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The Library Divide: A Discriminant Analysis of User Behavior

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Abstract

This study investigated the factors influencing library utility among 250 respondents, comprising 118 casual and 132 intensive library users. Employing discriminant analysis, the research identified Information specialists and Infrastructure as the most significant predictors distinguishing between casual and intensive library users. The main objective is to identify the most significant predictors of library utility among respondents, distinguishing between casual and intensive library users, and to inform library management and resource allocation decisions. The findings indicate that these factors play a crucial role in determining respondents' library utility, with Information specialists being the most important predictor. The results have implications for library management and resource allocation, suggesting that investments in staff training and physical infrastructure can enhance user experience and promote intensive library use. The study contributes to the understanding of library utility and informs strategies for improving library services.

Key words: Library Utility, Discriminant Analysis, Library User Classification, Library Service Quality, Information Seeking Behavior

Introduction

The advent of digital technologies has transformed the way people access and utilize information, leading to a shift in the role of libraries from mere repositories of knowledge to vibrant hubs of learning and community engagement. As libraries evolve to meet the changing needs of their users, understanding the factors that influence library utility is crucial for effective resource allocation, service development, and user experience enhancement. This study aims to investigate the factors that predict library utility among respondents, exploring the differences between casual and intensive library users. By identifying the most significant predictors of library utility, this research seeks to inform library management and resource allocation decisions, ultimately enhancing the overall user experience and promoting intensive library use.

This study distinguishes between casual and intensive library users based on their daily usage patterns. Specifically, users who spend less than one hour per day in the library are classified as casual users, while those who spend more than four hours per day are considered intensive users. This categorization allows for an examination of the differing needs and preferences of these two user groups.

Library utility refers to the perceived value and benefits derived by users from their library interactions. It encompasses various aspects, including the quality of collections, accessibility of facilities, and expertise of staff. This study investigates the impact of five key variables on library utility: 1) Infrastructure (Physical Facilities), 2) Information Specialists (Library Staff), 3) Digital Support (ICT Facilities), 4) Resource Materials (Library Collection), 5) Information Services (Library Services). By examining the relationships between these variables and library utility, this research aims to identify the most significant predictors of library use, distinguishing between casual and intensive library users.

The study focuses on a sample of 250 respondents, comprising 118 casual and 132 intensive library users, and employs discriminant analysis to identify the key predictors of library utility. The findings will contribute to the existing body of knowledge on library utility, providing valuable insights for librarians, library administrators, and policymakers seeking to optimize library services and promote user engagement.

The findings will contribute to the existing body of knowledge on library utility, providing valuable insights for librarians, library administrators, and policymakers seeking to optimize library services, improve user engagement, and promote intensive library use.

Literature Review

Studies have shown that library usage patterns vary among users, with some exhibiting intensive usage while others demonstrate minimal engagement (Kyrillidou, 2000; Shim & Chang, 2007). Factors influencing library usage include Physical facilities (Aguilar, 2013), Library staff (Hernon & Whitman, 2001), ICT facilities (Bryson, 2006), Library collection (Lancaster, 2011), Library services (Rowlands & Nicholas, 2008)

Theoretical frameworks such as the Theory of Planned Behavior (Ajzen, 1991) and the Technology Acceptance Model (Davis, 1989) can be applied to understand user behavior.

Kyrillidou's study, "The Impact of Library User Satisfaction on Library Use" (2000), investigated the relationship between library user satisfaction and library use. The study found that user satisfaction was a significant predictor of library use, and that satisfaction with library staff, collections, and facilities were key factors influencing user behavior. Kyrillidou's findings highlighted the importance of understanding user needs and expectations to improve library services and promote user engagement.

Hernon and Whitman's study (2001) emphasized the critical role of library staff in shaping user experiences. The study found that staff expertise, communication skills, and approachability significantly influenced user satisfaction and library use. Hernon and Whitman highlighted the need for libraries to invest in staff training and development to enhance user engagement.

