Chapter 5
Impact of 6G Technologies on Industry 5.0

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ABSTRACT

Manufacturing has evolved over the course of centuries from the days of handmade goods to the adoption of water- and steam-powered machines, the invention of mass production, the introduction of electronic automation, and now beyond. Today, the benchmark for companies to keep up with, is Industry 5.0. Here, Manufacturing systems go beyond simple connection, to also communicate, analyze and use collected information to drive further intelligent actions. It represents an integration of IoT, analytics, additive manufacturing, robotics, artificial intelligence, advanced materials, and augmented reality. The paper looks at the evolution of the Industrial revolution and the technologies that have impacted their growth. The proposed features of 6G technologies are listed and described how these features impact the industries of the future, leading to Industries 5.0. 6G promises to be a key enabler for Factories of the Future, providing unified communication platform needed to disrupt with new business models and to overcome the shortcomings of current communication technologies.

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1 INTRODUCTION

During earlier centuries, goods including food, clothing, houses and weapons were manufactured by hand or with the help of work animals. Manufacturing began to change dramatically by the beginning of the nineteenth century with the introduction of Industry 1.0, and operations rapidly developed from there. The core of Industrial automation is essentially the reliable exchange of information. Any attempt to automate, i.e. reduce/remove human intervention, requires a flow of information between some kind of sensors, controllers and actuators. To this effect, many kinds of industrial communication networks evolved over the years. The evolution of the industrial revolution is described below.

1.1 Industrial Evolution

1.1.1 Industry 1.0

Industries 1.0 started with the introduction of water and steam powered mechanical manufacturing systems during the end of 18th century and beginning of nineteenth century. Water- and steam-powered machines were developed to aid workers. As production capabilities increased, business also grew from individual cottage owners taking care of their own and maybe other's needs to organizations with owners, managers and employees serving customers. (Ansari & Khan, 2025)

1.1.2 Industry 2.0

Industries 2.0 started in the 20th century with the introduction of electrically powered mass production based on the division of labor. By the beginning of the 20th century, electricity became the primary source of power. It was easier to use than water and steam and enabled businesses to concentrate power sources to individual machines. Eventually machines were designed with their own power sources, making them more portable.

This period also saw the development of number of management programs that made it possible to increase the efficiency and effectiveness of manufacturing facilities. Division of labor, where each worker does a part of the total job, increased productivity. Mass production of goods using assembly lines became commonplace. Studies were done, and processes introduced to enhance worker productivity and methods of Just-in-time manufacturing. The focus was on increased quality and productivity with optimization of labor.