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Proceedings of the World Conference on Research in Social Sciences
Vol. 2, Issue. 2, 2025, pp. 37-52
DOI: https://doi.org/10.33422/socialsciencesconf.v2i2.1706

ISSN: 3030-0827 online

Analysis of Automated Circulation Data Patterns in Academic Libraries: A Case Study from the University of Sri Jayewardenepura, Sri Lanka

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Abstract

The study aimed to examine the automated circulation services, features, and patterns in the University of Sri Jayewardenepura library. A key issue identified was a significant disparity in students' knowledge and experience of library circulation services across faculties. Circulation data covering the period from May 2024 to April 2025 was retrieved from the university library management system and quantitatively analysed to address the objectives of this study. A total of 36,575 circulation records were analysed during the review period, and findings revealed that students from the Faculty of Humanities and Social Sciences accounted for most of the circulation activity, representing approximately 55.6% of the total. University staff accounted for 15.3%, and the Faculty of Management and Commerce ranked third at 10.1%. Monthly usage trends indicated peak circulation activity among students in January, February, March, October, and November. In contrast, staff members consistently borrowed and returned throughout the year. The top ten most borrowed items were predominantly Sinhala-language academic texts, reflecting localised academic needs in disciplines such as social science, economics, and history. Based on these findings, the study recommends enhancing faculty-specific resource allocation, expanding digital access, targeting outreach to underutilised groups, and optimising calendar-aligned services. These insights support evidence-based decision-making to strengthen the library's role in advancing institutional teaching and learning goals.

Keywords: Academic Libraries, Circulation Pattern, Circulation Services, Library Automation, Library Circulation

1. Introduction

Academic libraries are considered the heart of universities, as they play a central role in the educational community. Their primary responsibility is to provide a research setting that advances students' and researchers' knowledge and information. To this end, many academic libraries in Sri Lanka, including the University of Sri Jayewardenepura (USJ), have initiated

automated circulation services. Circulation remains a core function of academic libraries across Sri Lanka, playing a critical role in resource access and user engagement. In Sri Lanka, the implementation of automated systems in university libraries has grown steadily over the past decade, marking a significant shift toward more efficient, data-driven operations. At the USJ, this transition commenced in 2014 with the implementation of the Koha open-source Integrated Library System (ILS). Since then, routine circulation activities such as issuing and returning books, processing fines, renewing loans, and handling write-offs have become significantly more streamlined and manageable, enhancing both user convenience and staff efficiency.

Circulation analysis is a valuable method for conducting user studies and evaluating library collections, as it reflects the relevance of library materials to the user community. The insights gained from circulation data can inform a range of strategic decisions, including assessing acquisition policies and managing library resources. This may involve decisions related to purchasing, weeding, preservation, off-site storage, and the allocation of physical space within the library. As one of Sri Lanka's leading higher education institutions, USJ's library supports a diverse student body across multiple academic disciplines. However, there is a lack of comprehensive research on how circulation data from automated library systems is utilised to assess collection performance, inform acquisition strategies, or analyse user engagement trends. This study aims to fill that gap by analysing circulation data from the University of Sri Jayewardenepura Library.

2. Literature Review

Library circulation remains a core component of library operations and user engagement, and recent scholarship reflects a growing emphasis on leveraging circulation data and emerging technologies to inform service design, collection development, and user support. Across a range of institutional and geographic contexts, researchers have approached circulation through analytical, technological, behavioural, and managerial perspectives, collectively contributing to a more nuanced understanding of how libraries can adapt to evolving user needs and expectations.

Wang (2024) investigates how to enhance library circulation services by integrating collaborative filtering and augmented reality (AR) technologies in the context of China's "Five Education Initiatives." The study introduces a hybrid model combining an attention-based collaborative filtering algorithm for personalised book recommendations with AR-based navigation to guide users within the physical library space. The findings indicate that this integrated approach improves the user experience, increases resource discovery accuracy, and facilitates more efficient information retrieval. Similarly, Dutta and Bhuvaneshwari (2024) highlight the absence of standardised practices for managing circulation transaction data (CTD) across library systems. While established metadata standards such as MARC21 and BIBFRAME exist for bibliographic and linked data, there is no widely adopted framework for circulation-related data. To address this gap, they propose the Library Circulation Transaction Metadata (LCTM) model, which enhances interoperability, supports system migration, and enables evidence-based collection management, emphasising the broader importance of metadata standardisation for optimising library services and decision-making.

