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Unlocking Public Engagement in Reused Industrial Heritage: Weighting Point Evaluation Method for Cultural Expression

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Abstract: Industrial heritage has attracted much attention because of its significant historical and cultural values. Nowadays, the functional transformation of industrial heritage buildings, such as museums, parks, and so on, into public-space-oriented buildings has been taking place all over the world. The public users of these public realms become the main audiences of industrial culture. Architects transmit the industrial culture therein to public users by using the design language. However, differences in the public's understanding of design from different backgrounds may affect the attractiveness of the project. The tension between industrial culture and public acceptance becomes a key issue in industrial heritage renovation. The proposal of the "weighting point evaluation method" is the aim of this study, which demonstrates the usability of this mathematical and statistical method for the assessment of the cultural expression aspect in the renovation of industrial heritage. Such a quantitative assessment method is used to find the strengths and weaknesses that exist in the project, thus providing a reference point for optimizing future development. The methodology was applied at the Dalian Industrial Culture Exhibition Hall to demonstrate its validity. The results of the methodology in practice identified four aspects of the experience of public users concerned with the case and, at the same time, identified the strengths and weaknesses of the project in terms of cultural expression, providing an important reference point for further optimization in the future. Moreover, it also demonstrates flexibility and generalizability in responding to different expressions in different projects due to the variability of the weighting judgements of the methodology.

Keywords: revitalization of industrial heritage; industrial culture; material industrial elements; cultural expression; public acceptance; weighting point evaluation method

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1. Introduction

As the major cities have been heavily built up in recent years, there is a growing aesthetic fatigue towards "urbanization" [1,2]. The rapid growth of industry has led to the rise and fall of industrial buildings [3–5]. Numerous obsolete industrial buildings have become a valuable resource for cities. Although their functional life for manufacturing has ended, the structural and cultural life within the built environment can still coexist [6,7]. This has led to an increase in the value of reusing industrial heritage, which serves the dual purpose of preserving historical and cultural features of the locality and meeting contemporary city and resident requirements [8,9].

Although industrial heritage renovation has been widely practiced and researched globally [10], there are still many projects that are struggling to stay alive because they have not received the public's favor, and some have even been forced to close again. Industrial culture distinguishes between the reuse of industrial heritage and other buildings [11–13]. When discussing the issue of industrial heritage renovation, the preservation and promotion of cultural characteristics are regarded as the unshakeable core objectives of the transformation process [14]. Thus, the public's misunderstanding of the industrial culture

of the renovation project will have a direct impact on their experience of the building [15]. Therefore, the post-occupancy evaluation of the cultural expression of industrial heritage renovation has become an important indicator of the success of projects.

Although designers are always cautious and respectful when dealing with industrial heritage projects, striving to preserve their original features and characteristics during the renovation process, conflicts between architects and building users in terms of information transfer and understanding still occur from time to time [16]. This is because the design language itself has its uniqueness and indirectness, which is different from the direct expression of texts or images [17,18]. The design language encompasses rules for how individuals interact with architecture, which should be suitable for local customs, society, and climate [19]. A design language is visual and tectonic, typically stemming from available materials and their human applications [20]. Various design languages correspond to distinct architectural traditions or styles. The issue is that not all design languages are adaptable to human sensitivities. The level of understanding of the design language by individual sensitivities varies due to the different experiences and backgrounds of each person [21]. This "indirect" language form leads to the complexity and uncertainty of information transfer, which increases the difficulty of communication and understanding between designers and public users. It is therefore important to conduct an in-depth assessment of the practical utility of cultural expression in industrial heritage renovation [22]. Such an evaluation can not only extract valuable experience from existing successful cases and provide useful reference for future projects but also identify problems and deficiencies in current projects and provide directions for subsequent improvement and optimization.

This study aims to propose a methodology for identifying the strengths and weaknesses in the public acceptance of cultural expressions in industrial heritage renovations. The direct object of this study is the public, who have been involved in the use of the project. The public is the starting point of this study, in order to understand the real feelings of the users towards the project. The difficulty of this study lies in the statistics and analysis of public perception data. In this process, the statistical methods used not only need to be able to quantify the qualitative feedback from the public, but also need to be able to balance the different factors of feedback from different individuals' perceptions of the project.

