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# Application and Use of e-Granthalaya 4.0 Cloud Computing Services in Selected Academic Libraries in Madhya Pradesh: An Analytical Study

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**Abstract: This pilot study investigates the implementation and utility of cloud computing services in library management using data extracted from the e-Granthalaya 4.0 portal. Developed by the National Informatics Centre (NIC), e-Granthalaya is a cloud-based system designed to facilitate the automation and networking of libraries across institutions. The study focuses on government and autonomous college libraries in Madhya Pradesh, which have been categorized into ten clusters under this system. For this research, cluster number one allotted to Awadhesh Pratap Singh University, comprising 68 libraries, has been selected for analysis. The findings reveal a total book collection of 405,905 titles across these institutions, with Sanjay Gandhi Smriti College, Sidhi, holding the largest collection of 66,602 books. This study underscores the significance of cloud-based library management systems in improving cataloging efficiency, resource sharing, and accessibility. The results suggest that e-Granthalaya enhances the usability of library resources by promoting shared access, minimizing redundancy, and improving operational management. Furthermore, the findings highlight the potential of cloud computing services in modernizing library systems and optimizing knowledge management. The study concludes that the adoption of cloud-based solutions in library management is essential for ensuring seamless resource availability and accessibility across academic institutions, ultimately contributing to digital transformation and improved information dissemination.**

**Keywords: Cloud computing, e-Granthalaya, Library services.**

## I. Introduction

The concept of a library has been constantly changing with time and technology. The library and its professionals are constantly being updated and upgraded. Through research and development, the library has moved from a cage to the cloud. Evolution of human civilization has witnessed distinct waves of progress, with each wave marking a significant era in societal development [1].

Alvin Tafler, in his work "The Third Wave," identifies three major waves or age. Agricultural societies as the first wave, the industrial age as the second, and the current information age as the third. Within each wave, there are notable sub waves that contribute to the overall advancement (Mather, Kumaraswamy and Latif, 2009) [2].

The roots of cloud computing can be traced back to the developmental stages of the Internet, beginning with the establishment of ARPANET in the 1960s and 70s. J.C.R. Licklider, the Director of ARPA during that time, envisioned a global "inter-galactic network," where individuals could connect seamlessly, sharing programs and data from any location.

The concept of cloud computing gained momentum in the 1960s, with MIT Professor John McCarthy predicting that computation could evolve into a public utility, akin to water and electricity. However, the lack of necessary physical infrastructure hindered the realization of this vision in the 1970s. Recent years have witnessed a resurgence of interest in cloud computing, fuelled by technological advancements, the advent of Web 2.0, Artificial Intelligence and economic uncertainties that have created an environment conducive to the growth of cloud-based solutions. Nicholas Carr, in a keynote address at the 2008 Xconomy conference, drew parallels between the historical shift from self-generated power to shared electrical grids and the contemporary transition from individualized computing power to the collaborative nature of cloud computing. This chapter aims to explore the historical context, key influencers, and the perfect storm of factors that have propelled cloud computing into the forefront of technological innovation [3]. Paper is organized as follows: Section I Introduction, Literature Review in Section II, Research Gap in Section III, Objectives of the Study mention in Section IV, Data and Methodology in Section V, Data Analysis in Section VI followed by Conclusion in Section VII.

## II. Literature Review

### *Cloud Computing: An Overview*

The first scholarly use of the term "Cloud Computing" was in a 1997 lecture by Ramnath Chellappa, a B. Tech from IIT BHU, in his talk, titled, "Intermediaries in Cloud-Computing", presented at the INFORMS meeting in Dallas in 1997. Eric Schmidt first described the word Cloud computing at an industry conference in 2006. After this, cloud computing gained popularity. The emergence of salesforce.com was the first milestone in the history of cloud computing in 1999. The company expressed the concept of delivering business applications through the website. Amazon started its cloud services called Amazon Web Services (AWS) in 2006; it provides its services to computing and cloud storage. Another milestone in cloud applications is Web 2.0 and Google. Google started its browser-based business applications through Google Apps The definition of cloud computing remains an evolving and contested discourse, subject to diverse interpretations based on the specific context of implementation, core services, and associated features. The multifaceted nature of this technological paradigm often raises more questions than answers, emphasizing the ongoing nature of the dialogue surrounding it.

