A Study of the GNU General Public Licence-based Patients Information Management System to Manage Healthcare Systems

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ABSTRACT: *The GNU General Public Licence (GNU or GPL or simply GPL) is a set of widely used free software licences free to run, share, modify and update per users' requirements. Patients Information Management System is an efficient digital health records system that facilitates tracking patient information such as diagnosis, drug usage, prescription, health history, etc. This study explores and reviews the list of GNU GPL software in the healthcare domain and their comparative analysis. To find out the best FOSS software NGOs and Charitable Hospitals can use to manage their hospital management systems. The authors adopted scientific methods to select the software and visited each website to find the software documentation to collect detailed information; also, some data was collected from the website home pages. All the collected data have been entered into MS Excel; for review and comparison. This study found that OPenEMR is the best software, followed by GNUmed, OneTouchEMR and Nosh. Most of the software programs are written in Python, Javascript, PHP and Cross-platform supported, and most of the software has been released only in the last decade. All the software has the facility of Mediclaim Management interface. Also, the authors have figured out many facilities integrated with the software like inhouse pharmacy and dispensary support, HIPAA friendly, Encryption, 5010 standards, inventory management etc. This study impacts medical informatics and the healthcare sector in selecting appropriate FOSS software.*

1. Introduction

Most wealthy and developing countries' healthcare systems have faced difficulties during the pandemic. Public health record tracking is a significant issue in health care services. Many countries, mainly developing and underdeveloped countries face challenges in providing comprehensive medical care facilities to their citizens. Many factors affect the health care failure like lack of financing, weak healthcare policy, and limited technical and human resources. [1]. WHO recommends the adoption &

implementation of electronic health solutions starting from the national eHealth strategy and electronic health records, to bring positive changes to public medical care in developing countries. Information and Communication Technology (ICT) plays a crucial role in this area and has substantially transformed many domains, including healthcare, to provide medical care services efficiently and effectively. The 1960s EHR era began and healthcare professionals changed the direction toward digital format, increasing accuracy and reducing mistakes—real-time laboratory data access, patient history, and managing the administration and organisational tasks digitally. Free, open-source software has been embraced, creating new opportunities for value generation across all industries. Numerous examples of FLOSS projects and products are currently successful, including LINUX, Android, Open/Libre Office, MySQL, the Apache Web server and hundreds of embedded GNU/Linux kernels in various devices [3]. The most general free software licence means that the user should have access to the source code. The developers also include a legal disclaimer granting users permission to copy, modify and redistribute the software; this legal statement either sats that the source code is released in the public domain in nations where such provisions s allowed or it is an NGO without any government role. A large hospital, sometimes known as a charity hospital, is a non-profit facility that offers care to these hospitals is generally lower than at for-profit hospitals. The income from fees is reinvested in the hospital for services development, which has played a significant role in the healthcare sector in many countries; this research aimed to identify GNU General Public Licence patients information management systems to manage NGOs and charitable trust hospitals and the attributes of the free software development model for health information systems. Additionally, the authors of this paper review the evolution of FOSS in healthcare over the past ten years and summarise the state of the art in this field.

2. Literature Review

Developed countries see the incredible impact of ICT on clinical practice and the quality of health services. Many nations experience economic and social problems that limit their ability to benefit from ICT tools. As per Syzdykove et al. [5], the main barrier to adopting HER software in low and middle-income countries is the cost of its purchase and maintenance, highlighting the open-source approach as a good solution for these underserved areas. The systematic study of giving open sources of electronic health record systems. They have an evaluation methodology allowing assessment of key aspects like integrated applications, configurable reports, customer reports, interoperability patient portal, access control model, cryptographic features, web client, user interface etc. Free open-source software still has a minimal user base, and usage and penetration statistics are not accessible. Still, there has been a considerable increase in the previous five to ten years. Most IT-related industries, such as telecommunications and embedded devices, heavily rely on FOSS concepts, yet the healthcare sector needs to catch up to this development. Karopka et al conducted a study to analyse open and collaborative health informatics, the role of free/libre open sources principles contribution of the IMA open-source health informatics working group. They list FLOSS-related trends in healthcare that the IMIA open-source working group members expect to see. The authors contend that an ecosystem viewpoint is pertinent and that FLOSS principles are best suited to develop health IT systems that can change over time following advancements in medical knowledge, technologies, insights, processes etc, Istrate & Moldovab conducted a study on the free software model of development in the area of medical informatics. The study aimed to pinpoint the key characteristics of the free software development approach for health informatics projects used to computerise a doctor's office or a small clinic that guarantees their success. The data regarding the user community, internet sources, user interface ergonomics documentation, and hardware requirements are presented in the article. Srivatava [6] conducted a study to create a roadmap for adopting Electronic Health Records in India based analysis of the strategies of other countries and national scenarios of ICT use in India. Compared to other nations, the country has a lower level of ICT use in the healthcare industry. To take advantage of the potential provided by ICD, the Union and State Governments are working on several fronts. Private sector hospitals also implement ICT projects such as computerised patient records.