This study begins with the theory of symbolic representation of industrial culture in the renovation process of industrial heritage, as well as the public's reception and understanding of these industrial culture symbols. Then, the methodology and principles of operation of a "weighting point evaluation method" based on a weighting algorithm will be clarified for the quantitative analyzing the public's evaluation data in industrial heritage renovation projects. Finally, the Dalian Industrial Culture Exhibition Hall (DLICEH), in China, will be used as a case study to explore the problems and strengths of the project in terms of industrial expression, thus illustrating the advantages of this method in the collation of the factor set and the determination of the weights of the individual influencing factors.

2. Industrial Culture Attitude

In recent decades, there has been growing acknowledgement of the necessity to conserve the outdated remnants of former industrial buildings, due to their significance in industrial culture [23–26]. Industrial culture encompasses various aspects, and almost all human activities can be linked to local culture [27,28]. Culture is an abstract concept that exists in the minds and habits of societal members [29–32]. In this manner, culture can be perceived as social assumptions that are collectively shared by a particular region. Unconscious assumptions have an impact on the decision making and behavioral patterns of individuals in this region [33,34]. Socially accepted norms shape the conduct of organizations and individuals, conforming to the expectations of this area [35,36]. Industrial culture is defined as a dynamic phenomenon in which past and present industrial manufacturing is integrated into the physical environment, social structures, cognitive abilities, and institutions of humans [37]. It is a phenomenon that occurs in a particular location at a specific time in relation to specific artifacts from a previous era of industry. Industrial buildings are

the sites where assumptions and phenomena occur and are manifested. Similar to texts, images, songs, and video data, industrial heritage serves as evidence of industrial history and culture [38]. Therefore, future generations will have an improved understanding of the historical culture through industrial heritage.

People come to understand the abstract concept of culture through their understanding of physical things. This process is divided into the symbolic side of culture and the acceptance side. It is worth mentioning that people's understanding of the concept of culture is not uniform, which may create a gap between the base and the desired situation.

2.1. Cultural Symbol: Tangible Industrial Elements

The research on industrial culture has generated much discourse, prompting inquiries into how evidence of industrial culture can be unearthed from industrial sites [39]. The solution involves materializing the abstract concept of culture in order to search for and refine the carriers of culture in industrial heritage. Culture can be categorized into two types: tangible and intangible [40]. Usually, tangible elements provide evidence of intangible culture [41,42]. Industrial culture is attached to the industrial heritage. The abandoned machinery, walls, structures, materials, landscapes, and styles are valuable resources for historical culture research [43,44]. The construction of historical industrial buildings certainly carries a specific period of technology, social background, lifestyle, etc., and the tangible components (elements) of industrial heritage carry the industrial culture [12,38,44–46]. In other words, it is through the tangible elements of industrial heritage that people identify industrial culture and explore history. These elements also intuitively give the public a sense of history and industry.

This study puts forward the concept of "tangible industrial elements". When examining a former industrial building, tangible industrial elements may offer indications of the industrial culture present. Tangible industrial elements can be seen as more specific units within a complex architecture, capable of pinpointing specific embodiments and evidence of industrial culture. This concept is a good answer to the question of what the cultural values in an industrial heritage are and where exactly they are embodied. Tangible industrial elements, which comprise the material components of architecture and the built environment, can be differentiated from non-material or intangible elements such as manufacturing techniques and enterprise culture [40,41,47]. Nevertheless, tangible industrial elements could encompass both tangible and intangible meanings: firstly, those that have a direct functional use for building or manufacturing; secondly, those that have a symbolic meaning. Industrial culture is frequently conveyed through architectural elements, such as space, types, and surfaces, which can be regarded as a language used by architecture to communicate with people [48]. When a factory shuts down, its industrial culture can be preserved in its architectural components and thus its tangible industrial elements become essential in facilitating people's comprehension and recognition of their history. Tangible industrial elements may exhibit historical traces of industrial manufacturing technology, production, and living activities. Therefore, in the process of reusing industrial heritage, the concept of tangible industrial elements may express abstract culture with the assistance of physical components.

