""Integration Of Cloud Computing Technology In Academic Libraries Functions And Participation Towards Effective Library Services"

GUIDE

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ABSTRACT

Cloud computing is one of the recent Internet related computing paradigms being implemented by academic libraries across the globe in bringing information services closer to their diverse and remote users. This leads to user satisfaction, enhanced image of librarians and university at large. The aim of undertaking this research was to explore the integration of cloud computing and service delivery in academic libraries with reference ersity. The objectives were to assess the impact of cloud computing information services, examine the application of cloud computing technologies, find out the factors influencing optimal utilization of cloud computing information services and develop appropriate strategies to increase utilization of cloud computing information services

Cloud Keywords: Computing, Library, Services, models, Adoption, effective library services" Open Source

INTRODUCTION

Effective Library services now largely depends upon the Information and Communication Technology (ICT) development. The integration of ICTs for library services presents enormous challenges and opportunities to librarians, information professional and users [1]. The data generated in academic libraries is massively growing at such an exponential rate due to several factors including the constantly increasing amount of the number of published journal articles, books, magazines etc. the expanding formats

of information retrieval, and ever changing education and research needs of library users make it difficult for any library to be an effective learning resources. Nowadays without the use of modern IT facilities, no academic library can function effectively, prosper and achieve the desired library objectives of the current world. The use of modern IT facilities will perhaps make the library users to fall in line with the reality of the present world and the digital society. Keeping away from adopting technological innovations will likely make contact between the world of education and the society more difficult [2]. However, the deployment of own IT infrastructures and their maintenance at each academic library will be very costly and the maintenance costs are expected to increase periodically. Many academic libraries spend huge sum of money on computing and telecommunication facilities and as well as on their supporting software packages. Beside the above stated expenses a significant financial investments are required to hire or employ IT professionals to operate and maintain the establishment"s IT facilities. Cloud computing has recently surfaced and is set to revolutionize the way library service are offered, many less privileged libraries can be able to enjoy the use of modern IT facilities for the effective library services at a little cost or in a pay per use mode. However, this paper explores some possible ways of adopting cloud technology towards effective library services. Study of the challenges faced by academic libraries towards their library operations was conducted. Also, study of the cloud deployment models providing various cloud services for libraries was conducted. Benefits as well as the challenges of cloud adoption in academic libraries are also highlighted, an infrastructure is proposed for

CLOUD COMPUTING DEFINITION

Cloud computing is defined as the use of hosted services, such as data storage, servers, databases, networking, and software over the internet. Since cloud computing began, the world has witnessed an explosion of cloud-based applications and services in IT, which continue to expand. Almost every application we use resides on the cloud, helping us save storage space, expenses, and time. This article discusses the types of cloud computing and 10 trends to watch out for. Cloud computing refers to the use of hosted services, such as data storage, servers, databases, networking, and software over the internet. The data is stored on physical servers, which are maintained by a cloud service provider. Computer system resources, especially data storage and computing power, are available on-demand, without direct management by the user in cloud computing. Instead of storing files on a storage device or hard drive, a user can save them on cloud, making it possible to access the files from anywhere, as long as they have access to the web. The services hosted on cloud can be broadly divided into infrastructure-as-a-service (IaaS), platform-as-a-service (PaaS), and software-as-a-service (SaaS). Based on the deployment model, cloud can also be classified as public, private, and hybrid cloud. Further, cloud can be divided into two different layers, namely, front-end and back-end. The layer with which users interact is called the front-end layer. This layer enables a user to access the data that has been stored in cloud through cloud computing software.

