Chapter 15
Evolution of Information Systems and Technologies Maturity in Healthcare

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ABSTRACT

Information Systems and Technologies (IST) in healthcare have evolved gradually, and theories about IST adoption and maturity are sufficiently established in the literature of organizational management. This paper examines the evolution of IST in healthcare. The author introduces concepts associated with maturity models, addresses the generic maturity model for IST management, and presents the main maturity models, specifically focusing on the management of IST in healthcare. Widespread and detailed maturity models are not fully available, and the opportunity to develop new maturity models that focus on IST management in healthcare still exists.

1. INTRODUCTION

The field of Information Systems and Technologies (IST) in healthcare has gradually evolved. It is a very broad field, including advances like, for example, computerized diagnostic, decision support systems for medicine based on evidence, Electronic Health Record (EHR), inter-regional, national and international units of healthcare providers, medical imaging technology, for example Picture Archiving and Communication Systems (PACS), and images to guide surgery and therapy (Mullner & Chung, 2006; Wetering & Batenberg, 2009).

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Since the seventies of last century, theories about adoption and maturity of information systems and technologies are sufficiently established in the literature of management. The concept of the hypothesis of maturity/growth stages in the field of information systems and technologies was introduced by Nolan (Nolan, 1973). The maturity models of Nolan (1973, 1979) for information systems and technologies management instigated extensive discussion, with many researchers conducting studies to validate it, which led to several extensions of the model and even new models (King & Kramer, 1984; Earl, 1989; Galliers & Sutherland, 1991; Mutsaers et al., 1997; Khandelwal & Ferguson, 1999). In the field of IST in healthcare, although more recent, there are also

some maturity models, from specific focus models (Wetering & Batenburg, 2009) to generic focus models (Sharma, 2008; Filterrer & Rohner, 2010).

A maturity model shows the transformation and improvement of an organization over time. Maturity models are used in contemporary methodologies to establish goals for achieving and measuring progresses (Becker et al., 2009). Overall, the maturity models focus on information systems and technologies provide an overview of the structure of elements that represent the effectiveness of management processes of the information systems and technologies in organizations.

With this paper we intend to make a progress report of the situation of the maturity models focusing on the IST management in healthcare, aiming also to verify the opportunity and/or strategies for the development of better models. Therefore, we discuss the evolution of IST in healthcare, introducing the concepts associated with maturity models, addressing the generic maturity model for the IST management and presenting the main maturity models focusing on the IST management in healthcare. We conclude by identifying its major gaps and pointing out future work in order to mitigate them.

2. EVOLUTION OF INFORMATION SYSTEMS AND TECHNOLOGIES IN HEALTHCARE

The Information Systems and Technologies in healthcare are relatively recent. Probably not even arrive at five decades, but they were from the beginning, an enormous progress in healthcare and information technology. Haux (2006) identified several progress lines:

- Moving to a generalized treatment and storage-based computer, as well as an increase in data processing;
- Change of a local architecture of information systems to a global architecture;
- Use of data not only for administrative purposes and provision of healthcare but also for healthcare planning and clinical research;
- Shift focus from technical problems particularly, to change management problems as well as problems concerning the strategic management of information;
- Shift from predominantly alpha-numeric data for clinic pictures and also molecular data;
- And a constant rise of new technologies to be included with the purpose of allowing a continuous monitoring of patients health status.

Lines of similar developments can be found in other author's works. For example, Voguel (2003) presents different levels of investment in information systems and technologies in healthcare. In each subsequent stage the expectations raise, being produced more complex systems environments. Consequently it is expected that the information systems and technologies provide a better performance for healthcare organizations.

3. MATURITY MODELS

The maturity models are based on the premise that entities (people, organizations, functional areas, processes, etc.) evolve through a process of growth or development towards a more advanced maturity, across a number of distinct stages. These models have been used in various areas and have been used to describe a wide variety of phenomena (King & Teo, 1997; Becker et al., 2009).

Maturity models assume that there are predicated patterns, conceptualized in terms of stages, on entities development (Rocha & Vasconcelos, 2004). Typically, the stages are: (1) by nature, sequential and cumulative; (2) occur as a hierarchical progression that is not easily reversible; and