At the national level, Illangarathne and Wanasinghe (2024) conducted a case study examining circulation patterns among Social Sciences and Humanities (SSH) undergraduates at Rajarata University of Sri Lanka between 2015 and 2019. Their analysis revealed discipline-specific borrowing trends, with higher demand for materials in Religion, Philosophy, and Psychology, while areas such as Computer Science and General Works recorded lower circulation. Complementing this, Santosh Abaji Kharat et al. (2023) performed a systematic literature

review (SLR) spanning more than 140 years of circulation methods in academic libraries, categorising them into manual, mechanised, automated, and networked systems. Their study underscores the potential of QR code technology to enhance the user experience and operational efficiency in library circulation services.

Other research has examined circulation from computational and environmental perspectives. Han et al. (2022) propose an enhanced FAST algorithm that builds on the Fast Update (FUP) framework to mine association rules in library circulation data. This method proves particularly effective in dynamic environments where data are continuously updated, improving computational efficiency and scalability while offering a valuable tool for real-time analysis of library usage patterns and resource management. Meanwhile, Sato et al. (2021) explored how external factors, specifically weather conditions and the day of the week, affect circulation in two public libraries in Japan. Their findings indicate that while the day of the week consistently influenced borrowing behaviour in both libraries, weather exerted a statistically significant impact only in the urban library, suggesting that library use in urban settings may be more sensitive to environmental conditions than in rural contexts.

Jahangir et al. (2021) examined the implementation of automated circulation services in university libraries in Lahore, identifying several barriers that challenge the transition to automation, including limited funding, the absence of standardised software, high costs associated with proprietary systems, and complications with retrospective data conversion. These findings highlight infrastructural and financial constraints that impede the effective modernisation of library services in developing contexts. Similarly, Galyani-Moghaddam and Taheri (2020) investigated reading preferences among young users across public libraries in Tehran, revealing that, regardless of gender, most patrons preferred borrowing books unrelated to their academic studies. This underscores the importance of incorporating diverse and recreational reading materials to better engage younger audiences.

From a policy-oriented perspective, Igarashi et al. (2020) analysed public library circulation data in Japan to identify patterns in citizens' learning interests across different regions. Their findings have significant implications for the development of lifelong learning initiatives, demonstrating how borrowing trends can inform public policy and the design of more responsive and localised educational programs. Marasinghe (2020) conducted a longitudinal analysis of circulation trends at the Open University of Sri Lanka (2014–2018), identifying a notable decline in both borrowing and active user participation, thus signalling shifting user behaviour in academic libraries and recommending further research into institutional and user-related factors driving these changes.

Earlier research by Çetin and Howard (2015) examined book circulation patterns among undergraduates at an English-language university in Istanbul, exploring how academic achievement relates to variables such as discipline, gender, and borrowing behaviour. Their findings revealed a significant positive correlation between students' academic performance and the number of books borrowed. Similarly, Knievel et al. (2006) demonstrated that circulation statistics and interlibrary loan (ILL) data can be effective tools for collection management in academic libraries, providing insights into the relevance and usage of library resources that inform acquisitions, weeding, and resource allocation decisions.

Collectively, these studies present a multifaceted understanding of library circulation, illustrating its central role in supporting academic success, guiding collection development, and informing technological innovation. At the same time, they highlight persistent challenges related to infrastructure, standardisation, and equitable access, particularly in less-resourced contexts. As academic and public libraries continue to evolve, circulation data and associated

services remain vital instruments for strategic decision-making, service optimisation, and meaningful user engagement.

3. Objective of the Study

The main objective of this study was to analyse and identify patterns in the circulation of library materials of the University of Sri Jayewardenepura, based on data collected over one academic year. By examining automated circulation records, the study seeks to uncover trends in user behaviour and resource utilisation, providing insights that can inform library management and policy decisions.

In support of this overarching aim, the following specific objectives have been established:

- To identify the faculty or faculties whose students most actively borrow printed books
- To examine the behaviour and experiences of academic and non-academic staff about library circulation, including borrowing patterns and frequency of use.
- To provide evidence-based recommendations for collection development, particularly in terms of prioritising the acquisition of information resources based on actual usage trends.

