Chapter 34

Towards a Healthcare Interoperability Framework Based on Medical Business Artifacts, Social Networks, and Communities of Healthcare Professionals

Zakaria Maamar
Zayed University, U.A.E

Yousef Baghdadi
Sultan Qaboos University, Oman

ABSTRACT

This chapter looks into the challenges facing healthcare Information Systems interoperability from a technological perspective and how to address some of these challenges using three concepts, namely medical artifacts, social networks, and communities. Medical artifacts represent chunks of information that healthcare practitioners act upon and exchange as part of their daily activities. Social networks reflect interactions occurring between these practitioners when performing joint activities. Finally, communities illustrate pockets of expertise capable of collaborating with respect to pre-defined protocols.

INTRODUCTION

According to a 2009 report published by the World Health Organization\(^1\), `Globally in 2006, expenditure on health was about 8.7% of gross domestic product, with the highest level in the Americas at 12.8% and the lowest in the South-East Asia Region at 3.4%. This translates to about US$716 per capita on the average but there is tremendous variation ranging from a very low

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Spending on healthcare systems worldwide continues to surge in spite of the limited number of funding bodies besides governments. Healthcare systems have to include state of the art technologies and equipments to keep up the pace with the demands of a growing population and address the risks that diseases put on the welfare of this population. The rapid widespread of some diseases and scarcity of appropriate medical facilities in some countries are examples of challenges that healthcare stakeholders face daily. In addition the lack of a common healthcare systems interoperability framework undermines regularly the efforts put into offering better services that spread over multiple stakeholders. These systems are simply not meant to collaborate making any cross-system scenario tedious and error prone.

In this chapter we introduce two concepts upon which a new generation of healthcare systems can be built. The first concept refers to business artifacts (Cohn and Hull, 2009), which we rename into medical business artifacts (or medical artifacts for short) because of the nature of our application domain. A medical artifact represents a chunk of information that healthcare stakeholders act upon and exchange when completing their activities. The second concept refers to communities of healthcare professionals. Communities represent pockets of expertise by gathering healthcare professionals who practice in the same field so they can establish relationships (e.g., collaboration, referral, substitution) within and across communities.

For efficiency and traceability purposes, we ensure that the interactions between healthcare professionals are in line with specific relationships that connect them together. These relationships are established depending on the nature of communities involved and reported in a structure, which we refer to as social network (Ethier, N/A). We identify different types of social networks in the healthcare field for example those that facilitate the collaboration of professionals with different backgrounds in case of major medical case, and those that permit the substitution of professionals with similar backgrounds in case of leave of absence. Moreover we propose that the communications between the healthcare professionals within and across the communities happen through a dedicated management space (Maamar et al., 2001). In this space the stakeholders act upon the medical artifacts by creating them, posting them, locking and unlocking them, consulting them, archiving them, and deleting them when necessary. All these operations take place in accordance with strict policies that guarantee patients’ privacy.

This chapter proposes a healthcare systems interoperability framework in which (i) the medical artifacts are data elements to exchange between stakeholders, (ii) the communities establish relationships between stakeholders, and (iii) the social networks regulate these relationships by keeping track of who is working with whom, who has the required expertise, etc. The remainder of this chapter is organized as follows. Next we define some concepts and propose a literature review on some related works. Afterwards we discuss how medical artifacts and social networks can go hand-in-hand. Prior to concluding, we illustrate how the framework can be put into action.

**BACKGROUND**

**Definitions**

Interoperability is the ability of independent systems to collaborate in spite of heterogeneity and distribution obstacles. A formal definition is given in (Touzi et al., 2007) where interoperability is *the ability of a system or a product to work with other systems or products without special effort*. Independently of the application domain interoperability raises almost the same set of issues, which are lack of agreed upon data semantics and ways of doing things, limited access to third parties’ resources, and policy incompatibilities.