


Article

Improvement Strategies for Enhancing User Satisfaction with Spatial Publicness in Privately Owned Public Open Space in Post COVID-19: A Case from Italy

Jingwen Shan ^{1,2,3}, Gangwei Cai ^{2,4,5,*} , Alin Lin ^{1,*} and Binyan Xu ⁵

¹ School of Architecture and Engineering, Zhejiang Sci-Tech University, Hangzhou 310018, China; jingwen.shan@polimi.it

² Department of Urban Planning, College of Architecture and Urban Planning, Tongji University, Shanghai 200092, China

³ Zhejiang Shengfa Textile Printing and Dyeing Co., Ltd., Huzhou 313115, China

⁴ Baoye Group Company Limited, Shaoxing 312030, China

⁵ School of Civil Engineering and Architecture, Zhejiang University of Science and Technology, Hangzhou 310023, China; 1200540026@zust.edu.cn

* Correspondence: 11712014@zju.edu.cn (G.C.); linalin@zstu.edu.cn (A.L.)

Abstract: In the past five decades, privately owned public open spaces (POPOS) have become increasingly prevalent and significant in urban areas. However, the COVID-19 pandemic has led to significant changes in the performance and utilization of these spaces as the internal functions of adjacent buildings were shut down. This offers an opportunity to address the research gap in the theory of publicness—one of the most crucial attributes in these places due to their ownership and management—by assessing user satisfaction with spatial publicness in POPOS independently of adjacent commercial and corporate functions. This study aims to identify key environmental factors that significantly affect user satisfaction during a pandemic and develop adaptive strategies to enhance user satisfaction and resilience in such contexts. Based on a comprehensive literature review of previous assessment criteria for spatial publicness, the study proposes 30 vital indicators. Importance-performance analysis (IPA) is employed to analyze changes in user satisfaction regarding these vital indicators. Data from 386 users of Plaza Gae Aulenti in Milan, Italy were collected via an online questionnaire. The findings reveal that optimizing physical facilities and visual permeability are crucial environmental factors for promoting a higher degree of publicness during pandemics, as evidenced by a comparison of pre-COVID-19 and post-COVID-19 feedback. This study addresses the research gap by assessing the spatial publicness of POPOS independently of adjacent commercial and corporate functions. These findings have practical implications for the design and regulation of future projects in the post-COVID-19 era.

Keywords: publicness; public/private space; user satisfaction; assessment; COVID-19



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1. Introduction

With the intensification of urbanization, many cities have undergone extensive urban construction or transformation. Throughout these processes, public-private partnership (PPP) has been a tool in urban policies to address the financial challenges faced by governments worldwide [1,2]. Consequently, the private sector has played a significant role in creating publicly accessible open spaces, commonly referred to as privately owned public open spaces (POPOS). For these types of public spaces, one of the most crucial attributes is the authenticity of their “publicness”, due to their ownership and management by the private sector [3]. There are two diametrically opposed attitudes towards these particular types of urban spaces among scholars.

On the one hand, a negative school, or a traditional school, so to speak, doubted the authenticity of the publicness in these types of public spaces [4–7], arguing that they were

essentially pseudo-public spaces [8]. Public space is widely recognized as a vital public health asset for residents. However, public space within private developments has faced criticism for being overly controlled and exclusive, raising concerns about equal access to it as a health resource [9].

On the other hand, a positive school saw optimistic ideology in the provision of publicly usable spaces by the private sector [10–15], claiming that urban scholarship should adopt a broader perspective on the concept of publicness in order to better understand the composition of public life in cities. They suggest exploring alternative frameworks beyond the conventional notions of exclusion, encroachment, and claim-making. They argue that spaces become public not solely via legal or discursive recognition but also via various embodied and often habitual practices [13]. The argument is further proved by a study indicating that different user groups have their own distinct preferences, while government-owned and operated spaces continue to dominate in terms of comparative preference, specifically identified as “full freedom to use and explore”. However, it is worth noting that the private sector also contributes to sustainable public spaces that are interactive, self-managed, and provide a strong sense of security and safety for users [15]. Carmona contends that the commonly held negative perceptions of privatization are often misguided, as processes of publicization can bring significant benefits to society. By examining historical and current data, his study reached a contrasting observation—a “public-isation of private space” [14].

The conflict intensified with the radical change in people’s lifestyles and the reorganization of the cities due to the need for social distancing and other precautions related to Corona virus disease 2019 (COVID-19). In a webinar held in the midst of the pandemic, public health experts and policymakers discussed “how to support safe public space during COVID-19”. The panelists were convinced that access to public spaces enhances physical and mental health, especially in times of stressful inactivity and isolation [16]. However, during COVID-19, POPOS witnessed significant changes in performance due to the shutdown of interior functions in adjacent buildings, such as the closure of the main attraction of such places—the commercial functions—or the closedown of the corporate function that brings the most regular visitors to the places. One can find the notable consequences of such changes on POPOS in Milan, Italy during the lockdown of the COVID-19 crisis; the number of daily visits to the spaces dropped drastically since the “Mild Restrictions” of COVID-19 (closure of restaurants and other entertainment venues) in 2020. At first glance, it seems inevitable that the pandemic restrictions on different aspects of resident activities will seriously impact the overall quality of outdoor public life. Yet, it is not clear what the form of impact and its natural consequence would be. Are residents satisfied with the physical environment of POPOS when a pandemic such as COVID-19 occurs? If not, what are the crucial spatial quality attributes for improving user satisfaction in such places after COVID-19? Developing improvement strategies for user satisfaction in POPOS with adaptability to unpredictable pandemics is a crucial task at the moment.

A number of scholars carried out various kinds of publicness evaluations/assessments/measurements and developed related index/framework/model, including both qualitative and quantitative researches. However, there is limited understanding of the interrelationships and dynamics between the publicness dimensions of how physical configuration/design and user perception/satisfaction/experience interact and influence each other in shaping public spaces. Furthermore, regarding the spatial publicness of POPOS, the previous studies have overlooked a disturbing factor: the presence of clusters of privately owned or managed functions within adjacent buildings. It remains uncertain whether the presence of these functions significantly influences user satisfaction with spatial publicness, potentially either enhancing or detracting from the overall quality of the public space. Therefore, there is a need for conducting additional assessments of the spatial publicness of POPOS independently, disentangled from the influence of adjacent commercial and corporate functions. This disturbance was completely eliminated under the implications of the pandemic, while all shops and businesses were closed, giving the relevant research

an opportunity to collect conveniently suitable data, to discover the key spatial quality attributes for the publicness of POPOS.