4. Methodology

Library circulation data was collected from the reports module of the Koha Integrated Library System, which the USJ Library maintains. The dataset covers the academic year from May 1, 2024, to April 30, 2025, with data retrieved separately for each of the 12 months. The data were initially filtered and then analysed using Microsoft Excel. Descriptive statistics, including totals and percentages, were used to derive meaningful insights. Key patterns and findings were presented using tables and charts to enhance clarity and interpretation.

Reproducibility: Koha Report Configuration and Data Extraction Details

To ensure transparency and reproducibility of the findings, this section documents the Koha report configuration, extraction parameters, database tables referenced, and variables used in the analysis of circulation data.

System Context

Library System: Koha Integrated Library System (ILS)

Institution: University of Sri Jayewardenepura Library

Module Used: Koha Reports Module (SQL-based custom reporting interface)

Study Period: 01 May 2024 – 30 April 2025

The following filters were applied to ensure consistency with the defined academic year and study scope

Transactions were restricted using: issuedate BETWEEN '2024-05-01' AND '2025-04-30'

Transaction Types Included:

- Issue (Borrowing)
- Return
- Renewal

- Payment (fine-related transactions)
- Write-off (administrative clearance)

Item Scope:

- Circulating print materials only
- Non-circulating reference materials excluded
- Electronic resources excluded (not recorded within Koha circulation tables)

User Scope: Registered users affiliated with university faculties, Deactivated users excluded from per-capita calculations.

- User categories grouped as:
- S1–S5 (Undergraduates)
- PG (Postgraduate)
- Staff

Table 01. Variables were extracted and used in the manuscript's analyses

Field	Description	Used For
borrowernumber	Unique anonymised user ID	Aggregation
categorycode	User category (S1–S5, PG, Staff)	User-level analysis
branchcode	Faculty/library branch	Faculty comparison
issuedate	Date of issue	Monthly trend analysis
returndate	Date of return	Activity balance
itemtype	Material classification	Resource type control
biblio.title	Title information	Top-borrowed books analysis
accounttype	Payment/write-off classification	Administrative activity
amount	Fine/payment amount	Payment analysis

Operational Definitions of User and Transaction Categories

To ensure conceptual clarity and analytical consistency, the following operational definitions were applied to user categories and circulation transaction types extracted from the Koha Integrated Library System.

1. User Categories

User classifications were based on the borrower category codes recorded in the Koha system at the time of transaction.

Undergraduate Students (S1–S5): These categories reflect academic progression levels within degree programmes.

- S1: First-year undergraduates
- S2: Second-year undergraduates
- S3: Third-year undergraduates

- S4: Fourth-year undergraduates
- S5: Fifth-year undergraduates (primarily medical programme students)

Postgraduate Students (PG):

Registered students enrolled in postgraduate diploma, master's, or doctoral programmes during the study period.

Staff (All Staff Categories):

The staff category includes registered university employees with library borrowing privileges. For analytical clarity, staff may be disaggregated into:

- Academic Staff: professors,senior lecturers, Lecturers, Temporary academic staff
- Library Academic staff: Librarian, Deputy Librarians, Senior Assistant Librarians and Assistant Librarians
- Non-Academic Staff: Administrative, technical, and support personnel
- Library Non Academic Staff: Other all Staff with internal circulation privileges
- Deactivated Users:
  Users whose university registration or employment status had ended during the study period. These accounts were excluded from per-capita calculations but retained in aggregate circulation counts where relevant.

2. Transaction Categories

Circulation activities were classified into five operational transaction types based on Koha system logs.

- Borrowing (Issue): The initial checkout of a physical item to a registered user. This represents active demand for print resources and forms the primary indicator of resource utilisation.
- Return: The recorded check-in of a previously borrowed item.
- Renewal: An extension of the loan period for an already issued item without physical return at the time of renewal.
- Payments: Monetary transactions recorded in the system related to circulation activities. These typically include: Overdue fines, Lost-item replacement fees
- Write-Offs: Administrative adjustments in which items or associated fines are cleared from user accounts. Write-offs may occur due to: Long-overdue item resolution, Policy revisions affecting fine structures, Institutional administrative clearance processes

Data Cleaning Procedures

To ensure the reliability and integrity of the circulation dataset, a structured data cleaning and validation process was undertaken prior to analysis.

