

Implications of Social Q&A Platforms for Library Virtual Reference Services (Postprint)

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Abstract

[Purpose / Significance] In the Web 2.0 environment, social Q&A platforms with functionalities similar to virtual reference services have emerged and are increasingly flourishing. Investigating the factors contributing to their success can facilitate the sustainable development of library virtual reference services.

[Method / Process] This study conducts a literature review of domestic and international research on social Q&A platforms and library virtual reference services. Based on this review, four representative SQA platforms are selected as research subjects: first-generation web-based Q&A platforms represented by Baidu Knows and Yahoo Answers, and second-generation social Q&A platforms represented by Zhihu and Quora. Their Q&A models, information organization models, and user interaction and management models are systematically summarized and analyzed. Subsequently, a comparative experiment is conducted between library virtual reference websites and the selected research subjects.

[Results / Conclusion] Based on the characteristics identified through the investigation of social Q&A platforms and the findings of the comparative experiment, recommendations are proposed for library virtual reference services.

Full Text

Preamble

Social Q&A's Enlightenment to the Library Virtual Reference Service

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Abstract

[Purpose/Significance] Under the Web 2.0 environment, social Q&A platforms with functions similar to virtual reference services have emerged and

flourished. Studying their success factors can contribute to the sustainable development of library virtual reference services. **[Method/Process]** This paper reviews domestic and foreign literature on social Q&A platforms and library virtual reference services. Based on this review, four representative platforms are selected as research objects: Baidu Knows and Yahoo Answers as first-generation network Q&A platforms, and Zhihu and Quora as second-generation social Q&A platforms. The study analyzes their Q&A modes, information organization modes, and user interaction and management patterns. A comparative experiment is then conducted between these platforms and library virtual reference websites. **[Result/Conclusion]** Drawing from the characteristics of social Q&A platforms and the experimental findings, recommendations are proposed for improving library virtual reference services.

Keywords: social Q&A; virtual reference service; reader service; comparative study

Classification Number: G252.6

1 Introduction

The continuous evolution of internet technology and the development of Web 2.0 have fundamentally transformed how information is created, disseminated, and utilized. With growing user participation, an increasing number of users actively engage in information creation and sharing, which has catalyzed the emergence of social Q&A platforms. Social Q&A (SQA) platforms enable users to pose questions themselves, mobilize other users to provide solutions through incentive mechanisms, and deliver personalized answers, thereby establishing a self-organized platform for knowledge exchange. In recent years, these platforms have experienced rapid growth. For instance, Quora's monthly active users increased from 150,000 in January 2011 to 100 million by March 2016, making it a major website ranked within the top 100 globally by Alexa.

Virtual reference services (VRS), also known as digital reference services, represent an electronic form of reference consultation where users can communicate with public service staff without physical presence through computers or other technologies. Despite expanding service scope and systems, the actual effectiveness of VRS has been unsatisfactory. A survey conducted at a university in Nanjing revealed that 52.5% of students were unaware of digital reference services, and only 20.4% had actually used them.

These two platforms offer similar services and functions, yet their development trajectories have diverged dramatically. Given this reality, libraries must understand the features and characteristics of social Q&A platforms to identify valuable lessons for their own virtual reference services. This study builds upon domestic and international research on SQA and VRS, summarizes the features of social Q&A platforms, and combines theoretical analysis with empirical experimentation to provide improvement suggestions for library virtual reference services.

2 Literature Review

To understand the current research landscape on social Q&A communities and library digital reference services, the author conducted a literature search in September 2016 through CNKI using keywords such as “social Q&A platform,” “social Q&A community,” “network Q&A platform,” “digital reference,” and “virtual reference.” Google Scholar was also used to search for English literature with terms including “QAS,” “VRS,” and “Virtual Reference.”

2.1 Domestic Research on Social Q&A Platforms and Library Digital Reference Services

Domestic research in this field has been concentrated between 2005 and 2011, peaking between 2007 and 2009—a period closely associated with the maturation of Baidu Knows. Methodologically, most domestic studies are theoretical, with introductory and comparative research being particularly prominent.

