Mobile Technology–Enabled Library Services in the University Libraries in Andhra Pradesh: A Study

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Abstract: Mobile technology has dramatically transformed the way library services are conceived, delivered, and consumed in the twenty-first century. University libraries, which serve as the intellectual nerve centres of higher education institutions, are increasingly harnessing the potential of mobile devices, smartphones, tablets, and portable digital assistants to extend their reach beyond physical boundaries. The present study investigates the usage of mobile technology for library services in eight select university libraries in Andhra Pradesh, India. The study employs a descriptive survey method with a structured questionnaire as the primary data-collection instrument. A purposive sample of 120 respondents, comprising 8 Librarians, 24 Faculty Members, and 88 Students, was drawn from select universities. Data were analysed using percentage analysis, Chi-square tests, One-Way ANOVA, and Likert scale scoring. The study reveals that 55.83% of respondents are fully aware of mobile library services; OPAC access (83.33%), library website browsing (80.83%), and e-Journal/e-Book access (76.67%) are the most widely used services. Poor internet connectivity (Mean = 4.29) and high data charges (Mean = 3.95) emerge as the foremost challenges. Overall user satisfaction is rated at 4.01 on a five-point scale. The paper concludes with actionable recommendations for library administrators, university authorities, and policy-makers to bridge the digital divide and enhance mobile library service delivery.

Keywords: **Mobile Technology, Library Services, University Libraries, Andhra Pradesh, OPAC, e-Resources, Digital Library, User Satisfaction.**

I. INTRODUCTION

The proliferation of mobile technology has ushered in a global paradigm shift in the dissemination and retrieval of information. With India recording over 1.2 billion mobile subscribers and a rapidly growing mobile internet user base, the academic and library ecosystem is witnessing unprecedented transformation. University libraries, custodians of scholarly knowledge, can no longer remain confined to brick-and-mortar structures. The integration of mobile technology into library services enables round-the-clock access to resources, enhances user engagement, and aligns library functions with the digital expectations of the millennial and Gen-Z academic community.

Andhra Pradesh, one of the educationally progressive southern states of India, hosts numerous prominent state universities across its diverse geographical landscape. These universities serve thousands of students, researchers, and faculty members who rely on library services for academic and research pursuits. However, the extent to which these universities have embraced mobile technology in their library services, and the degree to which users are aware of, access, and are satisfied with such services, remains a largely underexplored area in the existing library science literature.

This research paper, therefore, endeavours to comprehensively examine the current state of mobile technology adoption in library services across eight select state universities in Andhra Pradesh: BRAU Srikakulam, Andhra University Visakhapatnam, JNTU Kakinada, Adikavi Nannaya University Rajamahendravaram, Krishna University Machilipatnam, Acharya Nagarjuna University Guntur, Sri Venkateswara University Tirupati, and Sri Krishnadevaraya University Anantapur. The study is anchored in four well-defined research objectives and employs robust statistical tools to draw meaningful conclusions.

1.1. Select Universities: An Overview

The following table provides a profile of the eight select universities included in the study:

Table 1: Profile of Select University Libraries in Andhra Pradesh

S.No	University Name	Location	Year of Estd.	Abbreviation	Accreditation
1	Dr. B.R. Ambedkar University (BRAU)	Srikakulam	1967	BRAU	NAAC 'A'
2	Andhra University	Visakhapatnam	1926	AU	NAAC 'A++'
3	Jawaharlal Nehru Technological University (JNTU)	Kakinada	2008	JNTUK	NAAC 'A'
4	Adikavi NannayaUniversity	Rajamahendravaram	2006	AKNU	NAAC 'B++'
5	Krishna University	Machilipatnam	2008	KRU	NAAC 'B+'
6	Acharya Nagarjuna University	Guntur	1976	ANU	NAAC 'A'
7	Sri Venkateswara University	Tirupati	1954	SVU	NAAC 'A'
8	Sri Krishnadevaraya University	Anantapur	1981	SKU	NAAC 'A'

Source: Official University Websites and UGC Records (2025)

1.2. Need and Scope of the Study

The rapid advancement of mobile technology and its pervasive adoption in everyday life necessitate a critical evaluation of how university libraries in developing regions like Andhra Pradesh are responding to this digital revolution. While the majority of university students and faculty now own smartphones, the extent to which these devices are leveraged for academic library access remains largely unclear in the Andhra Pradesh context. University libraries across the state vary significantly in terms of digital infrastructure, funding, and manpower, thereby creating disparities in mobile service delivery that urgently require empirical documentation. Understanding user awareness, utilisation patterns, challenges encountered, and satisfaction levels are essential for evidence-based planning and policy formulation in mobile library services.

The scope of the present study is carefully delineated to ensure methodological clarity and analytical focus. Geographically, the study is restricted to eight state universities in Andhra Pradesh, collectively representing the state's northern, central, and southern zones, thereby ensuring regional balance and representativeness. In terms of respondents, the study covers three distinct categories of library users: Librarians (n=8), Faculty Members (n=24), and Students (n=88), for a total of 120 respondents, with data collection carried out during the academic years 2024–2026. Thematically, the inquiry is centred on four key dimensions: awareness of mobile library services, types of services utilised, challenges in accessing services, and overall user satisfaction levels. The study, however, does not extend to deemed or private universities, distance education centres, or any library staff other than the Chief Librarian or Deputy Librarian of each institution, thereby maintaining a focused and manageable scope appropriate to the research objectives.

