THE USE OF OPEN SOURCE TECHNOLOGIES IN EFFECTIVE LIBRARY SERVICES: AN OVERVIEW

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Abstract
Technology is gradually taking over every aspect of human endeavour and many organizations or institutions are following the trend in their services or operations. Therefore, library which is seen as the gateway of knowledge should not be left out. There is no doubt that open source technology is now an emerging technological trend that drives success today and will do so in the future. This paper discussed the use of open source technologies in effective library services. This paper explains the concept of open source and the need for open source. It also discusses the concept of open source technology or software and mentions some of the benefits of open source technology, which includes its flexibility, reliability, quality of use and support options. There are emerging open source technologies, which includes open source in machine learning, the R programming language, blockchains and Bitcoin, open source and the Internet of Things (IoT), open source and big data analytics, progressive web apps, open source and cyber security, open source and virtual reality, augmented reality and mixed reality, open source and cloud computing. The paper also discusses the use of open source technology in library services and its examples.

Keywords: Open source, Library, Digital library, Technology, Library services, blockchain

Introduction

Technology no doubt is gradually taking over every aspect of civilization, in so much so that every sector in human endeavour is moving digitally. Therefore, in near future the world will be digitalized and those that are not conversant with the use of electronic resources in their daily work routine will find it difficult to communicate with the rest of the world. As the global events are transforming technologically, in the same vein, library operations should not be left out. The issue of open source technologies comes to mind as the result of technological advancement.

Open source technology is an emerging technological trend that drives success today and will do so in the future. It ranges from how the entire tech industry is getting reshaped by digital transformation and the makeover of all tech enterprises from 'Digital Immigrants' to 'Digital Natives', to the rise of innovation accelerators and the emergence of next generation open source tech platforms (Nayyar, 2018). Njoku & Ravichandran (2017) noted that the need for open source technology in library activities such as acquisition, cataloguing, circulation, serials and reports management all over the world is gaining grounds as libraries are moving from traditional practice to electronic system. The web-based information access of all kinds available free has made open source technology an indispensable research and learning environment. The aim of this chapter is to examine the issues on library software, automation and open source technology.

OPEN SOURCE TECHNOLOGY (SOFTWARE)
What is an Open Source?

Open source is a source code that is made freely available for possible modification and redistribution. Open source can equally be seen as a type of licensing agreement that allows users to freely modify a work, use said work in new ways, integrate the work into a larger project or derive a new work based on the original (BigCommerce, 2021).

Tripathi (2018) stated that open source, as by the name suggests Openness. The author continued that open source software denoting software for which the original source code is made freely available and may be redistributed and modified. It is computer software with its source code made available with a license in which the copyright holder provides the rights to study, change, and distribute the software to anyone and for any purpose.

The need for Open Source

According to Tripathi (2018), open source is a type of licensing agreement that allows users to freely modify a work, use said work in new ways, integrate the work into a larger project or derive a new work based on the original. By removing barriers between innovators, open source promotes a free exchange of ideas within a community to drive creative, scientific and technological advancement. The author continued that although it is most commonly used in the software industry, professionals utilize open source licenses in many industries; such as biotech, electronics, fashion, robotics and teaching, etc. The idea of open source stems from the technology community as programmers and engineers from the initial stages of computers came up with new technologies through collaboration.

For instance, a programmer in San Jose develops a new application, then another programmer in Singapore studies the application and discovers ways to improve it. The knowledge is shared, and the entire community benefits from the collective innovation. In many ways, the creation of the open source license was a direct response to proprietary manufacturing. The not-for-profit Open Source Initiative (OSI) was founded in 1998, which administered

open source licensing around the world, promotes open source development, facilitates community and educational initiatives. Many people believe that creating an open source product means giving that product away for free. While many open source applications are free, developers are entitled to sell their work to the public. However, the license dictates that they are not allowed to copyright or patent the derivative work, or keep any part of its code secret. Therefore, others may create derivative works that perform the same function better, for nothing. The open source license naturally propagates to all applications that derive from the original. By agreeing to the license, users are also bound to it. Once a piece of software is made open source, all versions of the software will be open source in perpetuity (Tripathi, 2018).

OPEN SOURCE TECHNOLOGY OR SOFTWARE

Open source is a term that originally referred to open source software (OSS). Open source software is a code that is designed to be publicly accessible, which anyone can see, modify and distribute the code as they see it. Open source technology or software as the case may be is a growing trend in Global Information System (GIS). It is software in which the source code is used to create the program freely and it is available for the public to view, edit and redistribute.

Open source technologies have numerous benefits to its user. The biggest benefit of open source technology is that it offers great flexibility to use the platform according to someone's needs. Open source technology is reliable, which means it is always under continuous review, which leads to more reliability of the platform. It is qualitative because it is being developed by countless users, as many new and innovative features get added, the product gets enhanced. Open

source technology has support options as it is usually available for free and it has a huge community group to support the piece of software.

