International Journal of Recent Engineering Research and Development (IJRERD)
ISSN: 2455-8761
www.ijrerd.com || Volume 04 – Issue 10 || October 2019 || PP. 109-114

Economic development in Era 4.0

Nguyen Thi Hoa, Pham Thi Minh Chau, Pham Thi Thanh Xuan
Ho Chi Minh City University of Transport, Ho Chi Minh city, Vietnam

Abstract: The level of initiative in participating in Industry 4.0 of our country is still low. Institutions and policies are still limited and inadequate, Vietnam's overall institutional ratings are still below average. In 2018, the World Economic Forum assessed that Vietnam reached 50/100 points, ranked 94/140 countries. Institutions for digital economic activities, sharing economy and innovation have not been formed synchronously. There is no legal corridor for piloting the application of new products, business models and services of Industry 4.0. The process of converting the number of countries is still slow and lacking initiative; many enterprises are still passive, the ability to access, apply and develop modern technology is still low. Digital economy has a small scale. The fight against criminals, ensuring cyber security is still challenging. Stemming from the above-mentioned reality, in order to seize and take advantage of opportunities of this Industrial Revolution for breakthrough development, the policy to actively participate in Industry 4.0. Proactively and actively participating in Industry 4.0 is an indispensable and objective requirement, considering this is a particularly important strategic task, both urgent and long-term of both the political system and the whole society closely linked with the extensive international integration process; At the same time, fully and properly aware of the content and nature of Industry 4.0 to resolve to innovate thinking and action, considering it a breakthrough solution with appropriate steps and roadmaps as an opportunity for Vietnam. Nam made a breakthrough in socio-economic development.

