Comparative Study of WeChat Official Accounts of University Libraries and Public Libraries: Postprint

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Abstract

[Objective/Significance] As WeChat Official Accounts have enhanced the intelligence level of library information dissemination and improved library service effectiveness, they have been widely adopted by libraries in China as an important self-media platform. Against this backdrop, comparative research on WeChat Official Accounts of university libraries and public libraries holds significant importance. [Method/Process] First, data on external and internal descriptions of WeChat Official Account posts were collected using social media big data platforms and web crawler technologies, then cleaned and stored in a MongoDB database. Second, the WeChat Communication Index algorithm was employed to calculate the communication indices of WeChat Official Accounts for university libraries and public libraries. Simultaneously, the Latent Dirichlet Allocation (LDA) model from machine learning was introduced to conduct thematic classification research on post texts from these two types of library WeChat Official Accounts. Finally, the concept and quantification method of the Integrated Audience Acceptance Index (IA&AI) were proposed, and comparative studies based on statistical analysis of representative post characteristic indicators were conducted under conditions where IA&AI thresholds were established. [Results/Conclusion] The read counts and like counts of WeChat Official Accounts for both university libraries and public libraries exhibit a strong positive correlation; the communication influence of university library official accounts is slightly lower than that of public libraries, yet both types of libraries demonstrate a polarization phenomenon in influence. Through comparative analysis, similarities and differences in post themes between university libraries and public libraries were identified, as well as differences in information characteristics between posts with higher or lower Integrated Audience Acceptance Index values. Finally, based on the research conclusions, recommendations for the operation of WeChat Official Accounts for these two types of libraries were proposed.

Full Text

Preamble

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Abstract

[**Purpose/Significance**] Since the WeChat public platform has enhanced the intelligent level of library information dissemination and improved library service efficiency, it has been widely adopted by Chinese libraries as an important self-media platform. In this context, comparative research on WeChat public platforms between university libraries and public libraries holds significant importance. [**Method/Process**] First, we collected external and internal description data of WeChat public platform posts using a social media big data platform and web crawler technology. After data cleaning, the data was stored in a MongoDB database. Second, we calculated the WeChat communication index for both university and public library platforms using the WeChat Communication Index algorithm. Simultaneously, we introduced the Latent Dirichlet Allocation (LDA) model from machine learning to conduct topic classification research on the texts of these two types of library WeChat posts. Finally, we proposed the concept and quantitative method of the Information Acceptance and Adoption Index (IA&AI) and conducted comparative research based on statistical analysis of representative post feature indicators under set IA&AI thresholds. [**Result/Conclusion**] There exists a strong positive correlation between read counts and like counts for both university and public library WeChat public platforms. The communication influence of university library platforms is slightly lower than that of public libraries, but both exhibit polarization in influence. Through comparative analysis, we identified similarities and differences in post topics between university and public libraries, as well as differences in information characteristics between posts with higher and lower IA&AI values. Based on these findings, we propose recommendations for operating WeChat public platforms for these two types of libraries.

Classification Number: G252
Keywords: library; WeChat public platform; latent Dirichlet allocation; information acceptance and adoption index; comparative study

1 Literature Review

Since its launch in 2012, the number of WeChat public platforms has grown rapidly. According to the *2017 WeChat Data Report*, by September 2017, monthly active accounts on the WeChat public platform reached 3.5 million, with 797 million monthly active followers [1]. Tencent's Q2 and interim 2018 performance report showed that combined monthly active accounts for WeChat

and WeChat reached 1.058 billion, a year-on-year increase of 9.9% [2]. The WeChat public platform has become an important self-media platform for government agencies, enterprises, and other institutions. During this period, the library community has also kept pace with the times, actively applying the WeChat public platform to practical work. Using Qingbo Big Data's WeChat tool for public platform information collection and searching for "library" yields 1,998 accounts, demonstrating the widespread application of WeChat public platforms in libraries.