EMERGING OPEN SOURCE TECHNOLOGIES

Nayyar (2018) enunciated some emerging open source technologies that drive success nowadays, which range from how the entire tech industry is getting reshaped by digital transformation. According to the author, some of the areas in which ground-breaking open source technologies are set to revolutionize the world are as follows:

- **Open Source in Machine Learning:** Machine learning (ML) is the study of algorithms that use large data sets to learn, generalize and predict. The most exciting aspect of ML is that with more data, the algorithm improves its predicting power. ML has acted as a strong base for self-driving cars, speech recognition, home automation products and much more. Machine learning is closely related to computational statistics and also focuses on making predictions via computers.

- **The R Programming Language:** R is a free and open source ML language supporting statistical computing and the graphics language on a wide range of operating systems. It provides diverse statistical functionalities like linear and non-linear modelling, classical statistical tests, time-series analysis, classification, clustering and advanced graphical techniques.

- **Emerging Trends in Blockchains and Bitcoin:** Blockchain technology is rapidly undergoing intense development due to great interest from academia and the industry sector. A blockchain is regarded as a shared, open source transactional database for tracking transactions of digital currency like Bitcoin.

- **Open Source and the Internet of Things (IoT):** The Internet of Things (IoT) is highly fragmented and changing

continuously. Open source is playing a crucial role in creating IoT platforms as well as ready-made prototypes in terms of development boards for research and development (R&D) and automation. IoT standards, together with Artificial Intelligence (AI), are controlling and interpreting a wide range of activities in a smart manner.

• **Open Source and Big Data analytics:** Nowadays, most organizations understand the value of capturing all the data streaming inside the business and hence employ open source Big Data analytics to gain crucial advantage from it. Open source software and Big Data go hand in hand these days since today's applications can handle diverse data in an effective manner, as it grows exponentially in variety, volume, velocity and veracity.

• **Progressive Web Apps (PWAs):** Progressive Web Apps (PWAs) bring a mobile-app like experience to end users without any app installation requirements. Designed by Google, these apps were promoted in the Google I/O 2017 conference. PWAs take advantage of the much larger Web ecosystem, plugins, community and the relative ease of deploying and maintaining a website when compared to a native application in the respective app stores.

• **Open Source and Cyber Security:** When creating a security policy for any organisation, or when building a security operations or research centre, the prime requirement is to have the right people, processes and effective tools. The open source market is filled with lots of security tools and even Linux distributions like Kali Linux, the Parrot Security Tool Set, Network Security Tool Kit, Cyborg Hawk and many more.

• **Open Source and Virtual Reality, Augmented Reality and Mixed Reality:** Tripathi (2018) noted that recent years have seen an increased interest in the implementation and usage of virtual reality, augmented reality and even mixed reality; particularly in the areas of healthcare applications, military, fashion, sports, construction, media, telecommunications, films and entertainment, engineering and education.

• **Open Source and Cloud Computing:** Cloud computing is one of the most significant technologies to have emerged in the last couple of years and perhaps, even the next couple of years, resulting in billions of dollars in investments. The cloud computing industry is expected to touch US$ 241 billion by 2020. Common open source cloud applications are Cloud Stack, Open Nebula or Open ERP servers.

USE OF OPEN SOURCE TECHNOLOGY IN LIBRARY SERVICES

According to Ukachi (2012), open source software (OSS) is also designed to meet the needs of library patrons. The open source integrated library services have become more popular in recent years, with a number of major systems and several companies offering support (Breeding, 2011). This has compelled some academic libraries in Nigeria to introduce open source integrated systems and in services such as acquisition, cataloguing, circulation, and serials services and reports management. Nowadays, digital libraries provide an integrated set of services for capturing, cataloguing, storing, searching, protecting, and retrieving information, which provide a coherent organization and convenient access to typically large amounts of digital information (Wei, 2011).

The open source software (OSS) initiative according to Reddy & Kumar (2013) is one such development that is changing the access to information system. It is many things from openness, flexibility, adaptability, speed, support and standards, and offers many opportunities for libraries and educational institutions to embrace

automation as the facilities provided go far beyond the acts of traditional libraries (Wong & Sayo, 2010). Academic libraries that key into the movement of OSS and implement them appropriately stand to gain comparative advantage, while those that fail to take advantage of this opportunity may find their ICT development behind that of other libraries. Open source software (OSS) has become an international phenomenon that allows researchers around the world to share knowledge and skills on daily basics without barriers.

Rossi, Russo &Succi (2007) described the characteristics of open source library management software including licensing, requirements and functionality as a mile stone in information dissemination. Ukachi (2012) maintained that the OSS is designed to meet the needs of library patrons. The open source integrated library services have become more popular in recent years, with a number of major systems and several companies offering support. This has compelled some academic libraries in Nigeria to introduce open source integrated systems and in services such as acquisition, cataloguing, circulation, and serials services and reports management. Gireesh, Kumar & Jayapradeep (2015) asserted that many libraries are yet to realize the advantages of using an OSS for library management. It is an opportunity for library and information science professionals to introduce newer and customized services, cost efficiently. They maintained to in order to achieve these; the professionals are to upgrade their proficiencies and competencies in free open access software.

