol value (E9).

3.3 Importance performance analysis of sustainability parameters

In the study, the IPA was applied in the context of functional, technical, aesthetic and environmental sustainability by taking the averages of the sub-parameters in the categories related to the evaluations made by the users for each sub-parameter (Table).

Amongst the sustainability parameters, functional sustainability was seen as the most important (4.49) by users and environmental sustainability was the lowest. In terms of performance, the highest satisfaction level was functional sustainability (3.61) and the lowest satisfaction level was environmental sustainability (3.29). The highest difference between importance and performance was technical sustainability (1.03) and the lowest difference was aesthetic sustainability (0.86) (Table 7). When the sustainability parameters were evaluated against each other, it appeared to be consistent that the one with the highest importance has the highest performance (functional) and the one with the lowest importance has the lowest performance (environmental). Whilst making improvements in the sustainability parameters, the results in the tables related to the sub-parameters should be considered. Improvements to be made in the sub-parameters with deficient performance will be effective in providing the significance performance balance of the general parameters.

Based on these data, an importance performance matrix was created for functional, technical, aesthetic and environmental sustainability. According to the matrix, functional sustainability and aesthetic sustainability are the areas that need to be protected. Whilst technical sustainability is the area of focus, environmental sustainability is the area of low priority (Figure 8).

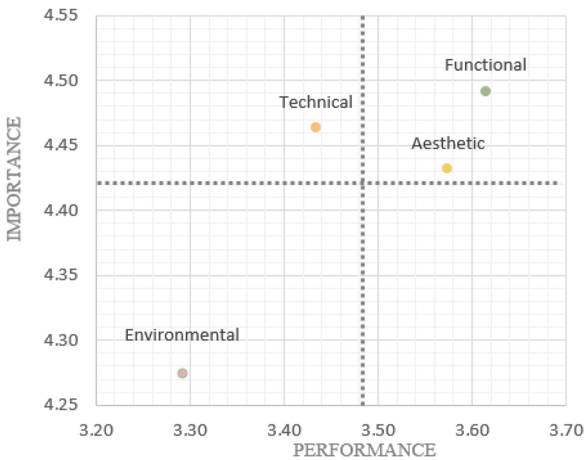
4. Evaluation

The data obtained from the IPA for Sakıp Sabancı Mardin City Museum were firstly evaluated in line with sustainability parameters and importance performance matrixes. After

Table 7. Importance performance data for sustainability parameters

Sustainability parameters	Importance	Performance	Difference (I-P)
Functional sustainability	*4.49*	*3.61*	0.88
Technical sustainability	4.46	3.43	*1.03*
Aesthetic sustainability	4.43	3.57	*0.86*
Environmental sustainability	*4.27*	*3.29*	0.98

Note(s): Italics indicates the highest and lowest values
Source(s): Created by the authors



Source(s): ©Authors

Figure 8. Importance performance matrix for the sustainability of Mardin Sabanci City Museum and art gallery

the evaluations, recommendations for the museum within the scope of the study were presented.

4.1 Evaluation according to sustainability parameters

In accordance with the functional, technical, aesthetic and environmental design criteria, various analyses were conducted to determine the sustainability of the reused building. When the study area was evaluated in line with the sustainability parameters, firstly, a graph of the density distribution of the sustainability parameters in the cells was created (Figure 9). This graph was created by calculating the number of sustainability sub-parameters in each cell and the percentile equivalent of these numbers in the relevant cell.

According to the analysis, it has been determined that functional sustainability and technical sustainability are prominent in terms of sustainability criteria that "keep up the good work". However, environmental sustainability has not been identified based on these criteria. In terms of sustainability criteria that "concentrate here", the following order emerges from the examinations; technical sustainability, environmental sustainability, functional sustainability and aesthetic sustainability. In examinations of "low-priority", it has been determined that environmental sustainability, technical sustainability, aesthetic sustainability and functional sustainability stand out in that order. In terms of "possible overkill", it has been found that aesthetic and environmental sustainability criteria are close to each other and stand out compared to functional sustainability. Technical sustainability has not been identified based on this criterion.

