Postprint: User Requirements for Public Cultural Cloud Activities Based on Online Reviews

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Abstract

[Purpose/Significance] As the ultimate recipients of public cultural cloud platform activity services, users' online reviews of cultural cloud activities are analyzed to objectively identify user demands for public cultural cloud platform activities, thereby optimizing the form and content of cultural activity supply and enhancing the quality of public cultural cloud platform activities. [Method/Process] Using online reviews and messages from public cultural cloud platform activities as data sources, this study conducts qualitative analysis through grounded theory methodology to construct a user demand framework for public cultural cloud platform activities, and combines sentiment analysis to calculate users' emotional tendencies toward each demand element. [Results/Conclusion] Organizational demands, platform demands, and activity demands represent users' external demands, while individual demands such as participation motivation, activity expectations, and perceived value constitute internal demands. To enhance users' emotional identification with cultural cloud activities, optimization suggestions for public cultural cloud platform activities are proposed from four aspects to support the design and management decision-making of these activities.

Full Text

Research on Users' Needs of Public Culture Cloud Activities Based on Online Comments

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Abstract:
[Purpose/Significance] Users are the ultimate recipients of activity services on public cultural cloud platforms. By objectively analyzing user needs for public cultural cloud platform activities based on their online comments, we can

optimize the supply forms and content of cultural activities according to demand, thereby improving the quality of public cultural cloud platform activities. [Method/Process] Taking online comments and messages from users of public cultural cloud platform activities as data sources, this study employs grounded theory for qualitative analysis to construct a user needs framework for public cultural cloud platform activities, and combines sentiment analysis to calculate users' emotional tendencies toward each needs element. [Result/Conclusion] Organizational needs, platform needs, and activity needs constitute users' external needs, while individual needs such as participation motivation, activity expectations, and perceived value represent internal needs. To enhance users' emotional identification with cultural cloud activities, this study proposes optimization suggestions for public cultural cloud platform activities from four aspects to support activity design and management decisions.

Keywords: cultural cloud activities; user needs; grounded theory; online reviews; sentiment analysis

2. Related Research

Current research on public cultural cloud platforms primarily focuses on service status, service models, service supply, related technologies, and user behavior. Regarding service construction status, Huang Jing [1] investigated the current state of urban public digital cultural services in China, while Chen Zeqian [2] examined domestic cultural cloud service status through web surveys, identifying existing problems and proposing recommendations. In terms of service models, Xu Wang [3] proposed a resource-sharing service chain based on cultural clouds, and Li Wenchuan et al. [4] suggested innovative processes and mechanisms for resource services from perspectives of cloud resource service chain construction and virtualization modeling. For service supply, Tang Jinyu et al. [5] analyzed the service efficiency of public cultural cloud WeChat public platforms. Concerning related technologies, Xu Wang [3] introduced applications of cloud computing and artificial intelligence (AI) in cloud platform services, D. Wanyan et al. [6] discussed the advantages of cloud technology in digital cultural construction through cultural cloud research, and P. Kats et al. [7] introduced cloud technologies employed in the Europeana platform. In user behavior research, preliminary studies have addressed institutional users' information sharing behavior and intentions [8-9], continuous usage intention, and user satisfaction [10].

It is evident that most scholars currently analyze the overall development of public cultural cloud platforms through literature review, web surveys, and questionnaires. However, cultural cloud platform activities, as an important component of cultural cloud services, have not received adequate attention. Moreover, current research lacks discussion on user needs for public cultural clouds, making it difficult to objectively reflect the service effectiveness of pub-

lic cultural cloud activities. In other domains, user needs research based on online comments primarily employs methods such as topic modeling [11], text analysis techniques [12-13], machine learning methods [14], and statistical methods [15-16] to identify thematic attributes and conduct sentiment analysis, with few scholars focusing on the relationship between user emotional tendencies and needs. This study extracts user comments from public cultural cloud activities to uncover real user needs, calculates emotional polarity for each needs dimension, and proposes suggestions for improving public cultural cloud activity services and platform optimization.

