Usage Statistics of Digital Resources in Library Consortia: A Case Study of JUSP (Postprint)

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Abstract

[Purpose/Significance] Digital resource usage statistics provide data-driven support for library consortia in evaluating resource utilization efficacy and constitute a critical metric for tiered pricing in library consortium procurement. The comparative data facilitates member libraries in optimizing their subscription decisions. This study analyzes the usage statistics service offered by the UK JISC Collections procurement consortium through a case study of JUSP, with the aim of providing reference and guidance for other library consortia in developing usage statistics services. [Method/Process] This study employs literature review and online survey methodologies to analyze the current state of digital resource usage statistics application in library procurement consortia domestically and internationally. Utilizing the UK Journal Usage Statistics Portal (JUSP) as a case study, this study introduces its background and developmental trajectory, and examines its practices and innovations in usage statistics services, encompassing data collection, data provision, and data maintenance. [Results/Conclusion] The success of JUSP provides numerous insights for consortia seeking to develop digital resource usage statistics services. Library consortia should prioritize user requirements for usage statistics, adopt collaborative development approaches for one-stop usage statistics platforms, adhere to relevant standards and specifications, and emphasize community engagement.

Full Text

Research on Digital Resource Usage Statistics of Library Consortia: A Case Study of JUSP

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Abstract

[**Purpose/Significance**] Digital resource usage statistics provide data support for library consortia to evaluate resource utilization benefits and serve as an important metric for tiered pricing in consortium acquisitions. Horizontal comparison data enables member libraries to optimize their subscription decisions. This paper analyzes the usage statistics services provided by the UK JISC Collections purchasing consortium through the case of JUSP, aiming to offer references for other library consortia developing usage statistics services.

[**Method/Process**] Through literature review and online surveys, this study analyzes the current application status of digital resource usage statistics in domestic and foreign library purchasing consortia. Taking the UK Journal Usage Statistics Portal (JUSP) as a case study, the paper introduces its background and development history, and explores its practices in usage statistics services including data collection, data provision, and data maintenance.

[**Result/Conclusion**] JUSP's success offers numerous insights for consortia developing digital resource usage statistics services. Library consortia should prioritize user needs for usage statistics, adopt cooperative approaches to develop one-stop usage statistics platforms, follow relevant standards and specifications, and emphasize community participation.

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2. Research Status and Practical Progress of Usage Statistics Services in Library Consortia at Home and Abroad

In theoretical research, foreign studies on digital resource usage statistics have a long history, covering topics such as usage statistics standards, data quantification techniques, the importance of usage statistics data, existing problems in usage statistics data, relationships between user demographics and usage statistics, and usage patterns across different disciplines [3]. Literature on usage statistics for library consortia is relatively limited, with only a few studies examining cases such as JUSP by C. Craddock [4] and A. Conyers et al. [5-6], INFISTAT by D.R. Pradhan et al. [7], and KESLI Usage Stats by Y. Jung et al. [8].

Domestic research on digital resource usage statistics has primarily focused on two aspects: introduction and analysis of usage statistics standards, and application of usage statistics tools in single-library models. Guo Yiqun [9], Zhang Jing [10], Suo Chuanjun [11], and Li Hong [12] introduced the COUNTER and SUSHI standards and analyzed their application scenarios. Zhang Jilong [13], Cao Xiuli [14], Chen Daqing [15], Qin Hong [16], and Wu Jinqiong [17] presented case studies of digital resource usage statistics applications at Fudan University Library, Sichuan Normal University Library, Shenzhen University Library, University of Electronic Science and Technology Library, and Guangxi University Library. Few studies have examined the impact of digital resource usage statis-

tics on consortium acquisitions or consortium practice cases. Only Xia Zhifeng [18] proposed using MS SQL Server to extract digital resource usage data for consortium member libraries from user log files to provide personalized usage statistics services. Additionally, Zhang Yang [19], Wei Junjie [20], and Wu Jinqiong [21] suggested adding benefit evaluation based on usage statistics from the perspective of consortium procurement and pricing models, but did not analyze in detail how to implement usage statistics within consortia.