Among the widely acknowledged definitions, the National Institute of Standards and Technology (NIST) provides a comprehensive understanding. According to Mell and Grance (2009), NIST defines cloud computing as a model facilitating convenient, on-demand network access to a shared pool of configurable computing resources, encompassing networks, servers, storage, applications, and services. This model allows rapid provisioning and release of resources with minimal management effort or interaction with service providers [4].

In his study standardising activities for effective implementation of ICT in eGovernance 3 stakeholders i.e., Government, Business & Citizens must walk together in collaboration. This is the purpose of the creation of GI Cloud/National NIC Cloud Meghraj. The ILMS, e-Granthalaya, are designed by NIC to meet the requirements of different library groups. Promoting ICT & automation in library management at affordable prices and providing the full flexibility needed by a librarian is the main objective of using e-Granthalaya [5].

In his study on cloud computing and libraries, the researcher provided a comprehensive analysis of cloud computing, encompassing its various types and addressing security concerns and challenges. The study delved into the specific aspects of cloud computing, including application installation, storage space, and connectivity. Furthermore, the researcher discussed several examples of cloud-based library services, such as WorldCat, Polaris,

Scribed, Discovery service, Google Scholar, and OCLC, to illustrate the practical implementation of cloud technology in library settings [6].

A survey focusing on web 2.0 related technologies was conducted in prominent libraries of Gujarat, including Nirma University, PDPU, and DA-IICT. The findings revealed that approximately 66.7% of the libraries offered services such as RSS, OPAC 2.0, instant messaging, web 2.0 social bookmarking, and tagging. Additionally, around 33.33% of the libraries utilized platforms such as blogs, Google Docs, and YouTube. Interestingly, none of the surveyed libraries incorporated wikis into their library services. The study also provided definitions of various web 2.0 tools and highlighted the range of web 2.0 library services offered by different institutions [7].

The researchers presented a cloud computing model tailored for Nigerian tertiary institutions, which leverages Platform as a Service (PaaS) and Software as a Service (SaaS) to effectively maintain and provide virtual library services. This proposed model offers cost-saving benefits in the management and upkeep of virtual libraries in Nigerian tertiary institutions, while ensuring widespread access to library resources. The study also examines the implementation of open-source software and cloud technologies within the context of virtual libraries, providing valuable insights for academic considerations [8].

The study highlighted the types and characteristics of cloud computing, problems of a digital library, architecture for e-library, the advantages of cloud computing in e-library, cloud computing's role in e-libraries. New technology, cloud computing is to bring the on-demand application of e-library, institute migrates their digital libraries to the cloud, it will help to reduce cost, infrastructure and IT manpower [9].

The issues associated with the construction and development of digital libraries utilizing cloud computing technology were examined, along with proposed solutions. The advantages and constraints of existing virtual libraries were also explored, with suggestions for overcoming these limitations. Instances of cloud-based digital libraries were discussed to provide practical examples of this technology in action [10].

The study underscored the significance of cloud computing in library systems, detailing cloud service models, their applications, advantages and disadvantages, as well as issues related to privacy, security, trustworthiness, and legality. The current state of libraries in India, along with Dura Cloud, Google Applications, and OCLC web-based services, were also discussed [11].

The study delved into various characteristics of cloud computing and different cloud models, along with challenges faced by digital libraries such as awareness of cloud computing and permission recognition. The researchers also examined the utilization of current user service models like WWW, BBS, FTP, and email in university digital libraries. Furthermore, they discussed the enhancement of user service models through unified search, integrated consulting, and real-time access service models in university libraries [12].

This study elucidates that 'MeghRaj' is a cloud computing service facility provided by the Indian government. Under this facility, SaaS, IaaS, and PaaS amenities are extended to governmental agencies, with cyber security also incorporated within it. Additionally, the study discusses the cloud computing deployment model [13].

The findings of the study reveal that library professionals are using cloud-computing tools in their daily works. They want to adopt cloud computing in the libraries to improve library services and avoid redundancy of works. Ubiquitous availability, economy and the various service layers are the core drivers of its adoption in the libraries. The respondents showed their concern over security and data privacy in cloud [14].

## III. Research Gap

After reviewing the literature from different sources, the researchers have observed that some research study had been taken up by some researchers related to a different aspect of cloud computing and different institutions. But no research study has been done

with "e-Granthalaya 4.0 Cloud Computing Services of Madhya Pradesh Academic Library: An Analytical Study". Therefore, the researcher would attempt to fill up the mentioned gap by doing the present research work.

