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Cloud-Based Knowledge Ecosystems: Strengthening E-Resource Access In Academic Libraries Of Madhya Pradesh

Sumit Gupta
Research Scholar, School of Studies in Library and Information Science
Jiwaji University, Gwalior

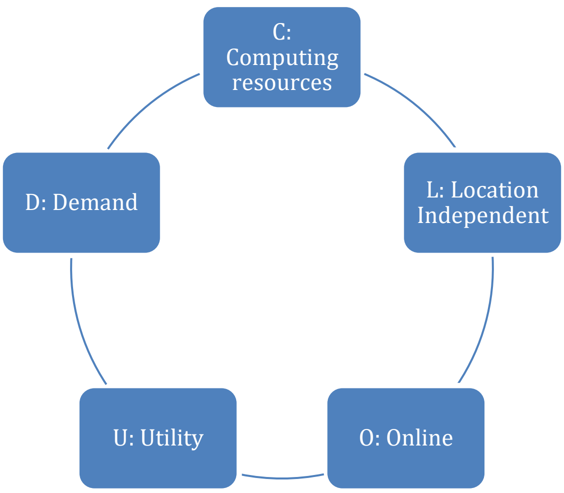
Dr. J. N. Gautam
Professor, School of Studies in Library and Information Science
Jiwaji University, Gwalior

Abstract: In the era of digital environments, cloud-based libraries have emerged as transformative frameworks for academic libraries in view of management and accessibility. This ecosystem of cloud-based libraries have provided scalability, flexibility and cost cut solutions to end users. This article will explore the cloud-based infrastructure especially for higher education, which offers seamless access to scholarly content anytime and anywhere. Features of cloud such as security of content, real time analysis etc. has strengthened the user engagement with knowledge ecosystems. Considering the potential of cloud-based libraries, this demonstrates the routine process such as updates, backups, and authentication, which improves the functionality and efficiency.

Keywords: Cloud-Based Knowledge Ecosystems, E-resources, Madhya Pradesh.

Introduction: Academic libraries are under showing shift driven by the rapid advancement of ICT. The transition from print to digital resources has expanded access to scholarly information, which enables users to retrieve knowledge beyond physical boundaries.

Various definitions of cloud computing are interpreted but according to Lewis G., "Cloud computing may have acronym as:



National Institute of Standards and Technology (NIST) has defined cloud computing as, "Model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction". (Mell, 2011)
Despite these advancements, several challenges like inadequate infrastructure, high subscription cost, and limited remote access in remote areas persisted in developing countries such as India. Digital divide continues to restrict usage of e-resources in such areas and after COVID-19 pandemic; there is a need for robust digital systems capable of supporting uninterrupted access to academic content. (Krishnamurthy, 2019)
In this landscape, cloud computing has emerged as transformative technology that offers scalable, flexible and cost-effective solutions. When integrated with the concept of knowledge ecosystems- where users, technologies and resources interact dynamically- cloud computing can significantly enhance the accessibility and usability of e-resources.
This paper aims to examine the role of cloud-based knowledge ecosystems in strengthening e-resources in Madhya Pradesh.

Need for cloud technologies in higher education Libraries:
Libraries are rapidly transforming from traditional knowledge center to digital hub. (Majhi & Meher, 2015). The growing demand for instant remote and uninterrupted access to scholarly information has increased the need for cloud technologies in academic libraries.
Expansion in digital education, online learning environments, research activities, increased study material has grown significantly in terms of volume and figure. There are constraints to store such and face limitations. On other hand, cloud-based knowledge system has overcome all these problems in terms of storage capacity, maintenance cost and software upgrades and accessibility. Initial cost may me higher but in long run, it helps by offering flexible and cost-effective solutions.
There is high need of cloud-based technologies in resource sharing and collaboration among other universities such as centralized access to scholarly communications to strengthening academic communication and research productivity.
In the context of universities of Madhya Pradesh, cloud technologies play a vital role in improving accessibility to digital library services especially institutions in which they are imparting education in multiple disciplinary and allowing remote learning support. In support of modernization of higher education libraries cloud based libraries makes its operational efficient.