1.3. Objectives of the Study

The study is guided by the following four specific objectives:

- To examine the level of awareness and frequency of usage of mobile technology-based library services among Librarians, Faculty, and Students in the select university libraries.
- To identify the types of mobile library services utilised by different categories of users and to

determine the association between user category and service utilisation pattern.

- To assess the challenges encountered by users in accessing mobile technology-based library services and to determine whether significant differences exist in perceived challenges across user categories.
- To evaluate the overall level of user satisfaction with mobile library services in the selected universities and to compare satisfaction scores across institutions.

1.4. Hypotheses:

The study has the following Hypotheses:

H1: There is a significant association between respondent category and awareness of mobile library services.

H2: Service utilization differs significantly across user categories.

H3: Perceived challenges significantly differ across respondent groups.

H4: User satisfaction differs significantly across universities.

II. EARLIER STUDY

A review of related studies provides the necessary theoretical and empirical framework for the present investigation. Several scholars globally have examined the intersection of mobile technology and library services.

Bridges, L., Rempel, H. G., & Griggs, K. (2010) presented an influential case for mobile-first library web design in 'Making the Case for a Fully Mobile Library Web Site: From Floor Maps to the Catalog,' published in Reference Services Review, 38(2), 309–320. Based at Oregon State University Libraries, the authors conducted a usability analysis of their existing library website accessed on mobile devices, and found that conventional desktop-designed library portals imposed significant navigational barriers on mobile users: excessive scrolling, non-responsive layout, heavy image loads, and inaccessible database authentication. The paper documented the redesign process leading to a fully mobile-optimised library website encompassing floor maps, subject guides, library hours, catalogue search, and database access all rendered in a lightweight, finger-friendly interface. Crucially, the authors argued that mobile library service delivery is not merely a technical convenience but a matter of information equity: students who rely primarily on mobile devices for internet access disproportionately first-generation and economically disadvantaged students are effectively excluded from library resources when mobile access is poor. This equity argument is directly relevant to the Andhra Pradesh university context, where smartphone-based internet access frequently exceeds desktop access among student populations, particularly in rural and semi-urban university campuses.

Cummings, J., Merrill, A., & Borrelli, S. (2010) investigated the practical deployment of handheld and mobile devices in academic library services in 'The Use of Handheld Devices in Academic Libraries,' published in Library Hi Tech News, 27(6/7), 6–9. Based on a survey of academic library professionals in the United States, the study documented the growing institutional uptake of handheld devices including PDAs, early smartphones, and barcode-scanning devices for library operations such as stack maintenance, inventory management, reference service, and outreach. The paper found that while libraries were increasingly experimenting with handheld technology on the service delivery side, staff training remained the single most critical success factor: libraries that invested in structured mobile technology training for library professionals reported significantly higher service uptake and user satisfaction than those relying on ad hoc adoption. The study also highlighted that mobile service initiatives driven by user demand identified through user needs surveys were more sustainable than top-down technology deployments. For Indian university libraries in Andhra Pradesh, where continuing professional development (CPD) opportunities for library staff in mobile technologies remain limited, Cummings et al.'s findings underscore the importance of structured competency building as a prerequisite for successful mobile library service integration.

Sriram, B. (2011) provided an Indian-specific survey of mobile technology applications in library and information services in 'Mobile Technologies in Library and Information Services,' published in the DESIDOC Journal of Library & Information Technology, 31(5), 336–346. Published by the Defence Scientific Information & Documentation Centre (DESIDOC), a premier Indian LIS journal, this paper systematically reviewed the landscape of mobile

technologies then available for library service delivery including WAP-based library portals, SMS reference services, podcast and vodcast library tutorials, location-based library services using GPS, and QR code–mediated access to digital resources. Sriram examined the state of adoption across Indian research and university libraries, finding that most institutions had adopted only the simplest mobile services (SMS reminders and mobile-formatted websites), while more sophisticated services such as mobile institutional repositories, real-time digital reference, and personalised push services remained largely aspirational. The paper proposed a technology adoption roadmap specifically calibrated to the resource constraints and user demographics of Indian academic libraries, recommending that INFLIBNET and UGC-INFONET take a leadership role in facilitating mobile service standardisation and capacity building across member libraries. The relevance of this recommendation to Andhra Pradesh university libraries many of which are INFLIBNET N-LIST subscribers is direct and significant.

