

Implementation of RFID System in Rajasthan: A Study of SKNAU, Central Library, Jobner

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ABSTRACT

Purpose-The primary purpose of this paper is to clearly describe and document the implementation process of a Radio Frequency Identification (RFID) system in the Jobner University Central Library, highlighting its significance in modernizing library operations and enhancing user services.

Design/methodology/approach-The paper presents a concise yet informative overview of the project background, including planning and execution stages, the major barriers encountered during implementation, and the operational and service-related changes observed after the successful adoption of the RFID technology.

Findings-During the initial phase, the library experienced several challenges, particularly due to the lack of trained technical experts to manage both the RFID hardware system and the supporting software. Subsequently, appropriate corrective measures and practical solutions were implemented to minimize these issues, and the technology has ultimately proven to be highly beneficial and transformative for the overall functioning of the library.

Originality/value-This paper offers useful practical insights and guidance for other academic and university libraries that are planning to implement RFID systems to improve efficiency, automation, and service delivery.

KEYWORDS: Rajasthan, RFID technology, Collection management, University Central libraries, Jobner, RFID solutions.

1. INTRODUCTION

Libraries play an important role in spreading knowledge through books, journals, audio-video materials, CD-ROMs, and digital services. The main aim of a library is to provide maximum access and effective use of available resources for its users. To improve services and management, libraries increasingly adopt new technologies. Barcode technology was widely used to enhance efficiency, but due to limited data capacity and lack of programmability, its applications remain restricted mainly to collection tracking and user cards (Mulla and

Chandrashekara, 2006). In the late 1990s, libraries began replacing barcode and electromagnetic systems with Radio Frequency Identification (RFID), which performs identification more effectively and offers additional features. RFID also supports advanced tools like smart shelves and automated return bins (Prakash, 2015). Today, academic libraries are moving toward smart service models emphasizing self-issue/return, faster circulation, and improved security. RFID systems generally include tagged books, staff workstations, self-check kiosks, security gates, handheld scanners, and integration with ILMS such as KOHA. In Indian university libraries, RFID is recognized as a reliable automation tool that reduces queues and increases accuracy in circulation and stock verification (Rathi, 2014).

2. REVIEW OF LITERATURE

RFID has been repeatedly reported as one of the most practical technologies for transforming academic libraries from manual or barcode-based circulation into smart service models. RFID supports contactless identification, faster issue/return, quick stock verification, and stronger theft detection through security gates (Sharma, 2018). Many studies emphasize that RFID reduces routine workload and improves service quality because multiple items can be read quickly without direct line-of-sight scanning.

2.1 Application of radio frequency identification technologies in different activities

RFID technology is not new, but its commercial use has grown recently as costs declined with technological maturity and wider adoption (Yadav, 2013). Today, many leading global companies apply RFID to improve business efficiency while addressing consumer and environmental concerns (Joshi, et al., 2019). Warehouses and supermarkets increasingly tag goods for accurate and faster inventory management (Kumar and Meena, 2020). RFID also offers advanced capabilities for diverse applications such as healthcare services, access control, information storage and analysis, inventory monitoring, business process automation, and improved security systems (Gupta, 2017).

2.2 Usages and application of radio frequency identification technology in libraries

RFID was proposed as a technology to enable self-service processing of books and media by library users in North America. They further reported that the system was first installed at the Rockefeller University Library in New York in 1999. In India, the commercial use of RFID in library applications began during the latter half of the 1990s (Singh, 2015). Since the late 1990s, libraries have increasingly adopted RFID as a replacement for traditional electromagnetic and barcode-based systems (Mulla and Chandrashekara, 2006). The application of RFID for library collection management and its key advantages is outlined below.

2.2.1 Application of radio frequency identification for collection management. The rapid advancement of Information and Communication Technology (ICT) has brought major changes in automation across many sectors, including business organizations, educational institutions, industries, government and private offices, shopping centres, and civil and military establishments (Shastri, 2023). Automation projects are widely implemented to ensure activities are performed efficiently, quickly, accurately, and with reduced human effort. Libraries have also adopted ICT to automate routine operations according to users' needs. Complete library automation became possible

only after adopting RFID technology (Kaur, 2018)) noted that RFID enables a significant shift in library services from semi-automated to fully automated operations.

2.2.2 Advantages of radio frequency identification in collection management. A university library performs many activities daily, including acquisition of books and journals, cataloguing, classification, entering bibliographic data into databases, updating accession registers, check-in and check-out, arranging materials on shelves by call number, re-shelving returned items, stock verification, and preparing reports for authorities (Devarajan, 2011). These tasks are tedious, time-consuming, and require skilled and experienced staff. Therefore, libraries increasingly depend on RFID technology to provide faster, more accurate, and user-friendly information services. RFID-based systems also offer several operational benefits and conveniences for library management (Sharma, et al., 2019).