In academic research, foreign library scholars began studying social networks earlier than their domestic counterparts. The first professional academic paper on social networks in libraries was published by L. Charnigo et al. in 2007, which surveyed the reactions of 127 American university librarians to Facebook and demonstrated the impact of social networks on libraries [4]. Since then, research on libraries based on social networks has increasingly attracted scholarly attention. D. Winn et al. examined the social media accounts of four university libraries in Montreal and measured each library's social media activity influence based on data collected over eight months [5]. J. Yep et al. analyzed the Twitter networks of undergraduate universities to identify influencers using networks constructed from Twitter behaviors [6]. S. M. Al-Daihani analyzed posts from academic libraries on Facebook to help improve academic library social media strategies [7]. N. Arroyo-Vazquez analyzed interactions on Spanish university library Facebook pages from quantitative and qualitative perspectives, proposing that interaction should be considered a key point in library social media strategies [8]. F. Hamad et al. explored how academic librarians view the role of social networks in improving library staff professional skills and how to use social networks to develop library services [9].

Domestic library research on social networks started slightly later than abroad, but its growth has been rapid. Using CNKI database for literature retrieval with the search terms "(WeChat or WeChat) and library" as of September 14, 2018, yielded 2,956 papers, indicating substantial related research. Further searches using "(WeChat or WeChat) and university library" and "(WeChat or WeChat) and public library" as themes returned 1,496 and 530 papers respectively, with significantly more research on university libraries than public libraries. Analysis of relevant literature reveals that research on university library WeChat platforms mainly focuses on: (1) practical application studies [10-12]; (2) operational strategy research [13-14]; (3) effectiveness evaluation studies [15-17]; (4) case studies [18-19]; and (5) user behavior research [20-21].

Research on public library WeChat platforms primarily focuses on operational strategies [24-28]. There are also comparative studies between Weibo and WeChat services in public (and university) libraries [29-30]. Undeniably, the social function positioning of public and university libraries differs. Generally, university libraries primarily serve their faculty and students, bearing the responsibility of supporting teaching and research, while public libraries, as free public service libraries, serve broader populations and shoulder the responsibil-

ity of serving the public and cultural guidance [31]. Although both are important pillars of the entire library industry, their differences cannot be ignored. However, beyond individual WeChat research in these two domains, comparative studies between university and public library WeChat platforms are lacking. Therefore, this research aims to fill this gap, hoping to provide libraries with a complete and replicable empirical method based on big data-driven WeChat post data collection → data extraction and indicator measurement → comparative analysis, while enabling scholars to deeply understand the current application status and similarities and differences of WeChat public platforms in domestic university and public libraries, thereby providing useful references for targeted social network promotion strategies in the library community.

2 Research Methods

This study's design process is divided into three stages: data collection, data extraction and indicator measurement, and comparative analysis (see Figure 1 [Figure 1: see original paper]). The data source is the Qingbo Index Big Data Platform [32], a research and formulation body for China's new media big data evaluation system and influence standards. First, we used Qingbo Big Data Platform to collect external description data of WeChat posts, including publisher name, release time, title, read count, like count, and URL link. Then we used a Python-based post link crawler to traverse all post URLs during the research period (January 1, 2018 to September 10, 2018), crawling relevant data (some posts were republished, requiring secondary data crawling). We obtained 12,638 structured data entries including post text, text length, number of dynamic images, static images, audio files, and video files. Sixty posts were deleted after publication, with their text data marked as "deleted" and other data items as "null." All post description data was finally stored in MongoDB in dictionary format, as shown in Figure 2 [Figure 2: see original paper].

2.1 Sample Selection and Data Collection

We selected WeChat public platforms from 42 "world-class university construction" libraries and 31 provincial public libraries (excluding Hong Kong, Macau, and Taiwan) as research objects. Except for China Agricultural University Library, all other surveyed libraries had opened WeChat public platforms. National University of Defense Technology, University of Electronic Science and Technology, South China University of Technology Library (Huatu Xiaowei), and Central South University Library had opened public platforms but had no collectible posts. Zhejiang Library had both subscription and service account data, which were unified for statistical convenience. Therefore, we collected push data from 37 "world-class university construction" libraries and 31 provincial public libraries.

Using the custom list function [33] in Qingbo Big Data Platform, we manually added these 68 libraries' WeChat public platforms to collect external description data. We then launched a Python-based post link crawler to traverse all post

URLs during the research period, obtaining 12,638 structured data entries (some posts were republished, requiring secondary crawling). Sixty posts were deleted after publication, with their text data marked as "deleted" and other data items as "null." All post description data was finally stored in MongoDB in dictionary format.