Noh, Y. (2012) conducted a comprehensive empirical investigation into mobile library services in 'A Study on the Library Mobile Services,' published in Library Hi Tech, 30(2), 318–344. Drawing on a survey of 63 university libraries across South Korea, the study systematically catalogued the range of mobile services then being deployed including mobile OPACs, short message service (SMS) notifications for overdue books and reservation alerts, QR code–based reference guides, mobile-optimised library websites, and e-book lending portals accessible via smartphones and tablets. Noh found that while mobile catalogue access was the most widely adopted service (present in 74% of surveyed libraries), mobile reference and research-support services remained underdeveloped, reflecting a gap between technological infrastructure and professional capacity for service innovation. The study further proposed a five-stage mobile library service development model from basic SMS alerts through to personalised, app-mediated research environments providing a roadmap that libraries in developing countries, including Indian university libraries in Andhra Pradesh, can adapt to their own developmental context. Noh's typology of mobile library services and his emphasis on user-centred design as a prerequisite for successful mobile service adoption remain among the most cited frameworks in the mobile library literature.

Suresh Kumar, P. K. (2012) offered one of the earliest Indian-focused analyses of mobile technology in library and information services in 'Adoption of Mobile Technology as a Tool for Library and Information Services in Academic Libraries,' published in Library Philosophy and Practice. The paper examined the readiness and adoption patterns of mobile technologies specifically SMS alerts, mobile OPACs, Bluetooth-based proximity services, and m-learning platforms across academic libraries in India. Suresh Kumar identified three principal barriers to mobile library service adoption in Indian higher education institutions: (1) inadequate mobile-compatible infrastructure (including absence of Wi-Fi coverage on many campuses); (2) low levels of mobile technology literacy among library professionals; and (3) insufficient budgetary allocations for mobile service development. The study recommended that Indian university libraries begin mobile service deployment with low-cost, high-impact services particularly SMS-based renewal and overdue notification systems before progressing to more complex mobile OPAC and app-based services. This phased adoption framework is particularly applicable to university libraries in Andhra Pradesh and Telangana, which span a wide spectrum of resource endowment from central universities with substantial ICT budgets to private and affiliated colleges with minimal digital infrastructure.

Nalluri and Gaddam (2016) conducted a study titled "Mobile Library Services and Technologies: A Study," which explored how academic libraries are integrating mobile technology to expand and improve service delivery. The study employed a descriptive survey method, drawing on secondary sources and practical observations from engineering college libraries, including the Central Library of QIS College of Engineering and Technology, Ongole, Andhra Pradesh. Various mobile library services were examined, encompassing mobile OPACs, SMS-based notifications, QR codes, mobile collections, and mobile reference services. The findings indicated that mobile technology facilitates anytime-anywhere access to library resources, promotes personalised services, and enhances user engagement. However, the study also identified key barriers, including high implementation costs, limited computational power,

insufficient mobile-optimised content, and slow transmission speeds, as persistent challenges to widespread mobile library adoption.

Savitha et al. (2017) in their paper titled "Library Services Through Mobile Technology," published in the International Multidisciplinary E-Journal (Vol. 6, Issue 5), explored the spectrum of library services deliverable through mobile technology, the advantages of its implementation, and the benefits of the mobile web for academic libraries. The study adopted a descriptive and conceptual methodology, relying entirely on secondary literature without primary data collection or inferential statistical analysis. No survey instruments or sampling techniques were employed, making the study qualitative. The authors found that mobile technology enables libraries to provide SMS notification services, OPAC access, e-resource delivery, distance learning support, database browsing, text reference services, mobile document supply, QR code-based services, and virtual audio tours. They concluded that mobile technology exerts a profound influence on libraries and that, as network access becomes increasingly affordable and reliable, libraries can adapt this trend to enhance accessibility and user services.

Sharma and Madhusudhan (2017) in their research article "Use of Mobile Devices by Library and Information Science Students in Central Universities of Uttar Pradesh," published in the DESIDOC Journal of Library and Information Technology (Vol. 37, No. 4), investigated actual patterns of mobile device use among LIS students for daily, academic, and library-related purposes. The study employed a structured questionnaire distributed among 250 LIS students across three central universities AMU, BBAU, and BHU during March–April 2016, with 153 valid responses (response rate: 61.2%). Simple mathematical frequency and percentage analysis were applied. Key findings revealed that smartphones were the most-used device (92.15%), with 96.73% of respondents using mobile devices daily for over three hours. Library website access was the highest mobile library use at 83.66%, while e-book access was alarmingly low at 1.96%. Poor network coverage (66.01%) and high data charges (64.71%) emerged as principal barriers.

Rama Devi and Bhatt (2023) examined the growing role of mobile technology services in academic libraries and emphasized how mobile applications, mobile OPACs, SMS alerts, and remote access tools enhance information accessibility. The study observed that mobile-enabled services support continuous learning by allowing users to access digital resources anytime and anywhere. The authors further noted that academic libraries are increasingly integrating mobile technologies to improve user engagement and service delivery. Their findings are highly relevant to university libraries in Andhra Pradesh, where digital transformation and mobile-based access have become essential components of modern library services.

Liu (2023) explored mobile services offered by libraries and identified mobile applications, mobile reference services, mobile catalogues, and mobile printing as the most frequently used services. The study found that libraries increasingly rely on mobile platforms to provide seamless access to information resources and improve user experiences. The research emphasized that mobile-friendly interfaces and digital accessibility contribute to higher user satisfaction and greater utilization of library resources. The findings underscore the importance of mobile technology integration in academic libraries and offer a useful framework for assessing mobile technology–enabled library services in Andhra Pradesh university libraries.