Cloud Deployment Models

In cloud computing, we have access to a shared pool of computer resources (servers, storage, programs, and so on) in the cloud. You simply need to request additional resources when you require them. Getting resources up and running quickly is a breeze thanks to the clouds. It is possible to release resources that are no longer necessary. This method allows you to just pay for what you use. Your cloud provider is in charge of all upkeep.
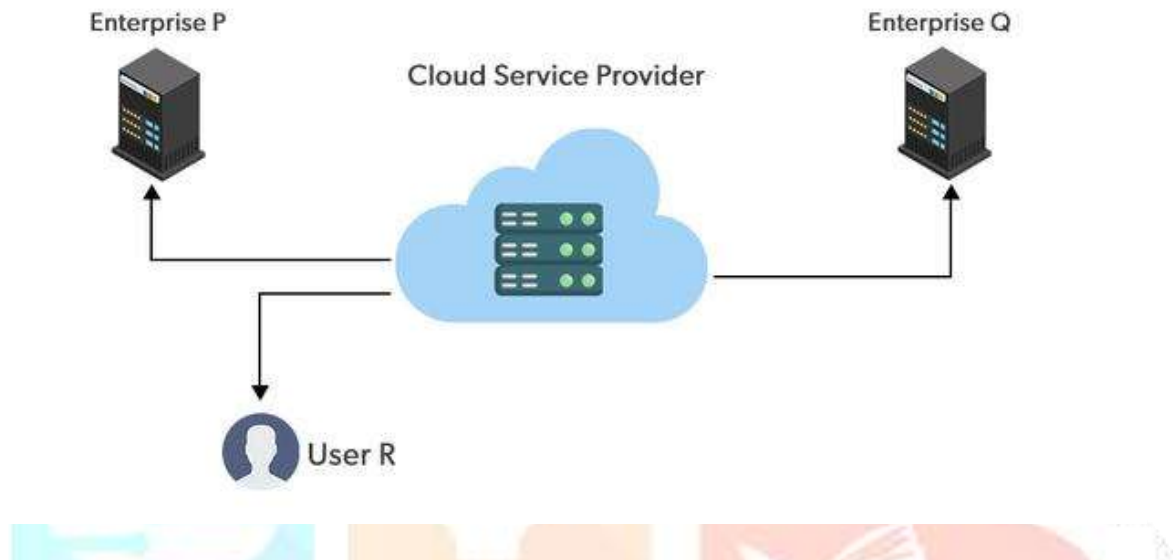
Advantages of the Public Cloud Model

- **Minimal Investment:** Because it is a pay-per-use service, there is no substantial upfront fee, making it excellent for enterprises that require immediate access to resources.

- **No setup cost:** The entire infrastructure is fully subsidized by the cloud service providers, thus there is no need to set up any hardware.

- **Infrastructure Management is not required:** Using the public cloud does not necessitate infrastructure management.

Disadvantages of the Public Cloud Model

- ➤ **Less secure:** Public cloud is less secure as resources are public so there is no guarantee of high-level security.

- ➤ **Low customization:** It is accessed by many public so it can't be customized according to personal requirements.

- ➤ **No maintenance:** The maintenance work is done by the service provider (not users).

- ➤ **Dynamic Scalability:** To fulfill your company's needs, on-demand resources are accessible.

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Cloud Deployment Model:-

functions as a virtual computing environment with a deployment architecture that varies depending on the amount of data you want to store and who has access to the infrastructure.

Public Cloud

The public cloud makes it possible for anybody to access systems and services. The public cloud may be less secure as it is open to everyone. The public cloud is one in which cloud infrastructure services are provided over the internet to the general people or major industry groups. The infrastructure in this cloud model is owned by the entity that delivers the cloud services, not by the consumer. It is a type of cloud hosting that allows customers and users to easily access systems and services. This form of cloud computing is an excellent example of cloud hosting, in which service providers supply services to a variety of customers. In this arrangement, storage backup and retrieval services are given for free, as a subscription, or on a per-user basis. For example, Google App Engine etc.

Private Cloud

The private cloud deployment model is the exact opposite of the public cloud deployment model. It's a one-on-one environment for a single user (customer). There is no need to share your hardware with anyone else. The distinction between private and public clouds is in how you handle all of the hardware. It is also called the "internal cloud" & it refers to the ability to access systems and services within a given border or organization. The cloud platform is implemented in a cloud-based secure environment that is protected by powerful firewalls and under the supervision of an organizati

Hybrid Cloud

By bridging the public and private worlds with a layer of proprietary software, hybrid cloud computing gives the best of both worlds. With a hybrid solution, you may host the app in a safe environment while taking advantage of the public cloud's cost savings. Organizations can move data and applications between different clouds using a combination of two or more cloud deployment methods, depending on their needs.

Community Cloud

It allows systems and services to be accessible by a group of organizations. It is a distributed system that is created by integrating the services of different clouds to address the specific needs of a community, industry, or business. The infrastructure of the community could be shared between the organization which has shared concerns or tasks. It is generally managed by a third party or by the combination of one or more organizations in the community.

Multi-Cloud

We're talking about employing multiple cloud providers at the same time under this paradigm, as the name implies. It's similar to the hybrid cloud deployment approach, which combines public and private cloud resources. Instead of merging private and public clouds, multi-cloud uses many public clouds. Although public cloud providers provide numerous tools to improve the reliability of their services,

mishaps still occur. It's quite rare that two distinct clouds would have an incident at the same moment. As a result, multi-cloud deployment improves the high availability of your services even more.

Libraries In The Digital Age: Their Value And Role

In a world where so much information is readily available at our fingertips, it may be easy to underestimate the value of libraries. However, these institutions play an important role in the digital age, offering a unique and vital service to their communities. Libraries provide a space for people to gather and access information, regardless of their income level or social status. They are also a hub for literacy programs, computer classes, and other educational opportunities. Additionally, libraries offer a sense of community that can be hard to find in the digital world. In this article, we will explore the value and role of libraries in the digital age. We will discuss how they are adapting to the changing landscape and how they continue to serve their communities in new and innovative ways.

