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Open-source health information technology: A case study of electronic medical records



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Abstract

Objectives: Open-source software (OSS) has achieved widespread adoption in many domains such as server operating systems, enterprise tools, and databases. We review the status of open-source in healthcare and discuss the potential of open-source to resolve some of the challenges surrounding the wide adoption of Health IT in North America. Specifically, we address aspects that are unique to using open-source in ambulatory care. We present the case of a Canadian open-source electronic medical record system (EMR) named OSCAR that is widely adopted by primary care units and family physicians in Canada.

Target audience: Health practitioners, health technology managers and policy makers.

Methods: A case study based on semi-structured interviews with various stakeholders of the EMR including users (medical and staff), developers, and service providers. In addition, we assess arguments presented in the literature for and against open-source software in healthcare in light of the OSCAR EMR.

Results and conclusions: Open-source development provides a unique platform that enlists contributions from various stakeholders toward creating a common good. As evident from the OSCAR case, the dynamics of OSS development are potential solutions for the low adoption of technology in healthcare. In particular the low cost of acquisition and maintenance, the high degree of customizability, and the community of users are important advantages of OSS EMR. On the other hand, the lack of understanding of OSS model and the unavailability of trusty support providers are unique challenges facing OSS EMR.

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Introduction

Open-source software (OSS) development has gained momentum and emerged as a serious competitor to traditional proprietary software. Adoption of OSS has gained a strong foothold in public sector and academia [1], however in healthcare, open-source has yet to gain wide acceptance. Commercial adoption of OSS is still not fully understood because of the complex and novel issues surrounding open-source [2]. For example, several open-source healthcare IT (HIT) systems developed in North America are still not widely adopted [3,4]. There is an increasing interest in OSS in healthcare. The unique characteristics of OSS represent potential solutions for hurdles associated with adoption of EMR systems [5]. Such characteristics include: low cost of acquisition and maintenance, a greater possibility of customization, and a lower exposure to vendor failure and product termination. At the same time, there are distinct challenges that face open-source health IT. They include the lack of familiarity with the open-source development model, a poor integration with existing vendor-based health systems, a fragmented development effort, a limited number of support providers, an absence of a clear software development roadmap, and the lobbying and marketing power of commercial vendors of HIT [6].

This paper examines a specific case of open-source HIT in ambulatory care. OSCAR, a Canadian open-source Electronic Medical Record (EMR), has been in existence for a decade and is currently used by over 1500 Canadian doctors to follow over a million patients. The OSCAR EMR is freely available open-source software and is gaining market share against commercial products typically costing thousands of dollars per year. Furthermore, contrary to other open-source projects, OSCAR is embedded in a community of doctors rather than a community of programmers. The community is active both face to face via user meetings and online via discussion forums. Given the complexity of such software, the mission-critical nature of patient records, and the fact that the vast majority of medical users are not computer savvy, this success is unusual and significant. Following this introduction, we outline the obstacles impeding the adoption of HIT and the arguments for and against open-source in healthcare. We then present the case study of OSCAR and reflect on how OSCAR may realize the benefits and respond to the challenges of open-source HIT.

Challenges of wide adoption of health IT

The use of technology in healthcare is associated with many advantages such as cutting down healthcare costs and improving the quality of care. It is estimated that, by improving health care efficiency and safety, the widespread adoption of electronic medical record (EMR) in the United States can save more than \$77-\$81 billion annually. In ambulatory care, EMR systems are found to reduce the number of unnecessary or marginally productive visits by 9% [7]. In hospitals, the implementation of integrated physician order entry (CPOE) and ICU physician staffing (IPS) is associated with improving patient safety and reducing cost. Such systems could save over 65,000 lives, prevent over 907,000 serious medication errors, and save approximately \$9.7 billion annually [8,9].

In spite their advantages, HIT are not widely adopted in North America compared to other organizational information systems such as enterprise resource planning (ERP) systems. For example, in a 2008 national survey, only 4% of physicians in the United States reported having a fully functional EMR system and 13% reported a basic system [10]. Only 1.5% of US hospitals reported having a comprehensive EMR system and 7.6% had a basic system. Computerized physician order entry (CPOE) systems were implemented in 17% of US hospitals [11]. During the last five years, the adoption of health records grew rapidly in the US and Canada, in part because of government push and support [12]. As of 2013, only 44% of US hospitals have a rudimentary EMR and 5% have a full-fledge one [13].

There are many challenges that face the widespread adoption of IT in healthcare [10,11]. The decision to adopt HIT depends on the characteristics of the innovation, the characteristics of the organization, and the characteristics of the external environment [14]. Those characteristics along with interconnections with economics and politics, make introducing change difficult in healthcare [15]. Barriers against wide adoption of HIT exist from both providers and consumers' perspectives. Providers of healthcare include both large institutions such as hospitals and small providers such as independent physicians and small clinics. Several issues must be addressed to promote successful adoption of electronic medical records (EMR) in clinics: financing, interpretability, standardization, and connectivity of clinical information systems, training and technical support [16]. Those issues are similar for hospitals but on a more complex and larger scale where various stakeholders are involved in the process [17].

Cost

Cost is the primary barrier to adopting HIT systems [12]. A recent estimate of the cost of purchasing an EMR in the US is \$15,000 to \$50,000 per physician [18]. Operating costs may reach \$20,000 per year [19]. Costs soar when the system is implemented in a larger organization. For example, a computerized physician order entry (CPOE) project took three years to complete and cost \$18 million dollars in 1995 money [20]. Nationwide implementations require a huge investment to be realized. For example of, the Quebec Health Record had an initial budget of \$562 million [21,22].

Complexity

HIT systems should be user-friendly and intuitive in order to reach wide acceptance and save on learning time, an important factor for adoption. As an example, the transition to an EMR system in one clinic slowed the work of physicians and resulted in a 10-20% reduction in productivity for a period of months or more [23]. Other research reports major slowdowns at the initial stages of adoption [16]. Customizability is also required because of the richness and diversity of medical practices. HIT systems should disguise their complexity to their users. This can be achieved via careful design of the user interface and allow for a high degree of customization in order to match the needs of different groups of users [24].

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