Analyzing the Cost-Effectiveness of Adopting Cloud Computing Solutions in Library

Sujatha S[1] and Dr. Golam Ambia[2]

Research Scholar, Department of Library and Information Science[1]

Professor, Department of Library and Information Science[2]

Sunrise University, Alwar, Rajasthan, India

Abstract: *Libraries have always served society. The final decade of the 20th century demanded effective use of library money and services. Library and service valuations are sought internationally. This research reviews library cloud computing cost effectiveness literature. Recently, cloud computing has become a significant tool that aids libraries. The present research is based on extensive online literature search. This study examines library service and cloud computing cost efficiency. Library adoption of SaaS, PaaS, and IaaS is examined. Success stories of libraries using cloud computing are presented. This article may help libraries implement cloud computing.*

Keywords: Cloud Computing, Libraries, Cost Effectiveness.

I. INTRODUCTION

Libraries have struggled with budget cuts and resource subscriptions for millennia. The University Grants Commission Library Committee, University Education Commission, Advisory Committee for Libraries, National Knowledge Commission, and others in India work to improve library services and finances. Commissions have made budget recommendations. On this backdrop, many libraries are conducting research to discover the most cost-effective approach to deliver services and construct infrastructure to optimize library services. Cloud computing may help libraries overcome budgetary restrictions and deliver excellent services to users. Libraries have increasingly turned to cloud computing as a cheaper option to on-premise IT infrastructure. The research will use current literature to assess the cost-effectiveness of cloud computing in libraries, including case studies of libraries that have implemented it.Cloud computing may improve library staff and consumer flexibility and accessibility. Cloud computing allows libraries to provide e-books, e-journals, and other digital materials to customers, increasing access and usage while lowering space and resource needs.

Cloud computing may save libraries money, but they must consider migration expenses, maintenance and support costs, and hidden fees like data transfer fees and premium service fees. Scalability, accessibility, and lower operating expenses are advantages of cloud computing. This has pushed several libraries to examine cloud-based storage and data management. The cost-effectiveness of cloud computing is a major element in its popularity in libraries. Cloud computing saves libraries money on hardware and software. The cost-effectiveness of cloud computing allows libraries to cut IT expenses while boosting service quality. This review will help libraries implement cloud computing and improve awareness of its cost-effectiveness in varied circumstances. This study's conclusions will be important for libraries adopting cloud computing. It will show how cloud computing might save money. Overall, the paper intends to add to cloud computing adoption literature and assist libraries make educated judgments.

Objectives

- To study literature on cost effectiveness of library services and
- To study literature on cost effectiveness of cloud computing applications in libraries.

Definitions

Cost effectiveness is "the most economical way of achieving a desired result, either in the public sector or the private sector," according to Collin (2003) in the Dictionary of Economics. In essence, it maximizes resources.

Cost effectiveness is "technique for evaluating broad management and economic implications of alternative choices of action with the objective of assisting in the identification of preferred choice," according to King (1970).

According to the criterion above, a process is cost-effective if it generates more than it costs. In libraries, service costs may benefit users more in monetary or cultural and social circumstances.

II. METHODOLOGY

Study literature is thoroughly searched. Reviewing the literature involves citing books, magazines, research papers, Ph.D. theses, and case studies. In addition to printed literature, Shodhganga, Emerald, ProQuest, JSTOR,LISA, and LISTA were searched. Research publications were available on Google Scholar, Academia, and Research Gate. Titles, abstracts, and keywords were used to evaluate research. Studies that fulfill inclusion requirements are being reviewed. Cost-effective libraries and proper research methods were inclusion criteria. Systematically gathered and synthesized data from chosen research. Analyzing and synthesizing gathered data reveals patterns , themes and sub-themes. This thorough and accurate study covers cost efficiency studies on cloud computing applications in libraries.

III. LITERATURE REVIEW

A literature review on the cost-effectiveness of cloud computing applications in libraries is the primary objective of this paper. It has examined the subsequent themes:

Cost Effectiveness in Libraries

Cost effectiveness of Cloud Computing in Libraries.