## IV. Objectives of the Study

In the present study, the area of concern is the application and use of cloud computing in Madhya Pradesh academic libraries with special reference to e-Granthalaya 4.0 in various work-related contexts. The overall purpose of this study has been to analyse and establish the importance of cloud computing applications in academic libraries, with a prime focus on two purposes. The first was to explore the level of awareness and usage of cloud computing applications. A central part of the study was an attempt to identify themes and trends in how librarians, as key stakeholders, conceptualize and otherwise understand the concept of cloud computing, its potential values and the tentative domain of its applications.

The specific objectives of the study will be:

- To identify the application cloud computing in academic libraries.
- To identify usage level of cloud computing among academic libraries.
- To identify the e-Granthalaya 4.0 cloud computing tools useful for academic libraries.
- To study whether cloud-based library services are helpful to users.

## V. Data and Methodology

This research paper utilizes data sourced from the *e-Granthalaya 4.0 Platform*, a robust cloud-based library management system deployed across India. The platform is structured into 72 clusters, with 4,284 libraries actively using its services, collectively serving a registered user base of 2,627,206 members. The platform hosts an impressive total of 20,106,406 book titles, representing a diverse range of educational resources. The data extracted from this platform provides a unique opportunity to study the transformation and impact of digital library services in India.

For the purpose of this study, we focus specifically on Cluster 1, which has been allocated to Awadhesh Pratap Singh University, Rewa, Madhya Pradesh. This cluster is comprised of 68 government and autonomous college libraries, all of which are integral parts of the e-Granthalaya network. These libraries represent a wide cross-section of higher education institutions within the state, offering a rich dataset for examining various aspects of library service delivery [15].

The data extracted for this research includes:

- *Library Metadata:* Information on the types of libraries (government and autonomous), their locations, and usage patterns.
- *Member Data:* Details regarding the registered members, including their demographic distribution and engagement levels with the platform.
- *Book Collection Data:* A comprehensive list of book titles, categorized by subject, publication year, and usage statistics.

### *Methodology*

To analyze the impact of the e-Granthalaya 4.0 platform on library services in Cluster 1, to employ a mixed-methods approach that combines quantitative data analysis with qualitative insights. This approach allows for a comprehensive understanding of both the numerical trends and the underlying factors affecting library usage.

- *Quantitative Analysis*
  - *Descriptive Statistics:* We use descriptive statistics to explore the size, growth, and diversity of book collections across the 68 libraries. The data includes the number of titles available in each library, subject areas covered, and circulation patterns.
  - *User Engagement Metrics:* Analysis of registered members and their interaction with the platform, such as the number of logins, book checkouts, and online usage statistics.

- *Qualitative Analysis*
  - *Case Studies:* In-depth case studies of selected libraries within Cluster 1 offer a deeper understanding of how e-Granthalaya is implemented at the institutional level and its impact on library operations, student engagement, and academic performance.

## VI. Data Analysis

e-Granthalaya 4.0 is a comprehensive, cloud-based library management system designed to facilitate seamless operations and networking among libraries. It offers a total of ten functional modules: database administration, cluster administration, library administration, master data management, book acquisition, cataloguing, circulation, serial management, micro-document management, budget management, and advanced search and reporting tools. These modules provide a structured and automated framework for library professionals, ensuring efficient resource management. In addition to core functionalities, e-Granthalaya 4.0 integrates various modern technological features such as email alerts, barcode integration, and SMS notifications, which enhance user engagement and operational efficiency. The system supports RFID-based circulation for improved security and faster transaction processing. Furthermore, it enables digital library services by allowing institutions to manage e-books, digital documents, and multimedia resources. The cloud-based nature of e-Granthalaya ensures real-time data synchronization, multi-location accessibility, and scalability, making it an essential tool for modern libraries aiming to adopt digital transformation. Only three main things have been included in this study. These include books issued by the library, registered users and total collection of the library [16].