2.2 Research Indicators

2.2.1 WeChat Communication Index (WCI) The WCI (Version 12.0) from Qingbo Index Big Data Platform is one of the evaluation indicators for data analysis in this paper. It has high recognition and authority, comprehensively and objectively reflecting WeChat's overall heat and public platform development trends. The specific calculation formula is:

$$WCI = 80\%\times(40\%\times\ln(R/d+1)+45\%\times\ln(R/n+1)+15\%\times\ln(R_{max}+1))+20\%\times(40\%\times\ln(10\times Z/d+1)+45\%\times\ln$$

Where:
- n = number of posts during the statistical period
- d = number of days in the statistical period
- R, Z = total read count and like count of all posts during the statistical period
- R_{max}, Z_{max} = maximum read count and like count of posts during the statistical period

2.2.2 WeChat Public Platform Information Acceptance and Adoption Index (IA&AI) From the user's perspective, two important concepts and indicators for measuring WeChat public platform push information are information reception and information acceptance. For WeChat public platforms, whether subscription or service accounts, merely pushing information does not necessarily mean users effectively receive it. Clicking on pushed information represents effective reception to a certain extent, making read count the measure of effective reception. Information acceptance refers to users' identification with, approval of, and positive evaluation of pushed information, i.e., information adoption. Many scholars have studied liking motivations in social networks [34-35], considering likes as indicative of positive attitudes toward information. Therefore, like count can effectively measure information acceptance.

Based on this, we propose the Information Acceptance and Adoption Index (IA&AI) to measure WeChat push information effectiveness. The specific calculation formula is:

$$IA\&AI = (0.8 \times \ln(R+1) + 0.2 \times \ln(10 \times Z + 1))^2 \times 10$$

Where:
- R = total read count of a post during the statistical period
- Z = total like count of a post during the statistical period

The steps for this stage are: (1) extract read and like counts for the 12,638 structured data entries from January 1, 2018 to September 10, 2018; (2) conduct preliminary processing to obtain primary indicators $\ln(R+1)$ and $\ln(10\times Z+1)$; (3) perform weighted processing to obtain the final indicator.

2.2.3 Topic Classification To classify post topics for university and public libraries, this paper uses the LDA topic model for post topic clustering analysis. This stage is divided into data preprocessing and formal LDA model training: (1) We added unique proper nouns from university and public library WeChat posts (including "yuedu," interlibrary loan, ESI, Wenlan, call number, CASHL, etc.) to the segmentation dictionary in dictionary format, used the Harbin Institute of Technology stop word list as the Chinese stop word table, and employed Jieba segmentation for all post texts. (2) We used the LDA library and Collapsed Gibbs Sampling algorithm (adding a prior Dirichlet distribution for parameter b on the original LDA model to improve estimation accuracy). As shown in Figure 3 [Figure 3: see original paper], parameter z represents topics, parameter w represents words, and θ represents document distribution over topics. Hyperparameters α (reflecting probability properties of z) and β (reflecting probability properties of w given z) are iteratively derived from different given parameters. The entire model is not significantly affected by initial values of α and β, so we set them as default values ($\alpha = 0.1$, $\beta = 0.01$). Due to the small sample size, perplexity was not used as a measurement standard. After trying 4-10 topic divisions, we selected 8 topics for university libraries and 5 topics for public libraries based on clustering results.

2.2.4 Information Feature Indicators To further explore what types of posts are more easily received and accepted by WeChat public platform users, this study extracted six indicators: title features, content presentation format, originality, content type, posting entity, and topic. Using the IA&AI index, we filtered 120 representative posts (30 posts with highest and 30 with lowest IA&AI values from both university and public libraries) from the 12,638 structured data entries for in-depth comparative research. Title features mainly analyzed title sentence patterns and internet buzzwords, with sentence pattern analysis focusing on whether titles were declarative sentences (most post titles are declarative). Content presentation formats included text only, text plus images, and text plus images with audio/video. Originality was obtained directly from collected external post description data. Posting entity research focused on whether posts were concentrated in certain libraries. Content types included suggestion type (expressing opinions and conveying suggestions), message type (publishing news), and Q&A type (requiring reader responses, such as soliciting opinions or information). Topic referred to post topic classification.

