Social Media as a Medium to Promote Local Perception Expression in China’s World Heritage Sites

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Social Media as a Medium to Promote Local Perception Expression in China's World Heritage Sites

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Abstract: The assessment of public participation is one of the most fundamental components of holistic and sustainable cultural heritage management. Since the beginning of 2020, the COVID-19 pandemic became a catalyst for the transformation of participatory tools. Collaboration with stakeholders moved online due to the strict restrictions preventing on-site activities. This phenomenon provided an opportunity to formulate more comprehensive and reasonable urban heritage protection strategies. However, very few publications mentioned how social networking sites' data could support humanity-centred heritage management and participatory evaluation. Taking five World Cultural Heritage Sites as research samples, the study provides a methodology to evaluate online participatory practices in China through Weibo, a Chinese-originated social media platform. The data obtained were analysed from three perspectives: the users' information, the content of texts, and the attached images. As shown in the results section, individuals' information is described by gender, geo-location, celebrities, and Key Opinion Leaders. To a greater extent, participatory behaviour emerges at the relatively primary levels, that being "informing and consulting". According to the label detection of Google Vision, residents paid more attention to buildings, facades, and temples in the cultural heritage sites. The research concludes that using social media platforms to unveil interplays between digital and physical heritage conservation is feasible and should be widely encouraged.

Keywords: cultural heritage management; inclusive governance; public participation; social media; Weibo; pandemic

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1. Introduction

With the emergence of social network sites (SNSs) in China, new media has growing importance in the traditional urban planning system and has facilitated the development of new types of planning [1,2]. In the recent ten years, the Chinese government has tried several times to employ the use of Information and Communication Technologies (ICTs) tools for provoking more citizen engagement in heritage conservation to create a positive impact. For instance, the Dashilar website, app, and navigate application have developed with the support of the Xicheng District Government of Beijing and were put into use in 2013. It shows that ICTs are gradually becoming important methods of public consultation and supervision during the urban renewal project [3]. On the other hand, experts and civic groups utilized Weibo to criticize "the regeneration projects of Beijing's bell and drum tower neighborhood" proposed by the local government [4]. However, there is a lot of optimism in this emerging field of study, although little quantitatively validated knowledge is available to support this view. Thus, the main research question

addressed is whether social media and mobile technologies have measurable impacts on citizens' engagement beyond the traditional mobilization and participation approaches. In the context of urban inclusivity and sustainable planning, the study explores how digital technology can encourage ordinary citizens to express their perceptions and opinions to manage their own heritage and achieve greater inclusive governance of cultural heritage. The research investigates the challenges in the application of open-source ICTs for citizen engagement in heritage conservation and possible coping strategies.

Following the introduction section, the article presents a comprehensive summary of the current use of ICT in heritage management. The details concerning common features and impacts of applying digital technology to involve audiences in cultural heritage conservation are included. The contributions of social media platforms to enhance stakeholders' communication and collaboration are also highlighted. The third part of this article explains the necessity to introduce social media tools in the rapid urbanization of Chinese cities. This is followed by a description of the open data acquisition process from Weibo which details the post screening and collection process through to the final analysis. The fifth part focuses mainly on the result generating and demonstration procedure. The outcomes detail and further explain the data regarding Weibo posts and users' general information, assessment of normalized messages, and mapping of uploaded pictures.

2. Research Background

2.1. Current ICTs Which Enhance Cultural Heritage Participatory Management

Various digital products can improve our understanding of people-centred heritage and encourage the public to take part in heritage conservation (see Figure 1). Augmented Reality, Virtual Reality, and 3D modelling help audiences experience the heritage site more intuitively, so that they can better understand the multi-level value of cultural heritage [5–7]. ICT also makes it easier for residents to participate in the co-design and co-production process and collaborate with professionals [8]. At the Bishops' House Museum, located in Sheffield, UK, digital augmentation helps engage visitors, in a co-design way, with architectural heritage [8]. Three-dimensional printing technology allows models of buildings to be constructed from archaeological drawings [9], which allows the recovery of more precise architectural details and reduces the damage to on-site exhibits significantly. Geographic Information Systems (GIS) assist with mapping and archiving of rural and urban heritage sites, utilising big data [10,11]. In Marmo Platano, the northwestern part of the Basilicata Region (Italy), a website which provides urban planning information to the public is combined with a web-based GIS tool and a blog to obtain citizens' feedback [12]. Location-based mobile apps, as well as some websites, promote the output of cultural heritage values with a very important educational function [13–16]. For instance, an app is developed to let the visitors learn historical facts by playing a mobile game while visiting the museum Palazzo Madama in Italy [13]. The Kampung Dolanan project, which is a valuable historic village in Indonesia, was created to encourage children to study heritage, histories, and traditional customs while playing games located in their own residential area [14].

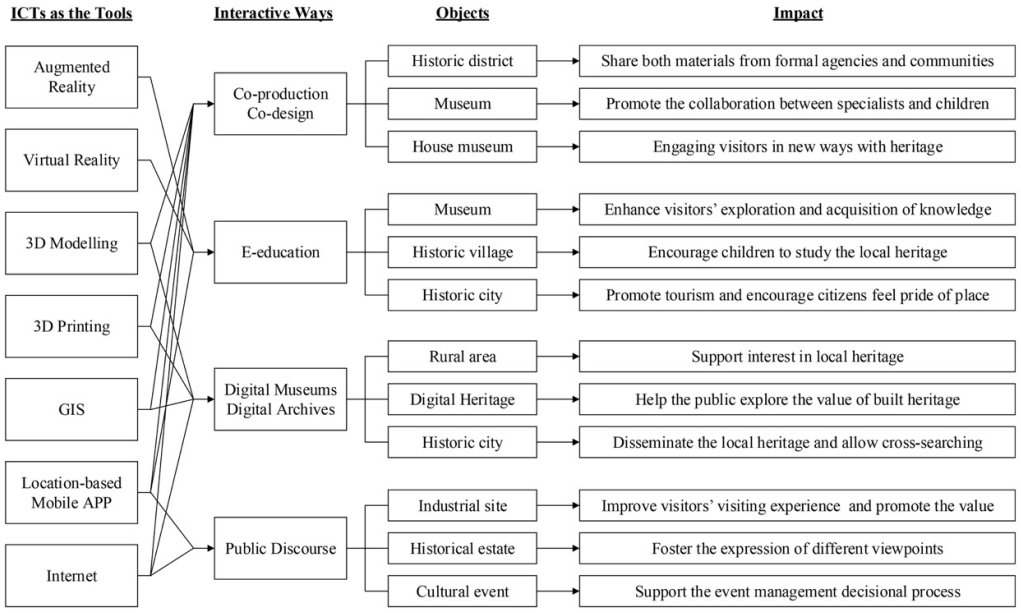

Figure 1. Current digital tools applied on involving public to cultural heritage.