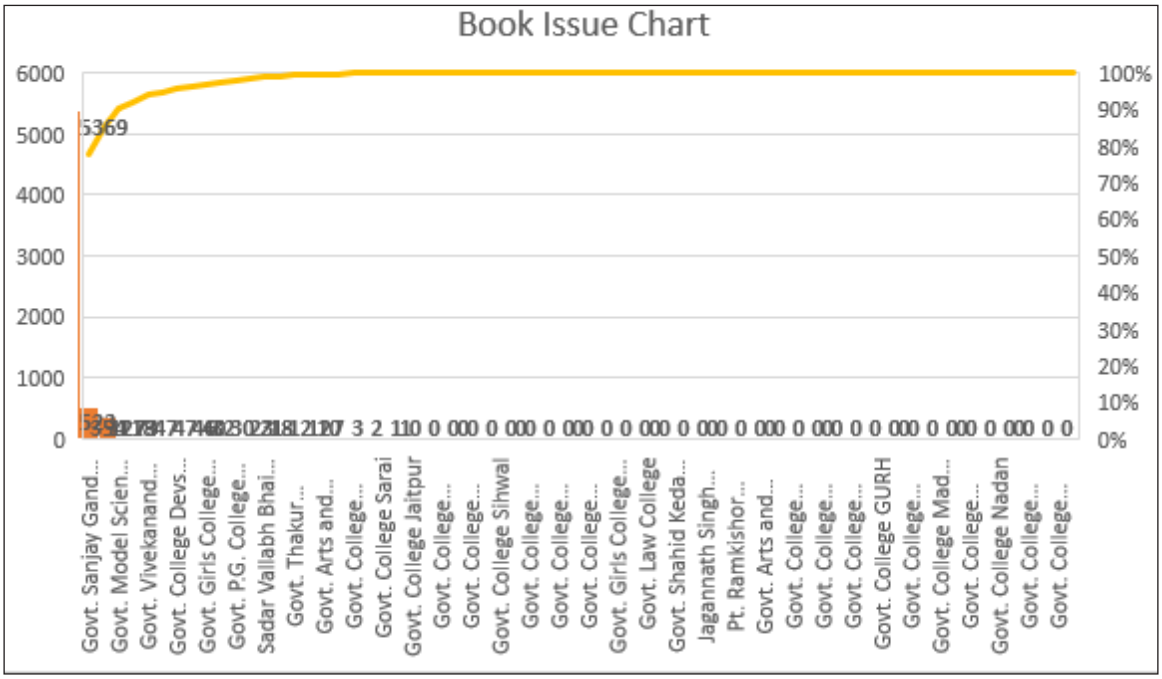
Table I

| Name of College | No. of Copies Issued | Total of Holdings | Total Members |
|---|---|---|---|
| Govt. Adarsh College Umaria | 0 | 3 | 152 |
| Govt. Arts and Commerce College Majhauli | 0 | 4618 | 0 |
| Govt. College Amdara | 0 | 0 | 0 |
| Govt. College Badhera | 0 | 0 | 0 |
| Govt. College Bijuri, Anuppur | 0 | 146 | 875 |
| Govt. College Birsinghpur | 0 | 0 | 0 |
| Govt. College Chandia, Umaria | 0 | 132 | 357 |
| Govt. College Churhat | 0 | 0 | 0 |
| Govt. College Gohparu | 0 | 0 | 441 |
| Govt. College Govindgrah Rewa | 0 | 1432 | 7 |
| Govt. College GURH | 0 | 6911 | 0 |
| Govt. College Jiathwara | 0 | 0 | 0 |
| Govt. College Keshwani | 0 | 0 | 0 |
| Govt. College Kotama Anuppur | 0 | 880 | 1694 |
| Govt. College Mada, Singrauli | 0 | 361 | 210 |
| Govt. College Mangawan | 0 | 1065 | 2 |
| Govt. College Manpur, Umaria | 0 | 2 | 416 |
| Govt. College Nadan | 0 | 0 | 0 |
| Govt. College Nagaud, Satna | 0 | 12050 | 40 |
| Govt. College Nashtigawn | 0 | 0 | 0 |
| Govt. College Naurozabad | 0 | 0 | 0 |
| Govt. College Pushprajgrah | 0 | 500 | 713 |
| Govt. College Raigaon | 0 | 1 | 45 |