Architects have found that by focusing on the concept of tangible industrial elements, they are able to better analyze and inform decisions about what to retain and what to demolish when undertaking reuse projects [49–51]. The significance of these tangible industrial elements has expanded with the evolving industrial culture. In the early years, the core values of industrial culture were mainly focused on its dimension as a form of historical cultural heritage. During this period, the preservation and restoration of industrial heritage was dominant, with the aim of ensuring that this tangible cultural heritage would be remembered and passed on to future generations as a testament to history. Today, the meanings of industrial culture are gradually beginning to blend historical culture with the new life of industrial heritage. The concept of industrial culture in this new era promotes the view of industrial heritage as a cultural resource with unlimited potential,

rather than as a mere remnant of history. When dealing with industrial heritage, it is not a question of whether "new is better than old" or vice versa, but rather the importance of showcasing the historical culture's value and reflecting the integration and innovation of old and new. Industrial culture includes not only historical culture but also the fusion of historical elements that are transformed into new uses. By integrating old tangible industrial elements with new ones, a hybrid culture can be created, and this integration allows the two types of elements to amplify their respective strengths. This can present a new aesthetic and freshness to users whilst also endowing the project with a unique character and identity and the creation of a new culture, based on history, that can meet the new needs of a new era [52].

2.2. Cultural Acceptance: Public Users

The promotion of an industrial culture is a key factor in sparking interest in exploring industrial heritage [53,54]. Users of these renovated projects play a crucial role in transmitting and perpetuating the industrial culture. To ensure the sustainability and vitality of revitalized projects, a seamless flow of communication and active engagement between industrial culture and the public is essential. Architectural revitalization leaders have the responsibility to present the industrial culture objectively and understandably to the public. Architects need to disseminate these specialized cultural stories in a popular manner. Nowadays, numerous projects are presented to the user via direct text or multimedia illustrations. Alternatively, they are presented by creating an architectural atmosphere that stimulates the users' imaginations.

Incorporating industrial culture within architectural design through the creation of a unique spatial ambiance constitutes a sophisticated design strategy, deeply rooted in the nuances of design language. This approach fosters a multifaceted perception of shared spaces among individuals from diverse backgrounds, thereby eliciting a sense of delight and satisfaction in the end-user [55]. The underlying rationale lies in the tendency for industrial-to-civil building conversions to preserve elements of industrial manufacturing that are inherently unconventional and atypical of conventional civil structures [13]. This divergence triggers a cognitive process of association and imaginative engagement among occupants, who are inherently drawn to novel environments [56,57].

The object of this study is industrial heritage buildings transformed into the public realm, in which the users are the public. Anyone is welcome in this space, and people come on their own initiative without any pressure. This also excludes passive participants, such as the staff here, who "have to" use the building because the building supports their lives. The success of industrial heritage revitalization efforts depends on the level of acceptance of the project by the public users, especially in terms of industrial culture. Specifically, it involves understanding the tales of the diligent individuals, their hardships and accomplishments, and the influence they had on the local community. By highlighting these stories, renovated industrial heritage can create a strong sense of connection between the past and the present, fostering a genuine appreciation among users [58]. Moreover, the effectiveness and advertisement of schemes to re-establish industrial heritage can be boosted through the meticulous integration of educational and interactive features, affording users the opportunity to fully immerse themselves in the industrial culture. One way to accomplish this goal is by creating informative displays, showcasing interactive exhibits, and hosting workshops and guided tours. By providing educational experiences, the restored industrial heritage goes beyond being solely a physical space, becoming an interactive platform for visitors to discover, learn, and engage with the historical impact and technological expertise of previous industries. However, these approaches to the process of transforming industrial heritage do not ensure that the project is sufficiently attractive to the public. The cultural needs and perceptions of public users vary from project to project, and public perceptions are constantly evolving as society develops. Therefore, the expression of industrial culture needs to be timely and in line with the public's tastes [59].

Evaluating projects from the perspective of the public can provide designers with a basis for future design, enabling more intricate and coherent expression while preserving the intended meaning. By considering the requirements and inclinations of the intended audience and integrating them with the features of the industrial legacy, designers can develop solutions that will be valued by a diverse user base. Designers may take pride in achieving self-actualization through their projects, incorporating new technologies, presenting visually striking forms, and so forth. However, they must acknowledge that architecture is intended to serve users, and that creating a culturally significant structure that can be comprehended by all is essential to the preservation and continuation of industrial heritage [60]. As cultural receptors, users will therefore play a vital role in heritage revitalization.