In view of these research gaps, our research distinguishes itself as a pioneering investigation that assesses user satisfaction with spatial publicness in POPOS, independent of the impact of adjacent interior functions. We achieve this by examining changes in user satisfaction levels with POPOS in Milan before and after the implementation of “Mild Restrictions” due to COVID-19, periodically from May 2020 [17]. Furthermore, our research aims to offer environmental improvement strategies for enhancing user satisfaction in POPOS to designers and developers after COVID-19. The data were collected from 386 users who had visited Plaza Gae Aulenti in Milan, Italy. An online survey was conducted on WeChat between 26 September and 12 October 2022. The study utilized an adjusted Importance-performance analysis (IPA), taking into account the impact of COVID-19.

For the assessment criteria, based on previous research on publicness evaluation models/frameworks worldwide [18–25], along with the endorsement of the Charter of Public Space at the second Biennial of Public Space in Rome, a set of factors were developed. These factors were also evaluated by a panel of experts affiliated with the authors’ respective institutions.

The logical framework is depicted in Figure 1. The first step of this study involves assessing the levels of user satisfaction and their correlation with spatial publicness in POPOS before and after the COVID-19 pandemic, focusing on the case study of Plaza Gae Aulenti in Milan, a prototype of POPOS in the city of Milan. There are 386 selected responses for the analysis. The study employs descriptive statistics along with an IPA to evaluate the influence of the spatial publicness of POPOS before and after COVID-19 on levels of user satisfaction in Milan. IPA is a market research method used to analyze and recommend management strategies [26]. It places emphasis on managerial recommendations that are derived from optimal allocations, aiming to enhance user satisfaction, making it a valuable tool for management decision-making [27]. Thirdly, some improvement strategies are proposed to the POPOS designers/developers to recover in a more resilient manner after the COVID-19 crisis via an IPA. Furthermore, the aim of this article is to enhance user satisfaction with the numerous POPOS during uncertain pandemics after COVID-19. Additionally, suggestions are provided for testing the framework and determining the level of impact of the associations among the analytic factors for future research.



Figure 1. The logical framework. Notes: SPEM = Spatial Publicness evaluation model; IA = Importance After COVID-19; PB = Performance Before COVID-19.

The remaining sections of the paper are organized into five sections. The following section contains a literature review that examines the phenomenon of POPOS and its implications during the COVID-19 pandemic within the context of the case study. It clarifies the discussion of publicness in academia, focusing on the theory of dimensions of publicness. Additionally, it reviews the main literature on the publicness dimensions of physical configuration/design and user satisfaction/perception/experience. Subsequently, data collection and research methods are clarified. The fifth section presents the analysis results and interprets them in six aspects. Eventually, the conclusion was found that, out of all the analytic indicators, the enhancement of a list of physical facilities and the optimization of the visual permeability of these places can greatly contribute to the environmental improvement strategies of user satisfaction in POPOS after COVID-19.

2. Literature Review

2.1. Privately Owned Public Open Spaces (POPOS) during COVID-19

Triggered by the introduction of PPP as a tool in urban policies worldwide, an increasing number of urban zones are surrendered to commercial and residential developers in exchange for a variety of spaces being open for public access and use, based on either holistic legal provisions or a single agreement between municipalities and private sectors since the middle of the nineteenth century. Thus, many privately owned public open spaces (POPOS) emerged. It is adapted from “privately owned public space (POPS)” —the term that was popularized in 2000 via the book *Privately Owned Public Space: The New York City Experience* [10]. “Public” is a word that contains many layers of significance—political significance, ideas about property, aim, use, etc. Regarding POPOS, “public” refers only to the use of the space, i.e., its availability for public use or access.

Since the 1980s (notably from 2000 to 2010), the phenomenon of privately owned public spaces and the notion of publicness have been studied in sociology and urban planning and later introduced to the spatial design discipline. In different regions, the debts were concentrated at various times in history due to development patterns. For instance, in Italy during the five years between 1990 and 1995 (especially 1993 and 1994), the issue drew a great deal of attention in academia and was intensively discussed in the *Casabella* journal by Gregotti, Secchi, Ingersoll, etc.; afterwards, the wave gradually faded.

The duration of home confinement during the COVID-19 pandemic has been unprecedentedly long [28]. During the COVID-19 pandemic, Italy, particularly the region of Lombardy in Northern Italy, experienced one of the highest death tolls in Europe, making Europe the second most affected continent [29,30]. Italy was the second country after China to be severely impacted by the COVID-19 pandemic and experienced a nationwide lockdown for two months. After the reopening of public spaces, social interactions in person, while maintaining physical distance, resumed, highlighting the significance of these places for people [31].

In response to the COVID-19 pandemic, urban planners, architects, landscape designers, and journalists have already started examining the impact of the COVID-19 pandemic on our engagement with public spaces [32–34]. Their efforts have shed light on the evolving dynamics and challenges faced by communities in navigating public environments amidst the pandemic. However, more targeted research is needed to investigate the specific effects on the realm of POPOS, which are a fragile (some scholars define them as “pseudo-public space”) yet integral part of urban landscapes during this particular period, to foster adaptive resilience.

2.2. Publicness as the Most Important Attribute of POPOS

As articulated before, publicness is the most significant attribute of POPOS due to their privately owned nature. In fact, it is a word that contains many layers of significance—political significance, ideas about property, aim, use, etc. Therefore, the previous studies and debates about publicness discussed the term from various perspectives:

- *Political/democratic.* The governmental policy-making and inspection are studied, such as how enactments and implementations affect public usage, and some probe the property rights of these spaces [11,35–39].
- *Economical.* The corporate management and property values of open space are analyzed, such as the property values of various landscape typologies or closeness to open areas in various neighborhoods, in order to guide the private sector to utilize open space to achieve maximum profitability [40–43].
- *Social.* The control in “secured spaces” is investigated, where the private developer exposes mandatory surveillance facilities on purpose, so the public feels psychologically safer and is more willing to conduct commercial activities. Moreover, there is an increasing awareness of civic organizations and advocates. It is a bottom-up approach for regenerating existing POPOS from public opinions and inspections [44–49].

- *Actor-networks*. The recurring relationship among various stakeholders and their impact on final projects are untangled since owner, manager, and users are all different identities, and their interrelationship is more complex in projects by the private sector than that in public projects [50–54].
- *Dimensional*. The dimensions of publicness are theorized, setting a framework for the evaluation of publicness in urban space [55–57].