Index Terms: Era 4.0, Industry 4.0, policy

I. INTRODUCTION

The term "Fourth Industrial Revolution" has been applied to important technological developments a few times over the past 75 years, and is for academic discussion. Industry 4.0 concept or smart factory was first launched at the Hannover Industrial Fair in the Federal Republic of Germany in 2011. Industry 4.0 aims to smartize the manufacturing and management processes in the industry. make. The birth of Industry 4.0 in Germany has motivated other advanced countries such as the US, Japan, China and India to promote the development of similar programs to maintain their competitive advantage. In 2013, a new keyword "Industry 4.0" (Industrie 4.0) began to emerge from a German government report referring to this term to refer to high technology strategy, computerization of the industry. produce without human involvement. At the 46th World Economic Forum (WEF) officially opened in the Swiss city of Davos-Klosters, with the theme of "4th Industrial Revolution", President of the World Economic Forum a new definition, extending the concept of Industry 4.0 of Germany. Humanity is facing a new industrial revolution that can completely change the way we live, work and relate to each other. The scale, scope, and complexity of this transformation are unlike anything that humanity has ever experienced. Specifically, this is "a term for the technologies and concepts of an organization in the value chain" that goes hand in hand with physical systems in cyberspace, the Internet of Things (IoT) and the Internet of service (IoS). At present, Industry 4.0 has gone beyond the scope of the German project with the participation of many countries and has become an important part of the fourth industrial revolution. The nature of the 4th technology is based on digital technology and integrates all intelligent technologies to optimize production processes and methods; emphasizing the technologies that are and will have the greatest impact are 3D printing technology, biotechnology, new material technology, automation technology, robotics. The 4th Industrial Revolution or Industry 4.0, is the current trend of automation and data exchange in production technology. It includes physical networking, Internet of things, and cloud computing. The 4th Industrial Revolution is not only about machines, intelligent systems and connected, but also has a much wider scope. At the same time are waves of further breakthroughs in fields ranging from gene coding to nanotechnology, from renewable energies to quantum computing. Industry 4.0 facilitates the creation of "smart factories" or "digital factories". In these intelligent factories, physical space systems will monitor physical processes, creating a virtual copy of the physical world. With IoT, these physical space virtual systems interact with each other and with people in real time, and through IoS, users will be able to participate in the value chain through the use of these services. Exploded around 1784. Characteristic of this first industrial revolution was the use of water, steam, and mechanization of production. This industrial revolution was marked by an important milestone that James Watt invented the steam engine in 1784. This great invention sparked the explosion of widespread 19th century industry from England. to Europe and the United States. Up to now, we have passed three major scientific and technological revolutions. First, the Industrial Revolution 1.0 (1784) was the arrival of the steam engine. Steam engines directly impact industries such as textiles, mechanical engineering, and transportation. Steam engines were introduced into cars, trains and ships, opening a new era in human history [1]. Second, the Industrial Revolution 2.0 (1870) was when the electric motor was born, bringing civilized life, productivity increased many times compared to steam engines. Third, the industrial revolution 3.0 (1969) is when transistors, electronics, connecting the world are in contact with each other [2]. Satellites, airplanes, computers, phones, Internet ... are the technologies that we currently enjoy [3]. Today is the era of the 4.0 industrial revolution, which is a high-level combination of physical and digital hyperlink systems with the focus on the internet, everything connected (IoT) and artificial intelligence. Technology 4.0 will free people from intellectual work[4]. The demonstration of Technology 4.0 is Robot Sophia, who has been granted Saudi Arabian citizenship. Sophia was created by Hong Kong-based Dr. David Hanson, founder of the Hanson Robotics company in Hong Kong, where he and his family moved to develop his career, because of its low cost and quality engineer team[5]. Currently, we are witnessing the Internet of Things, big data, cloud computing integrated with all smart technologies to optimize production processes and methods [6]. These fields of technology are promoting the so-called "Fourth Industrial Revolution". By being sensitive to the digital vision, the countries pioneering in Industry 4.0 are well aware of the potential for "digital transformation" in the structure of manufacturing industries, on the other hand, they also recognize the investment for Industry 4.0 will create a driving force for the economy with outstanding growth [7]. Instead of creating new industries, "digital" opportunities are driving a full transformation of today's industrie s[8]. In other words, Industry 4.0 renews the way it operates in business and production. However, the rate of using digital technology in businesses worldwide is still very low, specifically, over 41% of companies of the European Union (hereinafter referred to as the EU) have not yet applied. any advanced digital technology[9]. This is just a fact that businesses are facing challenges in the transition to digital businesses. However, reference to a recent survey of EU businesses shows that, 75% of businesses think that digital technology is an opportunity and 64% of businesses invest in digital technology that produces positive results [10]. The first industrial revolution ushered in a new era in human history - an era of mechanical manufacturing and mechanization. The first industrial revolution replaced the old traditional system of agricultural technology (lasting 17 centuries), mainly based on wood, muscular strength (manual labor), water power, wind power and animal traction with a new technical system with the steam engine and the new source of fuel, fuel and energy are iron and coal. It caused the production force to be strongly developed, creating a booming situation of industry and economy. This is a transitional period from agriculture to mechanized production based on science. The main economic premise of this transition is the triumph of capitalist production relations, while the scientific premise is the creation of a new, empirical science thanks to the revolution in science.

II. NATIONAL POLICIES ON INDUSTRY 4.0

The key points of Industry 4.0 policy are part of the overall strategic framework, reflecting Industry 4.0 priority in the EU as shown in Table 1 below. In particular, France's "Industry for the Future" Scheme is linked to the "Normandie Industry" Program.