3 Results and Discussion

3.1 Overall Analysis

Statistical analysis of the collected 12,638 data entries yielded post counts, average read counts, and average like counts for university and public library WeChat accounts. Using Tableau for analysis, we used library names as row parameters and post count, average read count, and average like count as column parameters, sorted by post count in descending order. As shown in Figure 4 [Figure 4: see original paper] and Figure 5 [Figure 5: see original paper]:

The top three university libraries by post count were Shandong University Library (346 posts), Lanzhou University Library (316 posts), and Sun Yat-sen University Library (302 posts). The top three public libraries were Hunan Library (809 posts), Henan Provincial Library (680 posts), and Zhejiang Library (612 posts). Sichuan University Library, Wuhan University Library, and Dalian University of Technology Library ranked top in average read counts among university libraries with 5,449, 2,573, and 2,192 reads respectively. Hunan Library, Shanghai Library, and Nanjing Library led public libraries with 5,932, 2,997, and 1,725 reads respectively. For average like counts, Sichuan University Library, Dalian University of Technology Library, and Wuhan University Library topped university libraries with 117, 49, and 44 likes respectively, while Hunan Library, Guangxi Zhuang Autonomous Region Library, and Shanghai Library led public libraries with 55, 26, and 26 likes respectively.

The data shows that libraries with high post counts do not necessarily have advantages in average read or like counts. The top three university libraries by post count are not among the top three in average read or like counts, and similarly for public libraries (except Hunan Library). The top three public libraries have more than double the post counts of the top three university libraries, and the top two public libraries also have higher average read counts. However, the top three public libraries have lower average like counts than university libraries. Public libraries' average post count (258.16) and average read count (965.06) are higher than university libraries' averages, while their average like count (14.00) is 4.78 lower than university libraries' average.

To further analyze relationships between post count, average read count, and average like count, we conducted Spearman correlation analysis, as shown in Table 1 and Table 2 .

The correlation analysis results show that both university and public libraries have significant positive correlations between average read count and average like count (0.880 for university libraries, 0.923 for public libraries). However, relationships between post count and average read/like counts are not close. In other words, high posting frequency does not necessarily lead to user reception and acceptance of posts, but high reception (average read count) often leads to high acceptance (average like count).

From a communication perspective, communication effects have three levels:

cognition, attitude, and behavior, which are also different stages in the complete communication effect formation process. Cognition is undoubtedly the first stage—only after reading (receiving) posts can readers express appreciative attitudes and liking behaviors, fully realizing the value of WeChat public platforms. To achieve high reception rates and good push effects, a good title is crucial as a traffic entry point. Only when article titles arouse readers' interest can they potentially gain positive evaluations and likes. For example, a Fudan University Library article titled "Fudan and Tongji Finally Take This Step…" received 32,709 reads and 500 likes. Analyzing this, its title is concise yet highly attractive, ending with an ellipsis that greatly captures curiosity and click desire. The article's layout also matches the theme, with a background image overlaying Fudan and Tongji's emblems, enriching readers' sensory experience while sparking imagination, thus achieving good response. Hunan Library's post titled "How Do People Who Truly Rest Spend Their Holidays?" received 38,395 reads and 193 likes. This title captured the article's key point, matched reader needs, and made readers recognize its reading value. Using a question format attracted attention, and with aesthetically pleasing images, it aroused reading interest.

3.2 WeChat Communication Influence Analysis

Using indicators including post count, total reads, total likes, maximum reads, and maximum likes, we calculated each library's WeChat Communication Index, as shown in Table 3 and Table 4 .

Careful analysis of WCI values shows polarization in both university and public libraries. The difference between first and last place is 504 points for university libraries and 655 points for public libraries. Four university libraries have WCI above 500, accounting for 10.70% of total posts but 25.40% of total reads and 24.40% of total likes. Three public libraries have WCI above 500, accounting for 18.10% of total posts but 61.00% of total reads and 47.40% of total likes.

In university library WCI rankings, Wuhan University Library, Sichuan University Library, and Dalian University of Technology Library rank top with WCI values of 588.14, 551.68, and 500.75 respectively. In public libraries, Hunan Library ranks first with a significant advantage (WCI = 826.87), over 200 points higher than second place. Shanghai Library and Sichuan Provincial Library rank second and third with WCI values of 616.20 and 518.12 respectively. The top three public libraries' WCI values are correspondingly higher than university libraries'.