Introductory studies focus on describing the characteristics and service models of specific SQA platforms, predominantly Baidu Knows. For example, Wu Lin et al. analyzed WikiAnswers’ question categorization organization and Q&A management models, summarizing its service features and proposing improvements for domestic digital reference services. Wu Weijuan and Zhang Ruixian examined Baidu Knows’ strengths and weaknesses and their implications for library online reference work. Liu Ying analyzed Baidu Knows’ information consultation model and proposed the concept of building a “Library Knows.” Zhang Lianfeng and Wang Jianmin summarized Baidu Knows’ mechanisms and applied them to library reference services, recommending improvements in Q&A patterns, incentive systems, and interaction mechanisms for digital reference services.

Comparative studies emphasize analyzing differences between SQA and VRS to propose improvements. Fang Jie and Tang Kai identified problems in current library virtual consultation services while analyzing Baidu Knows’ advantages, subsequently proposing suggestions for improving university library virtual consultation services. Zhao Lihong selected three major search engine-based Q&A platforms—Baidu Knows, Sina iAsk, and Yahoo Knowledge Hall—comparing their common features with library virtual consultation services and proposing improvements. Fan Jiayi compared three search engine-derived Q&A platforms with the Shanghai Library’s online joint knowledge navigation station, identifying differences. Mao Dan elaborated on the principles of these three platforms and proposed improvements for library virtual consultation through comparison. Wu Dan et al. not only conducted theoretical analysis and comparison of service models but also performed empirical research using experimental methods to demonstrate the respective advantages and disadvantages of Q&A platforms and virtual reference services, proposing lessons for joint reference consultation.

2.2 Foreign Research on Social Q&A Platforms and Library Digital Reference Services

Recent foreign research on social Q&A and library reference services has primarily focused on their collaborative coordination. As early as 2011, scholars at the ASIST annual conference discussed the synergistic complementarity between SQA and library virtual reference services. M. L. Radford et al. noted that while library virtual reference services were becoming increasingly professional and providing round-the-clock services, libraries faced reduced budgets for personnel and resources. To make library virtual reference services more efficient and sustainable, utilizing SQA for collaborative services could be a viable option, with data collected through telephone interviews to analyze barriers and advantages to cooperation. C. Shah et al. employed participatory design methods to propose a new hybrid reference model combining VRS and SQA, leveraging the strengths of both while compensating for their weaknesses to better serve users. In another study, C. Shah et al. interviewed experts and users to compare user perceptions of SQA and VRS systems, summarizing their respective characteristics. Y. Zhang et al. used surveys to identify reasons for user participation in SQA and the importance of using online services to find answers, then proposed suggestions for improving library VRS services through SQA-VRS comparison. L. Luo et al. introduced a practical collaborative activity called “Slam the Borders (STB),” a grassroots library initiative where librarians provide professional answers to users on SQA sites like Yahoo Answers on the 10th of each month.

3 Selection and Overview of Research Objects

3.1 Selection of Research Objects

The development of social Q&A platforms has undergone two stages: first-generation search engine-based Q&A platforms, which emerged to address the issues of search engines providing content that was too broad, indirect, and imprecise, typically employing monetary incentive systems to encourage users to answer questions (represented domestically by Baidu Knows and internationally by Yahoo Answers); and second-generation social network-based Q&A platforms, characterized by close social connections among users, more complex and in-depth answers, and a focus on knowledge sharing rather than information sharing (represented domestically by Zhihu and internationally by Quora).

To comprehensively understand social Q&A platforms, this study selected representatives from both categories: Baidu Knows and Yahoo Answers for the first generation, and Zhihu and Quora for the second generation. According to Alexa traffic statistics, all four websites have substantial traffic and high rankings, making them representative of social Q&A platforms.

3.2 Basic Information of Research Objects

Understanding the basic characteristics of these two types of social Q&A platforms is essential for providing targeted recommendations for library digital reference services. The basic information for the four websites as of September 2016 is summarized in .