In practice, library consortia are still exploring and experimenting with usage statistics services. The author investigated 194 library consortia worldwide listed on the International Coalition of Library Consortia (ICOLC) website [22] and found that 171 consortia provide group purchasing services. These consortia operate under three models: (1) self-funded participation in group purchasing, such as OhioLINK in the US and the Taiwan Academic E-book Consortium; (2) unified funding under national licensing, such as Denmark's DEFF (Denmark's Electronic Research Library), Greece's HEAL-Link (Hellenic Academic Libraries Link), and Poland's B-ON (Biblioteca do Conhecimento Online); and (3) combined government funding and member self-raising, such as Canada's CRKN (Canadian Research Knowledge Network), South Korea's KESLI, India's INDEST-AICTE (Indian National Digital Library in Engineering Sciences and Technology Consortium), Finland's FinELib (The Finland National Electronic Library consortium), the UK's JISC Collections, and New Zealand's EPIC (Electronic Purchasing In Collaboration).

Among the 171 consortia engaged in group purchasing, only 19 provide digital resource usage statistics services to member libraries, with most merely providing links to database vendors' usage statistics or offering non-standardized general statistics, or using third-party tools to provide limited usage statistics reports without in-depth data analysis or management. Currently, only KESLI (KESLI Usage Stats), India's UGC-INFONET DLC Consortium (INFISTAT [24]), France's COUPERIN (MESURE [25]), and JISC Collections (JUSP) provide one-stop usage statistics platforms, which aligns with the theoretical research mentioned earlier. The specific situations of usage statistics services provided by these consortia are shown in Table 1 .

Table 1 Overview of Digital Resource Usage Statistics Services Provided by Foreign Library Consortia

Service Type	Consortium Examples	Standards Compliance
Link to database vendor statistics	Turkey: Anatolian University Libraries Consortium (ANKOS); US: CARLI, Maine InfoNet, MCLS, OPLIN; Canada: SOLS, TAL; Australia: NSLA E-Resources Consortium; New Zealand: EPIC	COUNTER
Third-party tool provision	US: California Digital Library (MPSScholarly Stats tool); Canada: Ontario Colleges Library Service (Statista tool)	COUNTER
One-stop platform	UK: JISC Collections (JUSP), Wales Higher Education Libraries Forum (JUSP); South Korea: KESLI (KESLI Usage Stats platform); India: UGC-INFONET Digital Library Consortium (INFISTAT platform); France: COUPERIN (MESURE platform)	COUNTER, SUSHI
General statistics	US: MERLIN, VIVA; Australia: CAUL; Germany: MPDL	No standard, customized

Under the international influence of digital resource usage statistics standardization, domestic library consortia have also begun exploring standardized management and utilization of statistics data. The Digital Resource Acquisition Alliance of Chinese Academic Libraries (DRAA) [26] commissioned the Shenzhen University Library technical development team to develop an electronic resource usage statistics module to promote rational utilization of consortium databases and save libraries' financial and technical investment. This module uses SUSHI to automatically harvest COUNTER reports, providing member libraries with a convenient, timely, and efficient "one-stop" statistical data acquisition tool free of charge. It is currently the only purchasing consortium in China that provides usage statistics services to consortium members, offering various functions including individual library usage reports, consortium usage reports, comparative analysis, and rankings.

In summary, the analysis of research status and practical progress reveals that library consortia both domestically and internationally have recognized the importance of usage statistics. However, cases discussing usage statistics services from the consortium perspective remain limited, making experiences and cases like JUSP urgently needed to guide consortia's usage statistics work.

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3. Case Study of JUSP

3.1 Background and Development To ensure the UK education and research community's access to more online resources at lower costs, JISC established the JISC Collections purchasing consortium in 2002, focusing on implementing digital resource group purchasing through national licensing. JISC Collections' primary responsibilities include quality assessment of digital resources, negotiating group purchases on behalf of the education and research sectors, issuing effective national licenses for electronic content, and ensuring member libraries obtain optimal digital resource licensing schemes at the most favorable prices. In 2017, JISC Collections provided group subscriptions for 320 digital resources to member libraries, divided into two categories: digital resources provided free of charge under national licensing and digital resources for which member libraries self-fund participation in group purchasing. In addition to group purchasing services, JISC Collections provides multiple sub-services including digital archiving services (JISC eCollections, JISC Historic Books, JISC Journal Archives), multimedia services (JISC MediaHub), knowledge base services (KnowledgeBase+), institutional repository usage statistics (IRUS-UK), OA resource services (JiscMonitor), usage statistics services (JUSP), procurement decision tools, and identity management tools. Among these, JUSP provides accurate and comparable usage statistics data that effectively support JISC Collections' purchasing decisions and have been widely welcomed by UK academic libraries.

