

# Data-Driven Assessment: Visualizing Digital Resource Usage in XJTLU Library

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## 1. Background

Since 2017, to optimize library resource allocation, the Xi'an Jiaotong-Liverpool University (XJTLU) Library initiated a systematic evaluation of electronic resource usage, publishing the annual *XJTLU Library Digital Resources Usage Report*. This report aimed to reveal the usage status of subscribed databases, providing preliminary data references for the decision-making of the XJTLU Library Resource Development Committee regarding database renewal, acquisition, or cancellation. To further enhance the intuitiveness of data presentation, the library introduced the Tableau visualization tool, constructing a dashboard comparing usage data from two consecutive years to show short-term changes in database usage.

These initial explorations marked a significant step forward on the library's path to data-driven decision-making. However, as the variety of

electronic resources expanded and assessment needs deepened, the original reporting and analysis model revealed some limitations:

- **Data Fragmentation and Silos:** Usage statistics for various electronic resources remained scattered across numerous publishers and platforms. Data formats varied widely. While some adhered to the international COUNTER standard, a significant amount of non-standard data persisted. Librarians invested substantial time in manual collection, cleaning, and verification, yet the processed data was not stored in a unified platform.
- **Lack of Historical Data Analysis Dimensions:** The original Tableau dashboard only supported comparisons of data from the two most recent years, making it impossible to retrieve or query earlier historical data. This limitation hindered the committee's ability to conduct long-term trend analysis, preventing them from determining whether a decline in database traffic was a short-term fluctuation or a long-term decay. It also made it difficult to assess the true impact of resource promotion policies beyond a two-year cycle, constraining the depth of strategic decisions.
- **Inefficient Reporting and Communication:** When presenting annual budget requests or reporting on resource development outcomes to higher-level university committees, the library still had to extract key indicators from static annual reports and limited visual charts

on an ad-hoc basis, or search through manually compiled data tables from previous years to recreate presentation materials.

These issues indicated that the library needed a new-generation data analysis platform with more powerful functionality, more integrated data, and more comprehensive analytical dimensions to break free from the constraints of the original model.

## 2. Solutions

### 1) Building a Unified Data Warehouse

The Library's Electronic Resource Usage Data Dashboard not only continuously ingests COUNTER-standard data but also uniformly formats and imports various types of non-standard data. Furthermore, it integrates and correlates multi-dimensional data such as historical procurement costs, resource subject classifications, and resource type classifications, forming a master dataset covering multiple dimensions of "resource-cost-usage-time," effectively breaking down data silos.

### 2) Digital Resource Usage Dashboard

- **Global Data Overview:** Located at the core of the dashboard, this module provides an overall snapshot of key performance indicators, including total resources, usage scale, and core

cost-efficiency metrics, offering instant, macro-level business insights for senior decision-makers.

- **Multi-Dimensional Data Filtering:** Supports dynamic data filtering and drilling down from multiple analytical dimensions. Users can quickly focus on target datasets by selecting specific years, resource categories, subject areas, or specific database names, enabling precise analysis from macro to micro levels.
- **Monthly Full-Text Access Trend Analysis:** Clearly reveals fluctuations in access volume across different months, helping users identify peak and trough usage periods. This facilitates an understanding of user patterns in relation to the academic calendar and provides a basis for resource performance evaluation and demand forecasting.
- **Subject Coverage Analysis:** Shows the distribution of the library's electronic resources across various subject areas, assisting in evaluating the comprehensiveness of subject-specific resource development and ensuring the collection structure effectively supports the university's teaching and research needs.
- **Full-Text Access Share Analysis:** Presents the proportion of total full-text accesses contributed by each database or resource platform. It helps quickly identify core resources with the highest activity and resources with relatively lower usage rates.

- **Cost-Effectiveness Analysis:** Places the total cost and unit cost of each resource on a two-dimensional coordinate system, allowing users to easily identify different types of resources (e.g., "high-cost, high-benefit"; "high-cost, low-benefit") for precise cost-benefit evaluation and optimized budget allocation.