4 Analysis of Social Q&A Platform Characteristics

4.1 Q&A Mode

4.1.1 Collective Participation and Group Decision-Making Social Q&A platforms function not only as intermediaries but more importantly as social network communities. In terms of the question-answering process, the relationship between questioners and answerers is not one-to-one but one-to-many, with knowledge flowing multidirectionally rather than unidirectionally. After a question is posted, all users can answer without discrimination or restriction. Due to differences in users' knowledge structures and cognitive depth, multiple perspectives can be offered on the same question. Consequently, answers on social Q&A platforms are not only numerous but also cover a wide range of disciplines and approaches. This group decision-making approach provides comprehensive and rich answers that better satisfy users' information needs.

In terms of answer ranking, social Q&A platforms primarily adopt the Digg mechanism, leveraging collective intelligence to automatically filter optimal solutions for questioners and prevent "information disorientation" in massive information environments. Under group decision-making, platforms need not conduct quality control and judgment individually; instead, they equally delegate decision-making power to users, requiring only the design and implementation of ranking algorithms. This approach enhances user participation and strengthens user stickiness while demonstrating users' self-organization of knowledge and quality control that aligns with mainstream user preferences.

4.1.2 Support for Multiple Information Media to Fully Express Question Requirements In the internet era, users encounter not only textual information but also multimedia resources such as images, videos, and audio. Social Q&A platforms accommodate this characteristic by allowing users to describe questions using multiple information media, making question descriptions detailed, complete, and multimedia-rich. This enables full expression of question details and specific information needs, allowing answerers to better understand questions and provide more accurate responses.

An investigation of current questioning practices is shown in . Except for Yahoo Answers, the other three platforms support at least one additional form of question description and supplementation. Notably, Quora features a "request" function that alerts specific users, fully demonstrating the platform's deep social

attributes by connecting questions to specific individuals, strengthening inter-user relationships, and shortening resolution time for particular problems.

4.1.3 Diverse Information Exchange Forms and Strong Community Interaction Users on social Q&A platforms can not only express information or knowledge needs but also share experiences, insights, and opinions. Users can enhance their influence in social networks by posing thought-provoking questions and gain credibility and honor in Q&A communities by sharing unique perspectives.

From the questioner’s perspective, after asking a question, users can modify and supplement it multiple times to continuously improve its formulation. Answerers can make real-time modifications based on response situations to engage in indirect interactive communication, thereby extending information acquisition behavior and improving both the quantity and quality of information obtained. Not only can questioners supplement details, but other answerers can also modify details to help fellow answerers understand the questioner’s true intent and assist questioners in better articulating their needs.

From the answerer’s perspective, on Zhihu and Quora, users can repeatedly revise their own questions to continuously improve them. In terms of answer interaction processing, major social Q&A platforms provide rich and diverse communication forms, as shown in . “Support,” “oppose,” and “comment” functions enable users to participate in information evaluation and interaction. The “share” function on Baidu Knows, Zhihu, and Quora reflects users’ information sharing behavior. Zhihu’s “favorite” and Quora’s “bookmark” functions reflect users’ information organization and storage. Through these Q&A patterns, users can experience a deep problem-solving process that extends from information needs to information seeking, browsing, interaction, evaluation, collection, and reuse—far more comprehensive than the short-chain behavior of simply asking and waiting for answers. This also supports the collision of new ideas during information exchange, making answers more profound and effective.

4.2 Information Organization Mode

4.2.1 Detailed and Scientific Category Organization Classifying questions or topics facilitates user information and knowledge retrieval. The investigation reveals that social Q&A platforms all implement knowledge organization, as detailed in . First-generation platforms establish fixed category systems with classification leaning toward disciplinary structures, while second-generation platforms predominantly employ folksonomy, allowing users to organize topic categories themselves with strong flexibility and scalability.

Baidu Knows and Yahoo Answers employ highly detailed and comprehensive category structures with reasonable depth, supporting both refined categorization and avoiding excessive complexity. Their specific classifications do not rigidly

follow library classification systems but instead incorporate real-life situations, adding many life-oriented categories. For example, Baidu Knows' "Healthy Living" category and its subcategories have a strong life-oriented character, as shown in [Figure 1: see original paper]. Zhihu and Quora use thematic classification, where each question can correspond to one or multiple topics that users can create and organize hierarchically. Although numerous, these topics can comprehensively and accurately describe all questions.