Cost Effectiveness in libraries

Wilson, Stenson & Oppenheim (2019) say academic libraries make users better with information, not money. For proper money utilization, fund releasers expect cost analysis. Cost efficiency is examined in academic libraries. Payne (1996) at St Patrick's College Library, Maynooth pioneered research on ownership vs access to subscribed publications and resources. To save money, it advised maintaining mail-ordered papers but evaluating CD-ROM databases. Pawan, Gautam (2019a) found library-subscribed e journals cheaper than researcher and faculty benefits. Punjab Agricultural University (PAU) CBR is 1:2.9 and Guru Angad Dev Veterinary And Animal Sciences University is 1:4.5. Ahmad (2013) analyzed Aligarh Muslim University, Delhi University, and JNU library cost effectiveness. We evaluate average journal subscription and book processing times. Library stakeholders were observed by Mezick (2007). In US and Canadian university libraries, library budget, professional staff, and student retention were positively correlated. It was observed by Bano & Haridasan (2015) at Maulana Azad Library, Aligarh Muslim University, India, that the cost of current and e-journals subscribed at the library is substantially lower than the advantages acquired by teachers, research researchers, and (CBR Pawan Gautam (2019b) analyzed the cost and advantages of Nehru Library, Chaudhary Charan Singh Haryana Agricultural University, Hisar's 2015 print journal subscriptions.

Cost Effectiveness of cloud computing applications in libraries

A novel method of computation is cloud computing. It provides users with access to novel opportunities and diverse work environments. Users are able to access data according to their requirements. The provision of computational services on demand is a critical component of cloud computing. Cloud-based services, data processing, and preservation tools are available to patrons of libraries. The following section examines the cost efficacy of the various cloud service models.

Cloud Computing - Software as a Service (SaaS)

Mell, Grance (2011) described SaaS as "The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure." Library systems' future is examined by Grant (2012). He said several consumers might utilize one software program. Multi-tenancy may save money by sharing software maintenance and development expenses. SaaS affects libraries greatly. He added that vendors running such apps use less resources, cutting SaaS costs to libraries. In-house software and hardware maintenance costs more than multi-tenant computing. A second economic gain occurs. By using a single instance of software, suppliers paid each library less to upgrade software. Libraries will

eventually receive cost-effective technologies with efficient work flow, he said. Librarika is a cheaper Integrated Library System than proprietary software since it requires no hardware, software, or installation. It frees up to 2000 titles and saves library staff training time. National Institute of Electronics and Information Technology, Itanagar uses open source cloud-based library management software to handle e-books and periodicals, according to Stephen (2017). The above example indicates that cloud-based library management software is affordable. Panda and Chakravarty (2021) reported that government libraries may access e Granthalaya eG4. It costs Rs. 21275 to buy the program once. This fee lasts five years. Hosting, maintenance, and help-desk assistance are included. Indian government libraries employ SaaS software cost-effectively.

Cloud Computing - Platform as a Service

Users may deploy applications on the provider's cloud infrastructure using its programming languages and tools. End-users control applications. Such services are offered by libraries. Digital full-text electronic journals available directly or via Medline search at Rouen University Hospital France were cheaper than interlibrary loan fees, according to Roussel, Darmoni, Thirion (2009). Electronic books with interlibrary borrowing restrictions are cheaper. The University of Nebraska Omaha Criss Library Virtual Services saved $150,000 in the first year utilizing WorldShare Management Service. Staff and students enjoyed a campus ebook DDA trial program supported by this money. See Ye (2012) for Pepperdine University Libraries' case study. Switching to OCLC WorldShare Management Services. They asserted World Share reduced system expenses and enhanced purchases and cataloging. Server replacement every two or three years is no longer essential, giving systems librarians more time to work on other projects.

IaaS or HaaS cloud computing

Mell, Grance (2011) defined it as "capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer can deploy and run arbitrary software, which can include operating systems and applications".