Among the aforementioned layers, the dimension of publicness is the most closely linked to the assessment of the actual degree of publicness of POPOS, which is evaluated using various assessment models or frameworks. There is a clear continuation in the theorization of the dimension of publicness, starting from the 1980s, when publicness was first proposed as a multi-dimensional concept—access, agency, and interest [58]. After that, the dimensions were supplemented in both breadth and depth by a number of scholars, notably in sociology and urban planning, and later were also introduced to the spatial design discipline.

Ownership, accessibility, and intersubjectivity were argued as the three dimensions of publicness in urban spaces, emphasizing the encouragement of intersubjectivity in urban public spaces [59]. Through the development of this theory, function, perception, and ownership were proposed to be the three key aspects that determine whether an urban space is more public or private [60]. Uniquely, the cobweb diagram of Van Melik et al. did not measure publicness per se but focused on the models of “themed space” and “secured space” by illustrating the particular qualities of these two types of space using a cobweb diagram [61]. Furthermore, a tri-axial model for publicness—ownership, management, and uses/user—was concluded [19]. Based on a literature review of abundant previous studies about publicness, the existing dimensions of publicness were organized into five—the Star Model of Publicness—ownership, control, civility, physical configuration, and animation [18]. After that, another evaluation index called OMAI—ownership, management, accessibility, and inclusiveness—was proposed [62]. With measurable indicators to limit subjectivity, the ‘six-axial’ model was proposed, which can be applied not only to urban public spaces but also to various gathering places, including suburban areas [12]. Building upon those efforts, with particular attention to users, a publicness evaluation model (PEM) was created, structured in four dimensions: urban life, physical design, human connection, and management [24]. Examination of the case of public transport offers valuable insights into agency, power dynamics, and vulnerability, contributing to a holistic understanding of public space and prompting a reconsideration of the concept of publicness [63].

Based on the project processes, Wang and Chen restructured the dimensions of publicness into three stages: planning and design, management and control, and use [8]. They also identified three limitations in the Star Model of Publicness, namely its lack of comprehensiveness, generality, and systematic approach. To address these shortcomings, they further expanded and consolidated the three stages into eight dimensions of publicness, encompassing function, spatial design, ownership, management, control, perception, access, and use/user [8]. Similarly, based on place-making processes, publicness was subdivided into localized publicness, procedural publicness, and symbolic publicness [64]. Wu et al. proposed a tool that integrates the Star Model, a qualitative assessment tool, with Space Syntax, a quantitative assessment tool, to provide a scientific evaluation of different public spaces focusing on “measurement” [65]. In addition, there are a series of empirical studies on the publicity evaluation of actual plots based on the theory of the dimension of publicness [66,67]. The quality assessment of a public space that underwent redevelopment by the private sector in Dhaka was conducted via a comparative analysis, considering variables such as accessibility, services and facilities, environment and safety, structural design, as well as management and management systems [68].

2.3. The Key Environmental Factors of Publicness—On the Spatial and Perceptual Level

The spatial level and the perceptual level represent the two major levels of a space. At present, the main literature on the publicness dimensions of physical configuration/design and user perception/satisfaction/experience respectively is as follows:

The physical configuration dimension in the Star Model of Publicness proposed the three sub-dimensions: centrality and connectedness, visual permeability, and thresholds and gateways [18]. Considering contemporary needs for modern communities, an index for public spaces was constructed to evaluate their quality based on empirical assessments of inclusiveness, meaningfulness, safety, comfort, and pleasurability [69]. Figurative design means were suggested to control urban space—an index of encouraging and discouraging features being employed by publicly and privately owned media, respectively, is calculated, as are the features in different categories, ranging from laws signs, and surveillance equipment to access and physical facilities such as restrooms, seating types, microclimates, lighting, food vendors, art, cultural, visual enhancement, etc. [70]. Furthermore, previous models have identified specific indicators such as physical maintenance and cleaning of hard landscape areas and urban furniture, provision and maintenance of green spaces, CCTV cameras, police or private guards, control signage, active frontage, infrastructure for cycling and jogging, pedestrian walkways, cycling routes, etc. [22]. Ma et al. proposed calculations to evaluate the performance of the spatial structure of public space, which encompasses three indicators: the proximity degree to local urban blocks, the network connectivity degree, and the comprehensive connectivity degree of urban blocks interconnected by each public space [71]. Additionally, Pan et al. further examined spatial morphology at the level of “micro-renewal” or “micro-renovation” by considering indicators of spatial publicness such as the number of participants, betweenness centrality, and accessibility [21].

In the past few years, there have been an increasing number of related studies dedicated to user perception/satisfaction/experience and its influencing elements [72–75] and striving to create more inclusive public spaces for people [76,77]. The interactive relationships among publicness, quality/performance, and user satisfaction were examined in both privately owned open space (POS) and government-owned open space (GOS) in order to enhance the comprehension of utilizing both GOS and POS from the user’s perspective [25]. The perceptions of young people and the elderly were analyzed to identify environmental planning factors that contribute to enhancing the publicness of urban public spaces [78]. User perception was assessed through physical observations, online questionnaire surveys, and semi-structured interviews to identify the attributes of public spaces provided by both the government and private sector in the urban context of developing countries [15]. It is argued that publicness is generated via events by taking into account the attendees and their experiences, control practices, and spatial configuration [79]. Moreover, Smith et al. aimed to enhance the suitability of public spaces for hosting events by evaluating the level of publicness through accessibility and considering factors such as payment methods and the mobility of event audiences [80]. The situation of distance (both social and spatial dimensions) as a relational variable was constructed as an instrument to explore the lived experience of publicness, incorporating novel indicators to examine the interplay between tangible and intangible expressions of publicness with the aim of enhancing the concept of visibility through empirical analysis [81]. The legal sense and lived sense are also further related to interpreting public space, respectively [82]. A study aims to examine the various public spaces within Hail through six dimensions, including accessible and linked, activity and uses, amenity, attractiveness and appeal, safety, and maintenance, correlating quantitative and qualitative data by utilizing fieldwork observations and user perception [23].

Previous studies have proposed numerous qualitative and quantitative indices to assess the diverse dimensions of publicness in POPOS. Nevertheless, there are some limitations, which are outlined below.