3. Methodology: Weighting Point Evaluation Method

Obtaining feedback from public users on the use of industrial heritage is the basis for the establishment of a database. The collection of user feedback allows individuals from diverse backgrounds to share their evaluative opinions after being inspired and participating in a project. Subsequently, the key to the study is the processing of these feedback data. In the field of post-occupancy evaluation (POE), there are multiple factors that need to be considered to measure a project, and each factor varies in content and importance depending on the project [61,62]. Studying the interplay among various factors will be crucial to comprehensively evaluating the project [63]. Currently, the main method used as a POE of buildings is the multi-factor evaluation method, specifically the analytic hierarchy process and the fuzzy comprehensive evaluation method [64,65]. However, these methods also have their own shortcomings. For example, in the statistical operations of these methods, weights are determined by combining external factors (e.g., expert scoring) and are therefore subjectively influenced [64,65].

Overall, a good multifactor evaluation method should be able to address the following issues:

- How to decide what all the influencing factors are and make sure they are well-rounded in terms of the dimensions of the study.
- How to determine the weight of each influencing factor in the comprehensive evaluation result.
- How to quantitatively describe the public's qualitative assessment.

The weighting point evaluation method is an improvement of the traditional multi-factor evaluation method in the above three issues. Its practical steps are listed below:

(1) Interview

To investigate the cultural expression of a project based on public feedback, an interview is necessary in order to obtain the opinions of visitors after they use the building. The researcher will need to interview random individuals who have finished using (visiting) the building at the exit of the project. The interviews consisted of two main aspects: the items that users were most impressed by, and the users' comments on these impressed items. This type of interview differs from the conventional questionnaire format in that it has fixed questions and items. This requires the researcher to do more during the interview process to build a more comprehensive database for the study. Specifically, firstly, the interviewer asked the respondents the question: "Please talk about your feelings on the aspects that impressed you after the visit". After answering such open questions, interviewers will categorize "impressive items" based on the respondents' descriptions; at the same time, interviews will be required to rank the level (satisfactory, normal, or unsatisfactory) of the corresponding item based on the respondent's description. Finally, the categorization of "impressive aspects" and evaluation ratings should be fed back to the respondent for verification.

(2) Establishing factor and evaluation set

This step is a quantitative collation of the qualitative data obtained from the interviews and supports further calculations. Firstly, the "impressive items" of interest to the respondents are listed, and a factor set is formed for the evaluation of the project. The perceptions of individuals are different, and the collection of preferences from a large number of individuals allows for a more fully rounded set of factors to be obtained from different users. Thus, a collection of the factor sets that are relatively non-subjective judgements can be formed. In other words, this approach gets at what public users are concerned about. It is based on actual data and undermines subjective judgment. Let us suppose that a total of m impressive items are collected, the factor set F is established as follows:

$$F = \{F_1, F_2, \cdots, F_m\} \tag{1}$$

Then, the determination of the weighting of the impact of each factor $(F_1, F_2, \cdots, F_m)$ on the assessment of project satisfaction is also derived from interviews with public users. The frequency of mentions of each influencing factor can be used as a basis for determining weights. For instance, if a factor was mentioned more frequently, it should have a greater impact on the comprehensive evaluation results. Thus, the weight can be determined by calculating the proportion of times each influencing factor is mentioned by the respondents. This better avoids the problem of weight determination relying on subjective judgement as described above. The weight set is denoted by W, and the weights corresponding to each factor are as follows:

$$W = \{W_1, W_2, \cdots, W_m\} \tag{2}$$

Finally, the rating score for each factor comes from the sum of the number of levels individuals rated for the same factor. For example, suppose that there are n individuals mentioned the factor F_1 in the interview. Then, the evaluation score of F_1 at each level is the percentage of those n individuals who rated it satisfactory, normal, or unsatisfactory, respectively. The study used this to quantify the evaluation scores for each factor and to form an evaluation set, as shown in Table 1.

Table 1. The evaluation set (by author, 2024).

Factor Set	Satisfactory	Normal	Unsatisfactory
F_1	--	--	--
F_2	--	--	--
...	--	--	--
F_m	...	...	...

The evaluation set is described as E, in matrix form as follows:

$$Matrix\ E = \begin{bmatrix} F_1S & F_1N & F_1U \\ F_2S & F_2N & F_2U \\ \cdots & \cdots & \cdots \\ F_mS & F_mN & F_mU \end{bmatrix} \tag{3}$$

(3) The calculation

After establishing datasets, the individual quantized sets are subjected to matrix operations. A project's evaluation results can be obtained:

$$f(x) = W \times Matrix\ E \tag{4}$$

The result of the weighting point evaluation is a score, and the comparison of scores enables the identification of strengths and weaknesses of different projects.