What are libraries?

Libraries have been an important part of society for centuries. They are a place where people can go to find information and knowledge. In the past, libraries were mostly physical places where you would go to check out books. However, in recent years, libraries have become more digital. Many libraries now offer e-books and other digital resources that can be accessed online.Libraries play a vital role in the education of children and adults alike. They provide access to information and resources that people would not otherwise have. Libraries also offer a safe and welcoming space for people to gather and learn. In the age of the internet, it is more important than ever for libraries to remain relevant and accessible to everyone.

What is the role of libraries in the digital age?

Libraries play a vital role in the digital age. They provide access to information and resources that would otherwise be unavailable, and they help people to make informed choice about what they read, watch and listen to Libraries also provide a space for people to come together and share their love of books, movies, music, and other forms of media. In today's world, where we are increasingly isolated by our technology, libraries provide a much-needed sense of community. Finally, libraries play an important role in promoting literacy and lifelong learning. They offer programs and resources that help people of all ages learn new things and develop their skills. In a rapidly changing world, it is more important than ever to have places where we can go to learn and grow.

CHALLENGES OF ACADEMIC LIBRARIES TOWARDS EFFECTIVE SERVICES

A lot of effort has been made to ensure effective library services and operations, from manual process up to the adoption level of IT solutions. Very unfortunately yet many academic libraries were unable to achieve their desired goal. To make a clear distinction between the challenges, we categorize the libraries in to two; automated and non automated libraries. In an automated library here we mean completely or partially automated libraries that adopt IT solutions for effective services; and non-automated library in this paper solely means completely manually operated to deliver services. Now, an existing automated libraries partially solved the existing manually operated libraries problems and yet there are still a lot of existing problems that needs serious attention, which includes; Resource Cost, Deployment and Maintenance Cost, Lack of technical knowledge and support, Poor infrastructure, Hazardous ICT waste, Inherent problems of automated library, Less or absent of collaboration, Less resource usage (CPU cycles) etc.

CLOUD COMPUTING ADOPTIOM IM ACADEMIC LIBRARIES

Due to continuous development in IT technology infrastructure and frequent upgrades in hardware and application software has put more deal on expenses and pressure on educational budgets. Cloud computing services provide academic libraries with a new IT technologies to take advantage at an affordable cost. [14] The library community can apply the concept of cloud computing to amplify the power of cooperation and to build a significant, unified presence on the Web. This approach to computing can help libraries save time and money while simplifying workflows. 4.1 Advantages of Cloud Technology adoption in Academic Libraries For cloud computing adoption in academic libraries we can extract the following key advantages. On-demand self-service: A library can independently choose the set of computing capabilities and resources for use (e.g., storage space, server space, network equipment, memory, CPU cycles etc.). Scalability of resources: Thanks to scalability, computing resources can easily be reduced or increased, based on the library need. In the case of high load on a service, the quantity of computing resources will promptly rise without significant preliminary investments, and if the load decreased, the resources will be reduced. Upgrades guarantee: The cloud service providers provide automatic update to IT equipment and the associated software in a centralized passion commensurate to the change in technology, this helps to ensure that all IT equipment and software packages are appropriate, relevant and up-to-date. Cost savings: The use of cloud computing does not require capital expenses for creation and maintenance of own data processing centers, purchase of servers and network devices for the creation of own local IT infrastructure. Additionally, cloud computing eliminates operational expenses, since there is no need for the purchase and installation of expensive software packages, system updates, regular platforms, management skills, physical security for the premises where servers and other equipment are housed and payment of electricity charges for power consumed by equipment of the local IT infrastructure. All these expenses are shouldered by the cloud service provider. Fault tolerance and high level of availability: Datacenters of cloud service providers are reliably networked together, where the participating nodes are strategically placed at various corners of the world. Fault tolerance of such network is obviously above that of any local network, since it is designed with reiterative redundancy and the data-centers are under the control or serviced by highly qualified technical personnel. As a result, such distributed networks provide services with high level of availability.