4.2.2 Integration of Similar Questions to Reduce Information Redundancy As open and interactive platforms, social Q&A inevitably encounters users asking identical or similar questions, leading to repeated questioning, redundant answers, dispersed information, and degraded user experience. Platforms address this issue through different methods.

First, all platforms feature pre-questioning search functionality, where the system automatically queries similar questions based on user input. If users discover similar questions, they are directed to existing pages; otherwise, they proceed with new questions.

For first-generation network Q&A platforms built upon search engines, integrated search technology provides natural advantages, enabling users to find matching questions and answers through search engines. For second-generation social Q&A platforms, websites directly design similar question integration. Quora and Zhihu automatically redirect similar or identical questions to the most-answered primary question, achieving question concentration and reducing information redundancy.

4.2.3 Personalized Information Customization and Dynamic Homepage Updates Social Q&A platforms allow users to customize homepage information organization. High-quality personalized information push services facilitate knowledge discovery and expansion, enabling users to gain new knowledge through serendipitous information encounters, thereby enhancing platform stickiness.

Network Q&A communities like Baidu Knows and Yahoo Answers adopt a combination of editorial recommendation and user customization. Most homepage content is curated and recommended by official editors, such as Baidu Knows' "Daily Knows" section and "Hot Waves" and "Hot Q&A" sections featuring editor-selected popular content. Below these, questions from user-selected interest areas are dynamically pushed for answering. Similarly, Yahoo Answers' homepage features editor-recommended content ("special feature") followed by dynamically pushed new questions based on user preferences. This semi-manual push model ensures users don't miss premium Q&A content while dynamically updating content of interest on the homepage to attract information and knowledge sharing.

Social Q&A platforms like Zhihu and Quora combine user customization, social

dynamics, and editorial recommendations. Similar to network Q&A platforms, users can access answers related to previously followed topics and fields. Additionally, homepages display popular answers from other fields recently. Furthermore, homepage updates exhibit strong social elements, showing dynamics of followed users, such as questions they answered, followed, supported, collected, or column articles they wrote. This connects not only users with topics but also users with each other, establishing implicit indirect associations between users and topics through complex social networks. This helps users build knowledge-interest-based social circles and encourages continuous knowledge sharing.

4.3 User Interaction and Management Mode

4.3.1 Establishing Diverse Incentive Mechanisms to Ensure Participation and Q&A Quality On social Q&A platforms, user participation is key to maintaining vitality, while Q&A quality directly affects platform survival. To address these challenges, most platforms have established diverse reward mechanisms. Baidu Knows implements a points and levels system where users earn points by answering questions, with high-quality answers earning substantial points for rapid level advancement. Earned points can also be used as question bounties for continuous circulation. Yahoo Answers has a similar system.

Users require not only material incentives but also spiritual motivation in social networks. Therefore, Zhihu and Quora's answer voting and ranking systems indirectly provide spiritual incentives. Additionally, users receiving "thanks," "collections," and "follows" for quality answers gain social network capital, facilitating the emergence of "opinion leaders" and generating spiritual motivation. Zhihu also features a "friendliness score" to restrict random answering or personal attacks, controlling answer quality and interaction levels.

4.3.2 Valuing User Contributions and Protecting Answer Intellectual Property Questions on social Q&A platforms are diverse, ranging from abstract and uncertain problems requiring comprehensive answers based on personal knowledge and experience to highly professional responses. While Q&A platforms are open communities encouraging knowledge sharing, some answerers do not wish their responses to be used without limitation or for commercial purposes. Therefore, to respect user contributions, most platforms have established intellectual property rules for answers. Yahoo Answers ensures "users own copyright while Yahoo retains rights to use, modify, and disseminate." Quora guarantees "global, non-exclusive, royalty-free knowledge use, dissemination, and modification." Zhihu users own copyright and can independently decide whether their answers can be used and disseminated. These protective measures enhance user trust and experience, encouraging continuous knowledge contribution.