Impact of Cloud ecosystem on teaching, learning and research:
Using cloud technology to create rich and effective knowledge environments has improved the quality of research and education in universities by allowing users more convenient access to digital information and enabling collaboration in higher education. As a result, the implementation of cloud technology in academic libraries will aid in the ongoing rise of the information needs of students and researchers by allowing for continuous and easy remote access to scholarly publications.
As related to the learning experience, cloud-based ecosystems provide users with a means of having continuous access to e-books, e-journals, databases, institutional repositories, and digital library service management software such as E-Granthalaya in Madhya Pradesh, regardless of where they are located at any time. (Bansode & Pujar, 2012) This access allows for self-directed learning, independent study, and development of skills beyond the traditional classroom setting. Additionally, cloud-based platforms support collaborative learning through online discussion groups, shared academic resources, and virtual learning environments. (Imabong, 2024)
Implementing cloud technologies in academic libraries has removed time, distance, and physical/library access barriers, creating greater access to academic resources to an ever-expanding user base.

In the area of research, cloud ecosystems are critical in enhancing scholarly communication and knowledge sharing and provide researchers with the ability to search for and access through one search box millions of scholarly without geographical restrictions.

Review of Literature: The concept of cloud-based knowledge ecosystems has gained significant attention in the field of academic technologies due to increasing demand for seamless access to e-resources.

Evolution of LMS (Library Management System) from manual to integrated solutions have widened the usage of cloud computing which have provided the major application such as improved access, wider access, storage and backup. Efficiency and collaboration can be enhanced through cloud-based services and sources. Collaboration and innovation by leveraging cloud-based services into academic fields have increased which promote institutional growth. (Jain et al., 2024). Starting from the 1970s, the cloud computing and databases concept has been brought into light with the emergence of many services such as IaaS, PaaS, SaaS and DaaS. In academics, information which secrecy nature has to be stored with elastic and on demand nature. Services of cloud computing such as OCLC, LOC, Polaris and many more help in the academic field for better reach and resource polling. (S., 2021). Yuvraj (2013) has identified that librarians are also using services of cloud computing technology in libraries but the only problem in the system is less implementation of such technologies along with data protection and accessibility.

Usage of cloud-based applications such as E-Granthalaya with integration of RFID technology in Madhya Pradesh state has been promoted by M.P. Higher education department. There is significant variation towards low usage shows more efforts have to be implemented.

(Kumar & Singh, 2025)

Objective:

1. To examine the availability and implementation of cloud-based library services in academic libraries of Madhya Pradesh.
2. To assess the level of awareness and usage of cloud-based e-resources among students, faculty, and researchers.
3. To evaluate the effectiveness of cloud-based technologies in enhancing access, retrieval, and sharing of e-resources.
4. To identify the major challenges and barriers in the adoption and utilization of cloud-based knowledge ecosystems in academic libraries.

Research Methodology: This present study adopts descriptive and analytical research design to examine the role of cloud-based knowledge ecosystem to strengthening academic libraries of Madhya Pradesh. This study focusses on selected state universities, which were established before 2015 and imparting education across all major disciplines.

Data collection: 30 questionnaires have been distributed among research scholars in each universities. Overall, 233 (77.66%) questionnaires have been received satisfactory and included for analysis for this research article. Primary data is collected via structured questionnaire from respondents. Other data is collected through observation from library websites and digital platforms. Research articles, journals and books were also discussed.

***Analysis*:** Collected data were organized and classified into tables using descriptive statistical methods and analyzed through percentage and comparative methods.

This analysis was carried out to compare the availability and effectiveness of cloud-based services among selected universities.