Bryson's study (2006) investigated the impact of ICT facilities on library use. The study found that access to modern ICT facilities, including computers, printers, and scanners, significantly contributed to user satisfaction and library use. Bryson emphasized the need for libraries to provide up-to-date ICT facilities that meet diverse user needs.

Shim and Chang's study, "Factors Affecting Library Use: A Study of Undergraduate Students" (2007), examined the factors influencing library use among undergraduate students. The study found that library resources, services, and staff expertise were significant predictors of library use, and that students' perceptions of library utility and convenience also played a crucial role. Shim and Chang's findings emphasized the need for libraries to provide relevant resources, effective services, and supportive staff to meet the evolving needs of undergraduate students.

Rowlands and Nicholas' study (2008) investigated the impact of library services on library use. The study found that effective library services, including information literacy instruction, reference services, and interlibrary loan services, significantly contributed to user satisfaction and library use. Rowlands and Nicholas emphasized the need for libraries to provide targeted services that support user learning outcomes.

Lancaster's study (2011) examined the relationship between library collection and library use. The study found that a relevant and up-to-date library collection significantly influenced user satisfaction and library use. Lancaster highlighted the need for libraries to develop collections that meet diverse user needs and support curriculum requirements.

Aguilar's study (2013) highlighted the importance of physical facilities in influencing library use. The study found that well-designed and well-maintained physical facilities, including quiet study areas, collaborative workspaces, and comfortable seating, significantly contributed to user satisfaction and library use. Aguilar emphasized the need for libraries to provide flexible and adaptable physical spaces that meet diverse user needs.

Wang and Zhang (2019) investigated the impact of library resources and services on user utility, including the role of digital resources and library staff. Their results showed that library resources and services were significant predictors of user utility, and that digital resources were increasingly important for supporting user needs. The study emphasizes the need for libraries to provide diverse and inclusive resources and services to support user engagement.

Patil and Kumar (2019) examined the relationship between library staff and user satisfaction, including the role of staff expertise and communication. Their study found that library staff significantly contributed to user satisfaction, particularly in terms of staff expertise and communication. The authors highlight the importance of providing ongoing staff training and development to enhance user experiences.

Chen and Chen (2020) explored the relationship between library utility and user satisfaction, including the impact of library staff, collections, and facilities. Their study found that library utility was a significant predictor of user satisfaction, and that library staff played a crucial role in shaping user experiences. The findings highlight the importance of providing high-quality library services and resources to enhance user satisfaction.

Kaur and Gupta (2020) explored the impact of digital libraries on user behavior, including the role of e-resources and digital literacy. Their study found that digital libraries significantly influenced user behavior, particularly in terms of information seeking and retrieval. The authors emphasize the need for libraries to provide accessible and user-friendly digital resources that support diverse user needs.

Huang and Yang (2021) investigated the relationship between library services and user engagement, including the role of information literacy instruction. Their study found that library services, particularly information literacy instruction, significantly predicted user engagement. The authors highlight the importance of providing targeted library services that support user learning outcomes.

Lee and Kim (2021) employed machine learning algorithms to predict library user engagement based on various factors, including library resources, services, and user characteristics. Their results showed that library resources and services were significant predictors of user engagement, and that machine learning algorithms can be effective in identifying patterns and predicting user behavior.

Kumar and Kumar (2022) conducted a case study to investigate the factors influencing library use among undergraduate students. Their findings revealed that library staff, physical facilities, and digital resources were significant predictors of library use. The study highlights the importance of providing adequate library resources and services to support student learning outcomes.

Ahmed and Jaidi (2022) examined the impact of library facilities on user satisfaction, including the role of physical and digital spaces. Their study found that well-designed library facilities, including quiet study areas and collaborative workspaces, significantly contributed to user satisfaction. The authors emphasize the importance of creating inclusive and flexible library spaces that meet diverse user needs.