2.2.3. Book drop box supports to deposit books anytime. Book drop box (BDB) gives the patron an opportunity to return the book anytime even when library is closed. It is generally situated outside of the library. BDB and RFID handheld reader are very important components. These components are also comparatively expensive. BDB offers unprecedented flexibility and convenience of returning library items at any time of the day, even when the library is closed (Kumar and Singh, 2019).

2.2.4 A few staff could manage the circulation section. An RFID adopted library does not need extra staff for running the library, otherwise, a mentionable number of staff has to be engaged in issue and return of books. Implementation of RFID makes easier the circulation activities, therefore one or two staff is enough to help those patrons' system.

2.2.5 Challenges in RFID Implementation. RFID technology is considered the future of library services; however, the high cost of implementation and operation remains the main barrier to its wider adoption. RFID systems significantly speed up book borrowing, monitoring, and searching processes, thereby allowing library staff to focus more on user-oriented services (Sharma and Verma, 2018). Major global challenges associated with RFID adoption include the shortage of skilled human experts, privacy concerns, technological limitations, lack of standardization, implementation patterns, high costs, infrastructure requirements, uncertain return on investment and inadequate technical support (Mishra, 2017). Despite its advantages, multiple studies highlight barriers:

- High initial installation cost
- Recurring maintenance and AMC expenses
- Need for trained technical manpower
- Compatibility issues with existing systems
- Infrastructure limitations (power/network)

3. COMPONENTS OF RFID TECHNOLOGY

3.1 RFID Tags

RFID tags used in libraries are very thin, flexible, and small in size, which allows them to be placed discreetly inside the cover of each book as well as on users' library cards. Each tag contains a tiny microchip and an etched antenna that stores important bibliographic information along with a unique identification number for every item (Sharma,

2021). Unlike barcode labels, which only link to a database and do not store data themselves, RFID tags hold information directly on the chip. Libraries mostly use passive tags because they are cheaper, smaller, and do not require battery replacement during their lifetime (Chandel, 2016).

3.2 RFID Reader

An RFID reader is an electronic device made up of a transmitter, receiver, antenna, and decoder. It communicates with RFID tags to identify items and retrieve stored data. Typically, readers in libraries can detect tags within a range of about 30–45 cm. The reader is usually flat and connected to a desktop computer where it works in coordination with library management software (Kaur, 2015). Passive RFID tags do not have their own power supply; instead, they receive energy from the electromagnetic field generated by the reader, which activates the tag's chip and enables it to transmit identification data.

3.3 Antennae

The RFID antenna is connected to the reader and varies in shape and size depending on the required communication distance. Its main function is to activate RFID tags and transmit data using wireless signals. Antennae are generally classified into two categories:

1. Long-range antennas
2. Medium-range antennas
- 3.

4. OBJECTIVES OF THE STUDY

The aim of the study is to explore the present scenario of RFID technology usage in the agricultural university central libraries of Jobner. The more specific objectives are to:

- To study the present status of RFID technology usage in university central libraries of Jobner.
- To identify the challenges faced in adopting RFID technology in these libraries.
- To explore the opportunities of RFID technology in university library services.
- To suggest suitable measures for effective implementation of RFID technology in university libraries.
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5. RESEARCH METHODOLOGY

This study adopted a descriptive research design to examine the RFID system at the Central Library of Sri Karan Narendra Agriculture University (SKNAU), Jobner, Rajasthan. Quantitative and qualitative approaches were used for comprehensive analysis. Primary data were collected through structured questionnaires distributed to library staff, faculty members, research scholars, and postgraduate students. Interviews with librarians and IT personnel supported the survey findings. Secondary data were obtained from institutional reports, vendor documents, policy manuals, and published literature. Observation of RFID gates, self-check units, and tagging stations provided operational evidence. Stratified sampling ensured representative participation. Data were analysed using descriptive statistics and thematic methods, with confidentiality and ethical practices strictly maintained.

6. FINDINGS

1. Central Library, SKRAU, Bikaner (Established: 1987)

Swami Keshwanand Rajasthan Agricultural University (SKRAU), Bikaner was established in 1987. The Central Library of SKRAU is a key academic support system for students, teachers, and researchers working in arid agriculture. It has a good collection of agricultural textbooks, reference books, research journals, theses, and dissertations. The library also provides access to e-resources, online journals, and internet facilities. Its thesis section is especially useful for postgraduate and Ph. D. scholars. The library offers a peaceful study environment and supports quality teaching, research, and extension activities related to desert and dryland farming systems (https://raubikaner.org/central_library/).

2. Central Library, MPUAT, Udaipur (Established: 1999)

Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur was established in 1999. The Central Library of MPUAT is one of the major academic resources on campus. It houses a large collection of books, Indian and international journals, theses, and reference materials in agriculture and allied disciplines. The library also provides digital resources such as e-journals and online databases. Automated services help users search information easily. Spacious reading halls create a good learning environment. The library strongly supports teaching, research, and innovation for sustainable agricultural development in southern Rajasthan (https://en.wikipedia.org/wiki/Maharana_Pratap_University).