3. Objectives

The study aimed to conduct a systematic review and explore GNU General Public Licence patient information management systems in the healthcare domains' comparative analysis of the software to find the best FOSS in this domain.

4. Methodology

The authors adopted the scientific method to select the software for this study. To find out the GNU GPL licence software, the authors did a literature review in this domain and visited each website to find the software documentation to collect detailed information. Also, a few data have been collected from the software home pages, Authors have collected technical information; which types of the facility have been implemented and which standard has been followed by the software? All data have been

collected on MS Excel for review and comparison. The authors present the software information in Table 1 and Table 2.

5. Discussion & Suggestion

In this study, the authors have selected fifteen GNU General Public Licence software used in the Patient & Hospital management organization. All software is freely available & open sources all belong to GNU GPL family. Table 1 contains basic and technical information about the software, like the name of the software, maintainers and developers, programming language used, the licensed family, the present version which the operating system supports, release data and the software website. Other data includes URL, language and a few more. Based on the technical fane facility available, OpenEMR is the best software, followed by GNUmed, Onetouch EMR and Nosh. Most of the software is developed in Python, Javascript & PHP languages. Some of the software used newly emerged programming languages cush as MUMPS (World VistA), wxPython (GNUmed) Ext JS (GaiaEHR) etc. Most software is developed by an open community or based on open projects. All the studied software are under an open licence GNU GLP V2.0 and V3.0 and belong to various GNU families. The developer community frequently updates software as per requirement. Most software is supported by cross platforms (operating systems) like Unix like, macOS and Windows—the maximum number of software released during the last decades. Most of the software is supported by multilingual, and English is the most common language.

In Table 2, the authors have provided the facilities available on the software. Facilities like the medical claim management interface are integrated, whether the software supports the Inhouse pharmacy and dispensary facility, whether the mobile web interface is available or not, change and messaging facility is available. The software is HIPAA-friendly (health insurance portability and accountability). Integrate with the patient facility is available or not encryption & decryption security is enabled or not whether through the software generates lab orders, whether 5010 standards are followed, inventory management or not, which organisation used this software and multimedia platforms support or not.

We arrive at the below issues for better study and understanding.

To develop a digital preservation strategy demonstrating that such funds can be used responsibly and consistently.

The preservation of digital materials for current and future use.

To identify the properties of particular classes of resources that need to be preserved.

To assist agencies in designing digitisation programmes.

To provide a comprehensive statement on digital preservation.

6. Digital Preservation Policy

There are many benefits to having digital preservation policies at each institution, including making digital materials available for current and future use, providing comprehensive statements regarding this theme, and planning coherent preservation efforts. Further, by formulating policy, it is possible to address complex problems like the short-term life and small capacities of digital materials, the obsolescence of the hardware and software needed to access them, and the structural and technical heterogenity of the various types of digital materials.

7. Conclusion

Library and Information resource centers have exciting opportunities to develop a global knowledge base due to recent information and communication technology trends. Library and archival institutions face a significant challenge regarding digital preservation. To protect intellectual property and preserve physical and technical assets, it is necessary to establish principles, policies and strategies that guide the activities. A methodology has been presented in this paper for enhancing existing offerings and creating new ones. Although these offerings will undergo transformations, we are building them in the belief that users in centuries to come will appreciate our early collaborations in digital preservation.

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