
THE DEVELOPMENT OF TECHNOLOGY-ARTIFICIAL INTELLIGENCE AND INDUSTRIAL DIFFERENTIATION*

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ABSTRACT: *When it investigated at the industrialization processes in the world economy, it is seen that while the industrial sector in economies passes to a different stage with the development of production techniques, resources are directed to the production of new products with the differentiation in the products produced. In the development process of the world economy, the Taylor Production System, the Fordist Production System, the Post-Fordist Production System express the reflections of technical change in production on production. In a sense, the change in production knowledge has also brought about the change in production techniques. While the change in the process of change in production knowledge in the industrialization process brought about the change in production techniques, the industry also brought about the change in the product range. With the support of the increase in R&D activity, under the influence of new trends in technology, previously non-existent industrial sub-sectors have emerged. At this point, while the production knowledge changes in the industrial sector, the change in production techniques and product variety is analyzed.*

KEYWORDS: *Information, Technology Factor, Artificial Intelligence, World Economy, Industry.*

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1 Introduction

The economic development processes of developed economies have significant instructiveness for developing economies. When viewed from this point, the industrialization process information of developed countries provides important information for developing economies on the path to industrialization. This information shows itself in terms of production information and product information. It is a known fact that the development of production techniques in the industrial sector of economies brings about a different stage in production. And with the differentiation in the products produced, resources are directed to the production of new products.

In this context, while the economic thought and knowledge develop in the development process of the world economy, when the development of the industrial sector is examined, it is seen that different production systems such as the Taylorist Production System, the Fordist production system, and the Post-Fordist production system have emerged in support of the development of economic knowledge in industry. In this way, while production techniques change, there has also been a change in production. As production knowledge changes in economies, this change has also been reflected in the industrial production structure. And therefore, the change in production knowledge has brought a change in production techniques and created new industrial sectors.

2 Development of Production Knowledge from Taylorist System to Post-Fordist System

While the change in production knowledge during the industrialization process brought about the change in production techniques, the change in production techniques also brought

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about the change in the product range in the industry. An important stage in production technique in industry is the Taylorist production style.

Frederick Winslow Taylor is an engineer who introduced the scientific management approach in industrial production in the late 1800s and 1900s. He was born in the USA in 1856 and died in 1915[1]. F.W. Taylor aimed to restructure business processes in industrial production according to scientific principles and to increase efficiency in production. With Taylorism, named after F.W. Taylor, business management and production technical knowledge were created in industrial production and a major transformation was achieved in the industry with this dimension. Taylor's scientific management approach aims to increase industrial production efficiency and the main principles of this approach are as follows [2]:

- i) Standardization of work in production
- ii) Ensuring division of labor in a way that also supports specialization in production
- iii) Providing in-service training of the workforce and monitoring the performance of the workforce.

According to Taylor, the main goal of management should be to ensure the individual, maximum welfare of the entire workforce and thus to realize the maximum welfare of the employer[3]. In this system developed by Taylor, first of all, all the necessary movements are determined for the work to be concluded under the best conditions. In addition, the movements of the worker are strictly controlled during the industrial production activity [4].

Fordism, which became the dominant mode of production after Taylorism, is a production system developed by H. Ford. Fordism is essentially a structure that targets mass production. In Fordism, the division of labor and job descriptions are defined with importance and clarity. While this standardization is achieved in production, standardization is also aimed for the product. Thus, while standardization is achieved in production, productivity increases are aimed. Here, in line with the increasing demand in economies, rapid increases in production are targeted with Fordism, and the increased production can be directed to consumption quickly. As Güner's stated, the year 1914 is the year when Henry Ford started producing cars with a moving assembly line and started paying his workers \$5 for 8 hours of work per day. In this context, it is considered the beginning of Fordism. However, this year is a symbolic beginning and it is the year that this production system became dominant only after 1945. On the other side, the basic distinguishing features of the Fordist production and accumulation system can be classified as follows[5]:

- i) Orientation towards mass production and consumption.
- ii) The goal of high standardization in products: In this production system, custom-standard products are designed and produced according to the predetermined mass consumption demand.
- iii) An inflexible production process: In this production system, the workforce specialized in the division of labor produces standardized products.
- iv) New technologies are used in production.
- v) The aim is to use semi-educated workforce that can be easily replaced in routine work in production.
- vi) Keynesian economic policies were given importance on mass production.
- vii) The Fordist production system increased cooperation between sectors in the economy and dominated the formation of added value: The main weight in the economy is carried by mass production units, while other production units remain small systems compatible with this system.

viii) Fordism aims for a lifestyle with the anticipation of mass”.

