

## Chapter 7

# Application of Technology in Healthcare: Tackling COVID-19 Challenge – The Integration of Blockchain and Internet of Things

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### **ABSTRACT**

*The COVID-19 pandemic has disrupted healthcare worldwide and laid several fundamental problems that will have to be tackled to ensure high-quality healthcare services. This pandemic has represented an unparalleled challenge for healthcare systems and poses an opportunity to innovate and implement new solutions. Digital transformation within healthcare organizations has started and is reshaping healthcare. Technologies such as blockchain and IoT can bring about a revolution in healthcare and help solve many of the problems associated with healthcare systems that the COVID-19 crisis has exacerbated. In this chapter, IoT and blockchain technologies were discussed, focusing on their main characteristics, integration benefits, and limitations, identifying the challenges to be addressed soon. The authors further explored its potential in describing concrete cases and possible applications for healthcare in general and specifically for COVID-19.*

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## **INTRODUCTION**

Coronaviruses are a large family of viruses that can cause mild to severe respiratory tract infections in humans. In 2002 and 2012, with SARS (Severe acute respiratory syndrome) and with MERS (Middle East Respiratory Coronavirus), respectively, the world had the first glimpse of the potential impact of this family of viruses. In the first crisis, the SARS-CoV virus capacity of human-to-human transmission, the lack of preparation within hospitals for infection control, and international air travel enabled global dissemination of this pathogenic agent. SARS-CoV was initially detected in Guangdong province in China in late 2002, and it constituted the first known significant pandemic caused by a coronavirus, with 8,096 cases and 774 deaths reported in over 30 countries in five continents (Cheng et al., 2007). MERS-CoV was isolated from a patient who died in Saudi Arabia in September 2012, and since then, there have been multiple outbreaks that have amounted to 2564 confirmed cases of the Middle East respiratory syndrome 881 associated deaths. It has been reported in 27 countries, although most cases (80%) have been in Saudi Arabia. One of the most striking features is that this virus seems to have a case-fatality ratio of almost 35% (Al-Omari et al., 2019).

However, the worst was yet to come. In late 2019, in Wuhan in China, an initial outbreak of a new virus spread rapidly to other areas of China (Chahrour et al., 2020). In a few weeks, this virus had spread to other countries, and as of 1st February 2020, the World Health Organization (WHO) declared COVID-19 a Public Health Emergency of International Concern, and on 11th March 2020, the Coronavirus SARS-CoV-2 outbreak was declared a worldwide pandemic. As of January 2021, the virus has spread globally, with 89,416,559 confirmed cases of COVID-19, including 1,935,028 deaths. For the first time in history, a health crisis shut down the entire planet. Lockdowns and mobility restrictions imposed to control the spread of the virus and alleviate pressure on strained health care systems worldwide have had an enormous impact on economic growth and pushed millions of people into unemployment and poverty. The novel coronavirus pandemic has revealed deep underlying problems in health care systems across the world, and political, and healthcare authorities should swiftly address its impact in the longer term. Dealing with the impact of this health crisis, working on disease surveillance and prevention of new similar threats, and reconfiguring healthcare systems enabling them to deliver the best care while handling potential new crises are vital areas that must be tackled.

The COVID-19 challenge has undoubtedly been a catalyst for change. COVID-19 has dramatically accelerated digitalization and the adoption of new technology. This chapter aims to explore how blockchain combined with IoT could have played an essential role throughout the COVID-19 crisis in the healthcare system and pinpoint possible future applications.

## **BACKGROUND**

### **Internet of Things (IoT)**

The Internet of Things (IoT) is the real result of an applied principle: if you connect every tangible “thing” to the Internet, you create a network of shared data components.

Internet of Things refers to the ubiquitous network of interconnected objects capable of information storage and exchange using embedded sensors, actuators, and other devices. The IoT is a revolutionary technology which facilitates data-driven decision making by monitoring and managing objects in real-

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