3. Central Library, Agriculture University, Jodhpur (Established: 2013)

Agriculture University, Jodhpur was established in 2013 to strengthen agricultural education in western Rajasthan. The Central Library supports undergraduate, postgraduate, and doctoral students by providing essential learning resources. It includes textbooks, reference books, research reports, and periodicals related to agriculture and allied sciences. The library offers facilities such as reading rooms, newspaper sections, reprography, and internet access. It helps students and researchers access scientific information for coursework and research (<https://www.aujodhpur.ac.in/library.php>).

4. Central Library, Agriculture University, Kota (Established: 2013)

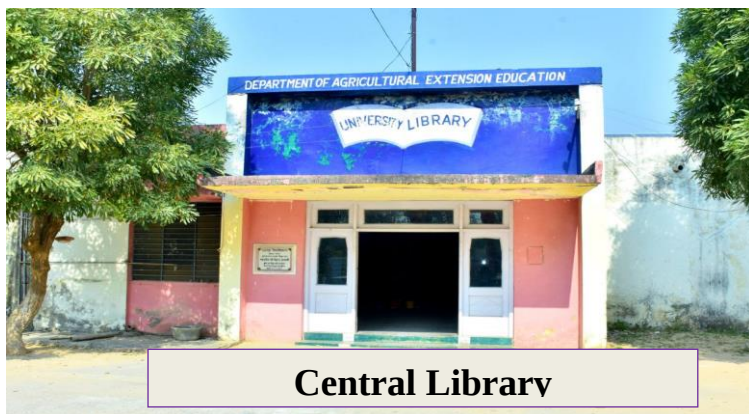
Agriculture University, Kota was established in 2013 to serve the agricultural education needs of southeastern Rajasthan. The Central Library supports students and faculty through its colleges and constituent units. It provides textbooks, reference books, research publications, and basic digital facilities. The library helps students prepare for examinations and supports researchers by providing access to previous studies and academic material. Reading rooms and internet services improve learning efficiency. The library plays an important role in strengthening agricultural education and research, especially in crop production and allied agricultural sciences relevant to the Kota region (<https://www.aukota.org/notifications/21>).

5. Central Library, SKNAU, Jobner (Established: 2013)

Sri Karan Narendra Agriculture University (SKNAU), Jobner was established in 2013 by the Government of Rajasthan to strengthen agricultural education, research, and extension activities in the semi-arid eastern plain zone of the state. The university carries forward the long academic legacy of the historic SKN College of Agriculture, Jobner, which has played a pioneering role in agricultural teaching and research in Rajasthan. The Central Library of SKNAU, Jobner functions as the main academic information centre of the university. It supports undergraduate,

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postgraduate, and doctoral programmes by providing access to quality learning resources in agriculture and allied sciences. The library holds a rich collection of textbooks, reference books, research journals, annual reports, and university publications relevant to agronomy, soil science, plant breeding, horticulture, entomology, and agricultural engineering.



Central Library



RFID Security Gate



Visit Hon'ble Vice Chancellor discuss about the library "RFID" System to Dr. Charat Lal Bairwa.



Library Stack Area



Students Orientation Programme

The Central Library of Sri Karan Narendra Agriculture University (SKNAU), Jobner offers access to more than 1,000 e-books, 52-Indian Journals through ICAR open access, and 30 publishers (13000+ journals) through the ONOS platform. The library maintains a collection of 54,381 books and also subscribes to 34 print journals, 25 newspapers and magazines, and 121 CD-ROM databases. In addition, it houses 2753 theses and dissertations and 2,998 government publications. A significant strength of the SKNAU Central Library is its thesis and dissertation collection, which serves as an important reference source for PG and Ph.D scholars. These research documents reflect region-specific studies conducted under semi-arid conditions and are valuable for advanced research planning, literature review, and experimental design (Bairwa and Bairwa, 2025). The library has adopted modern digital and automated services to improve efficiency and user convenience. Facilities such as computerized web-Online Public Access Catalogue (web-OPAC), internet access, e-resources, and CeRA-supported agricultural journals help users access national and international research literature. Comfortable reading rooms and a quiet study environment further enhance academic productivity(Bairwa et al., 2025). Overall, the Central Library of SKNAU, Jobner plays a crucial role in strengthening teaching, learning, and research activities. By combining traditional print resources with modern digital services, the library significantly contributes to the advancement of agricultural education and sustainable farming research in Rajasthan.

CONCLUSION

Based on institutional evidence, SKNAU Jobner's library environment demonstrates RFID-enabled automation practices such as self-issue/return services and KOHA-RFID integration, with continued system management through procurement/maintenance actions visible in 2025 documentation. Over the 2015–2025 period, RFID implementation in Indian academic libraries is consistently positioned in the literature as a practical route to faster circulation, improved inventory control, and enhanced security, while also requiring sustained investment in tags, hardware uptime, AMC support, staff training, and system integration. Future work should complete the evaluation using transaction/gate/inventory logs and structured user/staff feedback so that measurable impacts can be reported with statistical confidence.

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