In 2004, based on analysis of usage statistics data from NESLi2 project partner database vendors, JISC Collections proposed establishing a usage statistics portal in the UK higher education sector [27]. In 2008, a follow-up JISC-funded project proposed the technical design and prototype system for a usage statistics platform, which was tested at five libraries and three database vendors, verifying the feasibility of providing integrated platform services [28]. In 2009, JISC Collections, the University of Manchester's Mimas data center, Birmingham City University's Evidence Base, and Cranfield University formally launched JUSP (Journal Usage Statistics Portal) for the UK higher education sector, providing libraries with one-stop browsing and downloading of usage statistics reports from NESLi2 partner database vendors.

JUSP initially involved only five libraries and eight database vendors, collecting usage statistics solely from NESLi2 project (priority) database vendors. As it expanded, JUSP opened to other database vendors beyond the NESLi2 program.

As of September 2017, 207 university libraries and institutions and 80 database vendors participated in JUSP. Through the JUSP platform, libraries can obtain usage data in one stop without having to collect data individually from each database vendor's website. Moreover, because JUSP automatically harvests data based on the SUSHI protocol, it saves librarians considerable workload and time. JUSP also enables comparative analysis of usage across different database vendors, years, and platforms, helping libraries optimize procurement decisions. All usage data undergoes review and quality control, ensuring reliability and accuracy.

3.2 JUSP Services As a comprehensive usage statistics platform, JUSP primarily provides three services: (1) data collection—gathering journal and e-book usage data for member libraries from database vendors and establishing associations between procurement transactions and digital resource knowledge bases; (2) data provision—offering various customized usage statistics reports, tables, and charts to member libraries; and (3) data maintenance—serving as a bridge between libraries and database vendors and ensuring usage data quality.

3.2.1 Data Collection Initially, JUSP adopted manual collection, where participating member libraries downloaded JR1 and JR1a reports from different database vendors and uploaded them to the platform. This method was inefficient; during 2009-2010, member libraries uploaded only 9 million data entries. Using SUSHI to automatically harvest usage statistics from database vendors significantly improved JUSP's service breadth and efficiency. In 2009, leveraging the COUNTER Release 3 mandate to use SUSHI services, JUSP actively applied SUSHI, establishing good data exchange partnerships with database vendors and institutions. In 2011, journal-level data in the platform exceeded 32 million entries, surpassing 100 million by 2012 [29]. Meanwhile, SUSHI saved librarians substantial work. For example, in May 2012, JUSP collected 2,809 usage data files for over 140 libraries. Manually collecting this volume of data monthly (downloading and reviewing) would require 180 workdays (one person), whereas using SUSHI required only about 4 workdays—a time savings of nearly 98%.

The use of SUSHI for automatic harvesting is one of JUSP's main features. JUSP's data collection process using SUSHI proceeds as follows:

First, developing SUSHI client software. In SUSHI's early implementation, JUSP faced two major challenges: lack of suitable SUSHI clients and limited database vendor support for SUSHI. Early SUSHI clients available on the NISO website (such as MISO, SoapUI, and SUSHI Toolkit & WebClient) were developed in JAVA based on the Microsoft .NET framework for Windows environments, making them incompatible with JUSP's unified service platform developed in Perl. Moreover, the JUSP development team lacked JAVA development experience. Against this background, the JUSP development team developed the SUSHI Starters Project in Perl and successfully tested connectivity with

Oxford Journals' SUSHI server to obtain Oxford Journals' JR1 reports [4]. Although most SUSHI servers output nearly identical content, their exact implementations vary significantly due to different authentication and authorization requirements for SUSHI clients. Therefore, after achieving interoperability with Oxford Journals' SUSHI server, JUSP developed 27 Perl-based SUSHI clients and one PHP client between 2009-2012 to meet the precise needs of connecting with 33 database vendors' SUSHI servers [29].