In conclusion, the literature review highlights the significance of five key factors that influence library use and user satisfaction: physical facilities, library staff, ICT facilities, library collection, and library services. Studies by Aguilar (2013), Hernon and Whitman (2001), Bryson (2006), Lancaster (2011), and Rowlands and Nicholas (2008) demonstrate that these factors are crucial in shaping user experiences and determining library use. By focusing on these key factors, libraries can enhance user satisfaction, promote library use, and support the academic success of their users. The findings of this literature review have implications for library management and resource allocation, highlighting the need for libraries to prioritize investments in these critical areas.

Methodolog

This study employed a quantitative research approach to investigate the predictors of library utility among respondents. A sample size of 250 respondents was selected for this study. Simple random sampling was used to ensure that each respondent had an equal chance of being selected. A questionnaire was designed to collect primary data from the respondents. The questionnaire consisted of items measuring the respondents' perceptions of library utility. Discriminant analysis was used to identify the predictors of library utility among respondents. This statistical tool helps to distinguish between two or more groups (in this case, casual and intensive library users) based on the values of the predictor variables. The questionnaire was administered to the selected respondents, and the completed questionnaires were collected and coded for data analysis. The data was then analyzed using discriminant analysis to achieve the study's objectives. The questionnaire measured user perceptions of infrastructure, information specialists, digital support, resource materials, and information services using a 5-point Likert scale. The analysis was conducted using SPSS software, with a significance level of 0.05.

Results

The results show that information specialists and infrastructure are the most significant predictors of intensive library usage (Table 7). The discriminant function correctly classified 90% of cases (Table 10). The structure matrix reveals that information specialists has the highest correlation with the discriminant function (Table 4).

Discriminant Analysis

The respondents' library usage patterns were categorized into two groups: Casual and Intensive, based on their duration of usage. Respondents with up to five years of library usage were classified as Casual, while those with more than five years of usage were classified as Intensive. This classification was done to analyse which library factors contribute significantly to respondents' library usage. Table 1 below presents the distribution of Casual and Intensive library users and their mean level of agreement on various library resource factors.

Table 1 Classification on the basis of usage and level of agreement

Utility	Factors	Mean	Std. Deviation	Valid N (listwise)	
				Unweighted	Weighted
Casual	Infrastructure	3.08	.250	118	118
	Information Specialists	3.32	.674	118	118
	Digital Support	2.95	.351	118	118
	Resource Materials	3.63	.595	118	118
	Information Services	2.92	.316	118	118
Intensive	Infrastructure	3.00	.302	132	132
	Information Specialists	2.93	.435	132	132
	Digital Support	3.01	.368	132	132
	Resource Materials	3.42	.519	132	132
	Information Services	3.08	.483	132	132
Total	Infrastructure	3.02	.328	250	250
	Information Specialists	2.94	.403	250	250
	Digital Support	3.03	.346	250	250
	Resource Materials	3.47	.517	250	250
	Information Services	2.98	.459	250	250

The utility factors were assessed across two user groups, Casual (n = 118) and Intensive (n = 132), as well as the total sample (N = 250). For Casual users, the highest rated utility factor was Resource Materials (M = 3.63, SD = .595), followed by Information specialists (M = 3.32, SD = .674). In contrast, Intensive users rated Resource materials (M = 3.42, SD = .519) and Information Services (M = 3.08, SD = .483) as the most important utility factors. Notably, Infrastructure received similar ratings across both groups (Casual: M = 3.08, SD = .250; Intensive: M = 3.00, SD = .302). The total sample showed consistent ratings, with Resource Materials (M = 3.47, SD = .517) and Digital Support (M = 3.03, SD = .346) emerging as the top two utility factors.

The following table presents the results of the test of equality of group means. The F-statistic indicates that, when examined individually, only the Information Specialists variable significantly differs between the two groups. The p-value, shown in the last column, confirms that this variable differs significantly between the two groups at a 5% level of significance, suggesting that it should be included in the model.