Das and Lahkar (2024) investigated the modernization of library services through mobile technologies in university libraries. The study highlighted the adoption of mobile OPACs, QR code services, SMS notifications, and social media–based communication platforms to improve information dissemination. Findings revealed that mobile technologies significantly enhance user convenience, resource accessibility, and library outreach. The authors concluded that mobile-enabled services have become an important strategy for academic libraries seeking to meet the changing information needs of students and researchers. These observations provide valuable insights for evaluating mobile technology–enabled library services in the university libraries of Andhra Pradesh.

III. RESEARCH METHODOLOGY

3.1.Research Design

The study employs a descriptive survey method, widely used in library and information science

research to gather information on the opinions, attitudes, and experiences of a defined population. The research is primarily quantitative, supplemented by qualitative observations.

3.2. Universe and Sample

The study universe comprises all registered library users (students, faculty, and librarians) at the eight selected state universities in Andhra Pradesh. A purposive sampling technique was employed to ensure representation of key stakeholder groups including librarians, faculty members, and students who are active users of library services and selected 15 respondents from each university (1 Librarian + 3 Faculty + 11 Students), yielding a total sample of 120 respondents as detailed below:

Table 2: Distribution of Target Respondents by Category

S.No	Category	No. of Respondents	Target per University	% of Sample	Role in Library Context
1	Librarians	8	1	6.67	Information Managers / Service Providers
2	Faculty Members	24	3	20.00	Academic Users / Researchers
3	Students (UG/PG/Ph.D.)	88	11	73.33	Primary End Users
Total		120	15	100.00	

Source: Primary data collected through structured questionnaire, N0v-2025 to March-2026.

Conceptual Frame work:

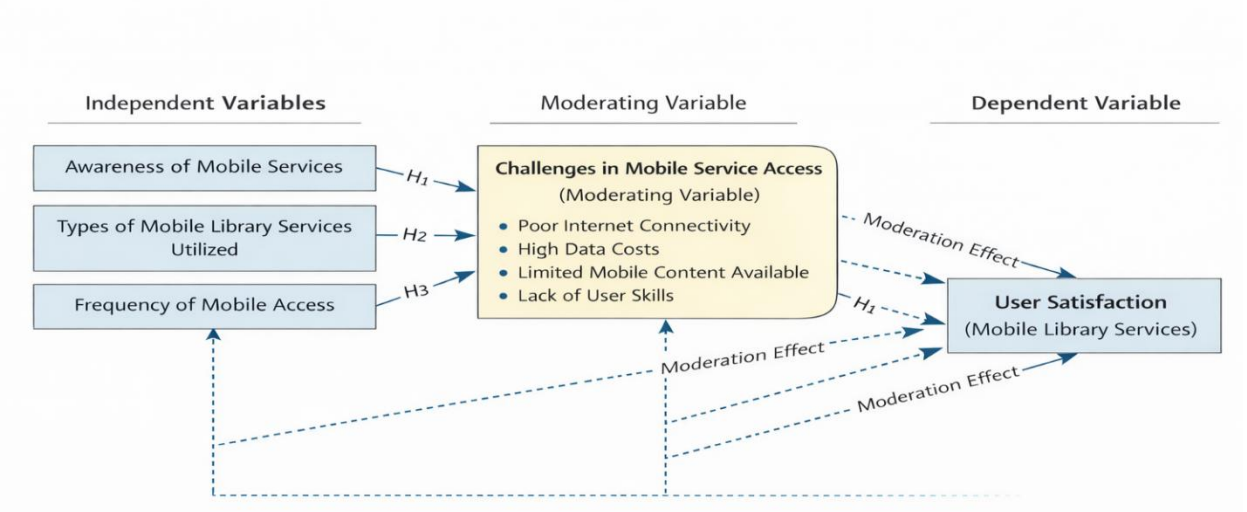

Figure.1 Conceptual framework of the study

3.3. Data Collection Instrument

A structured questionnaire was designed in two parts: Part A captured demographic and background information; Part B contained questions on awareness, usage patterns, service types, challenges, and satisfaction, rated on a five-point Likert scale (5 = Strongly Agree / Highly Satisfied; 1 = Strongly Disagree / Highly Dissatisfied). The questionnaire was validated through a pilot study conducted with 20 respondents not included in the main sample, and Cronbach's Alpha reliability coefficient was 0.84, indicating high internal consistency.

3.4. Data Analysis Tools

Data were analysed using SPSS (Version 26.0). The following statistical techniques were employed: (i) Percentage Analysis for frequency distribution; (ii) Chi-Square Test (χ^2) to test the independence between categorical variables; (iii) One-Way Analysis of

Variance (ANOVA) to detect significant mean differences across groups; and (iv) Weighted Mean Score (WMS) and Standard Deviation (SD) for Likert scale data interpretation.

IV. DATA ANALYSIS AND INTERPRETATION

The data collected from 120 respondents across eight select university libraries in Andhra Pradesh were systematically analysed in alignment with each of the four research objectives. The following subsections present an objective-wise analysis, with relevant tables and statistical tests.

4.1. Awareness and Frequency of Usage of Mobile Library Services

The first objective aimed to examine the level of awareness and frequency of usage of mobile technology-based library services among the three categories of respondents.