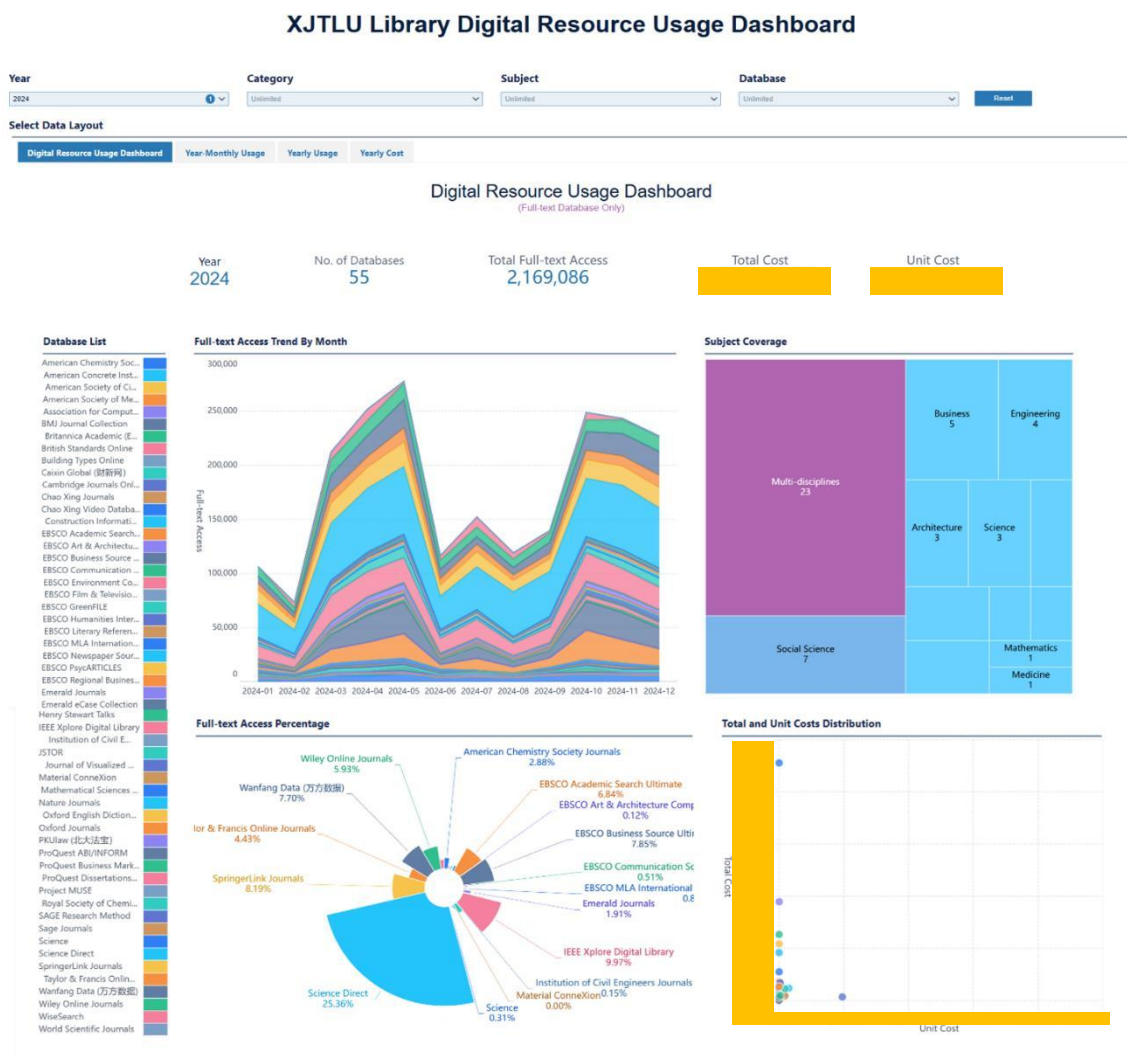


Figure 1. Library Electronic Resources Access Dashboard

### 3) Year-Monthly Usage Sheet

This sheet supports detailed queries of access volumes for specific databases by year and month, clearly displaying monthly usage trends

for different databases. This facilitates the identification of access peak periods and growth patterns.