We analyze that these gaps may result from differences in social function positioning: public libraries typically serve the general public free of charge, while university libraries primarily serve their faculty and students, supporting teaching and research as their core function. Although many universities participate in social services, their functions and funding limitations restrict their social services to selective participation, affecting limited social populations. Public

libraries, however, have increasingly comprehensive service networks, with some university faculty and students using public libraries during holidays, contributing to the gap in WeChat influence between university and public libraries.

3.3 Post Topic Analysis

Based on the LDA model, we implemented topic clustering for university and public library posts. University library post topics can be divided into 8 categories, while public library topics into 5 categories, as shown in Table 5 and Table 6 .

Through topic classification, we found: (1) Both university and public library post topics include book recommendations and reading activities, indicating that reading promotion has become an important part of daily library work under the national reading campaign. (2) The gap in expert lectures and knowledge popularization stems from different social responsibilities. University libraries mainly serve faculty and students, focusing on teaching and research support, thus emphasizing scientific tools and knowledge popularization, including database recommendations. Public libraries serve the general public, with lectures and encyclopedia posts being universally applicable while providing cultural guidance. (3) The *42nd Statistical Report on China's Internet Development* [36] shows that Chinese netizens are predominantly teenagers and young adults, with students being the largest group. These digital natives may be why university libraries can effectively convey notification information through posts. Public libraries serve broader populations (various ages, occupations, and education levels), where in-library notices may have higher reception rates than mobile platforms. Additionally, as university libraries are school literature information centers and learning spaces, their opening hours and major events significantly impact readers, making such posts on WeChat receive widespread attention.

3.4 Analysis Based on WeChat Information Acceptance and Adoption Index

Based on the collected 12,638 data entries from 37 university libraries and 31 public libraries, we calculated IA&AI values according to read and like counts, extracted 120 representative posts (30 posts with highest and 30 with lowest IA&AI values from both library types), as shown in Table 7 .

Using manual reading, we categorized and statistically analyzed the 120 posts using six information feature indicators: topic, title features, content presentation format, originality, content type, and posting entity. Results are shown in Table 8 .

3.4.1 Topic Analysis Analysis of high and low IA&AI posts shows that among high IA&AI posts from university libraries, 20 posts (two-thirds) were library-related notifications (including opening/closing notices, holiday notices,

and major event notifications). Among low IA&AI posts, training/lecture information was most common (14 posts, nearly half). Most high IA&AI posts from public libraries were life encyclopedia type (77%). Low IA&AI posts were mainly reading activity information, which may be due to insufficient innovation and targeting in public libraries' reading activities for their broad service objects.

3.4.2 Title Feature Analysis High IA&AI posts often use non-declarative sentence patterns (elliptical, interrogative). Among university library high IA&AI posts, 13 titles (nearly half) contained non-declarative patterns, while public libraries had 10 such titles. Low IA&AI posts had far fewer non-declarative titles (2 for university libraries, 5 for public libraries). Additionally, 10% of high IA&AI post titles from university libraries contained internet buzzwords like "easter egg" and "pick."

3.4.3 Content Presentation Format Analysis High IA&AI posts were mostly illustrated or used video/audio formats. For example, Tsinghua University Library's post "Tsinghua University Library Intelligent Return Cart Officially Launched" included both ceremony photos and a video introducing the cart's functions. Low IA&AI posts mostly used simple text or images. Notably, no high IA&AI posts were text-only, while 47% of low IA&AI posts from university libraries were text-only—over double the proportion for public libraries. This difference stems from topic variations: university libraries include library notification posts (often text-only), while public libraries don't emphasize such notifications.

3.4.4 Originality Analysis Among 60 high IA&AI posts from both library types, 6 were original articles, while none were original among low IA&AI posts. One original article titled "7:00-22:30 Ultra-long Opening | Library Winter Vacation Opening Hours Set New Record!!" not only announced winter vacation hours but also answered common reader questions (e.g., off-campus access). Such targeted original posts meeting reader needs gained more recognition. Public libraries' originality rate is lower than university libraries, possibly because their topics (life encyclopedia, graphic appreciation) often come from reposts, and their service focus differs: university libraries emphasize research innovation, while public libraries focus on public cultural services.