User satisfaction: Cloud technology offers more advantages to end users. It is very convenient when data are accessible from anyplace anytime using devices such as personal computers, smartphones or tablets; the only thing required is an access to Internet. Data Storage: Cloud service providers provides clients with almost unlimited storage spaces. Various data storage servers are geographically distributed all over the world for the benefit of clients. Go Green: Another benefit of cloud solution adoption in academic libraries is the reduction of carbon emission and elimination of unwanted sound from generators used to power the library IT facilities. In any library zero noise and conducive atmosphere is needed to make the readers or researchers fully engaged in information retrieval without external disturbance. Data Sharing (Collaboration): Data sharing is the major benefit in academic libraries from cloud computing if they adopt cloud solution. We can share the information (which is among the purpose of a library) between two or more academic libraries while going from one to another either within local, state, national or international context. Traditionally moving from one library to another is not only costly but also time consuming.

RECOMMENDATION

Despite the benefits of cloud solution, certain aspects are very essential to consider before adopting the cloud solution. Before adopting cloud solution for academic library services the following issues need to be investigated thoroughly. Functionality, Cost, Security and Reliability, Testing technical features and simplicity of the system, Contract Agreement, Collaboration, Platform, disaster recovery, etc. In addition to the before mentioned issues, when an academic library is considering cloud technology adoption it‟s recommended to adopt community cloud deployment model due to its collaborative nature and ease of use in resource sharing. [20] Stated very important recommendations for any organization willing to adopt cloud solution, with which it‟s also applicable and important to academic libraries considering the adoption of cloud technology for effective services. The recommendations includes the following: • Organizations that have IT risk assessment capabilities and controls for externally sourced services should apply them to the appropriate aspects of cloud computing. • Legal, regulatory and audit issues associated with location independence and service subcontracting should be assessed before cloud-based services are used. • Demand transparency. Don't contract for IT services with a vendor that refuses to provide detailed information on its security and continuity management programs. • Develop a strategy for the controlled and secure use of alternative delivery mechanisms, so that business managers know when they are appropriate to use and have a recognized approval process to follow. [20] If a company is considering the use of an external service of any sort, then it needs to: • Assess the security, privacy and regulatory compliance risks • Identify use cases that are inappropriate for this service delivery method, based on risk level and current controls • Identify use cases that pose an acceptable level of risk for the service delivery met

CONCLUSION

Cloud computing as a new trend in communication and collaboration technologies is set to revolutionize the education sector all over the globe by providing modern educational tools which promote exchanges of knowledge and ideas, group works, interschool projects etc., at a little or no cost. Many companies are providing such modern library management tools applicable in teaching and research activities to academic libraries almost free of charge, when such services are properly adopted and utilized by academic libraries that will break down the existing barriers between well-being libraries and less privileged libraries, and the underdeveloped libraries will definitely prosper, be in line with today"s technological world, achieve library objectives and subsequently increase the libraries rating all at a little or no cost. This paper carefull y explored some possible benefits and challenges of cloud solution adoption in academic libraries. Challenges faced by libraries such as the use of open source software applications for libraries were provided. To ensure proper and effective cloud solution adoption, useful recommendations were provided to libraries planning to adopt the cloud solution.

REFERENCES

➢ P. T. Jaeger, J. Lin, J. M. Grimes, and S. N. Simmons, Where is the cloud? Geography, economics, environment, and jurisdiction in cloud computing, First Monday, 14(4_5): 2009.

➢ A. Aminu , A. Haruna "An Overview of Cloud Solution Application in Education Process" International Journal of Advanced Information in Engineering Technology (IJAIET) ISSN: 2454-6933 Vol.2, No.12, December 2015

➢ Boca "The Handbook of Cloud Computing" ISBN 978-1-4419-6523-3 e-ISBN 978-1-4419-6524-0, DOI 10.1007/978-1-4419-6524-0,Springer New York Dordrecht Heidelberg London

➢ T.V. Anthony, J.V. Toby and E. Rober "Cloud computing: A practical approach". ISBN: 978007162695-8.

➢ H. Torry "Cloud Computing: An overview" white paper, accessed april, 2014

➢ NIST cloud definition, version 15 http://csrc.nist.gov/groups/SNS/cloud-computing/

➢ Mell P. and Grance T., "The NIST Definition of Cloud Computing, National Institute of Standards and Technology, Information Technology Laboratory", Technical Report Version 15, 2009.

➢ B. Rajkumar, B. James and G. Andrzej "Cloud computing : principles and paradigms" ISBN 978-0-470-88799 8, Published by John Wiley & Sons, Inc., Hoboken, New Jersey 2015.

➢ A. J., Aina, H. O., Okunnu and H. S. Dapo-Asaju "ICT Integration for Sustainable Development of Nigerian Academic Libraries: Issues and Challenges" International Journal Of Information Research, Vol 3 No 4 June 2014.

➢ N. B. Ukachi "Library Automation and Use of Open Source Software to Maximize Library Effectiveness" Information and Knowledge Management ISSN 2224-5758 (Paper) ISSN 2224-896X (Online) Vol.3, No.4, 2014.