- (1) There is a limited understanding of the interrelationships and dynamics between the different dimensions of publicness. Further research that examines the interplay and synergies between these dimensions is needed. Specifically, how do the publicness dimensions of physical configuration/design and user perception/satisfaction/experience interact and influence each other in shaping public spaces? There have been some attempts, such as the formulation of “informality” and publicness [20], to address this question. However, further in-depth research is required to fully understand the complex relationship between these dimensions.
- (2) Previous studies on spatial publicness assessments have been conducted in the presence of clusters of privately owned or managed functions within adjacent buildings. However, it remains uncertain whether the presence of these functions significantly influences the assessment results, potentially either enhancing or detracting from the overall quality of the public space. Therefore, there is a need for conducting additional assessments of the spatial publicness of POPOS independently, disentangled from the influence of adjacent commercial and corporate functions. The data collected during the pandemic period, when many shops and businesses were temporarily closed, are convenient and valuable.

3. Materials and Methods

The theory of publicness provides a framework that helps researchers understand and evaluate the degree of various dimensions of publicness in public space. By leveraging the theory, this study establishes evaluation indicators and uses quantitative methods for data collection and analysis to propose environmental design strategies.

Therefore, this study is a mixed-methods research method in the field of architectural and urban design. It utilizes quantitative data collection methods (a questionnaire survey) and statistical analysis methods (the IPA method) to assess user satisfaction ratings of the spatial design of a specific square in Milan. Through the statistical analysis of the evaluation indicators, the research aims to derive spatial design strategies that enhance user satisfaction. The selection of indicators is a qualitative study based on a literature analysis of the theory of publicness. The conclusion is derived from statistical analysis, providing quantifiable comparisons and inferences.

3.1. Data Collection Method

3.1.1. The Selection of Case Study

Milan has always been open to relatively heavy architecture and urban modifications compared to other Italian cities, at least since WWII. It is a historical European city that has gone through massive urban transformation projects in the last two decades. Almost all of the new Milanese interventions have been financed through private development, and the number of privately owned public open spaces (POPOS) skyrockets [4].

Plaza Gae Aulenti (PGA) in Milan is the central plaza of an urban transformation project (called “the New Gate of the City”) with the ambition of being a new center of the city, connecting several railway lines as well as the important metro lines. Owned and operated by UniCredit S.p.A., an international banking group Italy’s only systemically important bank according to the list provided by the Financial Stability Board in 2022 [83], the plaza is a prototypical exemplar of POPOS in Milan, which combines both corporate and commercial functions. Part of the success of the plaza can be attributed to Jan Gehl, the celebrated Danish social architect, who consulted in programming the area for liveliness. The place is constructed with certain environmental qualities instead of evident inferior space, and it is popular with residents of the city. However, its success is still controversial from certain critical angles, such as inclusiveness, consumerism, etc. [4]. Therefore, it is a suitable case study for this research.

3.1.2. Explanation of Questionnaire

The objective of this study was to address the research gap in assessing the spatial publicness of POPOS independently of adjacent commercial and corporate functions and propose environmental improvement strategies to enhance user satisfaction in POPOS post COVID-19. Therefore, the study employed a questionnaire survey to obtain visitors' satisfaction with the spatial publicness of Plaza Gae Aulenti before and after the mild restriction due to the COVID-19 pandemic. We designed an online survey using WJX (Changsha Ranxing IT Ltd., Changsha, China). Subsequently, we distributed the e-questionnaire to various online social groups in the Milan area, Italy, including work groups, student groups, etc. Additionally, we enlisted volunteers to share the survey on their respective social media pages. The data were collected between 26 September and 12 October 2022. We received a total of 386 survey responses from individuals who had visited Plaza Gae Aulenti in Milan before and after the COVID-19 pandemic, which were selected for analysis.

The initial section of the questionnaire includes a question: "Did you visit Plaza Gae Aulenti before the pandemic and during the period of mild restrictions following the outbreak?" Only 386 valid questionnaires that responded "yes" were selected for data analysis. In this case, it is assumed that the information provided by the participants is truthful and reliable, facilitating subsequent data analysis and research. The participants' responses serve as the basis for a scientific investigation.

The main content of the survey comprised a set of 30 elements, ranging from centrality and connectedness on an urban scale to physical facilities on an architectural scale. A Likert scale consisting of five points was employed to assess residents' satisfaction following their visit to the public open space [84]. The scale included the following categories: (1) Importance (post-COVID-19): "5 = highly important", "4 = important", "3 = moderate", "2 = unimportant", and "1 = highly unimportant". The questionnaire used for data collection can be found in Appendix A. (2) Performance (Pre-COVID-19): "5 = excellent", "4 = good", "3 = average", "2 = poor", and "1 = bad".

3.1.3. Questionnaire Questions

For the assessment of spatial publicness, the selected cases were analyzed in an inductive manner, considering public space as an external entity separate from individuals, which was opposite to emotion and perception [85]. There are plenty of analytic models, dimensions, classifications, definitions, and guidelines for the assessment of publicness. They are developed by a number of researchers from different disciplines. To address the above-mentioned research gaps, we aimed to develop a multiple-item scale to assess user perceptions of POPOS both before and after the COVID-19 pandemic.

We investigated the spatial publicness determinants of user satisfaction with POPOS and established an arrangement of these factors. Regarding the general index of the questionnaire, the study adopted the three sub-dimensions of the physical configuration dimension of the Star Model of Publicness, namely centrality and connectedness, visual permeability, and thresholds and gateways. Additionally, two additional indices were incorporated, including physical facilities and the surrounding buildings. The evaluation indices proposed by Nemeth and Schmidt [19], Mehta [20], Pan et al. [21], Sandaruwani and Hewawasam [22], Alnaim and Noaime, E. [23], Lopes et al. [24], Ho et al. [25], and others were referenced for the detailed spatial quality attributes of the physical environment in this research. Lastly, to determine the impact of adjacent commercial and corporate functions on visitors, the questionnaire also included the functional program as an indicator to compare user satisfaction in the presence and absence of these functions. Despite the temporary closure of neighboring functions, visitors still retain their perception of the space when the functions were available and can express their level of demand through scoring the questions related to this indicator. Eventually, based on previous research on publicness evaluation models/frameworks worldwide as well as the ratification of the Charter of Public Space at the second Biennial of Public Space in Rome, several factors were identified

(Table 1). A group of experts from three institutions associated with the authors evaluated all the factors for the validity of their content and appearance.

Table 1. The factors to assess user satisfaction of spatial publicness in POPOS before/after COVID-19.