### XJTLU Library Digital Resource Usage Dashboard

Year:  Category:  Subject:  Database:

Select Data Layout

Digital Resource Usage Dashboard **Year-Monthly Usage** Yearly Usage Yearly Cost

Title	Indicator	Month	2022	2023	2024
American Chemistry Society Journals	Full-text Access	1	1,250	1,319	3,476
		2	574	2,230	2,656
		3	1,208	2,844	5,956
		4	1,577	3,082	5,582
		5	1,374	3,104	7,453
		6	1,216	2,245	3,820
		7	1,237	2,670	4,874
		8	1,031	2,029	3,917
		9	1,832	3,014	5,909
		10	2,637	4,704	6,845
		11	4,087	4,706	6,228
		12	2,014	4,231	5,554
<b>Total</b>			<b>20,037</b>	<b>36,178</b>	<b>62,370</b>
American Concrete Institute	Full-text Access	1	12	5	0
		2	2	1	1
		3	2	6	0
		4	5	2	1,350
		5	3	5	0
		6	10	1	0
		7	0	1	0
		8	5	2	0
		9	1	3	0
		10	10	9	3
		11	10	5	2
		12	4	0	1
<b>Total</b>			<b>64</b>	<b>40</b>	<b>1,357</b>
American Society of Civil Engineering Journals	Full-text Access	1	434	249	599
		2	173	538	245
		3	687	996	635
		4	560	828	712
		5	572	932	554
		6	392	352	309
<b>Total</b>			<b>5,833</b>	<b>9,321</b>	<b>5,731</b>

Total 1,536 Records of Data

*Figure 2. Monthly/Annual Usage Data Table*

#### 4) Yearly Usage

This sheet systematically presents and compares the annual access volume and its year-on-year growth rate for each electronic resource over consecutive years. It not only lists the specific usage data for each database across years but also quickly reveals trends and magnitudes of

change in resource access through intuitive growth rate percentages and trend arrows.

### XJTLU Library Digital Resource Usage Dashboard

Year:  Category:  Subject:  Database:

Select Data Layout

Digital Resource Usage Dashboard | Year-Monthly Usage | **Yearly Usage** | Yearly Cost

Title	Year	Note	Indicator	2022		2023		2024			
				Usage	Growth Rate	Usage	Growth Rate	Usage	Growth Rate		
American Chemistry Society Journ...			Full-text Access	20,037		36,178	80.56%	↑	62,370	72.40%	↑
American Concrete Institute			Full-text Access	64		40	-37.50%	↓	1,357	3,282.50%	↑
American Society of Civil Engineer...			Full-text Access	5,833		9,321	59.80%	↑	5,731	-38.52%	↓
American Society of Civil Engineer...			Total Item Requests			437			152	-65.22%	↓
American Society of Mechanical En...			Full-text Access	499		492	-1.40%	↓	652	32.52%	↑
Association for Computer Machine...			Full-text Access	10,720		17,298	61.36%	↑	21,130	22.15%	↑
Audit Analytics - Audit and Compil...	Subscription cancelled in 2023		Time of Access	114		83	-27.19%	↓			
BKS Digital Library	Minor Site										
BMJ Journal Collection			Full-text Access			1,224			934	-23.69%	↓
Bentham Science			Total Item Requests						73		
Bloomberg	Subscription cancelled in Aug 2024		Active Users			12			0	-100.00%	↓
BoardEx	Access through local storage										
Britannica Academic (Encyclopaedi...			Full-text Access	8,528		9,314	9.22%	↑	7,132	-23.43%	↓
British Standards Online			Full-text Access	1,205		737	-38.84%	↓	322	-56.31%	↓
Building Types Online			Full-text Access	73		1	-98.63%	↓	494	49,300.00%	↑
Business Expert Press ebooks			Total Item Requests	162		263	62.35%	↑	180	-31.56%	↓
CAS ICR (Chinese Academy of Scie...	Subscription started from Sept 2023		Views			80			675	743.75%	↑
CEIC			Document Hits	600,818		412,959	-31.27%	↓	428,653	3.80%	↑
Casini Global (竞彩网)			Full-text Access	14,551		20,839	43.21%	↑	25,176	20.81%	↑