**Table 1: Comparison of Fordism and Post-Fordism, Source: Dağdelen,2007.
https://www.mevzuatdergisi.com/2005/06a/05.htm, on 06.11.2023**

	Fordist Period	Post-Fordist Period
<i>Regulation</i>	Keynesian/National	Monetarist/Global
<i>Markets</i>	Massive	Private
<i>Life Style</i>	Conformist	Pluralist
<i>System</i>	Central	Decentralization
<i>Organization</i>	Bureaucratic, hierarchical	Non-hierarchical, flexible organization, market
<i>Leading Sector</i>	Consumption	Finance
<i>Worker Qualification</i>	Standard	High Qualified
<i>Production</i>	Montage Line	Flexible
<i>Consumption Way</i>	Massive Consumption	Differential Consumption
<i>Worker-Enterprise Relations</i>	Sydicative Relations	Company and Private Agreements
<i>Efficient Source</i>	Machine	Information
<i>Technological Inputs</i>	Energy	Information

After Taylorism, the Fordist production style, which left its mark on working life until the 1980s, began to give way to a different model in which the structure of work and the qualifications of the workforce changed significantly[6]. After Fordism, which was the dominant production style between 1945-1973, the Post-Fordist production style became the dominant production system. The Post-Fordist production system is a production and accumulation system in which production is carried out in a flexible structure in order to meet consumption demands, flexible specialization is provided in labor and mechanization, and information and communication technologies are widely used in production. As A.R. Saklı's stated, it is thought that the Post-Fordist practice, referred to as flexible specialization, is effective not only in economic life but also in social structure, state understanding, culture and almost every area of life. Fordism' fed from Keynesian welfare state. But Post-Fordism process isn't related to Keynesian welfare state. As Saklı's and A. Güner's stated, Post-Fordist period is include internationalization, new technologies and over-loaded competition. These conditions that emerged in the late 1970s increased the crisis of Fordism.

In contrast to the Fordism production style that came to the fore with the production system designed by Henry Ford by combining it with scientific management principles, some researchers claim that the first starting point of Post-Fordism, as in Fordism, was the automotive sector and that Post-Fordism emerged with the flexible production and management techniques developed by applying them in the mentioned sector focus [7].

The characteristics of Post-Fordism can be classified as follows [8]:

- i- “Flexible production regime and flexible international division of labor
- ii- Small-scale production

- iii- Product differentiation
- iv- Stockless work
- v- Quality control during production
- vi- Fragmentation of the production process
- vii- Specialization of the workforce and multiple tasks
- viii- Job security and wages according to the nature of the workforce
- ix- Loss of importance of unionization
- x- The emergence of computer-based investments alongside old manufacturing and chimney industries
- xi- Dominance of multinational companies”.

3 Transition to the Leading Edge of Technological Knowledge in Industrial Production and the Transformative Power of Artificial Intelligence in the Industrial Sector

Economic growth refers to the change in production from one period to another based on the production factors of labor, capital, natural resources and business efficiency in an economy and supported by technological development. At this point, it should be said that technological development has an important place in terms of economic growth in economies.

The concept of technology includes not only the machinery and equipment used in production, but also it is included labor and management skills of the society [9]. In world economy, after the 1950s, production methods gradually began to develop: This period was a period in which the economy changed, especially after the 1970s. And it was a period in which technical knowledge and technology in production began to be questioned [10].

An innovation in production technique affects production processes as well as production quantities and product types. Especially in the 1990s and 2000s, great progress in technology field was made in the world economy. While world economy transforming to from Fordism to Post Fordism, production technics and technology changed. In this process, this development created more production and new products. While the production technique and technical infrastructure have changed, major changes have occurred in the field of industry and new industries developed. Example industries related to electronics-computer technologies developed, after 1990s. These developments have created big transformation in the production dimension of the world economy. These changes didn't live only in production technology but lived also in product technology [11].

Other important development in the technological world of 2000s is phenomenon of artificial intelligence at the support of electronic developments. The phenomenon of artificial intelligence brought about major changes in production processes. In a sense, smart machines are now performing production activities. Production facilities have begun to perform production with fewer people and more smart machines to a great extent. Artificial intelligence shows itself more with robots in production. As artificial intelligence studies develop, artificial intelligence robots used in production become more sophisticated and therefore it becomes possible to produce higher quality products with fewer production errors. This positive development in the industrial sector also increases the use of robots in industrial facilities of countries. The Figure 2 below shows this increase and the industrial sectors where the use of high-tech robots has

increased. In an environment where high quality products can be produced with lower risk and lower cost, this change can pave the way for businesses to exist in the markets. These developments describe an industrialization process in which technology is a factor. While many developing economies today focus on the production and export of traditional industrial products, some of the developed countries focus on the production and export of these technology-intensive industrial products.