3.4.5 Content Type Analysis Among 30 high IA&AI posts from public libraries, 19 were suggestion-type posts (e.g., Hunan Library's "How to Face Black Swans in Life: The Best Answer I've Seen," containing life philosophies). Among low IA&AI posts, message-type and Q&A-type posts accounted for 25 (83%), such as Henan Provincial Library's "Collection | Growing with the Library—Collecting Stories with the Library," which received only 27 reads and 0 likes. Both high and low IA&AI posts from university libraries contained

many message-type posts, but high IA&AI posts were mostly library notifications or major event announcements, while low IA&AI posts were mainly training/lecture announcements. This suggests public library readers prefer suggestion-type posts, while Q&A and activity announcement posts perform poorly. University library readers prefer library notification posts, while training/lecture announcements perform poorly, likely because training posts often simply promote databases with monotonous content about topics, times, and locations, lacking appeal.

3.4.6 Posting Entity Analysis Statistics show that among 30 high IA&AI posts from public libraries, 29 came from Hunan Library, indicating its posts are well-received and worthy of study. High IA&AI posts from university libraries were concentrated in Wuhan University Library, Sichuan University Library, and Dalian University of Technology Library, which also achieved good responses worth emulating.

4 Conclusions and Recommendations

WeChat public platforms have emerged from various social media platforms with powerful functions, becoming important platforms for library information services. However, their application in university and public libraries differs in influence, post topics, and content features due to differences in social responsibility and service objects. This study used Qingbo Index Platform and crawler programs to obtain internal and external description data from public and university libraries, analyzing the data using WCI, LDA model, IA&AI index, and six information feature indicators. We conclude: (1) Public libraries have higher overall post counts and average read counts but lower average like counts than university libraries. Spearman correlation analysis verified that post count is not closely related to read/like counts, while read and like counts are significantly positively correlated, demonstrating the importance of post titles. (2) University libraries have slightly lower WeChat influence than public libraries due to narrower service objects, but both exhibit polarization. (3) LDA model topic classification shows both library types grasp current research hotspots—reading promotion (book recommendations, reading activities)—but differ due to social responsibilities and service objects. University libraries emphasize scientific knowledge/tools, focusing on database recommendations, training, and popular science, while public libraries favor culturally guiding life encyclopedia and graphic appreciation posts. (4) In-depth analysis using six information feature indicators shows that posts with special title sentence patterns and illustrated formats are more popular. High and low IA&AI posts differ between library types: university library high IA&AI posts are mainly library notifications, low IA&AI posts are training/lecture announcements; public library high IA&AI posts are life encyclopedia type, low IA&AI posts are reading activity type.

Based on these conclusions, we recommend: (1) **Monitor industry trends**

and actively learn from peers. Both library types exhibit polarization. Libraries with lagging WeChat operations should follow industry leaders like Hunan Library, Shanghai Library, Wuhan University Library, and Sichuan University Library, promoting interaction and cooperation through online/offline activities (e.g., Tongji and Fudan's shared library program). (2) **Strengthen promotion efforts.** Public libraries have higher influence but should not relax promotion. University libraries can integrate WeChat promotion into new student orientations, lectures, and reading activities. Public libraries can use big data to analyze reader behaviors for targeted strategies. (3) **Strengthen IP protection and promote originality.** Both library types have low originality. Libraries should enhance IP awareness, avoid simple reposting, and increase original content through training and incentives. (4) **Emphasize content editing.** Increase content richness and format diversity, using illustrated or multimedia posts. Title setting is crucial—use elliptical, exclamatory, or interrogative patterns to arouse curiosity and resonance, adding internet buzzwords for appeal. (5) **Push information based on audience needs to enhance user stickiness.** University libraries should post more library notifications and be cautious with lecture/training announcements. Public libraries should post more suggestion-type, life encyclopedia posts with universal applicability and practicality, using social hotspots and celebrity effects to enhance appeal. When posting reading activity announcements, actively engage readers and improve targeting.

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Author Contributions

Lü Meixia: Responsible for data analysis and paper writing.
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