4. Practical Application

4.1. Case Selection

Dalian Refrigerator Factory, relying on the advantages of Dalian's port trade, has become China's leading manufacturer of refrigeration compressors since the 1930s. After nearly a century of construction and development, the factory site now has approximately 180,000 square meters and over 40 buildings, which are centrally located amidst residential areas, hospitals, businesses, offices, and schools [66].

Due to industrial development and urban regeneration needs, the Dalian Refrigerator Factory moved away to the suburbs of the city in 2017, leaving behind industrial relics to be reused as places of culture, entertainment, and learning; offices; meeting rooms; etc., becoming a comprehensive urban place that opened in 2021. Inside the site, a well-preserved workshop, built in 1959, serves as a museum of industrial culture after the revitalization [66]. The purpose is to spread the enterprise culture of Dalian Refrigerator Factory and popularize the industrial knowledge of refrigerator manufacturing, named the Dalian Industrial Culture Exhibition Hall (Figure 1). Its functional area is only 2500 square meters and consists of four main areas: a manufacturing equipment exhibition area, a science experience area, a lecture hall, and a souvenir store and café (Figure 2).

Figure 1. The red brick building of the DLICEH, preserved from 1959 (by author, 2024).

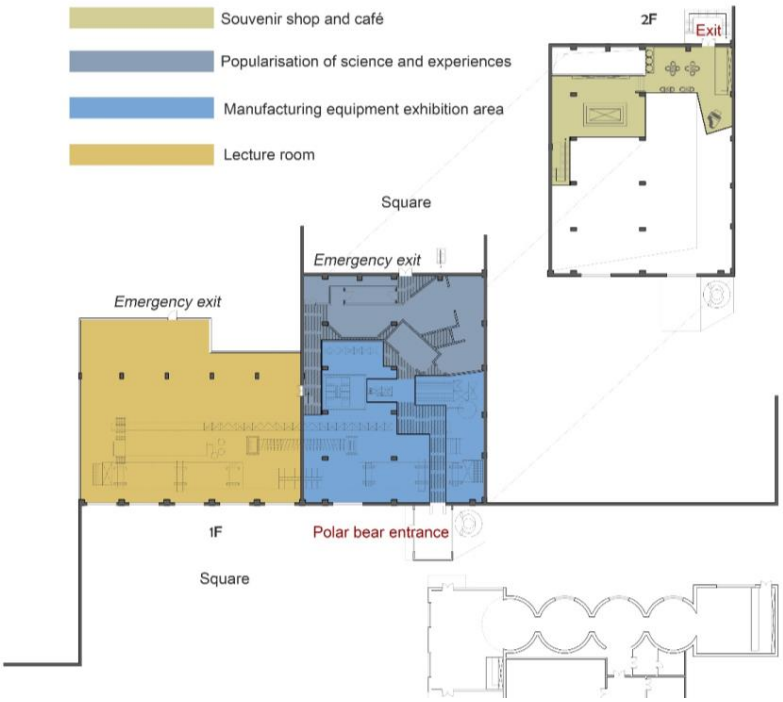

Figure 2. The functional layout of the DLICEH (by author, 2024).

The DLCEH, transformed from an industrial heritage building into a culture exhibition hall, is used as a public space in the city, and its visitors can be identified as public users, which is in line with the setting that the direct target of the study. Dalian is a pioneer in China for its transformation from an industrialized city to a tourist city [67], and its strong tourist population provides excellent support for data collection for this study. In addition, the project was completed and opened to the public in 2021, which was during the global crisis of the COVID-19 pandemic, when public spaces were restricted in terms of visitors, and now there is a need to test its publicness.

4.2. Establishing Factor and Evaluation Set and Weights

Researchers conducted detailed interviews with visitors to the DLCEH, resulting in a valid sample size of 147. Of these 147 respondents, the statistics ended up with 246 evaluations about the 4 factors (namely, cultural thematic expression, commercial and leisure operations, spatial visual creation, and interactive experience), because most of the respondents did not describe a single impressive factor. The results of the interview are as follows:

(1) Cultural thematic expression

After the interview, 69 respondents discussed the refrigeration equipment exhibit theme for the exhibit. The theme of machinery related to the manufacturing of refrigeration compressors was recognized by most of the respondents, who believe that Dalian, as an important industrial city, needs to have such a scientific display. However, several respondents described it as "excessively technical", "overly professional", and "incomprehensible to children". Indeed, the production technology of refrigeration compressors may be perceived by many as a highly specialized industrial system, which may not be easily accepted by some individuals. The number of persons recognized at different levels is shown in Table 2.