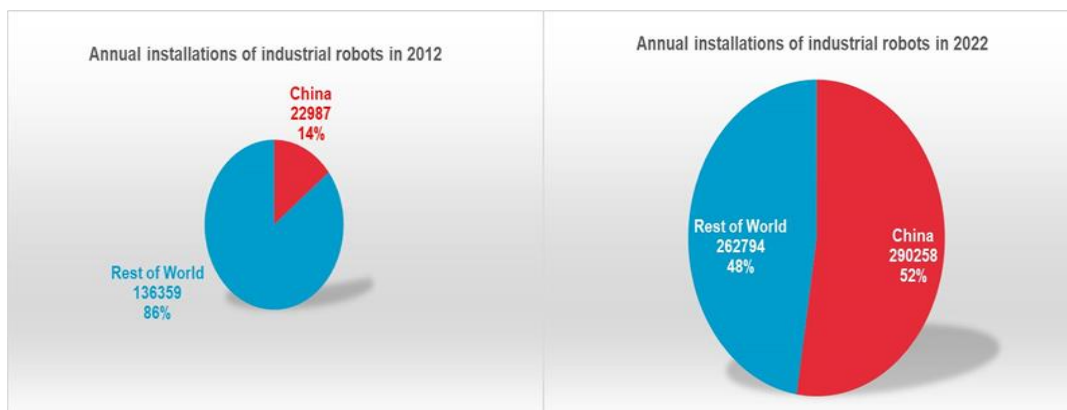


Figure 1: Annual Installation of Industrial Robots 2012/2022, Source: www.ifr.org (2024)

As we enter the 21st century, with technology and technical knowledge taking the lead in production processes, necessary of the addition of technology to the classical production function expressed in the form of labor, natural resources, capital and enterprise has become debatable. Especially in the environment where technological developments have brought artificial intelligence, new sub-sectors have emerged in the industrial sector. While the software sector, data analytics and cloud computing sector, computer and information processing hardware production sector, telecommunications, cyber security, and artificial intelligence hardware sectors have emerged under the influence of technology, the changing effect of technology on the industrial sector has not only been experienced in new sectors. The production structure has also changed significantly in traditional sectors.

4 Conclusion

The world economy has experienced a major transformation process since 1950, and the biggest change in this transformation has occurred in the industrial sector. Following the industrial revolution experienced in Britain in the 1600s, Germany also joined the industrialization race in the 1800s. Until the 1900s, the rest of the world was in the position of countries importing industrial goods, and these two economies were the world's producers of industrial goods. After World War II, while world politics and the world economy were polarizing into capitalist and socialist blocs, a similar rapprochement emerged in capitalist economies in an environment where socialist economies were getting closer to each other.

During this process, under the influence of the desire of countries not to enter into crises and risky political relations and the desire to establish an international division of labor within the bloc, but more importantly, under the influence of the desire of underdeveloped economies to increase their national income and maintain their foreign trade balance, a significant portion of

underdeveloped countries began to turn toward industrialization. These years were years when international relations experienced a problematic period in terms of the distinction between bloc formation. And again, these years – especially the 1960s – were the years when the application of planning in development was widely advocated by developed country economists.

Within this general view, some developing economies first started the industrialization process with import substitution industrialization policies, then with export-based industrialization policies. This period refers to a period in the world economy until the 1970s when countries were relatively closed to the outside world and state controls were intense. It was seen that some developing economies exhibited serious economic development with the industrialization orientation that started in these years. It is seen that countries started to open up more to the outside world with the 1980s. This opening up orientation brought globalization in the 1990s and the world economy became a global economy. As the world economy globalized, there was an increase in global competition in the goods markets of countries. Before the 1970s, it refers to a period in which national competition was largely decisive in national market position under relatively closed economy conditions, and therefore, there was a lower level of competition compared to today.

However, as foreign competition increased between countries in the 1980s, it became difficult for companies to survive in the competition, which led these countries to develop technology, produce new products and create new production trends. In the 1990s and 2000s when the global economy emerged, new production and consumption trends emerged in the world economy in the technological change led by companies. Therefore, new technological sectors were developed. (Digital products, new health industry, I.T. economy, equipping traditional industrial sectors with technology, etc.). In this case, different industrial sub-sectors emerged compared to traditional industrial sub-sectors. Over time, these new industrial sub-sectors became areas where resources were employed more, called the “new economy”, as demand also shifted to these areas. Behind this great change in the world economy and especially in the industrial structure was the change in production knowledge.

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