The following steps were implemented:

- *Date Filtering*: Transactions were restricted to the defined academic year (01 May 2024–30 April 2025) using Koha report date parameters to exclude records outside the study window.
- *Duplicate Removal*:Transaction IDs were examined to identify and remove duplicate entries resulting from report regeneration or system logging overlaps.
- *Transaction-Type Verification*:Circulation activities were validated and categorized into five operational types: borrowing (issue), returns, renewals, write-offs, and payments. Records with undefined or null transaction types were reviewed and excluded where classification was not possible.
- *User Status Validation*: Only active users were included in per-capita analyses. Deactivated accounts were excluded to prevent inflation or distortion of borrowing rates.
- *Cross-Verification with Monthly Administrative Logs:*Monthly totals were cross-checked against internal administrative summaries to confirm consistency between system-generated reports and operational records.

During the cleaning process, two notable anomalies were identified:

(a) Transactions in June (n = 3)

The unusually low borrowing activity recorded in June can be attributed to a strike by non-academic staff, which resulted in restricted library access and a temporary suspension of regular circulation services during that period.

(b) High Write-Offs in August (n = 778)

In August, a revision to the library fine policy was implemented in the Koha system. Following this update, the system automatically recalculated outstanding fines to align with the revised fine structure. As a result, previously recorded fine amounts were adjusted, and corresponding legacy entries were administratively removed to ensure consistency with the updated policy.

5. Data Analysing

The University of Sri Jayewardenepura comprises 11 faculties. As of the reported period, the total number of registered library users was 48361. Of these, 3062 users were deactivated. The deactivated user group comprises individuals who have terminated their university registrations for various reasons. This group may include students who have completed their studies and received degrees, as well as employees who are no longer on staff. The distribution of active users included 4036 first-year students (S1), 4109 second-year students (S2), 4144 third-year students (S3), 2751 fourth-year students (S4), and 186 fifth-year students (S5). Additionally, there were 3417 students with clearance pending (CP), 1168 postgraduate students (PG), and 1266 staff members (Staff).

5.1 Library Usage by Faculty

The analysis of circulation data reveals distinct patterns of library usage across faculties.

Table 02: Total library circulations by faculty-wise

Faculty	Circulation Counts	Contributions %
Faculty of Humanities and Social Sciences (FHSS)	20347	55.63
Staff	5621	15.37
Faculty of Management Studies and Commerce (FMSC)	3710	10.14
Faculty of Applied Sciences (FAS)	2314	6.33
Faculty of Medical Sciences (FMS)	1563	4.27
Faculty of Graduate Studies (FGS)	802	2.19
Faculty of Technology (FoT)	623	1.70
Faculty of Urban and Aquatic Bioresources (UAB)	598	1.63
Faculty of Allied Health Science (AHS)	529	1.45
Faculty of Engineering (FoE)	273	0.75
Faculty of Dental (FoD)	106	0.29
Faculty of Computing (FoC)	89	0.24