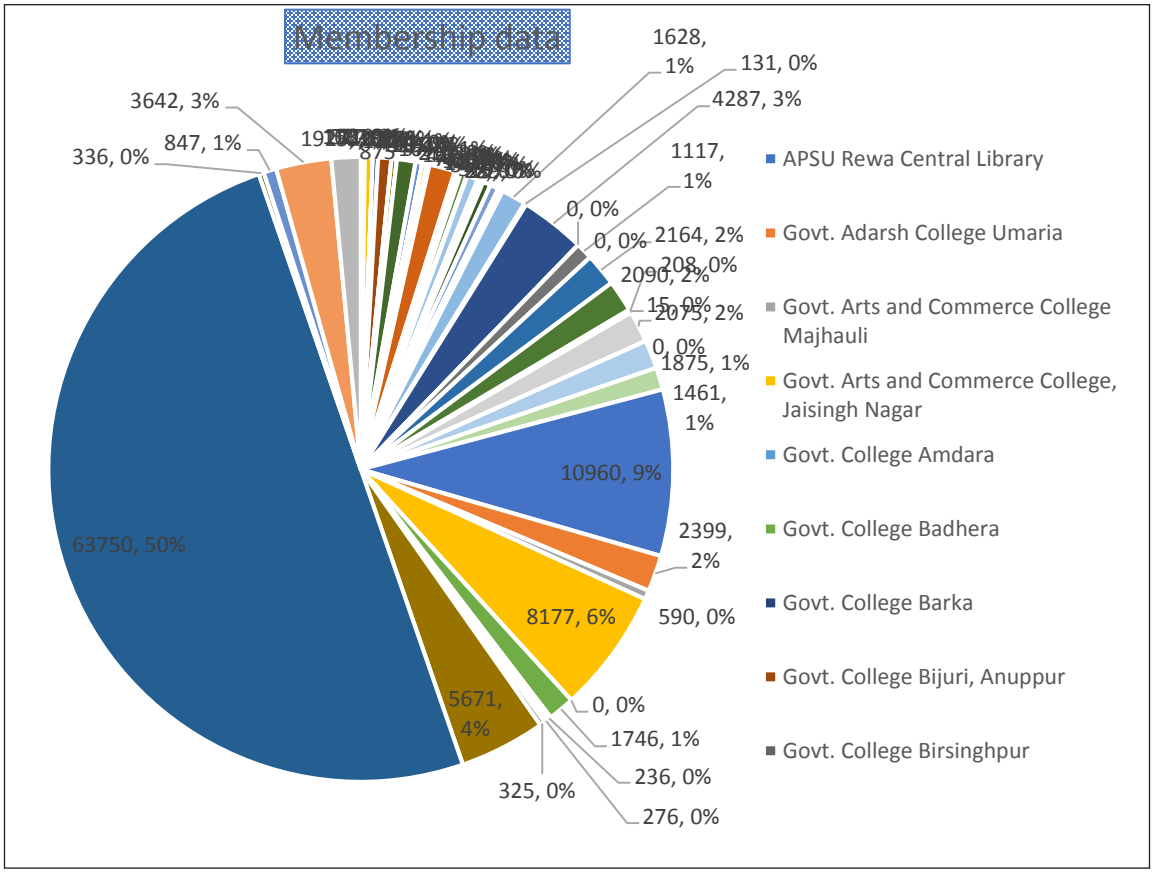
| Name of College | No. of Copies Issued | Total of Holdings | Total Members |
|---|---|---|---|
| Govt. College Raipur Karchulian | 0 | 1896 | 0 |
| Govt. College Rajmilan Singrauli | 0 | 95 | 122 |
| Govt. College Rajnagar | 0 | 188 | 112 |
| Govt. College Ramnagar, Satna | 0 | 0 | 0 |
| Govt. College Rampur, Bhaghelan | 0 | 612 | 112 |
| Govt. College Sihwal | 0 | 0 | 0 |
| Govt. College Tala | 0 | 0 | 25 |
| Govt. College Uchehara | 0 | 500 | 289 |
| Govt. College Umaria | 0 | 19432 | 1628 |
| Govt. College Vyankat Nagar | 0 | 137 | 131 |
| Govt. Girls College Anuppur | 0 | 0 | 0 |
| Govt. Girls College Rampurnaikin, Sidhi | 0 | 0 | 0 |
| Govt. Girls College Satna | 0 | 12449 | 2164 |
| Govt. Girls College Singrauli | 0 | 467 | 208 |
| Govt. Girls PG College Rewa | 0 | 156 | 15 |
| Govt. Law College | 0 | 2098 | 0 |
| Govt. Neharu College Budhar | 0 | 4592 | 1461 |
| Govt. Shahid Kedar Nath PG College Mauganj | 0 | 1299 | 0 |
| Govt. Tulasi Degree College, Anuppur | 0 | 4924 | 325 |
| Jagannath Singh Smriti Govt. College Singrauli | 0 | 200 | 336 |
| Library Govt. College Birsinghpur Pali | 0 | 1785 | 847 |
| Pt. Ramkishor Shukla Smriti Govt. Arts and Commerce College Beohari | 0 | 948 | 3642 |
| Govt. College Barka | 1 | 2900 | 342 |
| Govt. College Jaitpur | 1 | 605 | 155 |
| Govt. College Sarai | 2 | 550 | 514 |
| Govt. Swami Someshwar Singh College Naigarhi | 3 | 3044 | 1746 |
| Govt. College Semaria, | 7 | 2129 | 569 |
| Govt. Indira Gandhi Home Science College Shahdol | 10 | 4333 | 2075 |
| Govt. Arts and Commerce College, Jaisingh Nagar | 12 | 12491 | 527 |
| Govt. College Sadhashiv Rao Golbalkar | 12 | 11795 | 590 |
| Govt. Thakur Ranmat Singh College Rewa | 18 | 38238 | 276 |
| Govt. Swami Vivekanad College Theonthar | 21 | 2867 | 66236 |
| Sadar Vallabh Bhai Patel Govt. College, Devtalab | 23 | 1893 | 1927 |
| Govt. Girls College Sidhi | 30 | 14890 | 2090 |
| Govt. P.G. College Satna | 32 | 23396 | 10960 |
| Govt. Rajnarayan Smriti College Waidhan | 40 | 4372 | 2399 |
| Govt. Girls College Amarpatan, Dr. Sarvpalli Radhakrishanan Library | 46 | 15084 | 4287 |
| Govt. College Devsar Singrauli | 47 | 3779 | 1227 |
| Govt. College Majhgawan, Satna | 47 | 424 | 199 |
| Govt. College Jaithari Anuppur | 73 | 1339 | 319 |
| Govt. Vivekanand College Maihar | 118 | 9266 | 5671 |