4.3.3 Certifying Domain Experts to Control Answer Quality The openness of social Q&A platforms increases answer diversity but also raises

quality concerns. To ensure answer quality, platforms have established answer certification systems to highlight professional quality. Baidu Knows designates high-quality ordinary answerers as “Knowledge Stars” with quality certification, while also opening institutional and expert certification, marking experts and practitioners in professional fields. Yahoo Answers features “Top Contributors” to distinguish ordinary from excellent answerers. Zhihu designates “excellent answerers in fields” based on performance, prioritizing them when inviting answers. Certification systems ensure that excellent answerers and professionals’ responses are more prominent, helping questioners discover quality answers. Simultaneously, certification design establishes a dynamic expert database beneficial for platform user management.

4.3.4 Fully Integrating Social Tools to Create Knowledge Sharing Conditions The rapid development of current social knowledge Q&A platforms is closely related to the dissemination of other social network tools. Social Q&A platforms are not closed environments; knowledge and information circulate not only within platforms but also diffuse into users’ daily lives. Platforms support sharing questions or answers to other social network platforms, fully connecting users’ roles as questioners and answerers with their roles in daily social life. Dissemination through users’ social circles enables platforms to acquire more potential users and enhances knowledge sharing effectiveness. The social networks or tools that the four platforms can share to are shown in .

Most platforms support one-click sharing to mainstream social tools. Baidu Knows and Zhihu have also opened WeChat public accounts to select premium Q&A content, expanding their influence in social networks.

Furthermore, social Q&A platforms integrate with current live streaming social platforms to create new real-time knowledge sharing products. Quora launched the Sessions feature in November 2015, allowing users to conduct real-time Q&A exchanges with domain experts within limited timeframes. Zhihu launched Zhihu Live in May 2016, similarly enabling users to share real-time discussions on specific topics with multiple users.

5 Comparative Empirical Study of Social Q&A Platforms and Library Digital Reference Services

To gain deeper understanding of social Q&A platforms and library digital reference services, the author designed a comparative study to examine their practical similarities and differences.

5.1 Experimental Design

This empirical study employs experiential experimentation, designing five categories with ten questions total. Questions were posted on the four research platform websites and the National Library Reference Consultation Alliance

website (www.ucdrs.net). Differences in practical usage were analyzed based on experimental data.

To ensure objectivity and comprehensiveness, question selection was based on relevant literature regarding question classification methods and combined with actual circumstances. The specific design of the five question types is shown in

5.2 Experimental Process and Results

The author posted the ten questions from on Baidu Knows, Yahoo Answers, Zhihu, Quora, and the National Library Reference Consultation Alliance on September 24, 2016. Experimental results were collected by November 8, 2016.

During data collection, answers clearly unrelated to the topic were considered invalid regardless of correctness. In terms of response quantity, only the library virtual reference system answered all questions with valid answers. Among social platforms, Zhihu and Yahoo Answers provided the most responses and valid answers, followed by Quora with 18 valid answers, while Baidu Knows received 8 answers with 6 valid.

In terms of validity rate, all Quora answers were valid (100% validity), Baidu Knows achieved 83%, and both Zhihu and Yahoo Answers exceeded 85%. This indicates that library reference consultation essentially answers all questions, while open social Q&A platforms are influenced by multiple factors. For example, the question “What’s your opinion about Jeremy Corbyn’s success on labor party’s re-election on September 24, 2016?” posted on Yahoo Answers received numerous responses due to its timeliness and cultural context.

Within social Q&A platforms, first-generation platforms answered more factual, preference, and evaluation questions, aligning with their grassroots nature and search engine foundation. Second-generation platforms provided more explanatory, exploratory, and evaluative answers, consistent with their deep knowledge sharing characteristics.

Regarding response time, library reference consultation replies were concentrated around 6 hours. Social Q&A platform response times varied significantly, with some questions answered within minutes and others only after more than ten days (see). This shows that library reference systems offer stable, moderate timeliness but are constrained by business hours, while social Q&A platforms are heavily influenced by external factors, resulting in unstable and highly variable timeliness.