(1) When the data obtained are evaluated in the context of functional sustainability, functional features come to the forefront in those that should be protected (Quadrant 2). This shows that the functional sustainability of the building has been achieved to a great extent. The fact that functional sustainability is least concentrated in the area of low priorities is an indication of the importance that users attach to functional features.

(2) In terms of technical sustainability, the absence of technical features in possible extremes is noteworthy. The technical features are concentrated on the need for intensification and low priorities (Quadrant 1). This also indicates that the technical feature performance in the structure is weaker compared to aesthetic and functional features. Improvements should be made to increase the technical feature performance of the building.

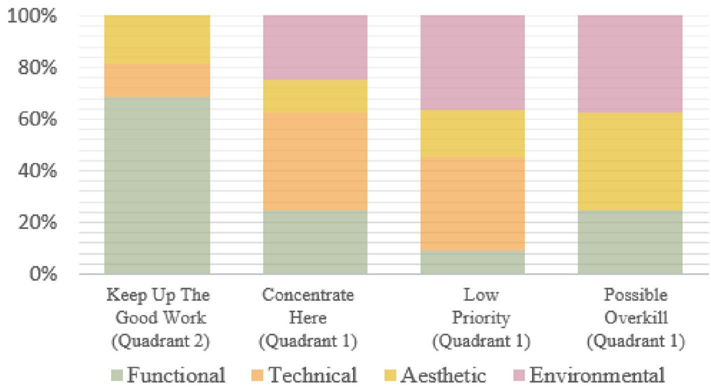


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Figure 9. Density plot of sustainability parameters

(3) When evaluated in terms of aesthetic sustainability, it is seen that aesthetic features are most intense in the area of possible extremes (Quadrant 2). This can be interpreted as a result of the user finding technical and functional sustainability parameters less important.

(4) When evaluated in terms of environmental sustainability, it is seen that environmental features are concentrated in low priorities and possible extremes. This indicates that environmental features are considered less important than other sustainability parameters. No environmental features have been found in the areas that need to be protected.

According to the analysis and evaluations, it can be stated that functional sustainability is the criterion that needs to keep up the good work, technical sustainability is the criterion that needs to be concentrate here, environmental sustainability is the criterion that is considered of low priority and aesthetics and environmental criteria emerge as prominent in terms of possible overkill.

4.2 Evaluation according to the importance-performance matrix

With the implementation of importance-performance analysis at Sakıp Sabancı Mardin City Museum, the performance perceptions of sustainability parameters, as expressed by the users, were compared on a matrix. This allows for more accurate decision-making in managing the performance of parameters, especially those that are identified as lacking. When examining the results obtained from the importance-performance matrix, it can be seen that the sub-parameters in each cell are related to each other. This indicates that the performance of parameters interrelates and supports one another (Figure 10).

(1) The spatial organisation of the building, the adequacy of the spaces, the suitability of the building for the function of a museum, the accessibility of the spaces, the suitability of the spaces for their purpose and the location of the spaces and their relationship with each other are sub-parameters, which are in the area of need to be protected that support and affect each other. Similarly, the suitability of the entrance-exit areas and the location of the ticket sales area can be seen as two sub-parameters that support each other. The visual effect of lighting on the space and the visual effect of lighting on the exhibition elements are amongst the parameters that affect each other in the area to be protected.

(2) The sub-parameters of suitability for pedestrian transportation and suitability for public transportation, which are in the area that needs to be concentrated, also have qualities that support each other. This situation indicates the negativities of the building in both pedestrian and public transportation.

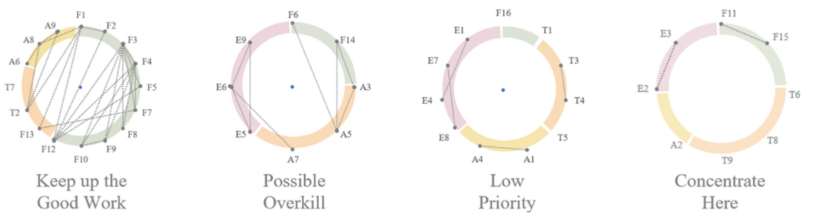

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Figure 10.
Relationship analysis of importance performance matrix sub-parameters

(3) In the area of low priorities, the sub-parameters of parking facilities and suitability for private vehicle transportation support each other. The fact that these sub-parameters are less important than the other environmental parameters related to transportation in those that need to be focussed on can be explained by their appearance in the area of low priority.