1. Population:

Sr. No.	University Name	Abbreviation	Distributed	Received
1	Atal Bihari Vajpayee Hindi Vishwavidyalaya, Bhopal	ABVHP	30	22 (73.33%)
2	Awadhesh Pratap Singh University, Rewa	APSU	30	25 (83.33%)
3	Barkatullah University, Bhopal	BU	30	21 (70%)
4	Devi Ahilya Vishwavidyalaya, Indore	DAVV	30	23 (76.66%)
5	Jiwaji University, Gwalior	JU	30	26 (86.66%)
6	Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot	MGCGV	30	22 (73.33%)
7	Maharaja Chhatrasal Bundelkhand Vishwavidyalaya Chattarapur	MCBU	30	24 (80%)
8	Rani Durgavati Vishwavidyalaya, Jabalpur	RDV	30	23 (76.66%)
9	Sanchi University of Buddhist – Indic Studies	SUBIS	30	22 (73.33%)
10	Vikram University, Ujjain	VU	30	25 (83.33%)

2. Awareness and Usage: While talking about the awareness about cloud-based services, following mentioned aspects were analyzed. These parameters help in understanding the level of adoption and utilization of such services in academic libraries.

Following data shows the users positive responses.

A. Are you familiar with cloud-based knowledge ecosystem?
B. Do you regularly use cloud-based e-resources for academic purposes?
C. Have you received any training related to cloud-based library services?
D. Do you access library e-resources from outside campus?

Sr. No.	University	A	B	C	D
1	ABVHP	63.64%	72.73%	36.36%	45.45%
2	APSU	72%	84%	40%	56%
3	BU	57.14%	61.90%	33.33%	42.86%
4	DAVV	69.57%	78.26%	39.13%	56.52%
5	JU	73.08%	88.46%	42.31%	57.69%
6	MGCGV	68.18%	68.18%	36.36%	45.45%
7	MCBU	70.83%	83.33%	41.67%	58.33%

8	RDV	65.22%	73.91%	39.13%	52.17%
9	SUBIS	63.64%	72.73%	36.36%	50%
10	VU	52%	60%	28%	48%

- Tables shows that majority of universities are familiar with cloud based knowledge system. Jiwaji University (73.08%) tops the category with familiarity with cloud based knowledge systems.

3. Satisfaction level of services provided by universities to its users: There are many services provided by different libraries to its user. To check the effectiveness of these services, below mentioned factors in table were analyzed.

Following data shows the users positive responses.

Sr. No.	**University**	**Cloud-based LMS (E-Granthalaya)**	**Web OPAC**	**E-Resources access in Library**	**Institutional Repository**	**Remote Access**
1	ABVHP	Yes	90.91%	63.64%	54.55%	50%
2	APSU	Yes	96%	72%	64%	60%
3	BU	Yes	86.95%	57.14%	47.62%	42.86%
4	DAVV	Yes	95.65%	69.57%	65.22%	60.87%
5	JU	Yes	96.15%	73.08%	69.23%	65.38%
6	MGCGV	Yes	86.36%	68.18%	59.09%	65.55%
7	MCBU	Yes	95.83%	70.83%	70.83%	66.67%
8	RDV	Yes	91.30%	65.22%	60.87	56.52%
9	SUBIS	Not Sure	90.91%	63.64%	59.09	54.55%
10	VU	Yes	84%	52%	48	40%

- Table shows that almost all the universities have implemented cloud-based library management software i.e. E-Granthalaya, indicating growing adoption of cloud technologies.
- Higher percentage of Web OPAC across universities shows strong implementation of online catalogue services.
- Institutional repository services show lower percentages indicating developing state of archiving and establishment of IR in Madhya Pradesh.
- Mixed percentages regarding remote access shows moderate availability in Madhya Pradesh for better accessibility of e-resources.

4. Effectiveness of cloud-based services:

The table presents only the mean score of respondent's perceptions for clear and comprehensive analysis. This will help to summarize the satisfaction and effectiveness for every category mentioned in table. Mean score has been analyzed through rating by undermentioned Likert scale.