Table 2. Number of persons evaluated in terms of cultural thematic expression (by author, 2024).

Factor Set	Satisfactory	Normal	Unsatisfactory
F_1 Cultural thematic expression	49 persons	12 persons	8 persons

(2) Commercial and leisure operations

Although the project is a place for exhibition functions, many visitors are impressed by the souvenir store. The data show that this space received feedback from 70 individuals. It was the most commonly commented-on influencing factor. At the exit of the building, at the end of the tour, visitors arrive at a fusion space containing a souvenir shop and a café. Situated on the mezzanine level, this area follows a similar industrial style décor as the display area and blends in with the spaces throughout the workshop (Figure 3). According to the respondents, the space offers a wide range of souvenir goods, an authentic industrial atmosphere at the café, and creative cakes. A total of 25 participants noted that they had visited the store repeatedly to acquire souvenirs and enjoy the innovative café. The space and product are recognized by most, as shown in Table 3.

Table 3. Number of persons evaluated in the commercial and leisure operations (by author, 2024).

Factor Set	Satisfactory	Normal	Unsatisfactory
F_2 Commercial and leisure operations	65 persons	5 persons	0 persons

Figure 3. Souvenir shop and café (by author, 2024).

(3) Spatial visual creation

Spatial visual creation is one of the most important factors in identifying industrial heritage renovation projects [68]. In line with numerous projects aimed at preserving industrial heritage, the DLICEH's buildings and sizable facilities have been maintained in a respectful manner. The red-brick factory, built in the 1950s, has been maintained in its original form with its large machines on display. It transports visitors back in time providing them with a sense of the past captured in a time capsule, rather than being shown a mere collection of abandoned artifacts. A total of 59 respondents provided feedback on the spatial visual creation of the project. Respondents frequently used phrases such as "photo sharing on social media" and "visual shock of industrial style". However, a few participants found the industrial style unappealing, with four individuals describing it as "depressing" due to the old machinery and dim lighting. The specific statistics are shown in Table 4.

Table 4. Number of persons evaluated in terms of spatial visual creation (by author, 2024).

Factor Set	Satisfactory	Normal	Unsatisfactory
F_3 Spatial visual creation	56 persons	0 persons	3 persons

(4) Interactive experience

A well-executed interactive experience can aid visitors in comprehending the theme and culture, as demonstrated in numerous museums [17]. In the exhibition space, the curator has designed interactive programs such as cartoon animation demonstrations, ice-making experiences, and so on. A total of 48 people commented on the interactive experience aspect, and their views were mixed. Although the public is more satisfied with the existing interactive experience, there are many people who think that there should be more interactive experience. The evaluation results are shown in Table 5.

Table 5. Number of persons evaluated in terms of interactive experience (by author, 2024).

Factor Set	Satisfactory	Normal	Unsatisfactory
F_4 Interactive experience	28 persons	13 persons	7 persons

4.3. The Calculation of the Weighting Point Evaluation Method

According to the description of the in Section 3, combined with the number of persons recognized at different levels, the quantitative evaluation set can be obtained through the percentage of the number of persons at the evaluation level, as shown in Table 6.

Table 6. The evaluation set for the DLICEH (by author, 2024).

Factor Set	Satisfactory	Normal	Unsatisfactory
F_1	71.01%	17.4%	11.59%
F_2	92.86%	7.14%	0
F_3	94.92%	0	5.08%
F_4	58.33%	27.09%	14.58%

From this, the matrix model can be created:

$$Matrix\ E = \begin{bmatrix} 71.01 & 17.4 & 11.59 \\ 92.86 & 7.14 & 0 \\ 94.92 & 0 & 5.08 \\ 58.33 & 27.09 & 14.58 \end{bmatrix}$$

As described in Section 3, the weights are determined solely by the respondents, and the weighting figure is created based on the frequency (percentage of mentions in relation to the total number of mentions) of feedback from visitors on the factors. Based on the data in Tables 2–5, the following equation can be calculated to obtain the following values for the frequency of feedback for each factor, with the result shown in Table 7:

$$W\ for\ F_m = \frac{(F_mS + F_mN + F_mU)}{\sum(F_mS + F_mN + F_mU)} \quad (5)$$

Table 7. The weight for each factor (by author, 2024).