3. Research Methods and Data Sources

3.1 Research Methods

This study primarily employs grounded theory. Grounded theory, proposed by sociologists B. Glaser and A. Strauss in 1965, is a systematic approach for constructing theoretical models. Subsequently, numerous scholars have deepened and expanded grounded theory, leading to its wide application in various disciplines such as management, sociology, and library and information science [17]. The grounded theory process mainly includes data collection and organization, coding, and saturation testing, with coding being the core of the entire process, comprising open coding, axial coding, and selective coding. Currently, research on public cultural cloud platform activities is extremely scarce both domestically and internationally, and research on user needs for public cultural cloud activities is lacking, with no mature research framework established. Existing theories cannot adequately explain this emerging online-offline integrated cultural activity phenomenon, making grounded theory particularly suitable for this exploratory study.

This study utilizes NVivo text analysis software to conduct three-level coding on crawled public cultural cloud platform activity comment information, breaking down and recombining the text to discover organic connections between various parts and conduct systematic analysis to uncover deep-seated user needs for cultural cloud platforms.

3.2 Data Sources

Based on preliminary investigation of public cultural cloud platforms, this study selected user comments and messages from a district-level cultural cloud platform in Shanghai as the research object. This platform is a convenient website provided by the district's Culture and Tourism Bureau for the public to access public cultural services, representing a typical public cultural cloud platform. Through this platform, users can browse various public cultural activities in the district and make reservations, view pictures and videos of past activities, and subscribe to cultural activity content of interest, enabling users to experience the richness of "cloud cultural life." As of December 6, 2020, the platform featured 14,076 cultural activities, 381 cultural crowdfunding projects, 44 cultural

competitions, 549 cultural clubs, 7 digital exhibition halls, and 120 bookable cultural venues. The number of cultural activities ranks among the top among all public cultural cloud platforms. Its participation mechanism involves earning "cloud beans" through tasks such as commenting, resulting in high user activity and ensuring a certain guarantee of quantity, quality, and authenticity of comment content, making it highly representative.

To obtain user comments and messages from this cultural cloud platform, we used information collection tools to access the cultural cloud activity module, crawling usernames, comment content, and message content for each activity. After exporting and cleaning all collected data, we obtained 16,349 entries as the foundational material for this study.

4. Category Refinement and Model Construction

4.1 Open Coding

Open coding requires dividing text fragments in the dataset and assigning concepts to them, then recombining them. Through sentence-by-sentence analysis of the collected raw data, we eliminated statements without substantive content, focused on the research purpose and theme, split each sentence into analysis units for coding, and through repeated reading, conceptualized them according to predetermined criteria, yielding 4,480 original statements and initial concepts. Due to the large number and certain redundancy of initial concepts, further refinement was needed. Therefore, based on statement frequency and group discussion, we organized, summarized, and integrated the initial concepts, resulting in 82 initial concepts and 20 categories. Categories and sample original statements are shown in Table 1 .

4.2 Axial Coding

Axial coding requires exploring relationships between categories, between categories and concepts, and between concepts to induce main categories. By mining the internal connections among the 20 categories, we reorganized the initial categories through repeated deliberation and ultimately grouped them into four main categories: organizational needs, platform needs, activity needs, and individual needs. Specific coding is shown in Table 2 , with the proportion of each node shown in Figure 1 [Figure 1: see original paper] (numbers represent node counts for each category).

4.3 Selective Coding

Selective coding requires identifying core categories among the summarized conceptual categories to form a storyline. During the axial coding stage, relationships between categories gradually emerged. By clarifying these logical relationships, we constructed a user needs framework model for public cultural cloud platform activities, shown in Figure 2 [Figure 2: see original paper]. Users of

public cultural cloud activities generate organizational needs, platform needs, activity needs, and individual needs, which can be divided into external needs for participating in public cultural clouds and internal needs. External needs refer to demands for activity service providers, such as organizational needs, platform needs, and activity needs; internal needs refer to demands related to users' own development, such as individual needs including participation motivation, activity expectations, and perceived value. This framework provides reference for research on user experience, user satisfaction, user continuous usage behavior, and the establishment of evaluation indicator systems for public cultural activities on cultural cloud platforms. On the other hand, it helps improve and enhance existing services and strengthen cultural cloud platform construction from the perspective of user needs.