5 = Strongly Agree
4 = Agree
3 = Neutral
2 = Disagree
1 = Strongly Disagree

	ABVHP	APSU	BU	DAVV	JU	MGCGV	MCBU	RDV	SUBIS	VU
Easy and quick access	3.86	4.12	3.62	4.00	4.12	3.86	4.04	3.87	3.91	3.56
24 x 7 access	3.77	4.04	3.52	3.91	4.08	3.77	3.96	3.78	3.82	3.44
Speed of information retrieval	3.73	4.00	3.43	3.87	4.00	3.68	3.92	3.70	3.68	3.36
Resources sharing among libraries	3.59	3.88	3.33	3.78	3.92	3.59	3.83	3.61	3.646	3.28
Support academic and research work effectively	3.86	4.04	3.52	4.00	4.08	3.86	4.00	3.78	3.82	3.44
Overall satisfaction	3.77	3.96	3.38	3.91	4.00	3.77	3.96	3.70	3.68	3.28

- The Likert scale analysis of cloud-based services shows higher positive perception towards the effectiveness of cloud-based knowledge ecosystem.
- Jiwaji University, Awadhesh Pratap Singh University and Maharaja Chhatrasal Bundelkhand Vishwavidyalaya Chattarapur have higher mean scores showing better implementation of cloud-based technologies while Barkatullah and Vikram University has low mean scores reflecting more effectiveness is required for cloud services.
- Easy and quick access received higher scores in most universities indicate that users perceive this service more relevant among all.
- However, lower mean scores for resource sharing analysis indicate lower satisfaction among users.
- Overall satisfaction revealed positive influence on access of e-resources through cloud services in digital libraries.

5. Challenges and Problems: Despite the increased adoption of cloud based knowledge ecosystem in academic libraries, many challenges and problems continue to affect to effective implementation in universities of Madhya Pradesh. These factors directly affect the accessibility of e-resources in academic libraries. Some significant factors are mentioned below:

Following data shows the users positive responses.

A. Internet connectivity issues while using cloud services
B. Difficulty in accessing e-resources remotely
C. Technical knowledge barrier in using cloud-based services
D. Security or privacy concerns related to cloud-based services
E. More awareness programme needed for effective use

Sr. No.	University	A	B	C	D	E
1	ABVHP	59.09%	54.55%	50%	54.55%	68.18%
2	APSU	64%	60%	56%	60%	76%
3	BU	57.14%	52.38%	47.62%	47.62%	66.67%
4	DAVV	60.87%	60.87%	56.52%	60.87%	73.91%
5	JU	65.38%	61.54%	57.69%	61.54%	76.92%
6	MGCGV	59.09%	54.55%	50%	50%	72.73%
7	MCBU	62.50%	62.50%	58.33%	62.50%	75%
8	RDV	60.87%	56.52%	52.17%	56.52%	69.57%
9	SUBIS	59.09%	54.55%	50%	54.55%	68.18%
10	VU	56%	52%	60%	52%	68%

1. A considerable number of users faces connectivity issues, which affects smooth access to e-resources in knowledge ecosystem.
2. Weak network, login issue and limited remote access are issues many user faces while accessing e-resources.
3. Respondents also expressed concerns regarding security and privacy of data while using cloud-based platform.
4. More awareness programmes, workshops, and training sessions are needed to improve effective utilization of cloud-based services.

Conclusion:

In Madhya Pradesh's academic libraries, cloud-based knowledge ecosystems have provided a strong foundation for improving e-resource access. The study shows that more and more universities are using cloud-supported services, such as Library Management Systems (LMS), Web OPAC, institutional repositories and remote access facilities, to enhance digital library operations and increase access to academic resources. These technologies have improved the accessibility, availability and sharing of academic information to support learning and research in higher education institutions. The analysis also suggests that universities with better digital infrastructures and cloud integration provide more effective and user-friendly library services.

The study identifies several challenges to the implementation of cloud-based services including inadequate ICT infrastructure, limited financial resources, technical issues, and a lack of skilled professionals to manage cloud-based systems. However, despite these challenges, the use of cloud technologies has had a considerable impact on transforming academic libraries into modern digital knowledge centers. The improvement of cloud infrastructure, enhancing remote access services, and promoting digital literacy among library professionals will help improve the effectiveness of e-resource services. Therefore, the ongoing growth and implementation of cloud-based knowledge ecosystems is critical to enhancing learning, research and scholarly communications at the universities of Madhya Pradesh.

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