As a function of the Internet, social media has greatly enhanced residents' public voice, making communication and collaborative planning easier to achieve [17]. Social media can also foster the expression of various viewpoints and support cultural event management in the decision making process [18,19]. In the northeast of Scotland, the Buckie and District Fishing Heritage Centre on the Moray Firth coast employs multiple social media apps and a dynamic web map to update resources from local residents to academic institutes [20]. It uses a double-way information transfer platform to realize co-curation activities.

The participation of additional stakeholders, such as those involved in an organisation's most basic level and professionals of more advanced levels in the conservation of cultural heritage, is encouraged by social media platforms [21]. In this present digitalised era, social networking sites are crucial in the promotion of communication and collaboration between companies invested in acquiring financial gain. Social media users assemble on this platform to achieve certain goals or arrange their practices, gather viewpoints, or swap knowledge on a particular topic [22]. Location, time, job, age, or other obstacles do note bind the online community. Despite the need for stakeholders to access the internet, social media platforms bring about great advantages by allowing easy communication and discussion amongst people from various interest communities.

Research concerning social media's role in cultural heritage conservation is largely based in Western countries. Social media can help analyse residents' behaviour or attitude in order to understand the users' landscape preferences, opinions, and perceptions, avoiding some of the drawbacks of traditional survey methods [23]. The colour of tweeted pictures from smart cities, with variations in colour saturation and brightness, has also been used as an effective way to present the affected territorialization in urban life. [24]. Effective communication amongst the government and citizens concerning the planning of Jordan's city has been aided by Facebook [25]. The collection of unauthenticated histories as digital records has also been implemented based on Facebook in the northwest of Ireland [26]. Computational analysis of more than 400,000 geotagged images from Instagram have been supplemented with interviews from 16 active users to reveal the social–spatial inequality in the city of Amsterdam [27]. The politics, religion, and residents' and tourists' likings in Lebanon's city of Tripoli, rich with history, are shown

through Flickr's photos, tags, and real-time geo-location [28]. A Weibo post may serve as a complaint towards China's government to cease removal of Guangzhou's Dafo temple [29]. Thus, it is evident that given China's rapid urbanisation, there is a pressing need for the use of social media to aid in cultural heritage management.

2.2. Cultural Heritage Management in Chinese Cities: The Need to Involve Social Media

There has been a vast amount of research completed on the adaptation of influence and evolution of trends in Western online social networks [30–32]. In particular, applying social media apps, such as Twitter, Facebook, and Instagram, to qualitative geography research is becoming increasingly popular [24,27,33,34]. Even if some researchers point out that social media apps have a lower penetration and a potential bias toward younger populations [35], some governments are still utilising social media as an important way to reach out to citizens. For example, the New York Digital City program complements the NYC.GOV portal with social media venues [36]. Noveck created the first social networking system in the United States, Peer-to-Patent, to break the obstacle and time-assuming communicative mode between "expertise of the many to the power of the few" [37].

In China, online social networks have become a major platform for the younger generation to share, disseminate, and receive information from others and meet like-minded individuals. As of June 2021, instant messaging users in China reached 983 million people, up 97.3% of all Internet users [38]. Some studies have mentioned the application of Chinese social platforms in cultural heritage protection research, indicating that it is feasible to introduce social media to promote public participation in Chinese contexts [29]. Data mining techniques could enable researchers to gain a more comprehensive and precise understanding of the Chinese public attitudes toward a specific issue [39]. The pictures obtained from Weibo can be analysed to understand public perception in Chinese historical and cultural block studies [2]. However, research regarding the evaluation and illustration of the governing of participation is still limited. Useful online instruments to encourage citizens' participation in decision-making processes are also yet to be properly surveyed.

The reason why the research scope is framed on urban heritage rather than general landscape heritage or rural heritage is as follows. Firstly, compared with rural areas, the proportion of Internet users in Chinese cities is higher. According to the CNNIC's Statistical Survey on China's Internet Development, as of June 2021, the size of urban Internet users was 714 million, making up 70.6% of the total. As of June 2021, the Internet's penetration in China's urban areas was 78.3%, while that in rural areas was 59.2%, up 3.3 percentage points over December 2020 [38]. This means that selecting research objects in cities can reach a wider range of people. Secondly, the construction and development in cities is faster and the land used for newly built residential areas in China continues to expand every year, leading to a greater threat to heritage conservation. The 2021 statistical report of the National Bureau of Statistics of China shows that from January to August 2021, the floor space of houses completed nationwide was 467.39 million square meters, an increase of 26% year-on-year [40]. The aggressive eroding of urban heritage land makes the protection of cultural heritage urgent. Thirdly, because the economy of urban areas is usually more developed, there is more sufficient funds to manage and maintain the urban landscape. At the same time, relevant cultural heritage protection laws and regulations are more complete than those in relatively underdeveloped rural areas, and more in-depth urban renewal strategies have been formulated. This is more conducive to obtaining raw data on heritage protection and provides a good basic condition for the advancement of this study. In summary, urban heritage was the best starting point to conduct this research, and the results could hopefully continue to be promoted and applied in rural areas.

