Chapter 41
Open Source Technology for Medical Practice in Developing Countries

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ABSTRACT

The purpose of this chapter is to provide an overview of the role of open source technologies within medical practice in developing countries. First, the background and meaning of "open source" principles is explored. Second, several fields of open source implementation are described. These include open source software, hardware, and digital content. Within each field, specific case studies are given to illustrate how the technologies have been adapted to the developing world for usage in information and communication sharing, electronic data management, mobile data collection, disease mapping, scholarly publication, and education. The issues and controversies, as well as future research directions and solutions are addressed.

INTRODUCTION

In the complex and ever-changing field of health care, electronic data management and information sharing is crucial to providing reliable, current, and accessible information to guide clinical decision-making, research, health policy, and public understanding. In developing countries, health information systems are challenged by inadequate health delivery infrastructure as well as poor monitoring and evaluation practices. These issues may be attributed to several factors including limited capacity, unreliable Internet connection, high cost of acquiring software systems, and lack of interoperability and scalability of existing systems. Open source represents an innovative and promising solution to addressing these problems. Open source principles are increasingly being adopted across a variety of domains and the field is rapidly growing and changing. This objective of this chapter is to discuss the current state of

the open source phenomenon within medical practice in developing countries. The chapter sections are outlined as follows: a background providing a brief history and overview of the open source movement; an overview of several domains of open source technologies, including: software, hardware, and digital content; discussion of the challenges and limitations of open source technologies that are specific to developing countries as well as to the field of healthcare; summary of chapter highlights and take-home messages; proposed solutions and guidance for the improvement and successful implementation of future open source projects; and an overview of the current gaps in research literature, as well as suggestions for further investigations of open source implementation in healthcare within resource-constrained regions.

BACKGROUND

The Open Source Movement is a worldwide effort founded on the belief that the best way to engage potential software developers and produce high-quality, far-reaching, bug-free software is by the sharing and collaborative improvement of software source code. The term "open source" does not simply imply open access. To truly fit the open source definition, products should also comply with the following criteria: free redistribution of the product and source code, allowance of modifications and derived works, and no discrimination against certain groups of people or fields. In addition, licensing of open source programs should follow certain requisites. For instance, licensing rights of a program must also apply to all whom the program is redistributed, must not be specific to a product, must not restrict other software, and should not be based on any individual technology (Open Source Initiative, 2012b).

While the ideals of sharing and collaborative development of software source code have been present since the beginning of software development, the Open Source Movement and the designation of "open source" as a label officially started gaining momentum in the late 1990s with the origination of the mainstream open source operating system, Linux, as well as the release of the Netscape source code (Open Source Initiative, 2012a). In 1998, the movement was undertaken by the Open Source Initiative (OSI), a group in Palo Alto, California (Open Source Initiative, 2012a), who then coined the Open Source Definition (OSD), the gold standard for open-source licensing criteria (Open Source Initiative, 2012b).

While proprietary products are maintained only by the developer and must be purchased for use, open source refers to freely available source code that anyone can utilize, modify, and redistribute. The terms open source software (OSS), Free and Open Source Software (FOSS), and Free, Libre and Open Source Software (FLOSS) are used somewhat interchangeably, but are slightly different (Aminpour et al., 2014). With rising recognition of its potential, the open source model has spread well beyond software to include efforts in open source hardware as well as open source digital content (Dibona et al., 2010; Proffitt, 2012), with collaborative web platforms such as wikis and open journal systems for open access publishing (Archambault et al., 2013; Paton et al., 2013).

OPEN SOURCE TECHNOLOGIES

Open source technologies are tools that embrace the open source criteria such that anyone may use, amend, or distribute the applications and/or information. The open source principles can be applied to

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