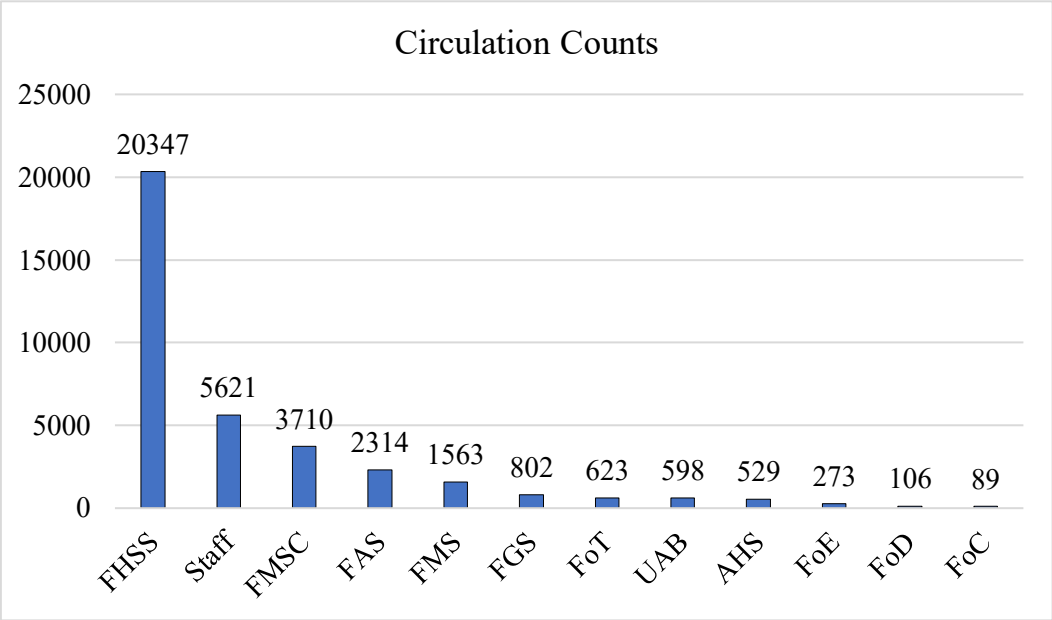

Figure 01: Total library circulation patterns by faculty

The Faculty of Humanities and Social Sciences demonstrates the highest level of engagement with library resources, with over 20,000 borrowing transactions during the analysed period. This high volume indicates the faculty's reliance on a broad range of textual and reference materials integral to the humanities and social sciences. Among the faculties, the Faculty of Management Studies and Commerce recorded the second-highest level of activity, with over 3700 borrowings. This substantial figure suggests a strong integration of library-based learning within the curriculum, particularly in areas such as economics, business studies, and organisational behaviour.

Borrowing activity from the Faculty of Applied Sciences, with more than 2300 recorded transactions, reflects consistent usage of scientific texts and academic references, supporting laboratory-based and theoretical learning. Notably, the Medical Library (MEDL), serving a more specialised user base, facilitated over 1500 borrowings, with the Faculty of Medical Sciences accounting for most of them. This suggests a focused and sustained demand for medical and health science literature, aligning with the needs of both undergraduate and clinical training programs.

In contrast, faculties such as Technology and Engineering exhibit moderate but upward-trending borrowing patterns. This may reflect either the relative novelty of these faculties or a curriculum structure that incorporates more digital or technical resources, which may not be fully captured by physical circulation statistics. Overall, borrowing trends underscore the varying degrees of library dependence across academic disciplines: traditional, text-heavy fields exhibit higher engagement, while emerging or technically oriented programs show more moderate use, potentially complemented by alternative digital resources.

5.2 Activity-wise Distribution of Circulations

Table 03: Activity-wise distribution of Circulations

Faculty	Circulations					
	Borrowing	Returns	Renewals	Write off	Payments	Total
FHSS	8944	8991	922	589	901	20347
Staff	2620	2841	117	26	17	5621
FMSC	1488	1734	168	143	177	3710
FAS	982	1006	132	53	141	2314
FMS	627	647	123	65	101	1563
FGS	342	335	42	43	40	802
FoT	276	263	39	15	30	623
UAB	248	284	32	17	17	598
AHS	231	251	32	9	6	529
FoE	95	112	25	17	24	273
FoD	40	45	8	6	7	106
FoC	26	21	23	9	10	89
Total	15919	16530	1663	992	1471	**36575**

The circulation statistics indicate robust engagement with the library's lending services, totalling 36,575 transactions. Borrowing (15,919) and returns (16,530) comprise the majority of activity, confirming sustained, regular use of print resources. The Faculty of Humanities and Social Sciences (FHSS) is the primary contributor, accounting for over half of total circulation (20,347 transactions), underscoring the faculty's reliance on library collections. Staff members also demonstrate notable participation (5,621), with balanced borrowing and returns and minimal penalties, indicating responsible use. In contrast, several faculties exhibit comparatively low engagement, suggesting either smaller user populations or a stronger preference for electronic resources. Overall, the data reveal a robust circulation system and highlight the need for targeted collection development and user engagement strategies to address disparities across faculties.

5.3 Circulation Trends by User Category

Table 04: Total Circulation counts by user category

User Category	Borrow Count
S3 (3rd Year Undergraduates)	9328
S2 (2nd Year Undergraduates)	8639
S4 (4th Year Undergraduates)	6745
Staff (All staff category)	5600
S1 (1st Year Undergraduates)	4881
PG (Postgraduate Students)	870
S5 (5th Year Students (Medical)	512

The circulation data analysis reveals clear patterns in user behaviour across different user categories within the university library system.