2.3. The Interpretation of Chinese Social Media Platforms: The Choice of Weibo

Parallel to well-known western online social networks, such as Facebook, Twitter and Instagram, there are a series of popular social media platforms in China, as well. Among these, WeChat is undoubtedly China's largest social media platform, as a representative of instant messaging tools [41]. According to Tencent's unaudited financial report data for the fourth quarter and full year of 2021, Wechat has more than 1.2 billion monthly active users [42]. Following that, Douyin (TikTok) and Xiaohongshu are social-network applications recently counted among the fastest-growing applications in China. What is worth highlighting is that Sina Weibo is the second-largest social media platform and the most popular microblog platform in China, which has been developed and operated by Sina Corporation since 2009 [43]. It is an open platform for information dissemination based on social relations and socializing with strangers with short-form web messages, comparable with Twitter and Facebook [41]. According to the number of active users published by Sina Corporation, it reached at least 573 million monthly active users by the end of 2021 [44]. The majority of the users are located on China's mainland and post in Mandarin, while citizens from special administrative regions, such as Hong Kong and Macau, are more likely to use Western social media platforms, which may cause a limitation on this research investigation.

Although urban-heritage related data should be examined on other social media platforms in China as well, this article uses Weibo for its research for the following two reasons. On one hand, Weibo is a relatively open real-time information network platform. Most of the time, users can get information shared by other bloggers without being online friends. This means that ordinary users can be reached through a simple search, allowing us to collect more extensive information. On the other hand, Weibo users are allowed to post small essays of more than 140 words with pictures and videos. Therefore, compared with other social platforms, using Weibo can help us judge the views and experiences of the posters more comprehensively. Above all, using Weibo to study and unveil interplays between the digital and physical worlds, which are strongly relevant to urban development or planning, is the best choice.

3. Method: Open Data Acquisition and Analysis for Policy Recommendations

Based on the influence and adoption of Weibo in China, the brief roadmap of this research can be demonstrated in the following four significant courses of action. Firstly, specific cultural heritage articles are collected based on the most updated World Heritage List (WHL) in 2020. In total, five Chinese heritage sites located in the cities were extracted from the world's tangible cultural heritage section. Following that, the searching code is assembled into two parts: the name of the city plus a keyword (a series of synonyms of urban heritage in Chinese, see Table 1). The Application Programming Interface (API) of Weibo is accessed to obtain the needed content. All data collection and privacy protection rules and regulations were addressed in this phase. Following content recovery, an examination process was carried out, both through computing and manually, to remove repeated posts. Finally, the characteristics in each of these corresponding tweets were analysed by identifying text and image content information and their geo-location information. A pilot study as a trial of the research assessment framework was undertaken with a smaller dataset in 2021 [17].

Table 1. The unprocessed database with a time restriction from 1 January 2020 to 31 December 2020 from Weibo.

Keywords	Keywords for Search (in Pinyin)	Lijiang	Pingyao	Suzhou	Macau	Kulangsu	SUM
Urban Heritage	Chengshi Yichan	138	97	90	66	26	417
Architectural Heritage	Jianzhu Yichan	56	41	123	73	59	352
Historic City	Lishi Mingcheng	722	515	586	77	157	2057
Historic District	Lishi Jiequ	6	12	575	27	35	655

Historical Buildings	Lishi Jianzhu	105	119	705	163	287	1379
Urban Regeneration	Chengshi Gengxin	11	1	110	20	251	393
Traditional Architecture	Chuantong Jianzhu	49	54	607	5	134	849
Traditional District	Chuantong Jiequ	1	0	25	37	15	78
Cultural Relic Protection	Wenwu Baohu	105	93	768	5	145	1116
Heritage Sites Conservation	Yizhi Baohu	7	1	24	12	15	59
Old District	Laojiequ	4	0	108	16	74	202
Old City	Laochengqu	11	5	522	149	346	1033
Old House	Laofangzi	35	83	336	12	162	628
Old Building	Laojianzhu	14	47	143	2	19	225
SUM		1264	1068	4722	664	1725	9443

3.1. Case Determination

Chinese World Cultural Heritage Sites were used in the design and development of this study. According to information made public on UNESCO's webpage, China owns 56 inscribed world heritage properties (second only to Italy in the WHL) in 2021, in which 38 are cultural heritage, 14 are natural heritage, and 4 are hybrid properties [45]. With a metropolitan heritage as the focus point, a filter was implemented to identify urban areas with a population of more than 500,000 residents (by January 2021) to make certain the data was sufficient and the samples were diverse. After screening, locations that fulfilled such requirements were Yunnan's Old Town of Lijiang (1997), Shanxi's Ancient City of Pingyao (1997), Jiangsu's Classical Gardens of Suzhou (1997, 2000), Macau's Historic Centre (2005), and Fujian's Kulangsu Historic International Settlement (2017). Figure 2 shows the geographical distribution of China's Urban Heritage and Other World Heritage Sites.

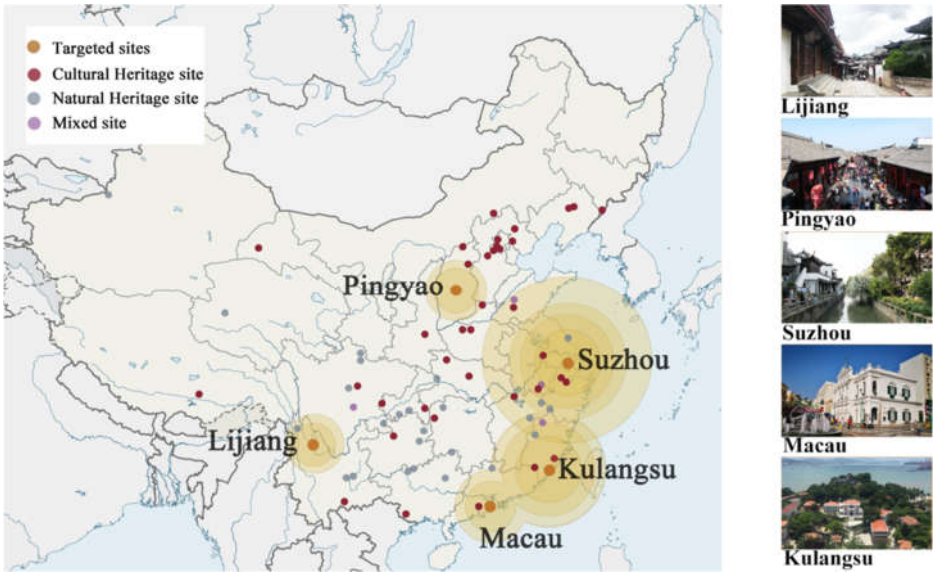

Figure 2. Geographical Distribution of China's Urban Heritage and Other World Heritage Sites (the author draws according to the UNESCO World Heritage List 2021).