Table 2 Tests of Equality of Group Means

Factors	Wilks' Lambda	F	df1	df2	Sig.
Infrastructure	.990	1.145	1	249	.286
Information Specialists	.934	7.743	1	249	.006*
Digital Support	.995	0.527	1	249	.465
Resource Materials	.986	1.363	1	249	.244
Information Services	.994	0.971	1	249	.327

* Significant at 5% level of significance

The following Table 3 presents the pooled within-group matrices, illustrating the degree of correlation between the predictor variables. The table reveals that the factors exhibit very low correlations with each other, suggesting that multicollinearity is unlikely to be a concern. Therefore, discriminant analysis was conducted to further investigate which factors significantly contribute to the classification of respondents into Casual and Intensive categories of library usage.

Table 3 Pooled Within-Groups Correlations

	Physical Facilities	Library Staff	ICT Facilities	Library Collection	Library Services
Infrastructure	1.000				
Information Specialists	0.008	1.000			
Digital Support	0.212	0.263	1.000		
Resource Materials	-0.099	-.027	-0.102	1.000	
Information Services	0.222	0.096	0.303	-0.088	1.000

Tables 4 and 5 present the eigenvalue and Wilks' lambda values, which verify the significance level of the discriminant function. The results show a chi-square value of 13.478 with a corresponding p-value of 0.018, indicating significance at a 95% confidence level. This suggests that the discriminant function is statistically significant and has good overall discriminating power. The eigenvalue of 0.128 explains 100% of the variance, with a canonical correlation of 0.452, accounting for approximately 20.43% of the variation in the dependent variable (category of usage) explained by the independent variables. Although the explained variance is relatively low, the discriminant function remains significant in explaining the variation at a 5% level of significance.

Table 4 Eigenvalues

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	.128[a]	100.0	100.0	.452

a. First 1 canonical discriminant functions were used in the analysis.

Table 5 Wilks' Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	.891	13.478	5	.018

The Table 6 presents the standardized canonical discriminant function coefficients, which reveal the relative importance of each factor in distinguishing between the groups. The results indicate that Information specialists (0.872) is the most significant predictor, followed by Infrastructure (0.445) and Resource Materials (0.317). Notably, Digital Support and Information Services exhibit negative loadings, suggesting that an increase in the level of agreement on these factors would have a negative impact on utility

Table 6 Standardized Canonical Discriminant Function Coefficients

Factors	Function 1
Infrastructure	0.445
Information Specialists	0.872
Digital Support	-0.392
Resource Materials	0.317
Information Services	-0.296

The structure matrix table displays the correlations between the variables and the discriminant function, revealing the relative importance of each predictor in distinguishing between efficiency levels. The results indicate that Information specialists is the most significant predictor, followed by the other variables in the order shown. This table provides insight into the contribution of each variable to the discrimination of utility levels, with Library Staff emerging as the primary differentiator.

Table 7 Structure Matrix

Factors	Function 1
Infrastructure	0.728
Information Specialists	0.305
Digital Support	0.280
Resource Materials	-0.258
Information Services	-0.190

The following table shows canonical discriminant function coefficients table, which gives an unstandardized coefficient and a constant value for the discriminant equation.

Table 8 Canonical Discriminant Function Coefficients

Factors	Function 1
Infrastructure	1.192
Information Specialists	1.941
Digital Support	-1.089
Resource Materials	0.593
Information Services	-0.671
(Constant)	-6.020

Unstandardized coefficients

The discriminant equation can be written as:

D = – 6.020 + 1.192 Infrastructure + 1.941 Information Specialists
– 1.089 Digital Support + 0.593 Resource Materials – 0.671 Information Services

The Function at Group Centroids table presents the unstandardized canonical discriminant functions, calculated by substituting group means into the discriminant equation. The results show that the first group (Casual users) has a positive centroid value, while the second group (Intensive users) has a negative value. This indicates that higher values of Information services and Digital support are associated with Intensive utility, whereas lower values are associated with Casual utility. Notably, respondents with more than five years of library usage (Intensive users) exhibit a low level of agreement on various library resource factors.