Second, developing a SUSHI server. To better serve consortium members and expand data service scope, JUSP developed a SUSHI Server for secondary data output. On one hand, JUSP SUSHI Server facilitates member libraries that already have usage statistics tools, allowing them to obtain one-stop data access without configuring multiple SUSHI clients to harvest usage statistics from database vendors. On the other hand, non-consortium libraries can authorize JUSP to collect their usage data and obtain usage statistics from multiple database vendors through JUSP SUSHI Server at once. The JUSP SUSHI Server was developed using PHP, taking only three weeks thanks to client development experience. User authentication is a key component. JUSP uses Shibboleth/OpenAthens authentication within site security. The SUSHI server's Requestor is an open parameter, meaning anyone with a Requestor ID can access the SUSHI server data, which is not conducive to privacy control. JUSP borrowed Oxford Journal SUSHI server's authentication model, adding IP address verification in addition to Requestor ID authentication. Users of JUSP SUSHI Server must register an IP address for the machine harvesting data [30]. Additionally, for libraries using third-party data integration platforms such as UStat, 360 Counter, Millennium, and EBSCONET Usage Consolidation, JUSP provides the JUSP API. Once authorized, third-party platforms can access JUSP to harvest usage data.

Third, configuring the SUSHI client. As a data intermediary, JUSP must collect SUSHI configuration information for libraries and database vendors, as well as procurement transaction information. Libraries joining JUSP must sign the JUSP agreement, authorizing JUSP to obtain their usage data on their behalf. The JUSP team confirms with libraries their purchased resources and database vendor lists, provides login details and database vendor data collection processes, and finally adds libraries to the participation list. Database vendor participation also requires signing participation agreements and providing information needed for JUSP SUSHI client configuration. SUSHI client configuration parameters include: SUSHI server URL, Requestor ID, Customer ID, COUNTER report name, and date range. JUSP provides database vendors with two methods for submitting Requestor ID and Customer ID: (1) assign different Requestor IDs and Customer IDs to different libraries, which JUSP then uses to download usage data; or (2) assign JUSP a central Requestor ID authorized to collect usage data for all JUSP-participating libraries. JUSP only needs to use one Requestor ID with a specific library's Customer ID to obtain that database vendor's usage data. JUSP recommends the second method.

3.2.2 Data Provision JUSP's data provision services fall into two categories: (1) member libraries logging into the JUSP platform to directly obtain reports, analysis, and charts of various statistical data; and (2) member institutions using local SUSHI client software to regularly harvest COUNTER data from JUSP's SUSHI server for analysis in local usage statistics tools. Currently, JUSP's SUSHI server provides 11 types of COUNTER-standard reports: JR1, JR1a, JR1 GOA, JR2, JR5, BR1, BR2, BR3, DB1, DB2, and PR1.

The JUSP platform provides diverse customized data reports and analysis functions. It currently offers two major categories: journal reports and e-book/other reports, each with multiple specific report types. Journal usage statistics report types are shown in Table 2 . JUSP began providing e-book usage statistics in February 2016 and database/platform usage statistics in September 2017. E-book and other usage reports are shown in Table 3 .

3.2.3 Data Maintenance Quality control is a crucial component ensuring stable data services. JUSP implements source control, managing data quality from the database vendors' data sources. JUSP uses a combination of machine control and manual control, based on both COUNTER and SUSHI standards to regulate data. JUSP developed a Perl script to perform various data checks, such as data integrity, correct format, correct identifiers, and title existence. If validation fails, JUSP further conducts manual data analysis, manually corrects errors, completes checks, feeds back problems and results to database vendors, and urges them to correct data or software promptly. JUSP also provides multiple user feedback channels, supporting library users in jointly monitoring usage data quality. Feedback can be provided through formal channels such as regular user surveys, JUSP website management and maintenance, and library case studies, as well as informal channels like seminars, emails, and forums [6].

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4. Implications of JUSP for Consortia in Providing Digital Resource Usage Statistics Services

Over more than a decade, JUSP has evolved from a small idea into a foundational service used by most UK academic libraries and has even been referenced by other library purchasing consortia worldwide. JISC Collections' experience in dedicatedly building a digital resource usage statistics platform offers valuable lessons for other library consortia.