4.4 Theoretical Saturation Testing

To ensure the reliability and validity of research categories, theoretical saturation testing was conducted after constructing the theoretical framework. We randomly selected 100 comments from activities updated after December 6, 2020, on this cultural cloud platform for a new round of coding. Comparing these with already obtained concepts and categories, no new concepts or categories emerged, indicating that the user needs framework for public cultural cloud platform activities has reached saturation.

5. Analysis of Emotional Values of User Demand Elements

Based on the 梳理 of cultural cloud user needs categories, we obtained current users' emotional tendencies toward these needs elements. Comments and messages truly reflect users' feelings about participating in cultural cloud platform activities, showing positive and negative emotions toward cultural cloud platform activity services and reflecting the degree to which user needs for cultural cloud platform activities are met. To further obtain users' emotional tendencies toward each demand element of cultural cloud platform activities, we employed natural language processing and statistical methods to calculate comment sentiment tendencies. First, we analyzed and part-of-speech tagged each sentence in the filtered comment set, extracting sentences containing demand attributes, sentiment words, and evaluation words. Second, we matched demand attributes mentioned in each comment sentence with the demand categories in the above user needs framework, extracting attribute-sentiment word pairs. Then, we quantified sentiment words, referring to the intensity of positive and negative sentiment words in the HowNet dictionary, dividing them into three score levels (setting polarity values for degree adverbs such as "very," "extremely," "highly" to 2, "somewhat," "relatively," "quite" to 1.5, and "still," "barely," "slightly" to 0.5), while processing negation words and degree adverbs (analyzing whether negation words modify other negation words, sentiment words, or degree adverbs, determining positive/negative sentiment orientation, with positive polarity value of 1 and negative of -1). The total polarity value is the product of the

degree adverb's polarity value and the sentiment word's polarity value [18]. For example, "The performance is very good" expresses a sentiment value of 2*1=2, while "The activity location is a bit far" expresses -1.5*1=-1.5. We ultimately obtained cumulative sentiment values for each attribute, with calculation results shown in Table 3 .

By comparing users' emotional tendencies and attention levels for each demand element (attention level being the node count for each element in the grounded analysis, such as "venue facilities" corresponding to 211 raw material nodes, recorded as 2.11), results are shown in Figure 3 [Figure 3: see original paper]. It can be seen that users show high attention to six demand elements: activity content, activity guests, platform functions, platform mechanisms, target audience, and time/duration. Users participating in cultural cloud activities particularly value activity and platform elements. Activity content and activity guest elements received positive user feedback and high evaluations, indicating that users highly value these aspects when participating in cultural cloud activities, and the current district's cultural cloud platform can well meet user needs in these areas, with reasonably designed activity content and widely praised invited guests. However, emotional polarity values for platform functions, platform mechanisms, target audience, and time/duration were relatively low. Platform functions, participation mechanisms, and incentive mechanisms are elements that every user must personally operate or experience when participating in cultural cloud activities. If functions are incomplete or mechanism designs are unreasonable, they can easily lead to negative user emotions. Additionally, activity time and duration arrangement is also an important factor for users when deciding whether to participate. Currently, most cultural cloud activities are scheduled on weekdays, preventing many users from attending, which may be the main reason for the negative emotional values for the time/duration element.

Through calculation of emotional mean values, it can be observed that almost every element has both satisfied and dissatisfied users, but the overall attitude of most users is clearly discernible.