Figure 3. Multi-Year Comparison Table of Usage Data

### 5) Yearly Cost

From a cost-benefit perspective, this sheet tracks and compares electronic resources across multiple years. By showing each database's annual total cost, total access volume, and cost per use over the years, it clearly reveals changes in resource cost structure. Simultaneously, it intuitively indicates the direction and magnitude of annual fluctuations in cost per use through "change values" and trend arrows, enabling the quick identification of resources where cost-effectiveness is improving or deteriorating.

## XJTLU Library Digital Resource Usage Dashboard

Year:  Category:  Subject:  Database:

Select Data Layout:

Title	Note	Indicator	2022				2023				2024			
			Total Cost	Total Usage	Unit Cost	Growth Value	Total Cost	Total Usage	Unit Cost	Growth Value	Total Cost	Total Usage	Unit Cost	Growth Value
American Chemistr...		Full-text Access		20,037			36,178		-4.26		62,370		-3.02	
American Concrete...		Full-text Access		64			40		155.08		1,357		-355.63	
American Society o...		Full-text Access		5,833			9,321		-2.81		5,731		4.69	
American Society o...		Total Item Requests					437				152		0.00	
American Society o...		Full-text Access		499			492		12.48		652		-18.43	
Association for Co...		Full-text Access		10,720			17,298		-1.24		21,130		-0.39	
Audit Analytics - A...	Subscription cancel...	Time of Access		114			83		0.00					
BKS Digital Library	Mirror Site										0			
BMJ Journal Collec...		Full-text Access					1,224				934		-74.37	
Bentham Science		Total Item Requests									73			
Bloomberg	Subscription cancel...	Active Users					12				0			
BoardEx	Access through loc...													
Britannica Academi...		Full-text Access		8,528			9,314		-0.28		7,132		1.51	
British Standards O...		Full-text Access		1,205			737		34.69		322		91.33	
Building Types Onli...		Full-text Access		73			1		9,319.49		494		-9,365.00	
Business Expert Pre...		Total Item Requests		162			263		0.00		180		0.00	
CAS JCR (Chinese ...	Subscription starte...	Views		0			80				675		-165.28	
CDC		Document Hits		600,818			412,959		0.38		428,653		0.00	

*Figure 4 Annual Cost-Benefit Table*

### 3. Outcomes and Benefits

- **Data Transitioned from "Decentralized Storage" to "Unified Storage":** The platform established a centralized data warehouse, storing complete historical usage and cost data. This not only resolved the previous limitation of comparisons being restricted to the two most recent years but also built a comprehensive resource usage archive. It laid a solid data foundation for implementing resource lifecycle management and conducting long-term performance tracking and retrospective research.

- **Decision-Making Dimensions Extended from "Short-Term" to "Long-Term":** Trend analysis based on multi-year data means decisions are no longer confined to annual fluctuations. It helped the library successfully identify databases with seemingly acceptable annual access volume but showing a consistent multi-year declining trend, prompting timely research into alternative solutions and preventing the hidden loss of resource value.
- **Data Retrieval Upgraded from "Ad-hoc Compilation" to "Rapid Export":** The platform integrated and standardized all historical data. When completing key reports such as the Ministry of Education's Higher Education Statistics and EAP data statistics, librarians no longer need to manually collect and collate data from multiple scattered sources. They can directly and quickly filter and export standardized data for the corresponding year from the platform, significantly improving the accuracy of data reporting and work efficiency.

#### **4. Next Steps**

Integrate more non-COUNTER standard usage data (e.g., platform logins, session duration) to build a more comprehensive resource impact evaluation system.