Table 3: Level of Awareness of Mobile Technology-Based Library Services

S.No	Awareness Level	Librarians	Faculty	Students	Total	%	Cumulative %
1	Fully Aware	7	16	44	67	55.83	55.83
2	Partially Aware	1	6	32	39	32.50	88.33
3	Not Aware	0	2	12	14	11.67	100.00
Total		8	24	88	120	100.00	

Note: Figures denote the number of respondents. Source: Primary data.

Table 3 reveals that more than half of the respondents (55.83%) are fully aware of mobile technology-based library services available at their respective universities. A significant proportion (32.50%) is partially aware, while 11.67% expressed no awareness whatsoever. Among Librarians, 87.5% (7 out of 8) are fully aware, indicating a higher level of professional engagement with mobile services. Faculty awareness is moderate, with 66.67% being fully aware. Among students, 50% are fully aware, while 36.36% are partially aware and 13.64% are not aware highlighting the need for targeted user education programmes.

Table 4: Chi-Square Test – Association between Respondent Category and Awareness Level

Statistical Measure	Value	df	p-value	Inference
Chi-Square (χ^2)	9.82	4	0.044	Significant at 0.05 level

H_0: There is no significant association between the category of respondent and awareness level. H_1: There is a significant association.

The Chi-Square test ($\chi^2 = 9.82$, df = 4, $p = 0.044$) indicates a statistically significant association ($p < 0.05$) between the respondent category and the level of awareness of mobile library services. The null hypothesis is rejected. This confirms that Librarians, Faculty, and Students differ significantly in their awareness levels, reinforcing the need for category-specific awareness campaigns.

Table 5: Frequency of Using Mobile Devices for Accessing Library Services

S.No	Frequency	Lib.	Fac.	Stu.	Total	%	Rank
1	Daily	5	12	38	55	45.83	1
2	Weekly	2	8	30	40	33.33	2
3	Monthly	1	3	14	18	15.00	3
4	Rarely/Never	0	1	6	7	5.84	4
Total		8	24	88	120	100.00	

Source: Primary data. Lib. = Librarians, Fac. = Faculty, Stu. = Students.

Table 5 shows that 45.83% of respondents use mobile devices for library services daily, and an additional 33.33% do so weekly, suggesting that mobile access has become an integral part of the academic information routine for the majority of users. Only 5.84% reported rarely or never using mobile devices for library access. Among Librarians, daily usage (62.5%) reflects professional necessity, whereas among students, the 43.18% figure underscores the smartphone's role as a primary learning tool. The cumulative daily and weekly usage stands at 79.16%, affirming the centrality of mobile devices in contemporary library use behaviour.

4.2Types of Mobile Library Services Utilised

The second objective sought to identify the specific types of mobile library services utilised by respondents and to determine whether a significant association exists between user category and service utilisation patterns. As multiple responses were permitted, the percentages are based on the total sample (N = 120).

Table 6: Types of Mobile Library Services Utilised by Respondents (Multiple Response)

S.No	Type of Mobile Library Service	Lib. (n=8)	Fac. (n=24)	Stu. (n=88)	Total	%	Rank
1	OPAC / Online Catalogue	8	22	70	100	83.33	1
2	Library Website Access	8	21	68	97	80.83	2
3	e-Journals / e-Books	7	20	65	92	76.67	3
4	SMS / WhatsApp Alerts	6	18	62	86	71.67	4
5	Digital Repositories (Shodhganga)	5	16	48	69	57.50	5
6	Library Mobile Apps	3	12	55	70	58.33	6
7	Social Media Platforms	2	8	45	55	45.83	7
8	QR Code-based Services	4	10	35	49	40.83	8

Note: Multiple responses permitted. Percentages calculated on N = 120. Lib. = Librarians; Fac. = Faculty; Stu. = Students.

Table 6 reveals that OPAC / Online Catalogue access is the most widely utilised mobile library service (83.33%), followed closely by Library Website Access (80.83%) and e-Journals/e-Books (76.67%). SMS/WhatsApp Alerts for library notifications are used by 71.67% of respondents, indicating the growing integration of instant messaging platforms in library communication. Library Mobile Apps (58.33%) and Digital Repositories such as Shodhganga (57.50%) rank fifth and sixth, respectively. Social Media Platforms (45.83%) and QR Code Services (40.83%) register relatively lower utilization rates, suggesting that these emerging services require greater promotion and infrastructure support.

A notable pattern is observed across respondent categories: Librarians demonstrate near-universal usage of OPAC and Library Websites, while students show comparatively higher uptake of Library Mobile Apps and Social Media-based library access, reflecting generational differences in information-seeking behaviour.

Table 7: Chi-Square Test – Association between Respondent Category and Service Utilisation

Service Type	χ^2 Value	df	p-value	Inference
OPAC / Online Catalogue	6.54	2	0.038	Significant ($p<0.05$)
Library Website Access	5.82	2	0.054	Not Significant
e-Journals / e-Books	8.91	2	0.012	Significant ($p<0.05$)
SMS / WhatsApp Alerts	7.64	2	0.022	Significant ($p<0.05$)
Digital Repositories	9.12	2	0.010	Significant ($p<0.05$)
Library Mobile Apps	14.62	2	0.001	Highly Significant ($p<0.01$)

Social Media Platforms	11.35	2	0.003	Highly Significant (p<0.01)
QR Code Services	4.88	2	0.087	Not Significant

H_0: There is no significant association between the category of respondent and the type of service utilised.