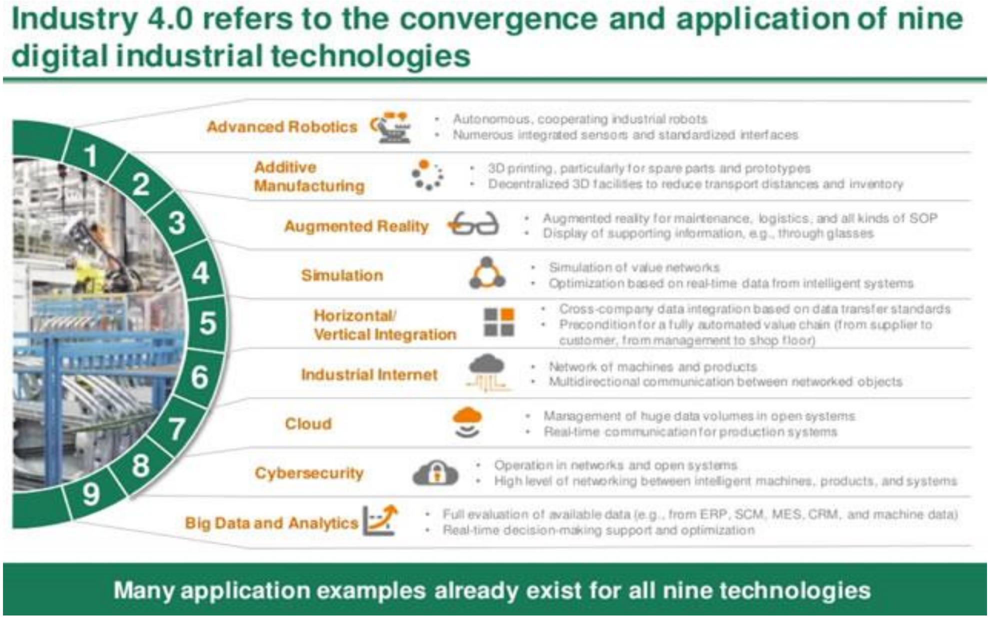

Fig. 1. Key points of Industry 4.0 policy in the EU

Italy's "Smart factory cluster" project is built on the Italian "Roadmap for Innovation", a broader strategy on the three challenging socio-economic areas that Italy is facing, including: climate change, scarcity of resources, mechanical population growth. France and the Netherlands have clearly defined the reasons to launch policy initiatives. In France, the lack of investment and digital industry development issues are the driving force behind policy creation. In the Netherlands, by contrast, the relatively low percentage of people working in the manufacturing sector has led to a smart industry. In some countries, policy initiatives are a direct result of a national strategic framework and / or agenda. Germany's "Industrial Platform 4.0" project began as one of ten projects in the High Technology Strategy Action Plan until 2020. In the case of Spain, the Scheme is a digital part of the Industry Strengthening Program and is gradually transformed into the "Connection Industry 4.0" Scheme. Meanwhile, the Project "Launching of high value-added production" in the UK shows how the UK Government has acted in proposing policy strategies to set up a series of technology centers in industry. To cope with the challenges of changing from "enterprise" to "digital enterprise", most of the governments of countries have put industry 4.0 as "priority", applying policies to create favorable conditions for the public. Industry 4.0 develops on a large scale to increase productivity, increase competitiveness and improve skills to use smart technology for their workforce. Industrial Revolution 4.0 (Industry 4.0), which is a high-level combination of physical and digital hyperlink systems with the focus on the internet, everything connected (IoT) and artificial intelligence. Industry 4.0 with digitalization system, aiming to liberate people from intellectual work. In this article, the author introduces: Industry 4.0 and its impact; world industrial development trend 4.0, mainly in Asia; Vietnam and the degree of digitalization, along with some opinions about the role of the state in promoting digitalization of manufacturing enterprises. This article will point out the focus of industrial policy 4.0 in leading EU countries such as France, Germany, Netherlands, Sweden, Italy, Spain, UK and Czech Republic. The author also clarifies the differences throughout the content of industrial policy 4.0 in the policy design of countries, mobilizing and using capital, implementing it has brought certain efficiency. Moreover, the authorities in these EU countries are aware of the actors involved in industrial policy 4.0, but there is a lack of systematic cooperation and exchange through regulations from government. In addition to conducting comparative analysis, this paper aims to find out lessons learned from policies for industry 4.0 to help facilitate objective and scientific perceptions in policy formulation and implementation in Vietnam in the short and long term. In industrial policy 4.0 of EU countries, there is a big overlap in the goals and objectives they pursue. Looking at specific goals in the national strategy, most of their policies are intended to enhance the competitiveness and modernize the national industry. The most obvious is the goal to ensure the sustainable growth of the mechanical engineering industry[18]. If fundamentally in a national policy, economic goals are often combined with social and environmental goals[19]. Although achieving economic goals requires a difference in policies and overall goal adjustments. In the case of Spain, the cost covered by a loan depends on the scope of operation and the type of business, between the cost of 25% and 70%. France's "Industry for the Future" scheme combines a variety of funding tools, for example, loans and tax incentives with private investment in scientific research and technology development (R&D). Sweden's "2030 Production" scheme is heavily controlled and financed by industry to ensure industrial impact and long-term sustainability. Meanwhile, the most unique element in the UK involves providing industrial scale technology and expertise to businesses to reduce the risk of technological innovation through the establishment of seven technology centers. In this way, the centers provide a favorable environment for cooperation between industry, research and government agencies and / or between regional and national parties. Although, all policies considered regarding Industry 4.0 are prioritized to accelerate the deployment and application of Industry 4.0 technologies. Only the Italian Smart Cluster Scheme focuses more on research, especially on developing new technologies to meet the challenges of creating innovation. Moreover, there is no clear technology or industry focus of national policies. While the internet of things / virtual-reality systems is the most common technology sector, it is only considered as a goal in German and French policy. At the sector and manufacturing level, specific models do not exist. This shows that the policy initiatives of the leading countries in Industry 4.0 tend to be relatively open to the application of specific 4.0 technologies or industry-specific technologies.

