# Chapter 36
# Cloud Services for Healthcare:
## Insights from a Multidisciplinary Integration Project

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## ABSTRACT

*Healthcare organisations are forced to reconsider their current business practices and embark on a cloud adoption journey. Cloud-Computing offers important benefits that make it attractive for healthcare (e.g. cost effective model, big data management etc.). Large Information Technology (IT) companies are investing big sums in building infrastructure, services, tools and applications to facilitate Cloud-Computing for healthcare organisations, practitioners and patients. Yet, many challenges that such integration projects contain are still in the e-health research agenda like design and technology requirements to handle big volume of data, ensure scalability and user satisfaction to name a few. The purpose of this chapter is (a) to address the Cloud-Computing services for healthcare in the form of a Personal Healthcare record (PHR) and (b) demonstrate a multidisciplinary project. In doing so, the authors aim at increasing the awareness of this important endeavour and provide insights on Cloud-Computing e-health services for healthcare organisations.*

## INTRODUCTION

The introduction of Cloud-Computing and its business models have been some of the biggest changes impacting not only the IT sector but also several others including healthcare. The impact of Cloud-Computing on healthcare can be characterized as a positive change as it provides integration at a manageable cost and it introduces a new market of services. These two issues will be analyzed in the following paragraphs.

Doctor's clinics, hospitals, and healthcare organisations (e.g., insurance bodies) require fast access to medical data, computing and large storage facilities which are not provided in the traditional settings (e.g., legacy systems). Additionally, in today's fast communication world medical data needs to be shared across various settings and geographical locations in a fast secure way without limitations (e.g., errors, cost) that might cause significant delay in treatment and loss of time. Recently, cloud technology has started replacing legacy healthcare systems and offers easier and faster access to medical data (e.g., exam results, patients history, etc.) as defined by the way it is stored (e.g., public, private or hybrid). Literature depicts that Cloud-Computing offers significant benefits to the healthcare sector with its business (e.g., pay-as-you-go) model and integration capability (Kuo, 2011). Renowned global IT players like Microsoft, Oracle, Amazon have already heavily invested in more powerful, reliable and cost-efficient cloud platforms, extending their new offerings for e-health services, such as Microsoft's HealthVault, Oracle's Exalogic Elastic Cloud, and Amazon Web Services (AWS) (Zhang, Cheng, & Boutaba, 2010).

The integration that can be achieved from such Cloud-Computing healthcare services is conceptualized under the term integrated patient centered care (Leventhal, Taliaferro, Wong, Hughes, & Mun, 2012). Integrated patient centered care reflects on integrated Healthcare Information Systems (HIS) (with elements as e-health cloud services) requiring coordination across professionals, facilities, support systems that is continuous over time and between patient visits (Singer et al., 2011). This approach is observed on national healthcare strategies that encourage patient involvement in their healthcare treatment. For example, the American Recovery and Reinvestment Act of 2009 (ARRA) laid down by the U.S. government is encouraging businesses in the healthcare industry to utilize certain applications of electronic records (Black et al., 2011). Following similar legislative opportunities worldwide, patients increase their involvement with cloud healthcare services (Axelsson, Melin, & Söderström, 2011). This is a growing involvement, seen in parallel with mechanisms for the collection of information (obtained by mobile and other sources) in order to develop an enhanced, complete and integrated view of citizens health status.

This is an emerging area of e-health and a new market segment for contemporary organizations, given the term m-health (Chatterjee, Chakraborty, Sarker, Sarker, & Lau, 2009). According to a recent report m-health applications that are published on the two leading platforms, iOS and Android, has more than doubled in only 2.5 years to reach more than 100,000 apps (e.g., 1st quarter of 2014) with a market revenue of USD 2.4bn in 2013 and projections to grow to USD 26bn by the end of 2017 (Research2guidance, 2014). The major source of income for m-health application publishers will come from services (69%). These services typically involve backend structures of servers and/or teams of medical staff which monitor and consult with doctors, patients and general healthcare-interested individuals. Sarasohn-Kahn (2010), identified that a major mobile application vendor provides 5,805 health, medical and fitness applications with 73% of them used by patients and 27% by healthcare professionals (Sarasohn-Kahn, 2010). A big advantage to the growth of this market is the parallel advance of the smartphones. Evidently, the latest generation of smartphones is increasingly viewed as handheld computers rather

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