

## Chapter 9

# New Perspectives on Sustainable Healthcare Delivery Through Web of Things

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### ABSTRACT

*This chapter focuses on examining the adoption of the web of things paradigm in healthcare in order to facilitate the development of new web-based systems in more effective and efficient ways. Nowadays, the increasing number of personal health sensors and medical devices present the opportunity for healthcare providers to interact with patients in entirely new ways. In this context, the WoT paradigm could be closely linked to patient care and has the potential to generate changes in healthcare. WoT could also be applied in the social and insurance fields, etc. The social web of things (SWoT) further extends WoT in order to facilitate continued interaction between physical devices and humans, allowing the integration of smart objects with social networks. Although it opens new social possibilities, it was less applied in the delivery of healthcare. Nevertheless, its successful adoption depends on overcoming some open challenges.*

### INTRODUCTION

In order to increase the overall quality of patient care, and also to reduce costs, the healthcare industry is constantly bound to adapt to the many occurring changes, from advances in diagnostic and therapeutic procedures to state of the art information technology.

Various worldwide surveys conducted in relation to this field reveal that one of the biggest technological initiatives in the healthcare industry is the Internet of Things (IoT) (Anon-a, 2015; Anon-b, 2015). And, inspired by the IoT concept, a new application development paradigm emerged in recent years, the so-called Web of Things (WoT). WoT enables connections and interactions with various physical

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things (such as medical devices, sensors, etc.) the same way as any other Web resource (Anon-c, 2017; Guinard & Trifa, 2009; Guinard & Trifa, 2016; Raggett, 2015a; Raggett, 2015b; Zeng, Guo & Cheng, 2011; Bovet & Hennebert, 2013; Guinard, Trifa, & Wilde, 2010; Guinard, Trifa, Mattern & Wilde, 2011; Trifa, Wieland, Guinard, & Bohnert, 2009), so the physical things become an integral part of the Web (Guinard et al., 2010).

Several papers and studies have focused on this new paradigm and the ways in which it can be applied in various fields. This chapter focuses on examining the challenges of adopting WoT in healthcare field in order to facilitate the development of new Web-based systems in more effective and efficient ways. We also present some WoT platforms and various enabling technologies that could be exploited in order to extend the current applications in the healthcare area and align them to the perspective of the new WoT paradigm. The movement of healthcare out of healthcare facilities (hospitals, laboratories, etc.) and into people's homes will be greatly facilitated by the latest remote sensing devices of all kinds connected to physicians and care givers. The examples are numerous and the potential for cost savings and improved care is overwhelming. Social Web of Things (SWoT) further extends WoT in order to facilitate continued interaction between physical devices and humans, opening up new social possibilities. Thus, social networks can be used for storing and sharing information of interest for WoT interactions. In order for things in WoT to understand each other, sharing a common understanding of the structure of information is required. We highlight the lessons to be learnt from the past, open challenges and some possible directions for future research.

The aim of this chapter, completely aligned with the purpose of the volume, is examining the adoption of WoT in healthcare. The authors provide an overview of the impact WoT can have in healthcare and the inherent challenges to be addressed in order to make its adoption a reality in the field.

## **BACKGROUND**

Nowadays, advent of digital technology, fast growing number of available low-cost consumer grade smart devices and pervasive use of heterogeneous sensors (such as temperature, pressure, humidity, accelerometers, gyroscopes, altimeters, etc.), facilitate continuous development of IoT and WoT in various fields (Bi, Da Xu, & Wang, 2014; Cai et al., 2014; Po Yang & Wenyan Wu, 2014; Wang, Bi & Da Xu, 2014), particularly in healthcare (Amendola, Lodato, Manzari, Occhiuzzi, & Marrocco, 2014; Daniel, Casati, Silveira, Verga & Nalin, 2011; Fan, Yin, Xu, Zeng & Wu, 2014; He & Zeadally, 2015; Li et al., 2011; Li, Li & Zhao, 2014; Zheng, Martin, Brohman & Xu, 2014; Xu et al., 2014; Yang et al., 2014). Advances in IoT/WoT technologies enable the development of new systems, that could deliver various medical services (e.g., patient monitoring or even medical care providing) to anyone at any time and in any place (even at any distance). According to a survey conducted by Forrester Consulting on behalf of Zebra Technologies (Anon-a, 2015), 97% of the surveyed healthcare industry professionals agree that IoT is the most strategic solution their organization will undertake this decade. Nine of ten healthcare IT departments are ready to make the necessary changes in order to implement IoT solutions. Over half of the healthcare organizations surveyed have already begun implementing IoT solutions in their practice, and another 30 percent of all respondents are planning to do so within the next year. Around the world, there are some success cases and best practices that have been used as examples for the adoption of WoT in healthcare. Thus, in recent years, a wide range of healthcare IoT/WoT applications have been

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