Undergraduate students constitute most library users, with S3, S2, and S4 exhibiting the highest borrowing frequencies, 9328, 8639, and 6745 transactions, respectively. This trend aligns with the increasing academic demands of students as they progress through their degree programs, particularly with research projects and core coursework in upper years.

Staff members were also significant users of the library, contributing 5600 circulations during the period. S1 also shows a notable level of engagement, with 4881 borrowings, suggesting that the library plays a foundational role in early academic development. The relatively lower borrowing count from S5 may reflect the specialised or clinical nature of final-year programs, especially in the Faculty of Medical Sciences, where physical borrowing may be supplemented with online resources or fieldwork. In contrast, postgraduate students account for 870 circulation activities, suggesting greater reliance on digital databases and journal subscriptions rather than print circulation.

These findings underscore the library's essential role in supporting undergraduate education and highlight differing resource needs and usage behaviours across user categories.

5.4 Per-Capita Normalization of Borrowing by Faculty and User Category

To enable meaningful comparisons across faculties and user categories with varying population sizes, borrowing data were normalized using per-capita calculations. Raw circulation counts alone may overrepresent larger faculties and underrepresent smaller academic units. Therefore, borrowing frequency was divided by the number of active registered users within each faculty and user category.

Per-Capita Borrowing Rate = Total borrowing transactions/Total active user in catogery

Accordinthe Table 05, staff exhibit the highest per-capita borrowing rate (4.42), indicating intensive individual-level engagement with print resources. Fourth year (S4) and fifth year (S5) students demonstrate higher borrowing intensity compared to undergraduates, reflecting advanced academic and research demands. Postgraduate students show the lowest per-capita borrowing (0.74), supporting the interpretation that they rely more heavily on electronic databases and journal resources. Although S3 recorded the highest total borrowings numerically, S4 and S5 show stronger borrowing intensity when adjusted for population size.

Table 05: Total Circulation counts by user category

User Category	Borrow Count	Estimated Active Users	Per-Capita Borrowing Rate
S3	9,328	4,144	2.25
S2	8,639	4,109	2.10
S4	6,745	2,751	2.45
Staff	5,600	1,266	4.42
S1	4,881	4,036	1.21
PG	870	1,168	0.74
S5	512	186	2.75

When circulation data are normalized by active user populations, borrowing intensity patterns shift. While the Faculty of Humanities and Social Sciences records the highest total circulation, per-capita analysis reveals that staff members and senior-level undergraduates demonstrate the highest borrowing intensity. This finding suggests that advanced academic engagement and research responsibilities significantly influence print resource usage. Therefore, collection development decisions should consider both total demand and per-user intensity to ensure equitable and strategic resource distribution across faculties.

5.5 Most Borrowed Books

The circulation data identifies the ten most frequently borrowed titles, offering valuable insight into the academic interests and curricular demands of library patrons. These high-usage items span disciplines such as social sciences, economics, history, law, and medicine, with a strong emphasis on the Sri Lankan context. A strong presence of Sinhala-language academic texts suggests a locally rooted academic focus.

Table 06: Top 10 borrowed books

Title	Borrow Count
Sociology (Sinhala medium)	289
History of Sri Lanka at the University of Sri Lanka (Sinhala medium)	170
Microeconomics (Sinhala medium)	137
Communication Studies Approach (Sinhala medium)	112
Economics (Sinhala medium)	107
Inscriptions of Lanka (Sinhala medium)	105
Lecture Notes in Forensic Medicine Vol. I	99
Criminal Victims (Sinhala medium)	95
Sinhala literature of the Kotte-era (Sinhala medium)	84
Commercial Law (Sinhala medium)	83

5.6 Months-wise total Circulation Activity

Table 07: Total circulations monthly-wise

Year	Month	Total Circulations
2024	May	346
	June	3
	July	1361
	August	3450
	September	3398
	October	4761
	November	3234
	December	2840
2025	January	4238
	February	4383
	March	4809
	April	3752

An analysis of monthly circulation data reveals clear seasonal patterns in library usage, closely aligned with the University of Sri Jayewardenepura's academic calendar. The top ten months for borrowing frequency span 2024 and 2025, with notable peaks in March 2025 (4809), October 2024 (4761), and February 2025 (4383).