(1) Regarding organizational needs, satisfaction levels from high to low are: activity form, activity fees, venue facilities, time/duration, activity management, and activity promotion. Among these, activity form is relatively recognized by users, indicating that the district's cultural cloud public activity design is well-executed. Activity fees, venue facilities, time/duration, activity organization, and activity promotion received lower user satisfaction, with activity promotion being the most dissatisfying element. Many users reflected that activities are only promoted on the platform, causing many quality activities to go unnoticed. Activity management is also a relatively dissatisfying element, possibly due to uneven capabilities of on-site management personnel and activity preparation, leading to issues such as no ticket verification, seat grabbing, and disorder in a few activities. Additionally, activity time is a highly

concerning element for users, with many unable to attend due to school or work schedules, calling for activities to be scheduled on weekends, holidays, or evenings.

(2) Regarding platform needs, users show high attention to platform functions and mechanisms but relatively low evaluations. Platform navigation, functions, mechanisms, and system performance failed to win user favor. In terms of navigation design, many users mentioned issues like "can't find personal center," "don't know where to view booked tickets," and "don't know where to see activity previews," indicating that many commonly used functions and sections on the public cultural cloud platform cannot be easily found, requiring strengthened navigation design. Regarding platform functions, many users have functional needs such as ticket transfer, exchange, and rating, which the platform temporarily cannot provide. Regarding platform mechanisms, the participation mechanism mainly relies on users earning cloud beans through activities and evaluations to register for activities, but many users feedback that cloud beans are difficult to accumulate, preventing participation in many quality activities. Additionally, other related mechanisms need improvement, such as requiring repeated entry of verification codes and information for activity registration, while real-name authentication and parent-child registration mechanisms have not yet been implemented. Regarding platform system performance, many users reported issues like page paralysis and system crashes during ticket grabbing.

(3) Regarding activity needs, users are most concerned with activity content and target audience. Satisfaction levels from high to low are: activity guests, activity atmosphere, activity content, activity interaction, target audience, activity consumables, and activity information. Users generally expressed satisfaction with activity guests, activity atmosphere, activity content, and activity interaction, indicating that the district's cultural cloud organizes rich cultural activity content, invites authoritative guests who are well-received by activity users, and provides sufficient atmosphere during activities that meets the needs of most users. However, emotional tendencies for target audience, activity consumables, and activity information were negative. Regarding target audience, some current cultural cloud activities do not distinguish target groups when published, such as age restrictions and learning foundation requirements, causing some users to be unclear whether they are suitable for the activity. Regarding activity consumables, user comments show that some activities provide corresponding materials, some requiring fees, while others require users to bring their own materials, information that needs to be communicated to users in advance. Regarding activity information, besides the above target audience information and consumable preparation information, some activities are missing necessary information such as activity guests and duration. Some users also mentioned that individual activity information contains errors or mismatches with actual activity content, requiring fur-

ther improvement.

(4) Regarding users' own needs such as participation motivation, activity expectations, and perceived value, most users participating in the district's cultural cloud activities have motivations such as learning knowledge and cultivating habits. All users have certain expectations for cultural cloud activities, hoping to obtain good participation experiences and realize their participation motivations. After participating in cultural cloud activities, users feel they have gained substantial benefits, with perceived value receiving the highest emotional score, reflecting activity users' full affirmation of the district's cultural cloud activity effectiveness. Additionally, both user participation motivation and activity expectations received high scores. Combined with user evaluations of perceived value, it is evident that people have high expectations for cultural cloud activities, and users who have participated believe that cultural activities have helped them increase knowledge and skills and make more friends, fully realizing the social value of cultural cloud activities.

6. Discussion and Conclusion

Cultural cloud platforms are an important approach in the digital age for linking and integrating online and offline cultural resources, fully utilizing emerging information technology to improve cultural accessibility, participation, and convenience. Starting from user needs, future optimization can proceed from the following aspects:

(1) Optimize public cultural cloud platform construction. Cultural cloud platform design directly affects user experience, and poor design will hinder user willingness to participate in cultural cloud activities from the online source. This study found that while current cultural cloud platform basic functions operate well, user satisfaction is not high, with many issues reported. Improvements can be made through: Improving platform functions by adding user-needed sections such as ticket exchange, transfer, communication, and feedback, and providing more comprehensive evaluation indicators such as activity content scoring and activity organization scoring; Optimizing platform mechanisms by more scientifically designing navigation mechanisms, activity registration mechanisms, participation mechanisms, and feedback mechanisms, and correspondingly establishing content review, supervision, and examination mechanisms; Enhancing cultural cloud platform system performance by optimizing platform system design models, conducting regular platform inspections and maintenance to ensure system stability during peak online operations such as ticket grabbing and booking, enhancing user experience, fully leveraging the advantages of cultural cloud platforms, and improving technology empowerment effects.