(4) In the area of possible extremes, the sub-parameters of the occupancy rate of the spaces and the layout of the facilities both support and affect each other. In fact, the fact that the layout of the equipment is seen positively can be explained by the fact that the occupancy rate of the space is also seen positively.

Based on all of these evaluations, it can be emphasised that the performance indicated by sustainability parameters should not be considered as independent from each other. When considering that each parameter has the potential to influence another, the effects of these interrelationships should not be disregarded in interventions or decision-making processes. It is important to considered the interconnected nature of sustainability parameters and consider their potential impacts when implementing actions or interventions. A stated in the Venice Charter (1964), The Declaration of Amsterdam (1975) and Charter on Charter on The Built Vernacular Heritage (1999) a building can be reuse for the common good and some interventions can be made. However, the historic fabric of the building should not be damaged. This supports the necessity to consider two different sustainability parameters in parallel. For example, it may be mandatory to add a fire escape staircase to the historic building. However, this staircase should be made of materials that do not harm the historical values of the building and should be designed to be dismantled when necessary.

4.3 Suggestions for Sakıp Sabancı Mardin City Museum

Evaluations and recommendations for the regulations to be made in line with the data obtained from the IPA matrix are given below. There is no priority for intervention as the relationship between the importance given to the sub-parameters in the areas of those that need to be protected and low priority, and the satisfaction level is consistent. As for the sub-parameters in the area of possible extremes, it can be said that there is no need for an intervention for improvement since there is a satisfaction level above the expected performance. Since the parameters in the areas that need to be concentrated on are the issues that need priority intervention according to the IPA matrix, in this section of the study, suggestions are made especially for these parameters in Sakıp Sabancı Mardin City Museum.

(1) The most important priority is not to damage the original texture of the building in the interventions to be made about satisfaction in noise control. The museum function should be organised in a way that does not distract the user's perception visually and aurally. At this point, the type of materials to be selected in furniture, such as exhibition elements, seating elements, etc., used in noise control, can be decisive. Soft materials and sound-absorbing materials can be preferred.

(2) The inadequacy of the museum in terms of fire safety can be explained as a result of the lack of a fire escape. For this reason, measures should be taken for fire safety in the building, and the original features of the historical building should not be damaged.

(3) The fact that the visual effect of the exhibition elements does not meet the expectations requires intervention for the exhibition elements. The use of most wall surfaces for the existing exhibition units is thought to be one of the obvious reasons for this situation. Considering the necessity of using the building as an exhibition element as much as the element to be exhibited in the use of historical buildings as a museum and not to prevent the original texture of the building, closing the walls with

exhibition elements contradicts the conservation strategies. At this point, an arrangement can be made for this purpose in the exhibition elements, or transparent materials that will not cover the structure can be preferred.

(4) There are no arrangements for disabled use in the building. The fact that access between floors is provided only by stairs or that there are levels in the transitions between some spaces shows that the building is unsuitable for disabled access. Elevator systems and ramps should be considered an alternative to access between floors and levels without damaging the historic structure. There are no arrangements for the visually impaired to use the museum. At this point, information elements using the Braille alphabet should be used.

(5) Signs and guiding elements supporting spatial orientation were insufficient in the building. For this reason, increasing the positions and numbers of the sign and guidance elements is recommended. The guiding elements should be positioned so as not to damage the original visual texture of the building, and transparent materials should be selected in that direction.

(6) Pedestrian and public transportation are environmental issues with negative usage satisfaction. Due to the congested layout of the historical Mardin urban fabric, the transportation of vehicles in the city is difficult in terms of both traffic density and road width. Although the physical conditions of Mardin make this situation difficult, the highly inclined area is also a museum function. This place transforms its surroundings and creates a memory together with its surroundings. In this context, alternative sub-roads that support pedestrian transportation can be developed at the point where the city museum is located. Inviting roads can be created, and the user can be transported to the museum by experiencing these roads without requiring participation in vehicle traffic. The inability of public vehicles to reach the museum is another important problem, and it is not possible to find solutions for vehicles in the congested historical urban fabric. Therefore, alternatives for pedestrians should not be developed on First Street, where there is a high density of vehicles and pedestrians can access the museum with bridges and staircase designs without being involved in this density.