4.1 Emphasizing Usage Statistics Needs and Active Practice Promotion Prioritizing digital resource usage statistics needs and putting them into practice is the cornerstone of JUSP's success. As early as 2005, JISC Collections keenly detected library users' needs for usage statistics data in a data survey conducted by Evidence Base. Driven by this demand, JISC funded multiple related studies and actively promoted the practical implementation of the JUSP

project. The JUSP platform employs agile development; the project team actively communicates with academic libraries and database vendors about needs through surveys or mailing lists, responding quickly and updating promptly to ensure needs are met [6]. JUSP's emphasis on needs is reflected not only in its development model but also in its feedback model. During platform use, participating libraries can reflect problems and needs through multiple feedback channels, and JUSP follows up and addresses them promptly. Furthermore, JISC Collections fully leverages its two major advantages—rich, high-quality purchased resources and extensive group purchasing users—to promote JUSP through exhibitions, conferences, research projects, case studies, and user surveys, successfully mobilizing the enthusiasm of libraries and database vendors to participate in JUSP platform construction, forming a virtuous cycle of demand-construction-feedback.

Library consortia should emphasize member libraries' needs for digital resource usage statistics. First, consortia should encourage member libraries to express their needs through mail, seminars, user surveys, and research projects to understand what types of usage statistics reports they require, collect customized statistics report needs at the consortium level, and identify technical questions member libraries have regarding platform deployment. Second, consortia should transform needs into usage statistics practice, encouraging member libraries to actively conduct usage statistics practice, researching the feasibility of implementing digital resource usage statistics services at the consortium level, discussing with other consortia the possibility of cooperatively developing usage statistics platforms, and developing usage statistics service platforms when conditions are mature. Third, consortia should build smooth and fast feedback channels to continuously communicate and promptly resolve user needs. Consortia should respond promptly to needs or questions raised by member libraries to maintain their participation enthusiasm.

4.2 Addressing Technology Development Gaps and Cooperatively Developing a One-Stop Usage Statistics Platform Digital resource usage statistics for library consortia involve data exchange among multiple libraries and database vendors, inevitably requiring software or platforms to provide automated services. Currently, no commercial digital resource usage statistics tools exist specifically for library consortium group purchasing, leaving consortia to develop independently. Technology development and operation maintenance represent a weakness for most library consortia and constitute one of the most direct factors leading to the absence of usage statistics services in consortium group purchasing.

JISC Collections adopted a cooperative division-of-labor model to build JUSP. JISC Collections handles legal review and strategic sustainability planning, the Mimas data center manages database administration, data collection, website development, and daily data maintenance, Evidence Base handles community engagement such as user support and training, and Cranfield University primar-

ily provides technology development and support. Each party performs its own duties, maximizing their respective strengths.

Therefore, cooperative development is an effective choice for consortia building one-stop usage statistics platforms. Consortia with independent development capabilities can have technically strong libraries within the consortium take the lead, mobilizing consortium forces to support platform development. For example, DRAA's usage statistics service was commissioned to Shenzhen University Library, a member with rich development experience, and established a statistics working group with multiple libraries to supervise and guarantee statistical services. For consortia with weaker technical capabilities, cooperative construction can unite multiple consortia for joint development. For instance, Pennsylvania's PALCI consortium is currently collaborating with JISC (UK), Couperin (France), VIVA (US), USMAI (University System of Maryland and Affiliated Institutions), SCELC (Statewide California Electronic Library Consortium), CDL, and Canada's CRKN (Canadian Research Knowledge Network) to develop a consortium-level usage data statistics platform based on the JUSP solution, with completion expected in May 2018 [31].

4.3 Following Relevant Standards and Specifications Standards play an important role in regulating industry behavior. Whether standards are followed is a crucial factor affecting software's widespread application. JUSP's rapid recognition by most UK academic libraries and its attraction of over 80 database vendors are inseparable from its adherence to COUNTER and SUSHI standards. JISC was an early participant in the COUNTER standard. Unlike some digital resource usage statistics tools that attempted to analyze usage log files for data, JUSP insisted on using COUNTER-standardized data as the normalized source data even when only a few database vendors provided COUNTER-based usage statistics reports. After the COUNTER Release 3 recommended SUSHI standards in 2009, JUSP actively promoted SUSHI service application, communicating with SUSHI-supporting database vendors and rapidly developing multiple SUSHI clients and servers. Following standards gave the JUSP platform broad applicability and promoted its service adoption.