3.2. Data Acquisition

The searching procedure ensued with a set of keywords that contained suitable geographical details and the location distribution of metropolitan heritage. Boolean Operators were utilised to connect each word. Based on this string of search codes, a time restriction (1 January 2020 to 31 December 2020) database was compiled and processed. It is important to note that the data acquisition is based solely on extensive searches on Weibo.cn.

The REST API was accessed to obtain posts, comments, and other official analysis data within the operation of authorised access to Weibo. The data fields obtained include user ID, publisher nickname, gender, region, number of followers and followers' posts' text and pictures, releasing time, number of likes, reposts, and comments, geo-location, and much more. The study examined and acquired the API interface and related interface frameworks from the Google Chrome browser by using Python programming and cookies to obtain browser access. The Python library was used to send requests. Obtained data were initially cleaned: missing values, duplicate fields, empty strings, and garbled data were deleted. More than 9000 posts with data source information under urban heritage topics were acquired to build the database.

3.3. Data Selection

Firstly, 1204 duplicated posts with similar content from the same user were ruled out automatically via coding. Subsequently, four other steps were needed to purify the acquired posts by both programming and manual filtering. The data cleaning program was run in the Xlwings library environment. By judging whether the content of the current line and the comparison line was equal, repeated text parts found in the microblogs obtained were marked. However, the disadvantage of this method was that it could not deal with text similarity issues, hence, the database was checked manually to validate the results.

The framework of stakeholders in the urban heritage management process involves a broad range of elements: management and organisation, technology, governance, policy context, people and communities, economy, infrastructure and the natural environment. However, in this research, local residents are selected as key players. Thus, the third step aimed to earn recognition from local residents. From the features of the posters, 1977 selected posts were revealed to be sourced from local users. At this point, users would be regarded as locals if they were registered in the same province as the selected heritage sites.

To obtain clean data, posts that were not identical but contained a content overlap rate of more than 90% (possibly from different users) were also screened out manually. Thereafter, the remaining posts were standardised manually according to the contents and categorised into 14 sections. The subject of content selection is also restricted to government–citizen communication and collaboration related texts under the holistic cultural heritage management topic. Thus, any documentation of daily life, simple accounts on restoration construction, emotional expression and memory, commercial advertisement, as well as other irrelevant topic posts were excluded at this phase of screening. As a result, 905 posts that were considered to have a strong association with creating dialogues among stakeholders were remained to be used for further analysis. Table 2 presents a summarised picture of the data selection process.

Table 2. The process of selection and purification of the relevant Weibo posts.

No.	Cultural Heritage Site Location	Listed Year as WHL	Original	Step 1	Step 2	Step 3	Step 4
1	Old Town of Lijiang	1997	1264	1101	130	84	65
2	Ancient City of Pingyao	1997	1068	869	153	87	80
3	Classical Gardens of Suzhou	1997; 2000	4722	4123	1078	903	538
4	Historic Centre of Macau	2005	664	553	55	49	31
5	Kulangsu: A Historic International Settlement	2017	1725	1593	561	458	191
	SUM		9443	8239	1977	1581	905

3.4. Data Analysis

A lesson from governance is to evaluate and classify the level of public participation, which builds the studying framework to analyse obtained text data. The consultative and informing activities are determined as a relatively elementary level in public participation

[46]. Effective communication, including a certain amount of complaints as a kind of feedback, is determined as a crucial phase in the reinforcement progress. Raising the citizen's awareness by educating, such as giving lectures, workshops, social media broadcasting, and building their capacity to take part in the decision-making process of their local environment, will be the final goal and the highest participatory level. It is accessible for both short-term and long-term benefit and responsibility-sharing [47,48]. Collaboration and empowerment are recognized as the highest level of government-community cooperation in integrated heritage management [3,49,50].

The data were analysed from three criteria, namely the users' general profile, texts, and pictures. The general profile of the users will be presented with the monthly number of posts, gender representation, the provenance of users, and posts by celebrities. The users' basic information was obtained automatically through computer operations, while the microblog content and image recognition were achieved mainly through manual screening. According to recent research, the Key Opinion Leader (KOL) is also an important promoter of network information dissemination in specific groups and has an important influence on the reposting and commenting behaviour of other users [51]. The leadership of KOL is 'significantly and positively associated with online civic participation', and ordinary users are very susceptible to the influence of opinion leaders [52,53]. KOL is an important part of the information dissemination of social networks. However, according to Huang, identifying KOL requires a complex recognition model [54]. The indicator used to determine KOL was that they should be identified as a celebrity with at least 50 reposts, 100 likes, and 100 comments in the selected post.

To identify the texts content, the posts were manually tagged and categorised by the context and content of the post. The posts were divided into 16 groups (see Table 3). Among these categories, collective experiences and memories, daily activities documentation, advertisements, and reports on restoration projects were considered to have no contribution to the participatory and communication activities. The remaining twelve categories were further fitted to a framework. This grading system is structured with five levels: inform, consult, include, cooperate, and empower, which aimed to provide a structured assessment of participation level through social networks [17,55].

Table 3. The identification and labelling framework for content categorization.

