

## Chapter 19

# The Effects of Industry 4.0 on Labor Force Attributes and New Challenges

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### ABSTRACT

*Unmanned factories became a topic of discussion after the concept of Industry 4.0 was first introduced in the Hannover Fair in 2001, and increasing the computerization level in business life and supporting the production processes with advanced technology were determined as targets. In this regard, artificial intelligence and increased automation are expected to create new kinds of jobs in the coming years; however, a significant problem is predicted considering that these changes will invalidate a high number of job types exist today. Thus, the workforce will face a severe unemployment threat. As a result of all of this, radical changes in the work methods, along with means of seeking employment, are now considered. The qualities of the work and the workforce are being transformed along with the organization methods of the production. While on the other hand, it becomes evident that education also has to adapt to this transformation. In this study, the issues the labor might have to face during this period will be discussed, along with what could be done to solve these problems.*

### INTRODUCTION

The concept of the industry has ever been changing and evolving throughout the historical process. The methods and tools used in the production, along with the management models of the production processes, also continue to change with each passing day. The effects of these changes have influenced not only the characteristics of the production processes, but also the population structures, cultures, and economic conditions of the countries, and have even led to the reshaping of country borders. This change was initiated in England first, which then spread throughout Europe and then to the world.

Before the industrial revolution, the economy was based on production factors of humankind, animals, and soil, and the priority was on agriculture, animal husbandry, carpentry, and smithing sectors. With

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the Industrial Revolution and the impact of new inventions on the production, along with the creation of steam-powered machines, the mechanized industry became capable of mass production. These developments lead to the replacement of manual handling with mechanical power (Schwab, 2017). Three industrial revolutions took place until now (Drath & Horsch, 2014).

The first industrial revolution (Industry 1.0) began in England and was influential between the mid-18th century and the beginning of the 19th century (Jänicke & Jacob, 2009). The discovery of new machines and increased efficiency in the textile sector, the introduction of steam machines, and the development of iron production are the most essential factors that started the first Industrial Revolution (Coleman, 1956). Thanks to the new textile factories established in England, the producers in the country began to produce an increased amount of products with more efficiency, which increased their need for new markets and raw materials. This was a situation which also brought with it exports of products to overseas countries. This Industrial Revolution led to an increase of capital in the United States of America and Europe, bringing with it an opportunity of improving the welfare in these societies.

The Second Industrial Revolution (Industry 2.0) is also referred to as the technological revolution and covers the period of the mid-19th and mid-20th centuries (Jänicke & Jacob, 2009). The primary factor that laid the foundations of the Second Industrial Revolution was the further development of railroads, facilitating the ease of access to distant markets and raw materials. Furthermore, the change in the utilized energy sources and raw materials, along with the development of technology with each passing day, were the foundational keystones of the Second Industrial Revolution (Jänicke & Jacob, 2009). The iron utilized in the industry was mostly replaced with steel during this period, and the use of chemical materials became widespread. Furthermore, the substitution of electricity and petroleum as energy sources instead of steam and coal made it possible to increase the speed of production. This, in turn, triggered the beginning of mass production. During this period, Henry Ford started the use of moving production lines in factories and emerged as an important actor in the transition to mass production (Alizon et al., 2009). Development of communication tools like telephones, radios, typewriters, and cheap print paper enabled faster and more efficient communication methods. Thus, the distance between people decreased even further. Societies' living standards and lifestyles underwent significant changes. Centralization became prominent. Migration from towns to cities gained speed, and politically and economically powerful central states were established. The Second Industrial Revolution spread to many regions of the world, primarily to America, Germany, and Japan.

Under the influence of the developing technology throughout the 1970s, the automation became widespread. The reason why the Third Industrial Revolution took place after a longer gap compared to the preceding one was the time required to overcome the effects of the Second World War and the great depression. That being said, while it's true that these events, particularly the Second World War, delayed the emergence of the Third Industrial Revolution, they also acted as the foundational causes of it. Technologies developed in line with the needs of the war shed light on the beginning of this period. Communication, correspondence, and technology developed as a result of the Second World War, making the use of automation in the production processes possible. The machines also underwent specific changes as the software sector developed during this period. Besides these, the development of nuclear, bio-agriculture, telecommunication, laser, fiber optic, microelectronic, and computer applications carried the production processes to a whole new level. Globalization gained speed due to the ease of communication and access. There was no more distance between individuals. An individual became capable of reaching within seconds to another individual on the other side of the world.

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