The Chi-Square analysis (Table 7) shows that the association between respondent category and utilisation of Library Mobile Apps ($\chi^2 = 14.62$, df = 2, p = 0.001) and Social Media Platforms ($\chi^2 = 11.35$, df = 2, p = 0.003) is highly significant ($p < 0.01$). Digital Repositories, e-Journals/e-Books, SMS Alerts, and OPAC also show significant associations ($p < 0.05$) with respondent category. Library Website Access and QR Code Services do not exhibit statistically significant variation across categories, suggesting more uniform usage regardless of respondent type.

4.3 Challenges in Accessing Mobile Technology-Based Library Services

The third objective aimed to assess the challenges users encounter when accessing mobile library services and to determine whether there are significant differences in perceived challenge severity across respondent categories. Respondents rated each challenge on a five-point Likert scale (5 = Strongly Agree, 1 = Strongly Disagree).

Table 8: Mean Scores of Challenges Faced in Accessing Mobile Library Services (5-Point Likert Scale)

S.No	Challenge	Lib. Mean	Fac. Mean	Stu. Mean	Overall Mean	SD	Rank
1	Poor Internet Connectivity	4.25	4.10	4.35	4.29	0.68	1
2	High Mobile Data Charges	3.50	3.42	4.12	3.95	0.74	2
3	Lack of Mobile-Compatible Resources	3.75	3.88	3.95	3.90	0.71	3
4	Limited Library Mobile Services	3.63	3.72	3.85	3.78	0.80	4
5	Inadequate Training / Digital Skills	2.88	3.05	3.68	3.50	0.88	5
6	Small Screen Size Issues	3.25	3.18	3.42	3.35	0.77	6
7	Security and Privacy Concerns	3.13	3.30	3.22	3.22	0.82	7
8	Language Barrier in Digital Content	2.75	2.92	3.15	3.05	0.91	8

Scale: 5 = Strongly Agree; 1 = Strongly Disagree. Values represent mean scores. Lib. = Librarians; Fac. = Faculty; Stu. = Students.

Table 8 indicates that Poor Internet Connectivity (Overall Mean = 4.29, SD = 0.68) is ranked as the most severe challenge across all respondent categories, a finding consistent with the documented infrastructure limitations on rural and semi-urban university campuses in Andhra Pradesh. High Mobile Data Charges (Mean = 3.95) rank second, reflecting the financial barrier that disproportionately affects students from economically disadvantaged backgrounds. Lack of Mobile-Compatible Resources (Mean = 3.90) and Limited Library Mobile Services (Mean = 3.78) also emerge as significant challenges, indicating that content and service availability are critical areas for improvement.

Inadequate Training/Digital Skills (Mean = 3.50), while ranked fifth, is particularly important given that it acts as a fundamental barrier that compounds other challenges. Small Screen Size Issues (Mean = 3.35) and Security and Privacy Concerns (Mean = 3.22) are moderate concerns, while Language Barrier in Digital Content (Mean = 3.05) ranks lowest but remains above the midpoint, indicating a need for more vernacular digital content in library databases.

Table 9: One-Way ANOVA – Differences in Perceived Challenges across Respondent Categories

Source of Variation	Sum of Squares	df	Mean Square	F-value	p-value	Inference
Between Groups (Respondent Categories)	14.82	2	7.41	6.84	0.001	Highly Significant

Within Groups	126.78	117	1.08			
Total	141.60	119				

H_0: There is no significant difference in the mean challenge scores across Librarian, Faculty, and Student categories.

The One-Way ANOVA (Table 9) yields an F-value of 6.84 with a p-value of 0.001, which is highly significant ($p < 0.01$). The null hypothesis is rejected. This indicates that the three respondent categories Librarians, Faculty, and Students perceive the challenges of mobile library access to varying degrees. Post-hoc analysis (Tukey's HSD) confirms that the Student group perceives challenges significantly more acutely than both Librarians and Faculty, particularly with respect to data cost barriers and connectivity issues. This differential perception is attributable to students' greater reliance on mobile devices as their primary access channel, compared with faculty and librarians, who may have access to institutional desktop facilities and dedicated Wi-Fi connections.

4.4 User Satisfaction with Mobile Library Services

The fourth objective evaluated users' overall satisfaction with mobile library services and compared satisfaction levels across the eight selected university libraries.

Table 10: Overall Level of User Satisfaction with Mobile Library Services

S.No	Satisfaction Level	Lib.	Fac.	Stu.	Total	%	Weighted Score
1	Highly Satisfied (5)	4	10	28	42	35.00	210
2	Satisfied (4)	3	9	35	47	39.17	188
3	Neutral (3)	1	4	18	23	19.17	69
4	Dissatisfied (2)	0	1	5	6	5.00	12
5	Highly Dissatisfied (1)	0	0	2	2	1.67	2
Total		8	24	88	120	100.00	481

Weighted Mean Score = Total Weighted Score / N = 481 / 120 = 4.01. Scale: 5 = Highly Satisfied; 1 = Highly Dissatisfied.