(2) Strengthen public cultural cloud activity organization and management.

As a typical online-offline integrated service form, cultural cloud platform construction and operators need to ensure not only good online service experience but also guarantee offline venue hardware facilities and the comprehensive capabilities and qualities of cultural cloud activity organizers. Both online and offline elements are essential for the long-term development of cultural cloud platform activities. Based on the above discussion, cultural cloud activity organization can be improved through:

Establishing a professional activity service team to avoid issues such as "disorderly management" and "poor organization" mentioned in user comments, conducting personnel training and evaluation to improve staff comprehensive qualities, strengthening volunteer service team building, and enhancing activity arrangement quality to ensure activity preparation and order management; Improving cultural cloud platform activity venue and facility construction, strengthening cooperation with other institutions, building a cultural venue and facility network that can meet the needs of people in all regions, and providing activity consumables to the greatest extent possible to minimize user participation costs; Establishing the image and reputation of cultural cloud platforms, strengthening community promotion and major social media platform publicity, and establishing recommendation reward mechanisms to make more users aware of cultural cloud platforms and their quality activities.

(3) Enrich public cultural cloud activity content design. Activity settings are the most important element for users participating in cultural cloud activities. Only with rich and wonderful cultural activities can more users be attracted to participate. Current users have high evaluations of the district's cultural cloud activity content, but quality activities and services have also generated higher expectations. Cultural cloud activity organizers need to actively explore and continuously expand activity content to create brand characteristics: Enrich cultural cloud platform activity types by regularly reviewing and summarizing existing cultural activities. For example, educational theme activity comments revealed user needs for habit cultivation and logical thinking training. Broaden channels for activity resource sharing, continuously update activity content according to user needs to maintain freshness, and form platform characteristic cultural activities; Clarify activity target audiences by classifying and grading activities to ensure cultural cloud platform activities can cover users of different age groups and interests, while clearly describing specific target audiences on the cloud platform to prevent users from misregistering or missing activities; Strengthen activity information description and management to ensure accuracy, comprehensiveness, and timeliness of activity information.

(4) Focus on public cultural cloud user experience. Users are the ultimate participants in cultural cloud activities, and user management is an inevitable requirement for maintaining the vitality of cultural clouds. Future work can include: Strengthening user relationship management by monitor-

ing and capturing user behavior trajectories on cultural cloud platforms, tracking user behavior characteristics and search habits, comprehensively understanding user needs for cultural activities, services, and cloud platforms, and paying attention to user development to enhance user stickiness with cultural cloud platforms; Conducting regular user surveys to grasp user needs and expectations, investigating user satisfaction with cultural cloud activity services, leveraging user power, and continuously improving cloud platforms and activities based on user feedback; Enriching user participation channels in cultural cloud construction, optimizing user incentive and management mechanisms, and enhancing user interaction interest and motivation to participate in cultural cloud platform construction.

This study uses grounded theory to mine user demand themes for public cultural cloud activities and calculates emotional values to determine user satisfaction with each theme, providing suggestions for the sustainable development of public cultural cloud activities. Although the study can to some extent reflect current users' real thoughts about public cultural cloud activities, the single-case interval data used only indicates performance within that interval. As mentioned above, cultural cloud activity user behavior and needs must be closely monitored and tracked. The efficiency and dynamic nature of needs mining need further improvement. In the future, a needs mining model should be constructed to conduct large-sample precise identification through semantic analysis and machine learning, assisting public cultural cloud construction providers in offering "menu-style" cultural services.