| Name of College | No. of Copies Issued | Total of Holdings | Total Members |
|---|---|---|---|
| Govt. Girls College Baidhan | 127 | 1788 | 1117 |
| Govt. Model Science College Rewa | 354 | 50932 | 1875 |
| APSU Rewa Central Library | 523 | 53309 | 103 |
| Govt. Sanjay Gandhi Smriti College, Sidhi | 5369 | 66602 | 8177 |

- *Library Holdings and Collection Size:* The total number of library holdings across all institutions is 405,905. However, there is significant variation among colleges in terms of holdings. Notable institutions such as Govt. Sanjay Gandhi Smriti College, Sidhi lead with 66,602 holdings, followed by Govt. Model Science College, Rewa with 50,932 and APSU Rewa Central Library with 53,309. In contrast, several colleges, such as Govt. College Amdara and Govt. College Churhat, report zero holdings.
- *Books Issued:* The total of 6,916 books issued across all institutions is indeed quite low for library circulation data, especially if this covers an extended period. This could suggest either low overall library usage or incomplete data reporting. Govt. Sanjay Gandhi Smriti College, Sidhi's 5,369 issued books (about 77.6% of the total) is significantly higher than other institutions.




- *Membership Distribution:* The total membership across all listed colleges in MPAPSU cluster no.1 is 63,750, with considerable differences in membership size between colleges. Govt. Sanjay Gandhi Smriti College, Sidhi has the highest membership, with 8,177 members, while several smaller institutions, such as Govt. College Jiathwara and Govt. College Rampurnaikin, Sidhi, report no members.




- *Resource Disparity:* There is a clear disparity in library resources and membership engagement. While some colleges are well-equipped with large collections and substantial membership (e.g., Govt. Sanjay Gandhi Smriti College, Sidhi), others show almost no activity in terms of issued books or library use. This highlights the uneven distribution of resources, potentially indicating a need for targeted improvements in underutilized or under-resourced institutions.

## VII. Conclusion

The data reveals substantial variations in library resources and their usage across government colleges. While certain institutions are thriving with large collections and active membership, many others report minimal activity. For policymakers and educators, this presents an opportunity to investigate the underlying causes of this disparity and explore strategies to enhance library engagement and resource distribution, particularly in underperforming colleges. A more balanced allocation of resources could promote equitable access to educational materials, fostering improved academic outcomes across all institutions.

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