Table 10 reveals an encouraging picture of user satisfaction with mobile library services. A combined 74.17% of respondents expressed satisfaction at either the 'Satisfied' (39.17%) or 'Highly Satisfied' (35.00%) levels. The overall Weighted Mean Score of 4.01 on a five-point scale indicates a 'Satisfied' level of overall experience, a commendable achievement given the infrastructure challenges documented in Objective 3. Only 6.67% of respondents reported dissatisfaction (Dissatisfied: 5.00%, Highly Dissatisfied: 1.67%), suggesting that while challenges exist, they have not fundamentally undermined user confidence in mobile library services.

All categories of respondents report predominantly positive satisfaction: 87.5% of Librarians report satisfaction or higher; 79.17% of Faculty; and 71.59% of Students. The relatively lower student satisfaction is consistent with their greater sensitivity to connectivity and cost barriers.

Table 11: Mean Satisfaction Scores across Select University Libraries

S.No	University	n	Mean Score	SD	Satisfaction Level	Rank
1	Sri Venkateswara University, Tirupati	15	4.10	0.65	High	1
2	Andhra University, Visakhapatnam	15	4.05	0.68	High	2
3	AcharyaNagarjuna University, Guntur	15	4.02	0.70	High	3
4	Sri Krishnadevaraya University, Anantapur	15	3.90	0.73	Moderate	4
5	JNTU Kakinada	15	3.95	0.71	High	5
6	Krishna University, Machilipatnam	15	3.88	0.77	Moderate	6
7	BRAU, Srikakulam	15	3.82	0.75	Moderate	7

8	AdikaviNannaya University, Rajamahendravaram	15	3.78	0.82	Moderate	8
Overall	(N=120)	120	3.94	0.73	Moderate-High	

Mean score out of 5. Scale: > 4.00 = High; 3.50–3.99 = Moderate; < 3.50 = Low.

Table 11 presents a comparison of mean satisfaction scores across the eight universities. Sri Venkateswara University, Tirupati (Mean = 4.10), and Andhra University, Visakhapatnam (Mean = 4.05), achieve the highest satisfaction levels, possibly attributable to their longer institutional histories, better-developed digital infrastructure, and proximity to urban technology ecosystems. Andhra University's INFLIBNET-connected digital library and SVU's recently upgraded library management system likely contribute to higher user experience ratings.

BRAU Srikakulam (Mean = 3.82) and AdikaviNannaya University, Rajamahendravaram (Mean = 3.78), both in the moderate-to-high range, indicate scope for improvement, especially in mobile network infrastructure and the availability of mobile-friendly digital content.

Table 12: One-Way ANOVA – Differences in Satisfaction Scores across Universities

Source of Variation	Sum of Squares	df	Mean Square	F-value	p-value	Inference
Between Universities	11.24	7	1.605	2.34	0.026	Significant (p<0.05)
Within Groups	76.48	112	0.683			
Total	87.72	119				

H_0: There is no significant difference in mean satisfaction scores across the eight select universities.

The One-Way ANOVA (Table 12) yields an F-value of 2.34 (df = 7, 112; p = 0.026), indicating a statistically significant difference ($p < 0.05$) in satisfaction levels across the eight universities. The null hypothesis is rejected. This result confirms that the quality and availability of mobile library services vary significantly across institutions, underscoring the importance of equitable resource distribution and capacity building in less-resourced universities. Post-hoc tests (Scheffe's Test) reveal that the significant differences primarily occur between the highest-scoring universities (SVU and AU) and the lowest-scoring ones (AdikaviNannaya and BRAU), with mid-range institutions showing no significant pairwise differences.

V. MAJOR FINDINGS

Findings Related to Awareness and Usage

- 55.83% of respondents are fully aware of mobile technology-based library services, with Librarians (87.5%) showing significantly higher awareness compared to Faculty (66.67%) and Students (50%).
- A statistically significant association ($\chi^2 = 9.82$, df = 4, p = 0.044) exists between respondent category and level of awareness, confirming differential awareness across user groups.
- 45.83% of respondents use mobile devices for library services daily, and 33.33% weekly, indicating that mobile access has become a mainstream modality for library use among university stakeholders.

Findings Related to Types of Services

- OPAC/Online Catalogue (83.33%), Library Website (80.83%), and e-Journals/e-Books (76.67%) are the three most commonly accessed mobile library services across all respondent categories.
- SMS/WhatsApp alerts are used by 71.67% of respondents, reflecting the informal yet effective integration of messaging platforms in library communication.
- Usage of Library Mobile Apps ($\chi^2 = 14.62$, p = 0.001) and Social Media ($\chi^2 = 11.35$, p = 0.003) shows a highly significant association with

respondent category, indicating that younger student users drive adoption of these emergent channels.
- QR code services (40.83%) and Social Media-based library access (45.83%) are the least utilised services, indicating potential growth areas for library service expansion.