Answer length indirectly reflects answerers’ diligence and detail level. According to , the National Library Reference Consultation Alliance provided answers typically exceeding 100 characters, offering detailed responses. Social Q&A platforms showed variation: Baidu Knows and Yahoo Answers generally provided short answers, except when Baidu Knows users directly pasted large sections

of online information. Zhihu and Quora answers were generally longer, particularly on exploratory and evaluative questions where social Q&A platforms demonstrated unparalleled advantages. Overall, library virtual reference platform staff work diligently and responsibly, while social Q&A platform users, especially on first-generation platforms, answer more casually.

Question views and follower counts reflect platform openness and interaction levels. The National Library Reference Consultation Alliance operates as a closed platform with one-to-one Q&A interaction, lacking conditions for knowledge dissemination and sharing. On social Q&A platforms, particularly second-generation social platforms, question views and follower counts were substantial, with each question on Zhihu and Quora receiving hundreds of views, and current affairs-related questions reaching over 30,000 views and 250 followers (see). This fully demonstrates social Q&A platforms' advantages in information interaction and dissemination.

Investigating question views and follower counts can indirectly reflect answer quality through third-party evaluation by non-questioners and non-answerers. On social Q&A platforms, the highest number of upvotes for experimental questions reached 512 (see), indicating broad recognition of the answer and demonstrating its relative correctness, universality, and objectivity in providing optimal solutions for questioners. Library virtual reference systems lack this functionality.

Response time distribution across the five platforms was categorized into three phases: within 3 days, 4-15 days, and 16-45 days, with primary response time phases identified for each question (see [Figure 2: see original paper]). For library reference consultation systems, most responses occurred within 3 days without subsequent supplementation, giving questions a lifecycle of approximately 3 days. First-generation network Q&A platforms like Baidu Knows and Yahoo Answers showed similar patterns. However, social Q&A platforms Zhihu and Quora exhibited different characteristics, with most experimental question responses appearing in the 4-15 day and 16-45 day phases, indicating sustained attention that extended question lifecycles and allowed continuous answering, discussion, and interaction, thereby further improving overall answer quality.

Answer quality was evaluated based on information quality assessment research, selecting the best answer across platforms for each question according to criteria including content (correctness, professionalism, completeness, language expression), cognition (understandability, 启发性, rationality), utility (practicality, usability), information source (professionalism, external links), and socio-emotional factors (emotional support, attitude, experience, identification, others) (see).

The results show that the National Library Reference Consultation Alliance provided good answers to factual, explanatory, and preference questions, attributable to librarians' professional skills in searching literature and online resources. Social Q&A platforms, particularly Quora and Zhihu, delivered high-

quality answers, with Zhihu far surpassing other platforms on subjective evaluative and exploratory questions. Quora also performed well on life experience preference questions and explanatory questions. For the factual question A1 with definitive answers, all five platforms provided different answers, with only Quora users offering the most timely answer with cited sources, demonstrating that even for definitive questions, quality varies due to user competence. Overall, library digital reference services provide relatively consistent answer quality but are somewhat deficient in addressing open, life-oriented, and strongly subjective questions. In contrast, social Q&A platforms demonstrate strong capabilities in solving subjective, exploratory, and comprehensive problems.

6 Discussion and Implications

Based on the analysis of service model characteristics of Baidu Knows, Yahoo Answers, Zhihu, and Quora, as well as comparative research with the National Library Reference Consultation Alliance website, the following recommendations are proposed for library digital reference services:

6.1 Transforming Q&A Mode from One-to-One to One-to-Many

Library virtual reference systems currently employ one-to-one consultation methods. Due to individual librarians' limited knowledge reserves and professional skills, they may not be able to provide high-quality answers to all questions, resulting in relatively narrow perspectives and quality deficiencies. Social Q&A platforms' one-to-many Q&A model leverages collective wisdom to better solve this problem. Therefore, libraries should open answer quotas when human resources permit, supporting multiple answers to the same question. This approach can create answer quality comparisons, strengthen librarians' competitive consciousness, and promote service quality improvement while providing users with more comprehensive responses and service experiences similar to social Q&A platforms.