Factor Set	Number of People Mentioning the Factor	Weight (Mentioning Frequency)
F_1	69	28.05%
F_2	70	28.46%
F_3	59	23.98%
F_4	48	19.51%

According to the methodology of the weighting point evaluation method, the calculation process and results of the comprehensive evaluation can be displayed as follows:

$$f(x) = \begin{bmatrix} 71.01 & 17.4 & 11.59 \\ 92.86 & 7.14 & 0 \\ 94.92 & 0 & 5.08 \\ 58.33 & 27.09 & 14.58 \end{bmatrix} \times \begin{bmatrix} 28.05\% \\ 28.46\% \\ 23.98\% \\ 19.51\% \end{bmatrix} = (80.48\ 12.20\ 7.31)$$

4.4. Discussion

The outcome of the evaluation of the DLICEH through the weighting point evaluation method highlights that satisfactory ratings were 80.48 of 100, normal ratings were 12.20 of 100, and unsatisfactory ratings were 7.31 of 100. Based on the principle of maximum affiliation, DLICEH's overall public satisfaction score was 80.48 of 100.

Specifically speaking, the cultural expression of the DLICEH was examined by being divided into four aspects from users' perception: cultural thematic expression, shop and café, spatial visual creation, and interactive experience. To some degree, people could be attracted to come to the project by these four factors. The technology of this industrial theme is a controversial factor, largely due to its cultural content. The operation and manufacturing principles of compressors are technical and professional, and they may pose challenges to the public's understanding. Thus, this may require future designers or curators to break down or simplify the principle of the compressor's operation for the

public. Additionally, the project has gained popularity in terms of the shops and café. Souvenir shops and cafés are great attractions for visitors, and the income they bring to the project is the basis for sustaining most adaptive reuse projects [69,70]. This revelation is noteworthy in that it challenges the prevailing perception of museums as primarily exhibition spaces [71]. Remarkably, this may present a new prospect for fostering small-scale industrial exhibitions in the future. Then, the complete preservation of the building and the large-scale machinery allows the public to enter a space that is very different from that of a civil building. This space can be seen in an academic context as a special kind of industrial heritage display area. Its "cyberpunk" visual atmosphere satisfies visitors' curiosity. Finally, respondents mentioned in their evaluations that they would like to have more interactive experiences, but in a way, there is an expectation and recognition of the current interactive programs. If there were no such interactive programs, the public might have weakened their comments on this factor. It can be seen that architecture also serves the function of inspiring the user.

Although the weighting point evaluation method is innovative compared to previous sociological statistics, there are some limitations. As people's perceptions and needs are constantly changing and developing, the public users of the project need to be continually interviewed and evaluated to ensure that the feedback is valid and that it provides a basis for continuous optimization of the project. In addition, as can be seen from Section 3, this method is more demanding on the interviewer and requires confirmation of the categorization and rating of the factors mentioned by their interviewees. In the future, this issue can be solved by semantic sentiment analysis (e.g., SpaCy). Furthermore, the quantitative evaluation scores of the weighting point evaluation method are not static and will change depending on the number of individuals interviewed. However, this does not affect the ability of the method to analyze the problems and strengths of the project through the feedback of the interviewees.

5. Conclusions

Architecture serves human beings. Despite architects and investors dominating the design of most buildings today, the user is the only group that can judge the success of a building. Hence, this research places control solely in the hands of the public by examining the revitalization of industrial heritage from users' perspectives, all with the hope of enhancing the status of building users. This study centers on creating an evaluation model and presenting the weighting point evaluation method. The effectiveness of this methodology in evaluating public satisfaction with the use of industrial heritage renovation was demonstrated through a study of the DLICEH.

The methodology creatively proposed by the research establishes crucial groundwork for assessing industrial heritage renovation ventures. As illustrated above, the statistics on the influencing factors and their weights are derived from public feedback, which enhances the reliability of the calculation results and improves the shortcomings of the traditional multi-factor evaluation method. In addition, the weighting point evaluation method pioneers the comparison between different projects. The diverse contexts of various projects result in distinct focuses on the cultural expression of industrial heritages in their transformation. Such variation poses challenges for scholars measuring these projects by a uniform standard. To address this, the weighting point evaluation method offers an approach that weighs individual project emphases by scoring the different programs, providing valuable support for future cross-project comparisons.

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