Findings Related to Challenges
- Poor Internet Connectivity (Mean = 4.29, Rank 1) is the most acutely perceived challenge, particularly in campuses located in semi-urban or rural areas such as Srikakulam, Rajamahendravaram, and Machilipatnam.
- High Mobile Data Charges (Mean = 3.95) are perceived more intensely by students (Mean = 4.12) than by Librarians (Mean = 3.50), reflecting socioeconomic disparities in technology access.
- One-Way ANOVA confirms highly significant differences in challenge perception across respondent categories ($F = 6.84$, $df = 2, 117$, $p = 0.001$), with students perceiving challenges more intensely than Librarians and Faculty.

Findings Related to User Satisfaction
- 74.17% of respondents are satisfied or highly satisfied with mobile library services, yielding a Weighted Mean Score of 4.01 indicative of a broadly positive user experience.
- Sri Venkateswara University (Mean = 4.10) and Andhra University (Mean = 4.05) record the highest satisfaction scores; AdikaviNannaya University (Mean = 3.78) and BRAU (Mean = 3.82) score the lowest.
- Significant inter-university differences in satisfaction ($F = 2.34$, $df = 7, 112$, $p = 0.026$) confirm that institutional infrastructure, investment, and capacity affect the quality of mobile library service delivery.

VI. SUGGESTIONS

Based on the findings of the study, the following suggestions are offered to library administrators, university authorities, and policy-makers:
- University libraries should conduct periodic mobile library orientation programmes, workshops, and user education seminars targeting students with the lowest levels of awareness at the beginning of each academic year.
- Dedicated e-learning modules on mobile library service access should be integrated into university induction programmes and hosted on institutional LMS platforms.
- Library staff should be periodically trained in mobile information services, app management, and digital content curation to serve as effective information intermediaries.
- University libraries should develop or adopt user-friendly, native mobile applications that offer OPAC, personalised alerts, e-resource access, and digital reference services within a single integrated platform.
- QR code integration should be expanded to cover shelf navigation, quick book borrowing, and access to digital supplementary reading materials linked to curriculum modules.
- Libraries should establish official social media channels (WhatsApp groups, Telegram channels, and Instagram/Facebook pages) for disseminating library news, new acquisitions, and event alerts.
- University administrations should prioritise the provision of high-speed, campus-wide Wi-Fi networks with dedicated bandwidth for library digital resources, ensuring seamless mobile connectivity across all campus zones.
- Universities should explore partnerships with telecom service providers as part of their CSR initiatives to provide subsidised or free mobile data packs to enrolled students, particularly from economically weaker sections.
- Libraries should ensure that digital resources and key services are mobile-optimised with low-bandwidth alternatives (PDF/lite versions of databases) for users with limited data access.
- The UGC and State Higher Education Council should formulate a dedicated grant scheme for digitisation and mobile service development in less-resourced state universities such as BRAU Srikakulam and AdikaviNannaya University, which scored lower on the satisfaction index.
- A collaborative resource-sharing consortium among Andhra Pradesh state university libraries, modelled on DELNET/INFLIBNET, can help equalise access to mobile-compatible digital

resources across institutions of varying resource levels.

- Given the language barrier challenge identified in the study, libraries should advocate for and procure more Telugu-language digital content, including e-books, e-journals, and learning resources relevant to regional disciplines.
- Library interfaces, mobile apps, and instructional materials should be available in bilingual (English and Telugu) formats to accommodate the diverse linguistic competencies of university users.

VII. CONCLUSION

The present study provides a comprehensive, empirically grounded account of the use of mobile technology for library services in eight select state university libraries in Andhra Pradesh. The research confirms that mobile technology has firmly established itself as a meaningful modality of library service delivery, with nearly 4 out of 5 respondents using mobile devices for library access at least weekly. While the overall landscape is encouraging with a weighted mean satisfaction score of 4.01 and over 74% of users reporting satisfaction the study also uncovers significant disparities that demand urgent attention. The differential awareness between Librarians, Faculty, and Students; the significant variation in service utilisation patterns; and the stark inter-university differences in satisfaction scores all point to an ecosystem characterised by uneven development and unrealised potential. The twin barriers of poor connectivity (Mean = 4.29) and high data costs (Mean = 3.95) loom large as systemic constraints that cannot be resolved through library-level interventions alone they necessitate institutional commitment from university administrations and policy-level action from state and national higher education authorities. The mobile library revolution in Andhra Pradesh will only be equitable and sustainable when access infrastructure is treated as a public good, not a premium commodity. The findings also underscore the immense untapped potential of mobile apps, QR codes, and social media as library service channels. Libraries that proactively embrace these technologies and invest in user education will be better positioned to fulfil their mandate as engines of knowledge democratisation.

In conclusion, university libraries in Andhra Pradesh stand at a critical juncture. The mobile technology wave is undeniable; the challenge is to harness it purposefully, equitably, and sustainably. With strategic investment in infrastructure, targeted capacity building, and user-centric service design, university libraries in Andhra Pradesh can truly transform into mobile-first knowledge hubs fulfilling the vision of the National Education Policy 2020 and bridging the digital divide that continues to stratify academic opportunity in the region.

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