All implements and organisations should be considered together in order to achieve building sustainability. Neglecting the consideration of one criterion whilst improving another can indeed have negative impacts on sustainability. For instance, the absence of fire resistance in the material used for sound insulation in a building can pose a significant threat to fire safety. It is essential to take a comprehensive approach that consider the interdependencies of different criteria to ensure the overall sustainability and safety of the building.

5. Conclusion

This study presented a methodology to evaluate the repurposing of a historic building using IPA. In order to examine the importance and performance of the historic building by the users, analyses were conducted, and a questionnaire was applied to the users. Within the scope of the determined criteria, the questions asked to the users revealed that the environmental performance of the historic building converted as a museum was poor, and some suggestions were developed for future processes. These suggestions, which were developed by being included in the protection area of IPA, will contribute to the sustainability of the building due to their user-targeted nature.

The parameters determined in this study to determine the sustainability of a reused building and the IPA method can also be used to evaluate a different museum. The extent of the parameters and sub-parameters can be increased or decreased according to the field studies to be performed since each historical building contains its own unique characteristics. Researchers, relevant public institutions, administrators, or architectural designers can also apply this evaluation to monitor the current performance of the building. Taking measures against the problems that arise over time before it is too late will contribute to sustainable conservation action. The data generated during the research process not only defines an assessment method for historical buildings reused as museums but also serves as an alternative evaluation example for historical building types utilised for different functions. However, its application on a building with a different function other than a museum requires re-establishing the parameters. The parameters used in this study for the reuse of historical buildings can serve as a guide for evaluating buildings with different functions. When determining function-specific criteria, such as educational, commercial, or residential purposes, it is important to consider the requirements outlined in national and international regulations. Additionally, for the redevelopment of historical buildings, it is advisable to examine various national and international laws and regulations that highlight the criteria to be considered. It is recommended that both stages progress in parallel, the analysis of regulations and the identification of function-specific criteria.

The study has shown that IPA can be integrated and used more intensively in the field of conservation. As a result of this integration, a user-centred process will be managed in the repurposing process, and the sustainability of the building will be ensured. It is concluded that IPA, which has not been frequently included in conservation processes to date, should be included in repurposing strategies. A decision-making policy should be implemented with the user.

It is expected that this study will guide future studies for the evaluation of the IPA process and determination of the parameters and sub-parameters to be utilised. Consequently, this study has provided a basis for the post-occupancy evaluation of the reuse of historic buildings using the IPA method.

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About the authors

İrem Bekar is an interior architect. She has been Research Assistant at the Department of Interior Architecture, Karadeniz Technical University since 2020. She completed his undergraduate and graduate education at Karadeniz Technical University. Currently, Bekar is a PhD candidate at Karadeniz Technical University in the field of historical buildings, interior quality in historical buildings and indoor sustainability.

Izzettin Kutlu is an architect. He has been Research Assistant at the Department of Architecture, Mardin Artuklu University since 2019. He completed his undergraduate education at Mustafa Kemal University in 2016 as a valedictorian. He completed his master's degree at Gazi University in 2019 about the "Restoration of the İsmail Miroğlu House in Mardin". Currently, Kutlu is a PhD candidate at Gazi University in the field of construction Technologies and structural design of historical buildings. He specializes in construction technologies and architectural conservation in cultural heritages. Izzettin Kutlu is the corresponding author and can be contacted at: izzettinkutlu@artuklu.edu.tr

Ruşen Ergün is an architect. He has been Research Assistant at the Department of Architecture, Dicle University since 2021. He completed his undergraduate education at Mustafa Kemal University in 2016. He completed his master's degree at Eskişehir Technical University in 2020 about the "Investigation of historical Tarsus Kırkkaşık Bedesten for sustainability". Currently, Ergün is a PhD candidate at Dicle University in the field of sustainability, sustainability conditions and comfortable conditions in historical buildings.