Participatory Level	Keywords	Definition
Inform	Exhibition	Museum exhibits, performances, photo exhibitions, etc. related to cultural heritage.
	Heritage value sharing	The introduction and detailed description of the cultural heritage itself, the purpose is to promote the value of the heritage.
	Lectures	Related education and publicity activities such as conferences, seminars, and symposiums, etc.
	Official announcement	A top-down notification from the government or authority, usually about a certain policy or verified important event.
	Archive	Records of interviews and visits by authorities, community activities, or other activities that are not easily classified.
Consult	Complaints	Bottom-up way to present suggestions or feedbacks from residents who are dissatisfied with a certain problem.
	Feedback on questioning	The response and explanation of the government or authoritative organization to the residents' suggestions or complaints.
	Interviews	Activities where authorities or experts collect opinions from the masses through questionnaire surveys and interviews.
	Suggestions	A bottom-up way of expressing opinions, mainly refers to proposals from residents on urban planning or renovation projects.
Involve	Workshops	Interactive methods organized by third parties or professionals for the purpose of promoting heritage values and heritage protection methods.

Collaborate	Collaborative planning	The co-design activities and events intending to involve multi-stakeholders taking part in heritage protection.
Empower	Empower	Agencies provide the public with the opportunity to make decisions for themselves.

After removing duplicates, more than 6000 images were labelled by accessing the Google Vision API. In order to verify the accuracy of the machine's image recognition, 10% of the images and their labels were manually checked. The labels were sorted into two groups: spatial and morphological catalogue, and other scenarios. The spatial and morphological catalogue contains a series of architectural spaces corresponding to urban scale: city, natural landscape, public place, neighbourhood, building, façade, interior design, building material landmarks, and rural landscape. By mapping the posted pictures, the study aims to cognize the local users' interests and concerns on the selected heritage sites.

4. Results

Classified statistics based on the public data released by Weibo users constitute the database of this study. The users' profile page of Sina Weibo displays the nickname with a short description, the number of fans or followers, the number of accounts followed, and the total number of posts the user had made [56]. As shown in Figure 3, Sina Weibo users can post texts with embedded pictures or videos. When reposting a certain post, users can add their comments on the reposted content without changing the original structure and content. The results of this study visualize the relevant number of posts of the intended heritage sites, examine the content and number of selected posts and further categorize them into five participatory levels, and, lastly, sort out the main targets of the selected pictures into 16 sub-categories under two domains.

Figure 3. A reposted Weibo by Suzhou Gardens (verified as official account) commenting "don't miss the autumn" with pictures. Source: Weibo.com (https://weibo.com/suzhouyuanlinlvhua (accessed on 1 November 2021)).

4.1. The General State of Weibo Posts and Posters

Table 3 shows that the garden of Suzhou attracts the most attention of the Weibo users and ranks first place, with 4722 searching results. Lijiang, Pingyao, Kulangsu are in the middle position with 1264, 1068, and 1725 posts, respectively, but are far behind Suzhou, with almost 50% fewer posts. Macau has received less data than all the other selected heritage sites. This may be due to the tendency of using Western social media platforms in Macau.

In terms of the total volume of results, the search results obtained by the keyword Historical City (Lishi Mingcheng) were the largest, with 2057 obtained. Next, Historical Buildings (Lishi Jianzhu), Cultural Relics Protection (Wenwu Baohu), and the Old City (Laochengqu) were considered the second echelon, with 1379 posts, 1116 posts, and 1033 posts, respectively; there is very little difference between the quantities of posts. This shows that the protection of cultural relics and the protection of the old city are closely related to the user's impression and have received widespread attention. In contrast, the keyword Heritage Site Conservation (Yizhi Baohu) has received the least attention from users, with 59 posts, putting it in the last position.

Users who shared their viewpoints regarding certain urban heritage sites online are composed of a niche online society. The result shown in Figure 4 illustrates the proportion and number of both genders, the number of locals and visitors, and the number of defined celebrities and KOLs. Among the 8239 users found, male users consisted of 4738 people, accounting for 58%, while female users consisted of 3901 people, accounting for 42%. The gender ratio of male to female users is calculated to be 135%. Compared with the data collected in the 2021 China Seventh National Census Bulletin, which shows 105%, the proportion of men is significantly higher in this case [57]. In addition, according to the collected region information from the users' profile, only one-quarter of users were considered as locals, indicating that most users were comprised of tourists from other regions. At the same time, nearly a third of the participants with more than 20,000 followers were defined as celebrities in this study, which was a lot more than the overall registration proportion, that was estimated to be around 0.3%. Due to Weibo's data-sharing restriction, the priority of accessing API is to obtain the account information of well-known individuals who have been authenticated. In other words, in the complete dataset of Weibo, the proportion of online celebrities will be much lower. A total of 10 KOLs were screened out, accounting for 0.1% of all acquired users. This article only makes simple judgments based on the number of reposts, likes, and comments, which has certain flaws. Further work should explore discussions relating to the KOLs' influence and the identification of KOLs.

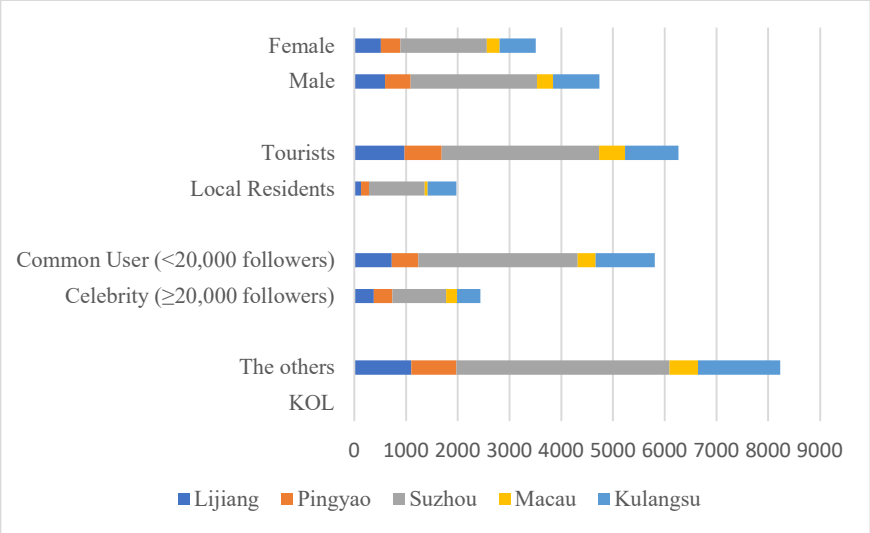

Figure 4. Components of Weibo users under the urban heritage conservation topic.