Examples of Open Source Software for Library Services

Njoku & Ravichandran (2017) noted that library and information centres are using various open source software for integrated library system. Below are examples of open

source software for library automation and management systems software:

- **Open source library automation software:**
  - **Koha** - is the world's first free and open source Integrated Library System (ILS). It has features suitable for library management system of various types and sizes. Koha is a browser-based using an Online public access catalogue interface. There is no cost for the license; and users have the freedom to modify the product to adapt it to your library needs. Development is sponsored by libraries of varying types and sizes, volunteers, and support companies from around the world. The strength of Koha lies with its strong community of users, libraries and businesses that contribute to its development. Koha runs on Linux, Web and Server.
  - **Evergreen-** is an open source integrated library system (ILS) software, freely licensed under the GNU GPL that helps library users locate library materials and manages, catalogue, and circulate those materials despite the size or type of the library. It runs on Linux, Windows and Mac
  - **NewGenlib (NGL)** - is an integrated library management system that provides a comprehensive support for many standards related library and information science. The Interface of is designed in such a way that even library managers without a library science background can use the system with little or no training. It provides many basic ILS functions as well as having

several social media functions built in.

- **OpenBiblio** - is an easy to use, open source, automated library system containing OPAC, circulation, cataloguing, and staff administration functionality. The purpose of this project is to provide a cost effective library automation solution for private collections and schools.

- **Opals**- Cooperatively developed, Cloud &Web-based, open source access to information databases and library collections.

- **Open source Digital library/Institutional repository software:**

  - **DSpace** - is an open source repository software package typically used for creating open access repositories for scholarly and/or published digital content. It is the software of choice for academic, non-profit, and commercial organisations building open digital repositories. DSpace preserves and enables easy and open access to all types of digital content including text, images, moving images, jpegs and data sets.

  - **Greenstone** - is open software suitable for building and distributing digital library collections. It provides a new way of organising information and publishing it on the Internet or on CD-ROM. It is open-source, multilingual software, issued under the terms of the GNU General Public License. It runs on Linux, Windows and Mac.

  - **Fedora** - open source software gives organisations a flexible service oriented architecture for managing and delivering their digital content. It is a powerful digital object model that supports multiple views of each digital object and the relationships among digital objects

  - **Eprints** - an open source platform for creating self-configuring repositories for libraries and the publishing industry

- **Open source learning management system software:**

  - **Moodle (Modular Object-Oriented Dynamic Learning Environment)** - is a free open source learning management system or e-Learning platform that serves educators and learners across the world. Moodle is a learning tool designed to provide educators, administrators and learners with an integrated system to create personalised learning environments.

  - **OLAT (Online Learning and Training)** - is an open source learning management system designed to the needs of academic institutions. It is a web application learning management system that supports any kind of online learning, teaching, and tutoring with few educational restrictions.

- **Open source electronics resource management system software:**

  - **Calibre** is a free and open source e-book library management application developed by users of e-books for users of e-books

- **eOpen source content management software:**

  - **Drupal**-is a free and open source content management

system that provides back-end for websites. It runs on linux.

- **Joomla** - is an open source platform on which Web sites and applications can be created. It is a content management system (CMS) which connects your site to a MySQLi, MySQL, or PostgreSQL database in order to make content management and delivery easier on both the site manager and visitor. Joomla's versatility, including its ease-of-use and extensibility has made it the most popular Web site software available because it is extremely customizable for different purpose.

- **Wordpress** - is an online, open source website creation tool written in PHP and MySQL. It has easy and probably the most powerful blogging and website content management system (or CMS) in existence today. Wordpress is a free and open-source content management system (CMS) based on PHP and MySQL and is installed on a web server.

Conclusion

Library as an information centre which is being established to satisfy the information needs of the users need to follow the information technology trends that is invoke in order to efficiently and effectively satisfy the needs of its users. Without these technologies and platforms, the world would be an extremely different place. While there are closed source alternatives available for some of these technologies, the entire landscape would be completely shifted if open source software was not a thing. The world would be a very different place if it was not for open source technology. Everyone wouldn't be using an iPhone, or

maybe Blackberry would never have taken a tumble in market share. Internet Explorer and Chrome would be the two dominate web-browsers, never facing any external competition for non-Apple users. The internet would be dramatically altered because there would be no Linux or WordPress. Open source technology has dramatically altered the world around us, nearly everything would be different. We would have no search engines, and the functionality of the internet would be significantly different. When something is referred to as "open source", it means that people can modify and share the code because its design is publicly accessible. Anybody can modify the code to suit their own needs.

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