6.2 Enhancing Interaction Mechanisms and Opening Consultation Platforms

Library digital reference consultation systems are currently mostly closed systems where the relationship between readers and the library reference system is limited to asking questions and receiving replies. Once a consultation is answered, users can only evaluate satisfaction, making subsequent supplementation inconvenient regardless of whether the answer truly meets their needs. Libraries can learn from SQA websites' open characteristics by first allowing users to search for relevant knowledge through search engines, while also permitting users to supplement questions in various forms and enabling them to comment on and revise librarians' answers. This promotes positive interaction among users and between users and librarians, continuously improving answer quality through interaction and providing more in-depth consultation services.

Additionally, library digital consultation platforms should strive to build knowledge consultation retrieval platforms, allowing users to search for answers independently while actively developing intelligent retrieval platforms that provide one-stop search services. This approach can reduce repeated questioning of duplicate information, decrease librarians' repetitive work to some extent, and make the knowledge outcomes of library digital reference consultation more accessible and disseminable.

6.3 Refining Service Processes and Improving Cooperation Mechanisms

Currently, most domestic digital reference services still operate independently. Even in collaborative platforms like reference service alliances, libraries only divide labor in the question-answering process. On social Q&A platforms, users naturally form multiple interactive roles during the Q&A process, such as answerers, answer evaluators, and question supplementers, making Q&A services extend beyond simple answering to form interactive clusters integrating answering, commenting, and modifying.

For libraries, cooperation should not be limited to dividing labor in answering questions. Instead, consultation teams can be formed based on librarians' knowledge structures, technical levels, and specialized fields. For the same question, there can be literature collectors, answer organizers, text revisers, answer evaluators, etc., creating detailed reference service processes through teamwork. This approach forms complementary effects and scale cooperation benefits, improving virtual reference service quality.

6.4 Strengthening Information Organization to Build Consultation Knowledge Bases

Current digital consultation services mostly lack effective organization of resolved Q&A pairs, while social Q&A platforms have achieved considerable success in information organization. The National Library Reference Consultation Alliance website, for example, does not systematically categorize various knowledge consultations—there are no discipline-level categories or thematic classification settings. As shown in [Figure 3: see original paper], the knowledge consultation section on its homepage only displays questions in reverse chronological order without featured Q&A or filtering options.

Experimental results demonstrate that library digital reference consultation possesses higher authority and professionalism than first-generation social Q&A platforms. The knowledge compiled by librarians can be systematically organized and curated into the library's reference consultation knowledge base. Libraries should categorize and organize frequently asked questions and librarians' quality answers in separate sections, regularly updating and maintaining the knowledge base to create a timely, high-quality knowledge ecosystem.

6.5 Fully Utilizing Social Networks to Enhance Influence

Social Q&A platforms, as Web 2.0 products, naturally possess social attributes, forming close social networks among members within platforms while linking to users' daily social lives. Internal social networks enhance user dependence on platforms, where core figures can attract users through their influence. Integration with external social networks significantly enhances Q&A platforms' dissemination power, continuously delivering new users to the platform.

For libraries with limited personnel and technical budgets compared to commercial internet companies, establishing complex internal social systems may be unrealistic. However, in the age of social networks, libraries can and should integrate their platforms with external social network websites and tools to enhance their influence. Librarians can apply for institutional accounts on social Q&A platforms to provide authoritative answers while utilizing social media like Weibo and WeChat to deliver multi-platform reference consultation services. This approach allows more people to learn about library digital consultation services in their daily social networks, attracting more users.

6.6 Establishing Incentive Mechanisms to Ensure Service Vitality

Social Q&A platforms employ various incentive mechanisms—material rewards, spiritual encouragement, and increased social network capital—to maintain user experience and enhance stickiness. In library digital consultation services, librarians' answers are mostly professional and authoritative, so answer effectiveness is not the most urgent issue. However, digital consultation platforms lack vitality guarantee mechanisms. The National Library Reference Consultation Alliance, for instance, only provides vague evaluations like “satisfied” or “dissatisfied” without specific evaluation criteria, reflecting a lack of effective performance assessment standards for consultation librarians. For librarians, answering a question completes the task, but without incentive mechanisms, this affects the vitality of library digital reference consultation.

