Chapter 2
The Risks of Wearable Technologies to Individuals and Organizations

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ABSTRACT

Advancements in wearable and integrated sensing devices have given tremendous opportunities to enable advanced remote applications including sensing, monitoring, and tracking systems and states. Accordingly, wearable systems can be utilized to provide social and economic well-being for individuals by assisting them in the performance of their daily duties and for organizations by keeping their employees anytime, anywhere connected and by enhancing their productivity. However, wearable devices are, mainly, wireless in nature, which make them exposed to several types of security attacks that may threaten the life of individuals and the security of organizations. This chapter brings a comprehensive study on the benefits of wearable technologies and their related security and privacy issues, discusses the major policies that can be used to mitigate the risk posed by wearable technologies and the proposed techniques to assist users' safety in hazardous workplaces; and discusses the digital investigation of security incidents on wearable technologies.

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PROMISES AND CHALLENGES OF WEARABLE TECHNOLOGIES TO INDIVIDUALS AND ORGANIZATIONS

The recent technological advancements in wearable systems have provided an unprecedented opportunity for enabling advanced sensing purposes without constraining the user's activities. Such purposes comprise ubiquitous real-time monitoring, tracking, and controlling systems. The term "wearable" refers to miniaturized computing devices that are incorporated into items of clothing and accessories and can be comfortably attached to or worn on the body to automate or enhance personal activities (Sultan, 2015). Indeed, individuals (at home or workplace) can be equipped with a useful set of smart, multi-functional, independent sensor nodes which are able to form a connected network. They can be of different types, including physiological and environmental wearable sensors. Particular classes of wearable sensors include body sensors for healthcare (e.g., heart rate detectors and temperature sensors), speed and motion sensors (e.g., GPS, compasses, and accelerometers), multimedia sensors for environmental monitoring (e.g., video sensors, audio sensors and voice-to-text recognition sensors), and sensors for road safety and intelligent traffic management.

Wearable sensors are in charge of detecting, collecting, and transmitting data to a main node (or system) that will provide a highly optimized processing (e.g., data aggregation, prioritization, and scheduling) (Berrahal & Boudriga, 2014). The motivation for the development of wearable systems is enhanced by the remarkable benefits that could be provided for efficiently monitoring individuals as well as improving an organization's productivity, which will be highlighted in the following two paragraphs.

For individuals, wearable systems can be a helpful way to monitor and track individuals' health statuses in real-time by measuring their biological signs such as body temperature, blood saturation, and oxygen level. In particular, a wearable system on a patient can send alerts to caregivers reporting on the occurrence (and even prior to the occurrence) of health deterioration, such as a heart attack. A wearable system assists physicians and health care professionals in the early detection of diseases, in intervention to improve a patient's comfort, in providing a wide range of advanced healthcare services for people with various degrees of cognitive and physical disabilities such as remote real-time health monitoring, and in accessing to medical data at minimal cost (Darwish & Hassanien, 2011). In addition to the observation of life signs, the opportunity of tracking human behavior and environmental metrics related to hazard phenomena might reduce the risk of mistakes and avoid lethal consequences. Moreover, wearable systems allow greater autonomy of mobility. This allows workers in complex and hazardous workplaces to identify signs and handle any danger. Therefore, a set of sensors can be carried by firefighters or attached to their uniforms to supervise their life signs and manage risks associated to their surrounding environment during the accomplishment of their duties.

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