Figure 5 presents an apparent rising inclination in the number of Weibo posts over twelve months in 2020, following the strict lockdown policy that was implemented as a countermeasure for COVID-19. The data were maintained at a low quantity in the first half of 2020. Along with the reopening of regional boundaries after the drastic period, the number started to increase exponentially. The total number of posts in July was 922, which was twice that of the posts in January and corresponded with the brief period of ease followed by the loosened restrictions of intra-urban traffic movement. As the seasons gradually entered the time of winter, the country was struck with a second wave of the pandemic, causing the national pandemic control to grow stricter. Therefore, following the peak of data collection in July and August, the total amount of Weibo posts showed a mild downward trend. At the end of December, the number of posts reduced to 781, which was 80% of the number of posts in July. Although residents were still permitted to travel freely between regions with their green pass until December, the state government implemented a strict lockdown policy in January 2021 due to the impact of the pandemic. Due to this policy, all students staying on university campuses returned to their hometowns, and all workers were not allowed to return to work unless they were key workers.

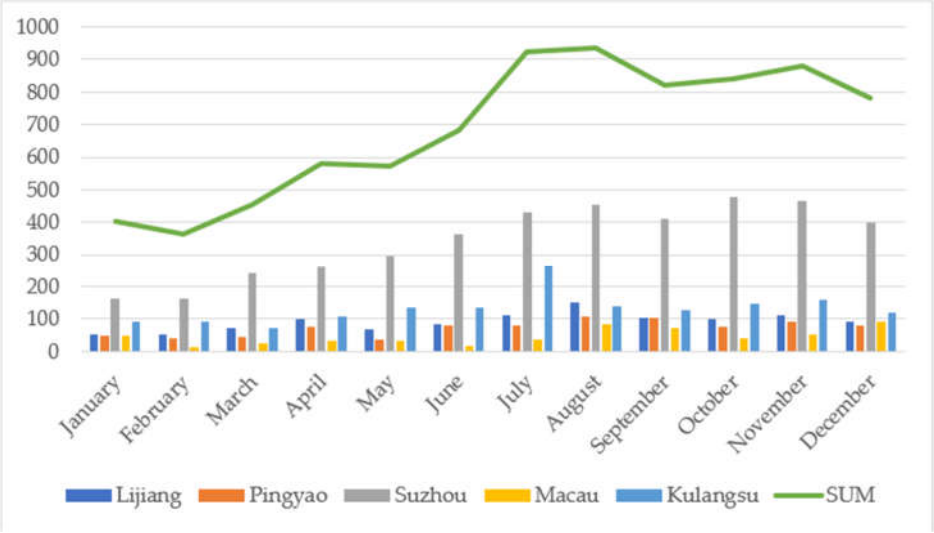

Figure 5. Monthly Weibo posts during the pandemic period in China (1 January 2020–1 January 2021).

4.2. Evaluating Participatory Degrees According to the Texts

The contents of the texts were analysed manually and categorised into five levels of engagement score. It was encouraging to discover findings that were qualified to be categorised at the involving and collaborating level, which was designed to be an advanced engagement score. In general, many common users were interested in sharing heritage cultures with the public. Most governments authorised accounts focused on posting official announcements about administrative activities and establishment of policies, while celebrities tend to publish education-oriented information on cultural heritage.

From ten users, eight were categorised into the one-way communicative level, which is the most fundamental engagement score of this evaluation structure (see in Table 4). From the perspective of information, what users do the most is to share the value of cultural heritage, such as historical allusions, poems, local folk customs, and architectural features of the heritage site. Many people also attended lectures and exhibitions related to cultural heritage and felt the charm of intangible cultural heritage, architectural heritage, and urban landscape heritage. Moreover, the number of posts reaching the consultation level was 132, reaching 14.6% of the total 904, including bottom-up feedback, complaint (n = 36), responses to residents' complaints from authorities, and feedback on question (n

= 4), etc. Among them, the records of on-site investigation activities by representatives of authorities and experts are the main part. It can also be seen that the public actively complained and responded to the problems in the architectural heritage renewal project. Even though the number of users that engage with the means of involvement and collaboration is comprised of only 2%, it still holds significant value as an approach of two-way communication. After a long series of uncovering and filtering data, it is regrettable that no posts were found to be deemed eligible for the empowering level in terms of engagement. Several factors that may be relevant to this occurrence are namely the dependence of documents, the wider target population of the elderly, and restricted engagement levels.

Table 4. Participatory Degrees Assessment on Weibo in the Cultural Heritage Management Process in China.

Keywords	Lijiang	Pingyao	Suzhou	Macau	Kulangsu	Participatory Level	SUM
Exhibition	2	3	20	2	6	Inform	754
Heritage value sharing	47	52	370	18	110		
Lectures	2	3	24	3	7		
Official announcement	7	10	41	7	20		
Archive	4	8	32	1	24		
Complaints	0	0	24	0	12		
Feedback on questioning	1	1	1	0	1	Consult	132
Interviews	0	0	4	0	7		
Suggestions	0	2	9	0	1		
Workshops	1	1	7	0	1	Involve	10
Collaborative planning	0	0	6	0	2	Collaborate	8
Empower	0	0	0	0	0	Empower	0
SUM	64	80	538	31	191	0	904

4.3. Reading and Mapping of the Pictures

With a special hot topic list mechanism, Weibo posts with more popular tags tends to attract more users' attention. Some users may add more popular tags to their posts based on this feature, even if these tags are not related to their posts, so that they can spread more widely and receive more attention. However, in the process of obtaining data, the keywords contained in the tag content were retrieved and identified, so they were included in the research database during the initial data collection stage. This means that the acquired microblogs with pictures need to be filtered out manually.

