Chapter 9
The Internet of Things: Opportunities, Issues, and Challenges

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ABSTRACT

The Internet of Things (IoT) has the potential to increase quality of life, heighten performance of systems and processes, and save valuable time for businesses and people. Common objects and devices are being linked with Internet connectivity and have capabilities for data analytics that affect day-to-day experiences of both individuals and businesses. The notions of Smart Health, Smart Cities, and Smart Living come into play as the Internet of Things plays a role in today's world. This chapter presents IoT devices and application examples as well as descriptions of the benefits and limitations alongside an assessment of each respective technology's potential for success in the future. Security and privacy are important factors that need to be addressed within the different domains. This chapter addresses these potentials, issues, and challenges for managers to be prepared for the new wave brought forth by the IoT.

INTRODUCTION

The phrase "Internet of Things" (IoT) was first introduced by Kevin Ashton in 1999 (Ashton, 2009). Ashton was a product manager at Oil of Olay where a popular lipstick was often out of stock. After investigating the reasons why, he found a problem within the supply chain that led him to drive the development of the RFID label. He used the term "Internet of Things" to describe how the RFID labels would connect an "object" to the Internet. At that time, there were more questions than answers to the IoT concept including how would everything be connected? What could be built into devices to enable it to communicate wireless? How would the infrastructure need to change in order to support the communication of billions of devices? What would power them? How would this be done cost effectively?

Today many of these problems have been addressed (Umar, 2005; Xu, He, & Li, 2014). Wireless technology has gotten smaller and less expensive. Wi-Fi and cellular wireless connectivity is being built into many devices (Li & Xiong, 2013; Jo, Paik, & Lee, 2014). Networks are offering broadband speeds and mobile data coverage is widespread. What exactly is the IoT? It is described as a network of "things"

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including people-people, people-things, and things-things connected to the Internet either through wireless or wired Internet connections (Dorsemaine, Gaulier, Wary, Kheir, & Urien, 2016).

The IoT is intended to do the following:

- Connect both inanimate and living things. Any device with an on and off switch can be connected to the Internet and/or to each other. Examples include cell phones, coffee makers, washing machines, headphones, lamps, wearable devices (e.g., fitbit), etc. They can also include living objects. Your refrigerator may know what you want to eat based on your weight loss plan or the time of day you arrive home (Xiao, Guo, Xu, & Gong, 2014).
- Use sensors for data collection. The objects will contain sensors that will collect data such as motion, location, vibration, and temperature (Ding, Cooper, Pasquina, Fici-Pasquina, 2011). Further, these sensors will connect with each other and to systems to make sense of the data or at least present the data from the sensors (Albrecht & Michael, 2013). As a result, people or companies will have a lot of new information (Li & Xiong, 2013).
- Allow equipment to communicate. Now objects can communicate with each other (Ding et al., 2011; Albrecht & Michael, 2013). Imagine your alarm clock goes off at 5:00 a.m. than notifies your coffee pot to start brewing coffee. Or in the office, they automatically re-order when supplies run low.
- The Internet of Things (IoT) is a prominent topic in today's world of technology that is constantly growing and evolving. This is a concept in which everyday objects are connected to the Internet, allowing them to send and receive data. In order for the IoT framework to be successful, wireless networks are essential because sensors need to be able to link without the limitations of physical wiring. The benefits are almost infinite as IoT devices and applications are altering the ways that people live and work on a day-to-day basis by saving time, making resources more efficient, and opening new doors to development and innovation. The far-reaching use of IoT products and devices shows the high capacities of automated home and work appliances, energy management, health monitoring gadgets, enhanced traffic systems, and countless more improvements within institutions and cities.
- The ultimate goal of IoT is to enable things to be connected at any time or place, by anything or any person who is using the network. Moreover, CEO of Cisco, Chuck Robbins, predicts that 50 billion devices will be connected to the Internet by 2020 (Vanian, 2015). The success of certain IoT devices will really be contingent on the ways that security and privacy matters are approached in the development stages as well as how those types of issues will be addressed if the concern becomes a reality. This paper will discuss and give examples of specific devices or applications used within the spectrum of Smart Health, Smart Cities, and Smart Living. Each section will give an overview of the industry, description of specific examples, and any further limitations or implications that it may have.
- As with the majority of information systems (IS), the Internet of Things depends on a variation of different hardware, software, and architectures. According to Whitmore, Agarwal, and Xu (2015), technology can be classified into three sub-categories. However, these are not exclusively separate from each other because architecture is developed and forms alongside software and hardware.
- In regards to hardware, the bulk of its foundation has already been around for some time now so this allows IoT to build upon its present framework. As Whitmore et al. (2015) illustrates, within the sub-sub-category of hardware, there are some important infrastructures to distinguish, such as