Determinants of User Satisfaction to Plaza Gae Aulenti (Based on Previous Research)	30 Factors: Importance (after COVID-19)/Performance (before COVID-19)	QN
Physical Facilities [18,19,24,25,86–88]	Public seating is sufficient with free/comfortable orientation and location for people watching and engaging.	1
	Tables are sufficient with free/comfortable orientation and location for people watching and engaging.	2
	The shading performance is good.	3
	Lighting is sufficient to encourage nighttime use.	4
	The pavement is safe and comfortable.	5
	Natural elements can be found in the plaza (such as trees, fountain).	6
	Interactive and fun elements can be found in the plaza (such as artwork).	7
	Various micro-climates.	8
	Restrooms are available.	9
	Drink fountain/food stall is available.	10
	Bicycle parking is available.	11
	Litter receptacles are easy to find.	12
Centrality and Connectedness [18,69,81]	The plaza is well located within the overall movement network (public and private transportation).	13
	The connection between the plaza and the city facilitates both movement to and movement through the space.	14
	Desire lines within surrounding area continue into and through the space.	15
Visual Permeability [18,89]	Visual connection between the plaza and external public realm (surrounding streets, etc.) is strong.	16
	Visual connection between the plaza and the adjacent building interiors in the same floor level is strong.	17
Thresholds and Gateways [19,24,90]	Thresholds and entry points are not distinguished from surrounding public realm (e.g., one does not know precisely when the space is entered).	18
	Distribution of gateways is balanced and convenient from every direction.	19
	Escalators/elevators are functional and convenient.	20
	Pedestrian roads and ramps are functional and convenient.	21
	Stairs are functional and convenient.	22
The Surrounding Buildings [62,91–93]	Entrances and exits of the surrounding buildings facilitate circulation to open space freely from all directions.	23
	The surrounding architecture design is attractive (with identifiers).	24
	Enclosing facades of the plaza are habitable (e.g., comfortable to stop and stay).	25
	Enclosing facades have fine details.	26
Functional Program [24,81,94,95]	There are a variety of functions around the plaza.	27
	Proportion of active commercial frontages is high.	28
	Proportion of active corporate frontages is high.	29
	Proportion of active cultural and art frontages is high.	30

3.2. Analysis Method

The aim of the data analysis was to identify the key environmental factors that influenced user satisfaction during a pandemic by comparing the satisfaction of visitors with the spatial publicness of Plaza Gae Aulenti before and after the mild restriction due to COVID-19 pandemic, periodically from May 2020. Importance-performance analysis (IPA) was chosen as the statistical analysis method. IPA is a research method and technique that aims to assess and provide recommendations for management strategies. The core principle of IPA is to evaluate the performance and significance of various service features and offer actionable recommendations for improving management practices. Therefore, it is a suitable choice for the research method in this study as it allows for a comprehensive assessment of the importance and performance of spatial publicness elements in relation to user satisfaction during the pandemic.

However, one challenge with using IPA is the selection of the most appropriate threshold values to divide the quadrants. There are two primary methods for determining these thresholds: the data-centric (DC) method, which utilizes the critical point determined by the actual average level of the data, and the scale-centric (SC) method, which provides a simpler description. Additionally, some researchers have employed diagonal lines (DLs) or isolines (IRLs). Among these approaches, the IRL method is more suitable for assessing the disparity between pre-performance and post-importance (satisfaction forecast) levels. In this study, the DC-DL method was used to establish the threshold values (Figure 2).

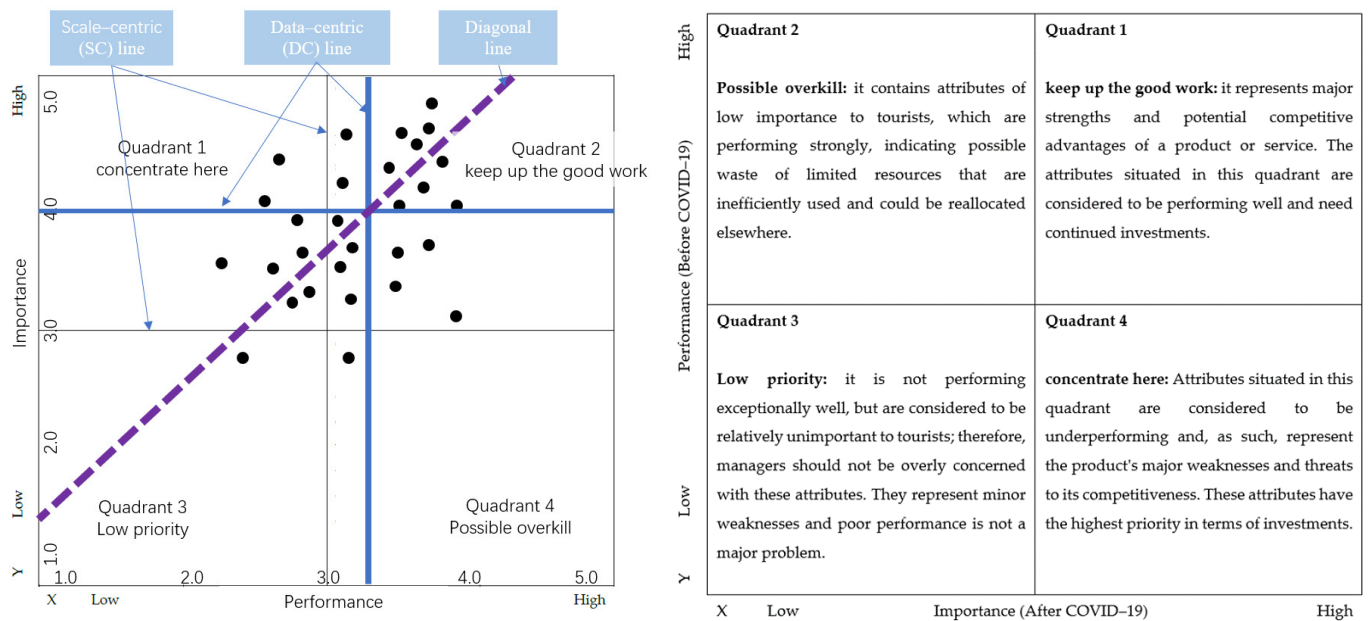


Figure 2. The line of different thresholds within the IPA plot [96–98].