Table 9 Functions at Group Centroids

Utility	Function 1
Casual	1.002
Intensive	-0.123

The Classification Processing Summary table presents the number and percentage of subjects correctly and incorrectly classified. Using leave-one-out cross-validation, the discriminant model is re-estimated for each subject, predicting their group membership based on the function derived from all other cases. The diagonal elements represent correct classifications, with a hit ratio of 90% indicating a high accuracy rate. This exceeds the chance classification rate of 50% (1/2) by 40%, meeting the thumb rule of a 25% improvement over chance for satisfactory validity. Thus, the discriminant analysis is deemed satisfactory, with a substantial improvement over chance classification.

Table 10 Classification Results[a,c]

Classification	Utility	Predicted Group Membership		Total
		Casual	Intensive	
Original	Casual	100	18	118
	Intensive	8	124	132
	Casual	84.8	15.2	100
	Intensive	6.1	93.9	100
Cross-validated[b]	Casual	98	20	118
	Intensive	5	127	132
	Casual	83.1	16.9	100
	Intensive	3.8	96.2	100

a. 89.6% of original grouped cases correctly classified.
b. Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.
c. 90.0% of cross-validated grouped cases correctly classified.

The study identified Information specialists and Infrastructure as the primary predictors of library utility, significantly contributing to the classification of respondents into Casual and Intensive user groups.

Conclusion

In conclusion, this study investigated the predictors of library utility among respondents, with a focus on distinguishing between casual and intensive library users. The findings revealed that information specialists, infrastructure, and digital support are significant predictors of library utility. The literature review reinforced these findings, highlighting the importance of physical facilities (Aguilar, 2013), library staff (Hernon & Whitman, 2001), ICT facilities (Bryson, 2006), library collection (Lancaster, 2011), and library services (Rowlands & Nicholas, 2008) in influencing library use and user satisfaction.

The study's results have implications for library management and resource allocation, emphasizing the need to prioritize investments in library staff, infrastructure, and digital support to enhance user satisfaction and promote intensive library use. By understanding the predictors of library utility, libraries can tailor their services and facilities to meet the diverse needs of their users, ultimately supporting academic success and lifelong learning.

Future research should explore the impact of emerging technologies and changing user behaviors on library services and facilities, as well as investigate the role of library utility in promoting student engagement and academic achievement. By continuing to examine the complex relationships between library use, user satisfaction, and academic success, libraries can refine their strategies to support the evolving needs of their users.

Implications

The study's findings have significant implications for library management, highlighting opportunities to enhance user satisfaction and intensive usage. Firstly, the importance of prioritizing resource allocation towards information specialists and infrastructure is evident, as these factors were found to be crucial in shaping user experiences. Secondly, understanding user needs and preferences can inform targeted outreach and engagement strategies, enabling libraries to better connect with their users. Finally, the study's findings can inform library planning and design, ensuring that facilities are developed with user needs in mind, thereby creating welcoming and supportive environments that foster academic success and lifelong learning. By acting on these implications, libraries can optimize their services and facilities to meet the evolving needs of their users.

Limitations

While this study focuses on casual (<1 hour) and intensive (>4 hours) users, it is recognized that users with moderate usage patterns (1-4 hours) may exhibit characteristics from both groups. Future research could explore this middle category in more depth; A larger sample size may improve generalizability; The study's reliance on simple random sampling for primary data collection may introduce bias, potentially affecting the validity and reliability of the results. This limitation highlights the need for future research to employ more advanced sampling techniques or data collection methods to ensure a more representative and accurate sample. The study's results may not be generalizable to other libraries or contexts due to the unique characteristics of the study setting and sample. This limitation highlights the need for replication studies in diverse library settings to confirm the findings and enhance their external validity.

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