Library-reserved Amazon Web Services (AWS) instances cost USD 0.03 per hour, according to Han (2011). Assuming a five-year system life, TCO study showed 50 cost decrease. Central Connecticut State University Library established Amazon Simple Cloud Storage (S3), which costs one third of OCLc's digital archives, according to Iglesias & Meesangnil (2010). Han (2010) moved systems to the cloud and saved money for a year. Author claimed two nodes cost USD 480 and hardware implementation USD 4000. Hastings (2012) explored cloud backup. Library acquired tape drives for three servers and paid USD 60 every six months for tapes. Everything was virtualized on one physical server, decreasing monthly costs to two backed-up servers for USD 15. Wilkin (2009) observed extensive cloud use. At least 50 libraries with 33000 public domain titles need 19 km of shelves. Total savings were USD 6.2 M.

The Yang (2012) research appears. Users may pay per hour on Amazon EC2. Hourly rates are USD 0.2–2.6. Power and server space were required. Spot occurrences are another facility. They employ spot pricing. Other author-cited cases are discussed. Amazon EC2 cost USD 2750–3570, whereas the local server cost USD 5858–7608. Amazon S3 cost USD 16800 for 10TB data storage, compared to local storage. Consider cloud computing after financial research. In 2013, Ogbu & Lawal explored cloud computing in Nigerian e-library services. They stated capital and operational expenses make installing and managing in Nigeria costly. Cloud computing makes e-library deployment and administration affordable by eliminating infrastructure failure, technical expertise, support, and software development costs.

Yuvaraj (2013) compared cloud-based and library IT systems. He stated the IT server cost USD 19050 and the cloud-based system USD 4500. Cloud system cost $6500, IT system $38800. This study found cloud-based IT cheaper than conventional IT.

IV. RESEARCH GAP

Library cost-effectiveness studies are examined. Few research examine cloud computing applications in libraries or its economic efficiency.Cloud computing helps libraries grow, increase accessibility, and save expenses. However, library cloud computing cost-effectiveness study is needed. This study evaluates library cloud computing cost effectiveness studies and highlights holes.

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Library cloud computing literature has focused on adoption advantages and drawbacks, including security and vendor lock-in. Some cloud computing cost savings studies have been done, but few in university libraries.

Cloud-based integrated library systems' cost-effectiveness needs additional study. While several studies have investigated the advantages of cloud-based ILS, such as enhanced accessibility and decreased maintenance costs, few have examined its cost savings. Additionally, cloud ILS cost-effectiveness study is needed to compare it to locally hosted ILS.

The cost-effectiveness of cloud-based digital repositories needs additional study. Libraries may save and preserve research data, e-books, and audiovisual resources in digital repositories. While several studies have investigated the advantages of cloud-based digital repositories, such as enhanced accessibility and lower storage costs, few have studied the actual cost reductions.

This evaluation thoroughly examined academic library cloud computing application cost efficiency. It has also examined library cost efficiency studies such accessioning, journal pricing, etc. However, the research found few examples discussing cloud computing application cost efficiency. Cloud computing applications in libraries being studied for cost efficiency to address this gap.

V. CONCLUSION

Global research found that library services are calculated. Professionals value acquisition, accessioning, journal collection, book processing cost per unit, and library services. Recently used by libraries, cloud computing has promising results.

Cloud computing in libraries is growing due to its cost-effectiveness and flexibility. This article examined cloud computing's cost-effectiveness in libraries and its advantages over on-premises systems. Low hardware, maintenance, and user-demand resource scalability are benefits. Cloud computing in libraries requires planning.

The review expects libraries to require cloud applications. These applications enhance library services and keep up with changing times. Cloud computing can speed up library operations, enhance user experiences, and provide cutting-edge services. This review emphasizes the importance of considering cloud computing's implications on libraries. Cloud computing may improve library services and solve problems cost-effectively, the paper says.

Cloud computing lets libraries utilize a provider's data center for many applications and services, reducing hardware and software demands. Cloud providers update, manage, and troubleshoot software, freeing library staff to focus on other tasks. Libraries may increase resources utilizing cloud computing, paying just for required services. This might save libraries a lot of money compared to on-premises systems, which overprovision hardware for high usage.

Studies suggest cloud computing may be cost-effective for libraries with limited IT resources or those upgrading their IT infrastructure. Cloud computing saves libraries money, improves service, and boosts efficiency. Libraries may benefit from cloud computing while retaining high-quality services with careful planning and evaluation.

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