4. Results

4.1. Reliability and Validity Analysis

The analysis of the questionnaire was performed using IBM's SPSS 26 statistical software in New York, USA. The reliability of the questionnaire was assessed via the Cronbach's alpha coefficient, with a value greater than 0.7 indicating "high reliability" and greater than 0.5 indicating "reliability". The questionnaire's alpha coefficient was calculated to be 0.991, which is considered comparatively high and satisfactory [94]. Furthermore, the survey instrument demonstrated satisfactory content validity, construct-related validity, and structural validity, as indicated in Tables 2 and 3.

Table 2. Validity statistics.

		Number	%
Cases	Valid	386	100
	Excluded	0	0
	Total	386	100

Table 3. Reliability statistics.

Cronbach's Alpha	Number of Items
0.991	60

4.2. Importance-Performance Scores

The findings are presented in Table 4 and Figure 3. Initially, these components are situated in (Q4 + Q3): numbers 1, 3, 7, 8, 9, 10, and 17. As an illustration, these elements require heightened priority in the aftermath of COVID-19: Physical facilities (public seating is sufficient with free/comfortable orientation and a location for people watching and engaging; interactive and fun elements can be found in the plaza, such as artwork; the shading performance is good; there are various micro-climates; restrooms are available; a drink fountain/food stall is available); and visual permeability (the visual connection between the plaza and the adjacent building interiors in the same floor level is strong). Secondly, these items are in the priority area (Q1): numbers 12, 13, 14, 19, 29, 21, 22, and 23. Thirdly, these items fall within the medium priority area (Q3 + Q4): numbers 2, 4, 5, 6, 11,

18, and 26. Fourthly, these items are situated in the low priority area (Q2 + Q1): numbers 15, 16, 24, 25, 27, 28, 29, and 30.

Table 4. Means of importance and performance and paired sample *t* test (df =357).

No.		Paired Differences					<i>t</i>
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		
					Lower	Upper	
Pair 1	I1–P1	0.14249	1.02078	0.05196	0.04033	0.24464	2.742
Pair 2	I2–P2	0.06995	0.97116	0.04943	−0.02724	0.16714	1.415
Pair 3	I3–P3	0.11399	0.93834	0.04776	0.02009	0.20789	2.387
Pair 4	I4–P4	−0.01554	0.89719	0.04567	−0.10533	0.07424	−0.340
Pair 5	I5–P5	0.05440	0.81839	0.04165	−0.02750	0.13630	1.306
Pair 6	I6–P6	−0.01813	0.91577	0.04661	−0.10978	0.07351	−0.389
Pair 7	I7–P7	0.05959	0.96917	0.04933	−0.03740	0.15657	1.208
Pair 8	I8–P8	0.12694	0.92971	0.04732	0.03390	0.21998	2.683
Pair 9	I9–P9	0.11399	1.01032	0.05142	0.01288	0.21510	2.217
Pair 10	I10–P10	0.05959	0.95839	0.04878	−0.03632	0.15550	1.221
Pair 11	I11–P11	0.03627	0.86113	0.04383	−0.04991	0.12245	0.827
Pair 12	I12–P12	0.05181	0.80091	0.04077	−0.02834	0.13196	1.271
Pair 13	I13–P13	0.05699	0.83859	0.04268	−0.02693	0.14092	1.335
Pair 14	I14–P14	0.02591	0.85241	0.04339	−0.05940	0.11121	0.597
Pair 15	I15–P15	0.01036	0.88561	0.04508	−0.07826	0.09899	0.230
Pair 16	I16–P16	0.01813	0.93263	0.04747	−0.07520	0.11147	0.382
Pair 17	I17–P17	0.05440	0.93122	0.04740	−0.03879	0.14759	1.148
Pair 18	I18–P18	−0.02073	0.93951	0.04782	−0.11475	0.07330	−0.433
Pair 19	I19–P19	0.05181	0.92717	0.04719	−0.04097	0.14460	1.098
Pair 20	I20–P20	0.07513	0.91853	0.04675	−0.01679	0.16705	1.607
Pair 21	I21–P21	0.12176	0.93319	0.04750	0.02837	0.21515	2.563
Pair 22	I22–P22	0.08290	0.94984	0.04835	−0.01215	0.17796	1.715
Pair 23	I23–P23	0.08808	1.00260	0.05103	−0.01225	0.18842	1.726
Pair 24	I24–P24	0.00259	1.07751	0.05484	−0.10524	0.11042	0.047
Pair 25	I25–P25	−0.02591	1.04663	0.05327	−0.13065	0.07883	−0.486
Pair 26	I26–P26	0.00518	1.00646	0.05123	−0.09554	0.10590	0.101
Pair 27	I27–P27	0.02332	0.96805	0.04927	−0.07356	0.12019	0.473
Pair 28	I28–P28	−0.05699	1.06995	0.05446	−0.16407	0.05008	−1.047
Pair 29	I29–P29	−0.14508	1.03180	0.05252	−0.24833	−0.04182	−2.762
Pair 30	I30–P30	−0.08549	0.98585	0.05018	−0.18415	0.01317	−1.704

