

# Defining and Characterising the Landscape of eHealth

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## INTRODUCTION

The need for reforming the delivery of healthcare services to accommodate the needs of modern societies is being experienced on a global scale. Government expenditure for the healthcare domain is increasing on a yearly basis (Bergamo, 2015). Population figures are growing with a reported increase of one billion people within the next 15 years, reaching 8.5 billion in 2030 (UN, 2015). Such a rapid increase in population is placing pressure on existing resources for healthcare (Keehan et al., 2015), thereby stressing the need for healthcare services to be reformed. Within the rapid rates of population growth, the fastest growing segment in the European population is the over 65 age group (Coale and Hoover, 2015), a group which utilises three to five times more healthcare services than their younger counterparts. Additionally, disease growth is on the increase as population rates incline. Despite the major progress in reducing death rates from various diseases, dramatic changes in global diseases have occurred whereby diseases have shifted to more lifestyle-related diseases (e.g. obesity, chronic obstructive pulmonary disease, type 2 diabetes and heart disease). Issues such as expenditure, population and disease growth enhance the need to reform the delivery of healthcare services. It is recognised that Information Systems (IS) is a critical success factor in the achievement of health care reform goals (Heeks, 2006) as the general use of IS globally is a powerful driver for change across

the healthcare industry. Advantages of successfully implementing IS within the healthcare domain are reported in literature. These include reduced time to diagnosis, improved access for patients to care, quality of life and patient satisfaction, enhanced healthcare provider decision making, increased accuracy in medical treatment and cost-savings (Bergamo, 2015).

Hospital Information Systems (HIS) were the main and earliest use of IS in healthcare (Reichertz, 1975). Prior to 1960, electronic computers were not in general use in hospitals (Austin and Greene, 1978). From these early days HIS were defined as systems for “transmitting data among various personnel in different support units of the hospital” which ultimately seeks to “integrate all elements of information processing related to patient care into one system with a shared database” (Barnett and Zielstorff, 1974, p. 158). This definition of HIS has been used as a guide to defining the various eHealth technologies which subsequently emerged. However, since the 1970s HIS have evolved by incorporating other types of eHealth technologies, e.g. electronic medical records or electronic health records (EHR), electronic clinical decision support systems (CDSS), which has resulted in the varying definitions we observe in literature today.

Building from this, the objective of this paper is to define and characterise the landscape of eHealth technologies from an Information Systems (IS) perspective. The next section defines and characterises the concept of electronic Health (eHealth).

In doing so, various features and functionalities of eHealth technologies are reported. It is argued that the evolving nature of technological artefacts influence how the term eHealth is defined. In light of this, the concepts of eHealth integration and ontologies are subsequently discussed. Concluding this chapter is an overview of both academic and practitioner-orientated contributions and future eHealth research directions.

## BACKGROUND

Although the term electronic health or ‘eHealth’ first emerged in the literature circa 1999-2000 (Eysenbach, 2001; Ahern et al. 2006) the use of IS within the healthcare system occurred well before then (Blum, 1984). According to Goldschmidt (2005) the first electronic health record was designed and deployed in the late 1960s-1970s, thirty to forty years before the term eHealth was coined. Since the turn of the 21<sup>st</sup> century the term eHealth has received attention in both academia and practice. Subsequently, eHealth has been defined by many people but a lack of evidence as to the existence of a comprehensive definition has emerged (Della Mea, 2001; Oh et al., 2005; Pagliari et al., 2005; Boogerd et al., 2015). To address this issue, journals such as “Journal of Medical Internet Research” published papers which explicitly sought to clarify what is meant by eHealth (cf. Oh et al., 2005; Pagliari et al., 2005) as part of its “What is eHealth” series leading to various reports about definitions concerning eHealth. For example for Ontario Hospital eHealth Council, eHealth is a consumer-centred model of health care where stakeholders collaborate, utilising ISs, including Internet technologies to manage health, arrange, deliver and account for care, and manage the health care system (Alvarez, 2002). The Internet clearly drives the development and adoption of eHealth applications; standing alone, it has the reach, the infrastructure, and the acceptance to achieve widespread change. Similar to this definition, Eng (2001) describes eHealth as the utilisation of emerging IS, especially the Internet, to improve or

enable health and healthcare. While many definitions for the term eHealth were proposed, it was the work of Della Mea (2001) which received the most attention as he described eHealth as a broad term that encompasses multiple domains (Boogerd et al., 2015). Over ten years later, and due to the rapidly changing field of eHealth, Boogerd et al., (2015) argues that a clear, uniform definition for eHealth still remains to be identified with many terms (such as Medicine 2.0, Health 2.0, mHealth) being used interchangeably.

For the purposes of this paper, eHealth is expressed as an umbrella term which encompasses three domains (i.e. business, clinical and consumer). According to DeLuca and Enmark (2000) business eHealth refers to systems focusing on financial and administrative transactions required to conduct the daily operations of healthcare whereas clinical eHealth refers to systems focusing on transactions which involve the collection, transmission and analysis of electronic health-related data by healthcare professionals. Consumer eHealth engage patients (i.e. consumers) in managing their own health care, to facilitate communication with providers and social networks, meeting their informational needs, making knowledgeable health decisions, using patient education resources, and promoting healthy lifestyles (Kreps and Neuhauser, 2010). Building from this, eHealth is defined as “*the use of any information technology by various stakeholders which transmits, stores, searches, and/or retrieves digitised data electronically for business, clinical and/or consumer purposes*” (adapted from De Luca and Enmark 2000; Della Mea, 2001). Further, the World Health Organisation (WHO) defines eHealth as “the transfer of health resources and health care by electronic means... encompasses three main areas: (1) The delivery of health information, for health professionals and health consumers, through the Internet and telecommunications; (2) Using the power of IT and e-commerce to improve public health services, e.g. through the education and training of health workers; (3) The use of e-commerce and e-business practices in health systems management. This

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