These peak months likely correspond to critical academic milestones. Examples include the start of new semesters, mid-term assessments, and final examinations. High borrowing volumes during these periods reflect intensified academic activity. They also indicate increased student engagement with coursework and heightened demand for reading materials and reference texts. Borrowing activity remains consistently high from January to April 2025. There is a slight tapering from May to July, which may coincide with breaks or reduced academic load. A similar rise is observed from August to November 2024, consistent with the second-semester schedule. The decline in December 2024 (2840) is attributable to the year-end academic break and the holiday period.

Overall, these trends demonstrate the cyclical nature of library resource utilisation. They emphasise the importance of aligning collection availability, staffing, and service enhancements with the academic timetable. Understanding these monthly fluctuations enables more effective resource planning. It also supports targeted assistance during peak-demand periods.

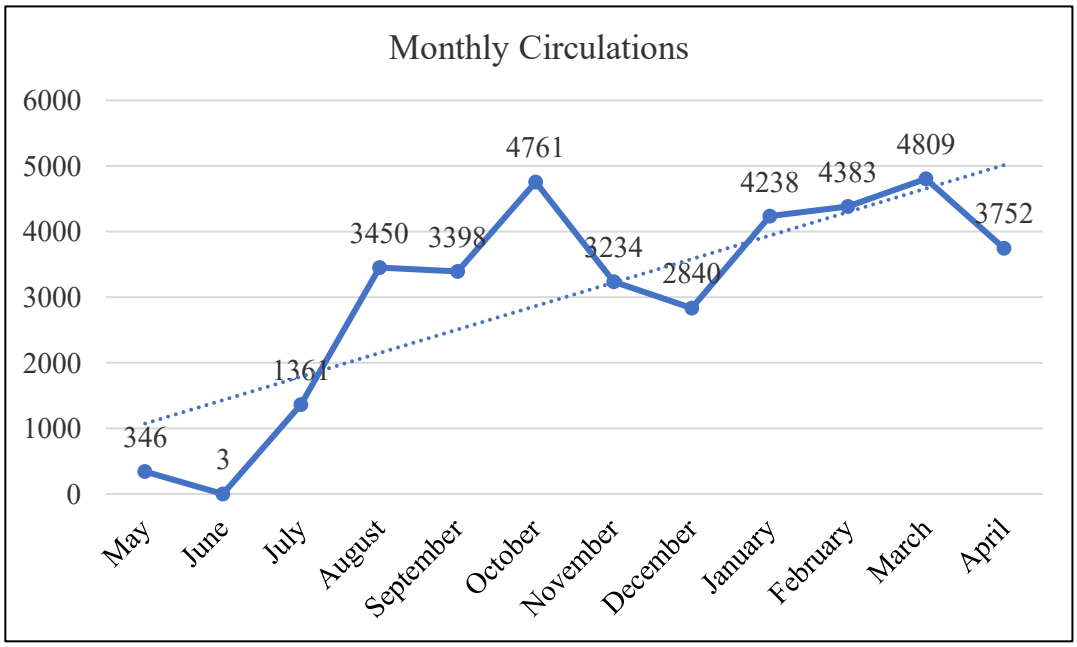

Figure 02: Total circulations monthly-wise

5.7 Activity-wise Monthly Circulation Patterns

Table 08: Activity-wise monthly circulation patterns

Month	Borrowing	Returning	Renewal	Write off	Payments	Total
May	169	113	56	0	8	346
June	0	0	3	0	0	3
July	411	861	7	0	82	1361
August	1225	1194	45	778	208	3450
September	1592	1393	106	114	193	3398
October	2113	2101	167	78	302	4761
November	1276	1696	171	2	89	3234
December	1141	1478	118	1	102	2840
January	2441	1572	151	1	73	4238
February	2122	1920	269	8	64	4383
March	2055	2415	288	7	44	4809
April	1374	1787	282	3	306	3752
Total	15919	16530	1663	992	1471	**36575**

The monthly circulation data show a strong alignment between library use and the academic calendar. Borrowing and returning accounts for most activities remain closely balanced, indicating regular use and effective return behaviour. Circulation is lowest in June due to the academic break, then increases sharply from July, peaking between October and March during active teaching and assessment periods. Renewals gradually rise toward the later months, suggesting extended use of materials, while write-offs and payments are concentrated in peak months, reflecting higher transaction volumes. Overall, the pattern indicates consistent demand for print resources with predictable seasonal fluctuations.

