Chapter 13
Digital Transformation in the Utilities Industry:
Industry 4.0 and the Smart Network Water

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ABSTRACT

Nowadays, there is a digital transformation in industry, which is being referred to as a new revolution, known as the fourth industrial revolution. Today, we are in the fourth industrial revolution, which strongly supports itself at enabling technologies, such as: Internet of Things (IoT), big data, cyber-physical systems (CPS) and cloud computing. These technologies are working cooperatively to promote a digital transformation in the forms of: Industry 4.0, Industrial Internet Consortium and Advanced Manufacturing. To meet these needs and as a proof of concept, a platform for digital transformation for a water issue is proposed with the objective of achieving an efficient management of resources linked to rational use of water. For the platform definition, a survey was performed of the process of a water treatment plant from the third industrial revolution and improved the process by applying the concepts of digital transformation to improve the new platform.

1. INTRODUCTION

Digital transformation is part of a major ongoing technological process and it is associated with the application of digital technology in all aspects of human society. According to Khan (2016) and Westerman (2014), digital, digitization and digital transformation are concepts that are commonly confused, and there is no clear or broadly accepted definition of digital transformation.

Also, according to Khan (2016), it is first necessary to establish the concepts of digital and digitization in order to be able to define digital transformation. Digital is associated with the process of converting analogical information into digital format; in Collin et al. (2015), it is defined as a condition for converting, for example, a print photograph into a digital format. Meanwhile, according to Bounfour (2016), digitization is related to the issue of transforming physical processes into virtual processes using specifically tailored technologies. In accordance with Khan (2016) and Collin et al. (2015), digital transformation is the effect of this digitization, and thus not only pertains to the adoption of new technologies, but also to new ways of making business operations more efficient and competitive. However, it is still not known how digital transformation will be implemented, its degree of complexity, the nature of its interconnections among different sectors and, above all, its impact on society.

The new technologies involved in this transformation will bring far-reaching changes to all sectors of society, affecting current business, production, consumption, transportation and delivery methods, as well as the very way people live. Therefore, it is necessary to obtain a comprehensive vision of how this digital transformation will change all aspects (social, cultural or economic) of the world in which people live.

In recent centuries, industry has undergone vast operational changes, generating innovation and far-reaching social and economic shifts. The first industrial revolution took place in England at the end of the 18th Century and beginning of the 19th Century, and it was characterized by coal as the primary energy source, leading to the development of the steam engine and, consequently, the locomotive. One of the first areas to implement this new technology was the textile industry, which, prior to this revolution, was intensively manual. This new industrial model accelerated the rural exodus, thus leading to burgeoning urban centers. The second industrial revolution triggered from the second half of the 19th Century as part of the quest for continual improvement. This basically comprised the discovery of fossil fuels and electromagnetism as energy sources, with electricity arising as an alternative to steam power. Use of these resources accelerated the industrial steamroller with the discovery of the potential for reducing both costs and product manufacturing time, with the result that goods could be consumed on an ever-greater scale. One of the most evident examples of this revolution is the introduction of the assembly line, the most traditional reference of which is the Ford Model T automobile. The third industrial revolution began in the middle of the 20th Century, characterized by the intensive use of electronics and information technology (IT) in order to achieve the objective of automation in manufacturing. In the industrial area, Supervisory Control and Data Acquisition (SCADA) systems, in conjunction with the programmable logic controller (PLC) were its most significant feature, and these systems are currently converging to open-source systems that, in some cases, are connected to corporate networks or even the internet. The use of telecommunications resources and technological advances have enabled remote access, sharing, integration and, consequently, long-distance data processing using these resources. Integration with different systems is aimed at increasing productivity and efficiency in decision-making processes.

Currently, according to Schwab (2016), we are currently on the cusp of a fourth industrial revolution, the so-called Cyber-Physical Systems (CPS) systems-based industrial revolution. In addition to Cyber-Physical Systems, new technologies are arising in the form of the current enabling technologies, whose use is leading to the breakdown of the current paradigm. Such technologies include Internet of Things (IoT), big data analytics and cloud computing, intended to address the requirements of an advanced manufacturing system through integration of the entire supply chain. This new revolution is characterized by the intensive use of digital technologies with the purpose of manufacturing products rapidly, with an agile response to demands and real-time production and supply-chain optimization. Also, according to

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