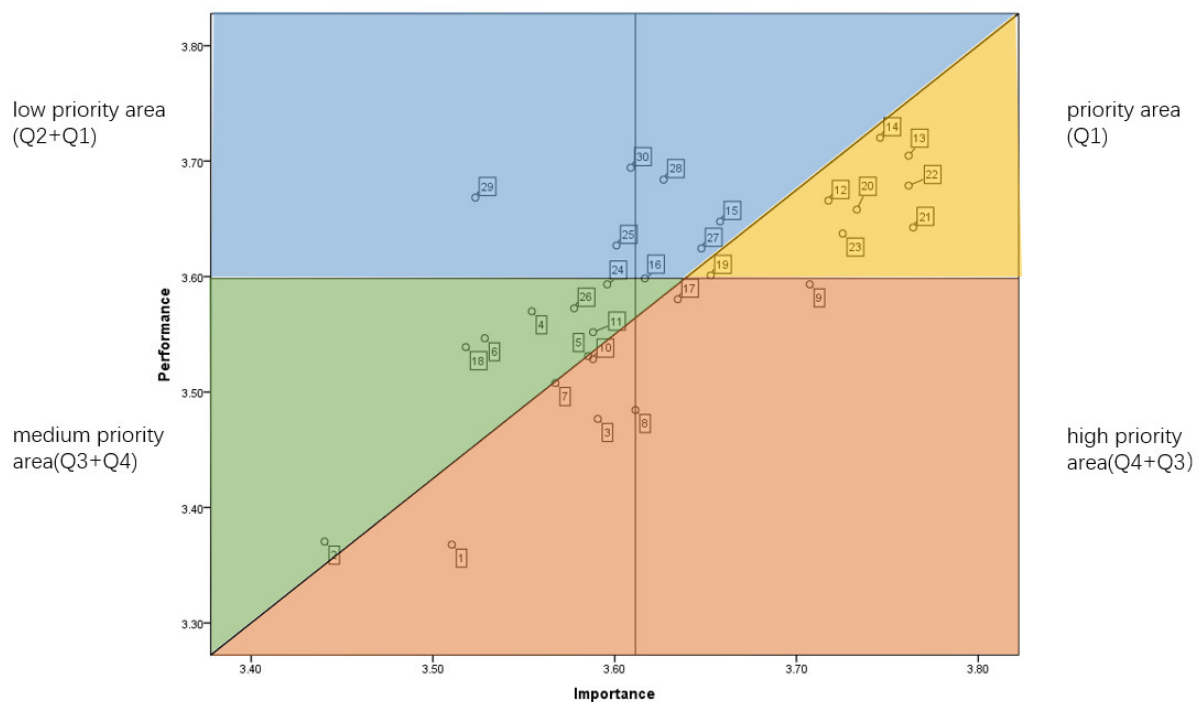


Figure 3. The Importance-Performance Analysis.

5. Discussion

5.1. Impacts

First, this research represents one of the initial attempts to unveil the effects of COVID-19 restrictions on user satisfaction with spatial publicness in privately owned public open spaces (POPOS) independently of adjacent commercial and corporate functions. Secondly, considering the research methodology aspect, the combination of DC and IRL methodologies utilizing content analysis provided a framework to disentangle and navigate the intricate relationships between variables, thus offering potential benefits for subsequent studies. Third, recommendations will be provided to the design, planning, and regulation departments of POPOS to improve the user satisfaction of public open spaces following the COVID-19 pandemic using the IPA. This study expands the scope of this field of study beyond the conventional POPOS context and contributes insights to the design and management of POPOS in the aftermath of COVID-19. In general, following the COVID-19 pandemic, visitors have shown great interest in the physical amenities and the visual permeability of POPOS, which were previously under-performed as well. However, the centrality and connectedness, as well as the ease of access related to POPOS, remain major strengths and competitive advantages of the place among visitors.

5.2. Suggestions

Feasible suggestions are also provided by this study for POPOS designers, planners, and regulators in place-making approaches for the aftermath of COVID-19. As our outcomes suggest, the contentment of visitors in the post-COVID era may be impacted directly by key spatial quality attributes of publicness in POPOS directly. The designers and developers of POPOS ought to take into account the factors identified as “High Priority” and “Priority” areas. The “Medium Priority” area represents factors that underperformed but were relatively unimportant for the users. The “Low Priority” area includes factors that performed strongly before the pandemic but were again relatively unimportant for the users, potentially leading to the inefficient use of limited resources. Consequently, the environmental improvement strategies for POPOS in the post-COVID-19 era do not encompass the factors within these two areas. The following recommendations are proposed to enhance the visitor experience.

5.3. Top-Priority Recommendations

Recommendations for the ranking based on paired differences (IA-PB): (1) “Public seating is sufficient, with free/comfortable orientation and location for people-watching and engaging”. It demonstrates that visitors like better, sufficient seating arrangements that facilitate participating in social life (not necessarily directly) after the pandemic. Sparse, fixed, and secluded seating arrangements need to be reconsidered. (2) “The shading performance is good”; (3) “Various micro-climates”. These environmental qualities were neglected to a certain extent before the outbreak. They require special awareness in the post-COVID-19 period. (4) “Restrooms are available”, and (5) “Drink fountain/food stall is available”. Restrooms and drink fountain/food stalls are mainly provided by the interior functions of the surrounding buildings with or without payment. This is obviously inconvenient for POPOS utility after the COVID-19 pandemic, and it needs to be improved. (6) “Visual connection between the plaza and the adjacent building interiors in the same floor level is strong”. Disruptions to the visual connection are mainly caused by store closures during disease outbreak prevention and management. It also needs to be focused on in POPOS.

Most of the high-priority suggestions originate from the determinants of “Physical Facilities” and “Visual Permeability”. These above-suggested spatial configurations are mainly undertaken by the indoor functions of adjacent buildings before COVID-19, either charged or free. However, the supply of these factors is largely affected by the closure of the surrounding functions under the pandemic control. In fact, the spatial layout of these physical facilities is inconvenient for users of the public open space, even in the absence of pandemic control. They are deeply hidden inside the building interiors, with longer

(compared to facilities arranged inside POPOS) and sometimes implicit paths to reach them. Therefore, the accessibility of the facilities is reduced. In addition, the disturbance of visual permeability has a great impact on user satisfaction, indicating that the adjacent interior display of the architecture (generally so-called “Starchitecture” [99]) is one of the main regular attractions of POPOS. It relies on “the architecture of public space” rather than the spatial quality of the communal area itself.

5.4. Priority Recommendations

Recommendations for the ranking based on paired differences (IA-PB): (7) “Litter receptacles are easy to find.” After the COVID-19 pandemic, litter receptacles provided by the surrounding building interiors were not available. (8) “The plaza is strategically positioned within the broader transportation network (public and private transportation);” and (9) “The connection between the plaza and the city facilitates both movement to and movement through the space”. Obstacles added by pandemic control prevented regular transportation and mobility within and through the area. POPOS should be planned within a larger network of public open spaces with ordered and controlled accessibility to citizens, even in the case of an outbreak. (10) “Distribution of gateways is balanced and convenient from every direction”, (11) “Escalators/elevators are functional and convenient”, (12) “Pedestrian roads and ramps are functional and convenient”, and (13) “Stairs are functional and convenient”. The suggestions in this part are that more attention should be paid to the balanced arrangement of thresholds and gateways in POPOS after COVID-19. People tend to reach open places via convenience and a wide choice of amenities. (14) “Entrances and exits of the surrounding buildings facilitate circulation to the open space freely from all directions”. Internal entrances and exits were used by many POPOS before the outbreak. However, during COVID-19, they are no longer open options.

Priority suggestions extend from one important amenity of “Physical Facilities” to the determinants of “Centrality and Connectedness” and “Thresholds and Gateways”. The determinant of “the Surrounding Buildings” has relatively little impact on visitors’ satisfaction.