In the database acquired in Table 1, around 18% of the microblogs are embedded with pictures. Table 5 shows the screening process of images starting from the obtained raw data. The first step of image analysis was to manually read the associated text in the obtained Weibo data with images and roughly filter out the strongly irrelevant data, such as the content of the image is a historical site in Wuhan (not a research object), etc. In the second step, the VisiPics image recognition tool was used to further check and sort the image data. VisiPics is a free software developed by Guillaume FOUET (Ozone). It was used to identify pictures with duplicate or similar content based on the size of the picture. Pictures with similar content but different watermarks were identified and removed at this stage. In the third step, Google Vision was used to tag the image classification.

Table 5. The process and result of screening obtained images.

Heritage Site	Step 1	Step 2	Step 3
Lijiang	600	557	451
Pingyao	408	406	367
Suzhou	3876	3709	3495
Macau	223	212	198
Xiamen	2197	2074	1931
SUM	7304	6958	6442

By accessing the Google Vision API, this research has carried out label detection on the obtained pictures, as shown in Figure 6. The default label set for detection because the number of images obtained was less than 7000, which is not enough for Google Vision to perform machine learning based on the division of spatial categories. In response to the issue of machine errors, after obtaining a dataset containing label descriptions, a manual selection of 700 pictures were randomly sampled for a second verification. The number of labels assigned to each picture is different, fluctuating from a few to even more than thirty. Eventually, 64,285 labels were detected and obtained on 6442 annotated images that made up the dataset. On average, each picture was accompanied by 9.98 labels. After the dataset was processed by the pivot table and count function, it was further classified into 1530 tags, such as Building, Plant, Sky, Tree, Window, etc.

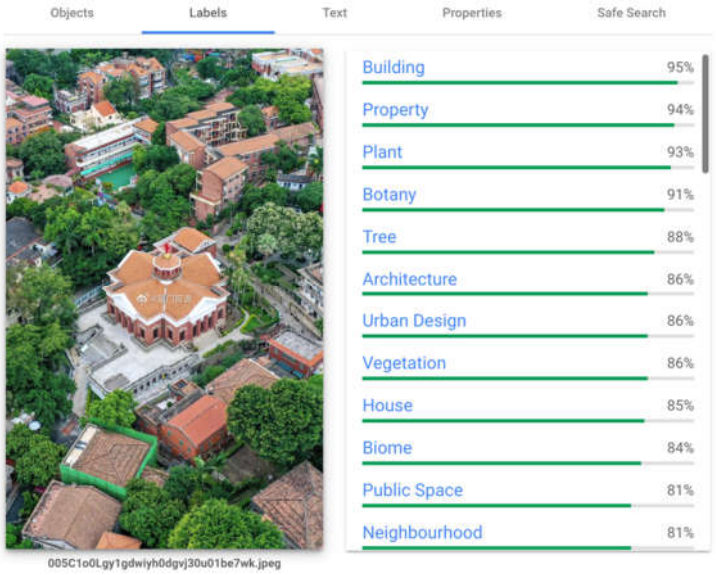

Figure 6. An example of using Google Vision to label images using a picture of the bird's-eye view of the Kulangsu Historic Settlement obtained from Weibo.

Due to the complexity of the labelling algorithm and the multi-label attribute of the image, no further classification or merging was undertaken on 1530 label types, but 20 labels relating to the morphological space were extracted, as presented in Table 6. In order to identify the users' preferences on heritage sites more accurately, other tags such as wood, leisure, water, etc., that are considered irrelevant to the description of the urban architectural space, were excluded. The information extracted from images indicates the people's attention and interest in urban heritage. Based on this table, it is evident that locals are mainly fascinated with various types of architecture, such as temples and pagodas. The specific structures of a building's exterior, such as doors, windows, and bricks, were among the most photographed objects. Although the attention paid to the city and the streets precedes the natural landscape itself, there is still a big gap of attention compared with the buildings. The number of pictures tagged under the city and urban design consists of only half of the pictures tagged with the buildings. The other features of the area were almost in the same range of concern, while the commercial buildings attracted the least attention, as the design features were the rarest among the five sites. From the perspective of spatial scale, it seemed that physical spaces and features that were close to the human body in scale received more attention. From the perspective of building types, the audience seemed to prefer buildings with traditional Chinese architectural elements and characteristics. From the perspective of architectural function, residential areas and traditional settlements were more attractive to bloggers than some noisy and bustling

commercial districts. It can also be seen from several lists that landmarks and rural landscapes were also popular topics among social media users.

Table 6. Top 20 labels related to the morphological space.

No.	Labels	Amount
1	Building	2950
2	Facade	962
3	Temple	959
4	City	819
5	Urban design	747
6	House	675
7	Natural landscape	605
8	Architecture	597
9	Chinese architecture	582
10	Landscape	557
11	Interior design	463
12	Neighbourhood	376
13	Residential area	215
14	Public space	198
15	Landmark	190
16	Pagoda	158
17	Room	115
18	Building material	75
19	Rural area	55
20	Commercial building	51

5. Discussion

Even though public participation in inclusive heritage management in China is still in its early stages, the existing condition still highlights a growing interest that is only likely to increase due to the generalization of smart devices and the internet. This paper offers a new approach to examine and present the level of public engagement through social media in China. The result has shown that the number of participants may have a great relationship with the financial condition of the city. Urban heritage sites which are in more developed areas would have a greater degree of attention [17]. In addition, the fashion of posting on social media is closely associated with the rules and policies made as a countermeasure for the COVID-19 pandemic.

5.1. Utilization of Digital Technologies to Promote Public Participation

Due to the high attrition rate of digital citizen science projects, more work is needed on the factors that attract and retain participants [58,59]. As a medium, social media has certain limitations and cannot be used as a representative of the collective consciousness of local people, but it can still reflect the current public attitude and participation status to a certain extent. This paper attempts to provide a new perspective and quantitative research method for Chinese urban heritage management through data (both texts and photos) analysis of Weibo.