Therefore, library purchasing consortia should first actively follow the two internationally 通用 standards, COUNTER and SUSHI, when building usage statistics platforms. Second, they should promote these standards to member libraries to enhance their understanding and awareness. Additionally, consortia should fully utilize their discourse power and influence to urge database vendors to quickly comply with COUNTER and SUSHI standards, providing usage statistics data that meets COUNTER specifications and can be automatically harvested via SUSHI protocol. Finally, while promoting international standards, consortia should strengthen cooperation with international standards organizations, actively participate in research and formulation of international electronic resource usage statistics standards, feedback problems raised by member libraries regarding standards, and drive problem resolution, becoming contribu-

tors rather than just adopters or users of standards.

4.4 Emphasizing Community Participation and Support JUSP's vitality for continuous improvement stems from both meeting library functional needs and its emphasis on library community participation [29]. JUSP platform community organization and management activities are primarily undertaken by Evidence Base, which is responsible for: (1) regularly organizing workshops, webinars, and offline training to provide libraries with consultation, exchange, and usage training; (2) establishing a specialized JUSP Community Advisory Group composed of JUSP members to collect comprehensive opinions from member libraries and provide feedback; (3) providing JuspConsult services to offer consultation and advice, and even help develop usage statistics portals for libraries and consortia outside the UK (such as France's MESURE); and (4) providing rapid-response email services and support documentation and video materials on the JUSP website.

Therefore, library consortia developing digital resource usage statistics services should consider establishing usage statistics communities. Such communities should primarily undertake tasks including reviewing the current status and problems of digital resource usage data collection and statistics, collecting libraries' usage statistics needs, controlling usage data quality, and establishing long-term supervision and guarantee mechanisms for usage statistics. Establishing usage statistics communities can effectively enhance consortium libraries' awareness of digital resource usage statistics and provide a community foundation for subsequent usage statistics practice. Usage statistics communities should include consortium member libraries at different levels to hear diverse voices. Library consortia should play organizational, communication, and supervisory roles in the community: (1) organizationally, consortia should organize multi-party meetings to encourage cooperation and research among different stakeholders, creating diverse multilateral and efficient interaction opportunities; (2) in communication, consortia should provide multiple channels such as email, forums, offline seminars, video conferences, training, and user surveys; and (3) in supervision, consortia should fully utilize collective strength to urge database vendors to improve usage data quality and enhance usage statistics services.

Developing usage statistics services is an inevitable future direction for consortium procurement. Developing usage statistics platforms or tools is only a small step for consortia in providing digital resource usage statistics services and usage performance evaluation. How to ensure the sustainability of usage statistics services and deepen the analysis and utilization of usage data are eternal questions that every library purchasing consortium must consider. JUSP's successful experience deserves our reflection and reference. Following relevant standards and specifications is the prerequisite and foundation, cooperative development is the optimal manifestation of the consortium model, and emphasizing users' usage statistics needs and community participation is the dynamic source for sustain-

able development of usage statistics services. Library consortia can learn from these experiences to continuously deepen usage statistics services and provide support for library digital resource procurement and evaluation.

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Research on Digital Resources Usage Statistics of Library Consortia: A Case of JUSP

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Abstract: [Purpose/significance] Usage statistics of digital resources provide library consortia with basic data to evaluate digital resources, and also serve as important evidence for budget allocation in library consortium acquisition. With horizontal contrast usage data, consortium members can optimize their acquisition decisions. This paper takes JUSP as an example, analyzing the usage statistics services of the UK JISC Collections purchasing alliance, hoping to provide references for other library consortia. [Method/process] By methods of literature review and online survey, this paper analyzes the application status of usage statistics in domestic and foreign library consortia acquisition. Then, taking Journal Usage Statistics Portal (United Kingdom) as an example, it introduces its background and developments, and explores its practices of statistical services including data collection, data providing and data maintenance. [Result/conclusion] The experiences of JUSP give us some enlightenment. Library consortia should pay more attention to the user requirements for usage statistics, develop one-stop usage statistics platform through cooperation, follow relevant standards and specifications, and build a mechanism of community participation.

Keywords: usage statistic; library consortium; electronic resources; JUSP; SUSHI

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