6. Conclusions

The performance of privately owned public open spaces (POPOS) holds significant importance in many global cities due to their current large number and wide distribution, and the construction and re-development of urban spaces continuing to open up to transnational private developers in Milan. This study aims to address existing research gaps and provide an insight into the dynamics of spatial publicness and user satisfaction in POPOS. As far as we know, our research represents a pioneering investigation to probe the direct influence of the COVID-19 pandemic on user contentment with spatial publicness in POPOS in Milan, Italy, independent of adjacent interior functions. Previous related research mostly focused on exploring the correlations between public spaces and COVID-19 for some special social groups in Milan, such as the elderly, medical staff, etc. Some researchers dig into the effects of current urban planning on these correlations. However, hardly any works provide a critical account of the impact of POPOS within the framework of COVID-19 on people’s satisfaction. The reframed IPA, which compares performance before COVID-19 with importance after COVID-19, represents a novel endeavor. The study can contribute to the development of evidence-based design strategies and policies that enhance user satisfaction in POPOS, along with the establishment of standardized assessment tools to advance our understanding and practical application of Spatial Publicness Theory in architectural and urban design. It provides a series of post-COVID-19 tactics for the improvement of POPOS making.

The results depicted in Figure 3 demonstrate that the factors “Physical Facilities” and “Visual Permeability”, situated in quadrant 3 according to Figure 2, belong to the “concentrate here” category. This indicates that they exhibit low performance but hold high importance. These aspects represent a significant weakness of the place, as they were evaluated by the users as underperforming before the outbreak but are now highly valued

by them. Consequently, these determinants should be given the utmost priority in the post-COVID-19 period, demanding further consciousness. Conversely, the attributes positioned in quadrant 1, predominantly from “Centrality and Connectedness” and “Thresholds and Gateways”, fall into the “keep up the good work” category. They serve as major strengths and potential competitive advantages of POPOS, as they exhibit high performance and importance. These attributes are regarded as priority recommendations. The top-priority and priority recommendations outlined in this study have the potential to significantly contribute to the environmental quality of POPOS for their users in the post-COVID-19 era.

Furthermore, approximately half of the environmental quality attributes related to “Surrounding Buildings” fall into quadrant 3, reflecting underperformance and low importance according to the assessment results. This reveals that the physical design of surrounding buildings is not particularly exceptional in terms of performance and is relatively overlooked by users. Consequently, these attributes are significant for improving spatial publicness, but they are not considered priority areas for enhancing user satisfaction during pandemics. Lastly, the factors related to “Functional Program” occupy quadrant 2, indicating high performance but low importance. This suggests that these attributes are unimportant to users but performed strongly before the pandemic. As a result, the factors associated with “Surrounding Buildings” and “Functional Program” are not included in the environmental improvement strategies for POPOS in the post-COVID-19 era.

Nevertheless, there are certain limitations to this study, listed as follows, as well as some future research directions. Initially, the data were gathered from visitors in POPOS in Milan, Italy. Consequently, the environmental improvement strategies for user satisfaction in this type of urban space in the post-COVID-19 era could be, to some degree, hard and inappropriate to put into other regions. Furthermore, although the IPA is broadly familiar with the field of Hotel and Tourism, applying this method to privately owned public spaces is a new effort. Hence, to establish a comprehensive body of literature on the impacts of crises such as COVID-19 in POPOS, we recommend broadening the research scope to encompass related phenomena. Secondly, while we were able to establish links between the factors that influence user satisfaction and COVID-19, the degree of correlation between them remains uncertain and requires further investigation. The model can be further examined to recognize the degree of the effects of the linked relationship between the above-mentioned determinants to upgrade the POPOS making in future investigations and incorporate more nuanced research questions.

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Appendix A

Table A1. The sample questionnaire.

Have you visited Plaza Gae Aulenti before COVID-19?			YES					NO					
30 factors: performance (before COVID-19)/importance (during COVID-19) Note: the plaza = Plaza Gae Aulenti, referring to the larger area of open spaces that adjoining the Unicredit Tower, including the Park of Tree Library.			QN	Importance (after COVID-19): “5 = very important”, “4 = important”, “3 = so-so”, “2 = unimportant’, and “1 = very unimportant”.					Performance (Before COVID-19): “5 = very good”, “4 = good”, “3 = so-so”, “2 = not bad’, and “1 = bad”.				
				1	2	3	4	5	1	2	3	4	5
Physical Facilities	Public seating is sufficient with free/comfortable orientation and location for people watching and engaging.	1											
	Tables are sufficient with free/comfortable orientation and location for people watching and engaging.	2											
	The shading performance is good.	3											
	Lighting is sufficient to encourage nighttime use.	4											
	The pavement is safe and comfortable.	5											
	Natural elements can be found in the plaza (such as trees, fountain).	6											
	Interactive and fun elements can be found in the plaza (such as artwork).	7											
	Various micro-climates.	8											
	Restrooms are available.	9											
	Drink fountain is available.	10											
	Bicycle parking is available.	11											
	Litter receptacles are easy to find.	12											
Centrality and Connectedness	The plaza is is strategically positioned within the broader transportation network (public and private transportation).	13											
	The connection between the plaza and the city facilitates both movement to and movement through the space.	14											
	Desire lines within surrounding area continue into and through the space.	15											
Visual Permeability	Visual connection between the plaza and external public realm (surrounding streets, etc.) is strong.	16											
	Visual connection between the plaza and the adjacent building interiors in the same floor level is strong.	17											

Table A1. Cont.

Have you visited Plaza Gae Aulenti before COVID-19?		YES	NO
Thresholds and Gateways	Thresholds and entry points are not distinguished from surrounding public realm (e.g., one does not know precisely when the space is entered).	18	
	Distribution of gateways is balanced and convenient from every direction.	19	
	Escalators/elevators are functional and convenient.	20	
	Pedestrian roads and ramps are functional and convenient.	21	
	Stairs are functional and convenient.	22	
The Surrounding Buildings	Entrances and exits of the surrounding buildings facilitate circulation to open space freely from all directions.	23	
	The surrounding architecture design is attractive.	24	
	Enclosing facades of the plaza are habitable (e.g., comfortable to stop and stay).	25	
	Enclosing facades have fine details.	26	
Functional Program	There is a variety of functions around the plaza.	27	
	Proportion of active commercial frontages is high.	28	
	Proportion of active corporate frontages is high.	29	
	Proportion of active cultural and art frontages is high.	30	

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