The result of this research suggests that the participatory level in the World Cultural Heritage site in China is near informing and consulting. Generally speaking, the extent of Chinese public participation in heritage protection practices is relatively weak. With the increase in the participatory level, the number of related posts tends to decrease. The lack of public empowerment posts may be evoked by poor successful cases, low awareness of residents' participation, or certain communication restrictions on Weibo. However, in the

process of urban management, the perception of public opinion cannot be ignored. Therefore, analysing social media data to understand the perception of the public and further support decision makers' decision is vital for a successful management process. It is foreseeable that empowering the public to truly participate in heritage conservation research and projects can enhance their sense of shared responsibility for the heritage environment in which they live and become more active in participating in collaboration driven by common interests.

At the government level, multiple stakeholders should be encouraged to participate in the heritage protection decision-making process in order to better balance the interests of all parties [60]. ICTs such as social media could be applied to enrich the construction of third-party platforms that promote the communication between citizens and the government. In addition to legislation, decision-makers should also provide an open digital platform for communicative collaboration and encourage citizens to use it. Concerning the urban renewal strategy, in the process of cultural heritage management, the fundamental interests and choices of residents should be widely considered [61]. Furthermore, lectures, exhibitions, and other public events could be a powerful approach to publicise cultural conservation due to the gradual popularisation of online activities. Virtual exhibitions are also methods that could potentially attract a great number of audiences online, hence, should be recommended to be held frequently. Online mechanisms should also be effectively utilised to offer recurrent access to the establishment of a structured cultural conservation system.

5.2. Reflects on Design and Conservation Planning

The user's preference profile identified through the pictures can show that the residents pay more attention to traditional Chinese buildings compared with cities and streets. The focuses of the citizens are mainly on the human-friendly elements, such as the details of the built environment and architectural materials. Modern commercial buildings did not become the focus of the audience, ranking behind the residential areas by a clear gap. Generally speaking, social media users pay much more attention to outdoor elements in urban heritage, such as natural landscapes and building facades, than interior design, while rural landscapes have received very little attention. Therefore, in the transformation and renewal of urban heritage, the protection of the exterior of the building and the preservation of traditional features should be listed first. The interior design of the building has little effect on the overall urban landscape and can be handled more personally. The features and structures of heritage sites and historic buildings should be conserved while taking into account the restoration of the interior living space. Therefore, a feasible strategy is to carry out the functional transformation of indoor space while preserving the appearance of the building as much as possible, bringing great benefit to both the improvement of the residents' quality of living as well as the conservation of cultural heritage.

5.3. The Current Policy System and Practical Challenges

China's cultural heritage protection has gone through a complicated process, in part due to the emphasis on economic and urban expansion, which led to considerable pressure to develop in areas containing historical monuments during the second half of the 20th century. However, the overall trend of Chinese cultural heritage management is gradually becoming more sustainable and holistic. The Chinese government's insistence on holistic cultural heritage protection can be found in the laws and regulations promulgated in the recent fifteen years. In 2008, the "People's Republic of China Urban and Rural Planning Law" stipulated that public participation should be included in the process of planning [62]. In the official notice of the 14th Five-Year Plan for Cultural Relics Protection and Technological Innovation, issued in November 2021, the Central Government of China pointed out that in the overall planning of urban and rural areas, we must adhere

to the overall protection of the system and improve the cultural relics protection mechanism [63].

It is necessary to protect and continue the urban context with cultural relic resources as the carrier and to combine the protection of cultural relics with the protection of old cities and urban renewal. Nevertheless, public participation is facing many difficulties at the actual operational level and has not been fully promoted [64]. Some scholars pointed out that the low empowerment level (both on social media and general) in decision-making is mainly due to the government's excessive emphasis on economic interests, the inadequate implementation of planning regulations and rules, and the weak involving awareness [65]. Wu pointed out that the protection of urban heritage in China has been facing the dilemma of diversified property rights [65]. In Li's opinion, coordinating the property rights of buildings requires more clarification of the legislative details [66].

5.4. Limitations

There are several limitations in the current study. Firstly, the study is restricted by the method of accessing the Weibo open dataset, some users' data, especially the ones that do not have account verification, are absent to a certain degree. In addition, some critical comments may be censored and then banned due to the strict monitoring system on social media in China, which may lead to the underutilization and inadequate analysis of a certain amount of the data. Secondly, some mis-estimation of the users' perception may have been caused by the dataset of the study, which is not based on their self-evaluation. A mass survey on the cultural heritage preservation and management process, such as online questionnaires, is still needed to fill this gap. Thirdly, the manual label filing, which is based on subjective judgment, which was used in the current study is relatively limited when analysing a big dataset. More advanced analytic deep-learning models, such as Convolutional Neural Networks, could deepen and improve this research. Lastly, variables that may influence the users' attitudes, such as economic development, collaboration tightness with government, and other cultural and social indicators should also be better investigated.

6. Conclusions

Due to the diversity of cultural backgrounds, social systems, economic models, and social development levels, it is not only necessary to carry out extensive discussions on the role of social media in promoting public expression at the theoretical level but also to conduct small-scale tests and experiments on it. The main purpose of the article is to explore a way to evaluate the degree of public participation through Chinese social media platforms by obtaining big data. The final result is based on a series of purification and interpretation based on the posting data of Weibo users during the 2020 epidemic. The results of this study can lead to a new viewpoint for professionals and researchers in the field of heritage conservation to further acknowledge the factors of cultural diversity and general participation in relation to the managerial process of heritage management.

Social media, as a medium, offers a platform to enhance the voice of the people and actively promote the formation of diversified participation. Weibo to a certain degree build a channel between the government and the local for dialogues. The study on users' data and posts on Weibo can offer some valuable information on the participatory status quo, possible collaborative trends, and citizens' preferences to support decision-making in the urban conservation process. In order to enhance the level of public participation, corresponding legislation and policies should be adopted to ensure the citizens' participatory activities in the decision-making process, rather than only feedback and expression of attitudes. At the level of national and local policy implementation, laws and regulations related to urban heritage conservation should be further deepened and improved to enhance the public's right to input into urban protection decisions. In addition, the filter of the dataset should be carefully processed considering the limitations of the current study

in future research. Another investigation to let the locals express their opinion in a more substantial and consciously way is also encouraged as a supplement to the current study.

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