5.8 Resource Utilisation and Demand Forecasting

While descriptive statistics provide a clear overview of current library use patterns, a detailed review of resource allocation relative to distribution activities offers important insights into the efficiency and impact of resource investments. By mapping borrowing data to specific expenditures, libraries can assess whether financial allocations are proportionate to users' actual involvement across disciplines.

For example, faculties with consistently high borrowing volumes, such as Humanities and Social Sciences, likely justify sustained or increased funding for print acquisitions and updated reference materials. Conversely, faculties with moderate or low borrowing activity, such as Technology or Engineering, may benefit from a strategic rebalancing, potentially prioritising digital resources, targeted collections, or collaborative subscriptions over traditional print holdings.

Moreover, analysing circulation trends over time enables predictive modelling of future demand. Borrowing peaks align with academic cycles, suggesting predictable resource pressures during semester commencements and examination periods. By applying simple forecasting techniques (e.g., moving averages or regression-based trend analysis), the library could anticipate future borrowing spikes, ensuring timely acquisition, improved availability of high-demand titles, and optimised staffing during critical periods.

- Align budget allocations with actual usage patterns across faculties and disciplines to ensure resources are directed where they have the most significant impact.
- Identify under- or over-served academic areas, enabling more equitable access to materials and targeted support for disciplines with evolving needs.
- Anticipate future demand by leveraging borrowing trends, ensuring that high-demand resources are available during peak academic periods.
- Inform long-term collection development strategies by balancing investments in print and digital resources, optimising both cost-effectiveness and user satisfaction.

This enhanced analysis not only deepens the study's scholarly depth but also delivers actionable insights that can directly influence policy, budgeting, and service innovation at the University of Sri Jayewardenepura Library.

6. Limitation of the Study

However, this analysis has several limitations. First, the data reflect only physical circulation transactions and do not account for the use of electronic resources, which may be substantial in science, medical, and technology-oriented faculties, potentially underrepresenting their actual library usage. Second, variations in student enrolment across faculties are not accounted for, limiting the ability to assess per-capita usage or comparative efficiency. Third, the analysis is based on a single year of data, which restricts the identification of long-term trends or the impact of policy changes. Finally, factors such as curriculum structure, assessment schedules, and temporary access restrictions are not captured in the dataset. Despite these limitations, the findings provide a reliable snapshot of circulation behaviour and offer a useful baseline for longitudinal and comparative studies within the Sri Lankan university library context.

7. Conclusion and Recommendations

This study provides a comprehensive analysis of circulation patterns at the University of Sri Jayewardenepura, revealing notable variations in borrowing activity across faculties, user groups, and academic periods. The findings underscore the critical role of the library in supporting undergraduate learning, particularly within the Faculties of Humanities and Social

Sciences, Management Studies and Commerce, and Applied Sciences, while highlighting comparatively moderate engagement among staff, postgraduate students, and newer, more technically oriented faculties. The data also confirm that borrowing activity fluctuates closely with the academic calendar, with distinct peaks during assessment and examination periods.

Based on both the current findings and these suggested analytical improvements, the following recommendations are proposed. Academic libraries should align their budget planning with demonstrated borrowing trends, ensuring that high-demand faculties receive timely access to updated core materials while also monitoring underutilised areas for potential reallocation. Introducing predictive modelling of borrowing behaviour would enable proactive service management, enabling the library to prepare for anticipated circulation peaks and academic pressure points. Greater attention should also be given to diversifying resources to support emerging faculties and postgraduate programs, where digital and specialised content may be more relevant than traditional print materials. Finally, a structured discussion framework that links these findings to broader institutional goals, such as teaching quality, research advancement, and equity in access, would help position the library not merely as a service provider but as a strategic partner in the university's academic mission.

8. Ethical Considerations and Data Privacy

This study involved the analysis of library circulation transaction data derived from the Koha Integrated Library System of the University of Sri Jayewardenepura. Given the sensitive nature of user-related transactional records, appropriate ethical and privacy safeguards were implemented throughout all stages of data collection, processing, and analysis. All circulation data were anonymized at the point of extraction. Personally identifiable information and contact details, was excluded from the dataset. Each record was analysed solely in aggregate form, ensuring that individual users could not be identified directly or indirectly. By implementing these ethical and privacy safeguards, the study ensured responsible use of transactional data while maintaining the integrity, confidentiality, and trust of library users.

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