Additionally, librarians' professional levels vary. SQA websites typically feature public answer records, excellent answerer certification, and other incentive measures to help users understand answerers' specific capabilities. On library digital reference consultation pages, users cannot see librarians' overall answer quality, only simple statistics like answer counts at most. Incentive mechanisms reflect answer quality differences, functioning as implicit competition systems. Good incentive mechanisms not only motivate librarians to improve consultation levels through competition but also enable users to assess librarians' capabilities and answer quality.

6.7 Strengthening Answer Timeliness and Practicality

Social Q&A platforms have large user bases. On one hand, questions appear on webpages immediately after posting, enabling rapid response, as confirmed by experimental data. On the other hand, question types vary widely in breadth

and depth, ranging from professional knowledge to life experiences and even life decisions, all being asked and answered on these platforms. Social Q&A platforms, especially Quora and Zhihu, feature many excellent responses based on personal experiences or life stories. Overall, social Q&A platform answers demonstrate considerable practicality and life relevance, which is why they can attract users and integrate into users' daily social lives.

Library virtual reference consultation Q&A types are relatively singular, particularly deficient in exploratory and preference-based answers. Additionally, Q&A is somewhat disconnected from real life, limiting business expansion. Therefore, library VRS should address these needs by actively responding to users' demands for in-depth answers. Libraries can establish special sections for life experience and personal experience questions with dedicated staff. They should also encourage librarians to pursue lifelong learning, continuously expand their perspectives, and transform library resources and knowledge into practical, guideline-based answers that provide more useful information and knowledge, further expanding collection value.

7 Conclusion

“A library is a growing organism.” Only by closely connecting with society and continuously drawing nutrients from the external environment can libraries maintain their lasting vitality. Social Q&A platforms and library digital reference consultation are both Q&A service platforms, but their different service model characteristics have led to vastly different development statuses. By analyzing the current state of domestic and international social Q&A platforms across two developmental stages, this study proposes improvement suggestions for library digital reference consultation services from perspectives including Q&A mode transformation, information organization enhancement, social network utilization, and incentive mechanism establishment, aiming to better meet users' information needs.

This study has several limitations. First, research object selection has certain limitations. The experimental study only selected the “National Library Reference Consultation Alliance” as the digital reference consultation platform, which affects the representativeness of results to some extent. Future research could select multiple digital reference consultation platforms for comparative studies. Second, question design in the experiment was influenced by current affairs, disciplines, and other factors that may affect answer quality and quantity. Future studies should balance various objective factors to minimize external influences. Finally, the criteria for selecting best answers were not deeply explored, only adopting existing research outcomes. Future research could design more scientific and practical answer selection standards based on actual conditions to ensure more reliable experimental results.

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Social Q&A's Enlightenment to the Library Virtual Reference Service

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Abstract: [Purpose/significance] Under the circumstance of Web2.0, the social Q&As, possessing the similar functions of the library virtual reference services, emerge consequently and enjoy tremendous prosperity. Thus, conducting the research of its success could shed light on the sustainable development of the

library's virtual reference services. [Method/process] According to the present-day situation that Social Q&A's prosperity challenged the library virtual reference service, a literature review of domestic and foreign relevant research was completed. On the base of this review, typical Internet Q&A websites such as Baidu Knows and Yahoo Answers, social network-oriented Q&A websites such as Zhihu and Quora, were selected as the research objects. Then, the paper analyzed the traits of four representative SQA platforms from the perspectives of the Internet interlocution mode, the information organization mode and the user interaction and management mode. In addition, an experiment between SQAs and VRS was conducted as empirical research. [Result/conclusion] Finally, on the base of the research status, the platform investigation and experimental outcomes, the improvement suggestions for library VRS are proposed.

Keywords: social Q&A; virtual reference service; reader service; comparative study

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

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