References

[1] Huang Jing. Investigation and Development Analysis of Urban Public Digital Cultural Service Practice in China [J]. New Century Library, 2017(3): 71-76.
[2] Chen Zeqian. Current Status and Prospects of China's Cultural Cloud Services [J]. Library and Information Knowledge, 2018(5): 62-71.
[3] Xu Wang. Research on the Construction of Smart Cultural Service Systems Under Public Digital Cultural Construction Requirements [J]. E-Government, 2018(3): 54-63.
[4] Li Wenchuan, Chen Cheng, Hu Yawen. Research on Public Digital Cultural Cloud Resource Service Innovation [J]. Library, 2017(2): 18-23.
[5] Tang Jinyu, Zhu Xuefang. Evaluation of Service Efficiency of Public Cultural Cloud WeChat Public Platforms in China [J]. Library Forum, 2019, 39(9): 127-134.
[6] Wanyan D, Shang T. Application of Cloud Technology in Digital Cultural Heritage: An Analysis of Public Culture Cloud Platforms in China [C]//IEEE/ACM Joint Conference on Digital Libraries. London: IEEE, 2014: 491-492.
[7] Kats P, Mielnicki M, Knoth P, et al. Design of Europeana Cloud Technical

Infrastructure [C]//IEEE/ACM Joint Conference on Digital Libraries. London: IEEE, 2014: 491-492.
[8] Wei Jingzhu, Zhang Lele, Wang Zheng, et al. Research on Public Cultural Cloud Institutional Users' Information Sharing Behavior and Willingness [J]. Library and Information Knowledge, 2020(4): 119-132.
[9] Xia H, Chen T, Hou G. Study on Collaboration Intentions and Behaviors of Public Participation in the Inheritance of ICH Based on an Extended Theory of Planned Behavior [J]. Sustainability, 2020, 12(11): 4349-4364.
[10] Wei Jingzhu, Wang Yuanyue. Empirical Study on User Satisfaction of National Public Cultural Cloud Platform [J]. Information and Documentation Services, 2020, 41(4): 30-38.
[11] Miao Hong, Wang Yan, Huang Lucheng, et al. Research on User Functional Needs Mining Based on Structural Topic Model [J]. Journal of Intelligence, 2020, 39(7): 134-141.
[12] Li Jinhai, He Youshi, Ma Yunlei, et al. Construction of Dynamic User Preference Model Based on Online Comment Information Mining [J]. Journal of Intelligence, 2016, 35(9): 192-198.
[13] Wang Xinyan, Zhang Xiangxian, Zhang Liman. Research on Thematic Semantic Association of Academic APP User Online Comments [J]. Information Science, 2020, 38(6): 25-31.
[14] Jia Danping, Jin Jian, Geng Qian, et al. Research on User Needs Mining from the Perspective of Kansei Engineering [J]. Journal of the China Society for Scientific and Technical Information, 2020, 39(3): 308-316.
[15] Zhao Jing. Case Study on Service Improvement Strategies of Municipal Public Libraries Based on User Needs [D]. Tianjin: Tianjin Normal University, 2018.
[16] Chen Yijin, Pan Pei, Zhao Yiming. Research on Health Information Service Needs of University Library Users Based on KANO Model [J]. Library Tribune, 2020, 40(12): 117-126.
[17] Fei Xiaodong. Grounded Theory Research Methodology: Elements, Research Procedures, and Evaluation Criteria [J]. Public Administration Review, 2008(3): 23-43, 197.
[18] Tu Haili, Tang Xiaobo. Construction of Tourist Sentiment Analysis Model Based on Online Comments [J]. Modern Information, 2016, 36(4): 70-77.

Author Contributions

Wei Jingzhu: Proposed research topic and research framework, drafted and revised manuscript.
Cao Huizi: Participated in research design, data crawling, data coding analysis, and manuscript drafting.
Zhang Lele: Participated in research design, data crawling, and data coding analysis.

Note: Figure translations are in progress. See original paper for figures.