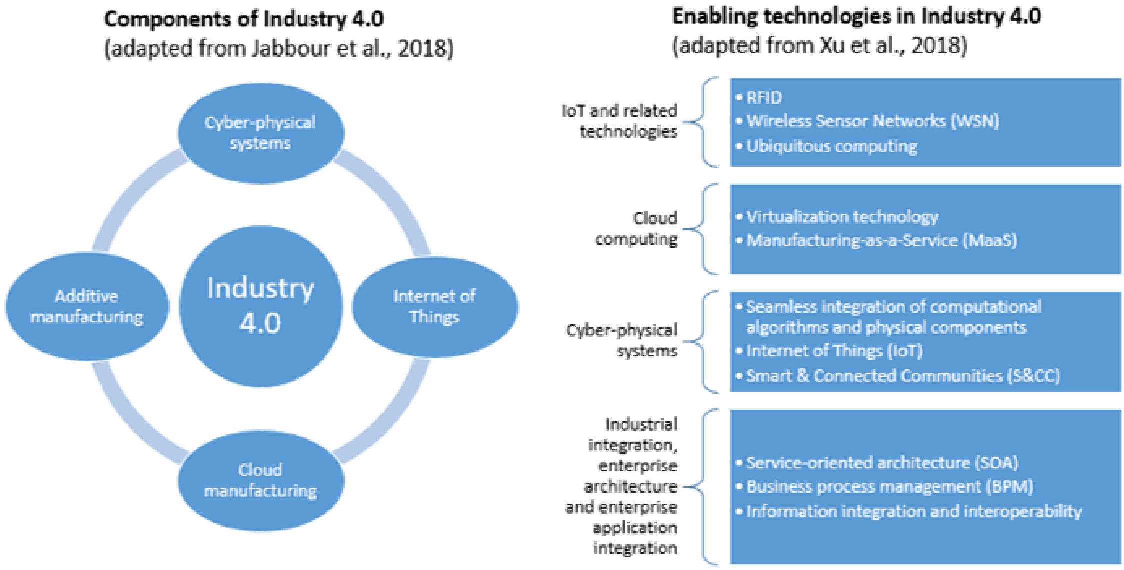

Fig. 2: Key strategic and technological focus for industry 4.0

Although national industrial policies 4.0 are based primarily on public (state) financing, additional private investments are also important with significant leverage efficiency. However, the volume of leverage increase in investment between the policies under consideration is largely different[23]. Similarly, measures adopted by policy initiatives to ensure private investment vary by type of activity. Moreover, information on private leverage is not expected to be available to all policy initiatives, hindering comparisons between policies. The UK's "High value-added production launch pad" project underwent a comprehensive review of the leverage effect of public investment. With a leverage of 17/1, "High-value manufacturing launchers" exceed the leverage of any other policy initiative, even more than many times. To a large extent, this success can be attributed to the considerable amount of income from commercial activity that the "High value-added production launch pad" is achieved through competitive R&D contracts. Despite the difficulties in assessing the success of policy initiatives in promoting private sector investment, it is clear that the range of measures taken varies. The two projects "Industry for the Future" and "Launching of high value-added production" have provided the most comprehensive measures. "Industry for the Future" provides tax incentives for private R&D investment. Moreover, "High value-added production launchers" provide strategic participation with important industry partners and support programs for the participation of small and medium-sized businesses. Although, real mechanisms are in place to better ensure private investment - that is, encourage or require private investment - national policy initiatives will benefit from consideration tighter private investment in policy design. The second industrial revolution was born from about 1870 until World War I broke out. The characteristic of this industrial revolution is the use of electric power and the introduction of large-scale mass production lines. The second industrial revolution took place when the development of electricity, transportation, chemistry, steel production, and (especially) mass production and consumption. The 2nd Industrial Revolution has created new premises and solid foundations for developing the industry at a higher level. This revolution was prepared by the 100-year development of production forces on the basis of modern mechanical production and by the development of science on the basis of technology. The decisive factor of this revolution is to switch to electricity-based mechanical production and to the local automation stage in production, creating new branches on the basis of pure science and scientific variables. into a special labor industry. This revolution opened the era of mass production, fueled by the introduction of electricity and assembly lines. Industrialization was even more widespread in Japan after the Meiji Restoration, and penetrated deep into Russia, which developed booming at the beginning of World War I. Regarding socio-economic ideology, the revolution This network creates the successful premise of socialism on a world scale. The third industrial revolution has been around since 1969, with the advent and spread of information technology (IT), using electronics and information technology to automate production. This revolution is often called the computer revolution or the digital revolution because it was catalyzed by the development of semiconductors, supercomputers, personal computers (1970s and 1980s) and the Internet (1990s). This revolution facilitated the facilitation of natural resources and social resources, allowing relatively less cost of means of production to produce the same amount of consumer goods. As a result, there has been a change in the structure of social production as well as the correlations between sectors I (agriculture - forestry - fisheries), II (industry and construction) and III (services).) of social production. Radically changing production forces, the modern S&T Revolution has affected every aspect of human social life, especially in developed capitalist countries because this is the birthplace of this revolution. The SWOT analysis result of industrial development policy 4.0 shows a low level of convergence. Among the main strengths, support is given to businesses, along with agreement between policy administration levels, as well as industry co-financing. In contrast, the main weaknesses identified are closely related to barriers such as funding constraints, lack of capacity, poor planning, monitoring, and ways to engage SMEs. into programs, ... These are also considered to be the main weaknesses in 4.0 industry policies. In France, there are doubts about the ability to effectively measure policy achievements. Spain, at present, has no clear definition of goals. Meanwhile, Industry 4.0 mainly reflects potentials, expandability and transferability, new markets and international cooperation opportunities. In Sweden, the potential for expanding the scale of school production at the Nordic level provides new opportunities. Meanwhile, in Italy, the publication of a talented instrument. The new key of "Industry 4.0" will open up new opportunities for businesses. In terms of threats, the imbalance between the way of administration between levels in administrative management, along with the conflict of interests of sectors and within each industry is quite clear. Unusually, the "High value-added production launch pad" is attempting to maintain a balanced funding model, as profits have exceeded expectations. The balanced funding model is important to ensure a balance between encouraging growth and stimulating innovation in areas that are beneficial to manufacturing. The objective fact is that Industry 4.0 is gradually coming to our country. So it's time to take action. Policymakers should encourage technological innovation in association with social innovation, considering all possibilities on the supply side, as well as on the demand side. A systematic understanding of the innovation policy is needed, including strategy and implementation coordination so that production innovation can become social innovation and conversely social innovation can become innovation. manufacturing. Specifically, promoting learning and scientific research associated with enterprises so that new technologies and new knowledge can spread faster. The social innovation policy should promote interdisciplinary projects to create momentum for production innovation. Support the transfer of basic research results to application development through laboratories, smart factories with future technologies. This will encourage cooperation and prepare the basis for social innovation. The social innovation policy can support direct procurement of high-tech equipment, infrastructure development, vocational training and new career opportunities. Moreover, each Vietnamese must be understood as an opportunity for industry 4.0. Or determined to reach out to be the market leader, for example: Vietnam's cloud infrastructure, digital content market. The world has undergone the industry's greatest changes over the past 100 years, so Manufacturing has become a hot topic that gets a lot of attention. Professor Klaus Schwab, author of The Fourth Industrial Revolution, points out that we are in the middle of the 4.0 revolution. Historically, the First Industrial Revolution took place in the late 1700s (steam engine). The second industrial revolution took place at the beginning of the 20th century (electrical power), and the third industrial revolution took place after World War II with the advent of automatic machinery based into computers and electronic devices. As an inevitable process, the Industrial Revolution we are currently experiencing - the Industrial Revolution 4.0, is driven by advances including smart manufacturing, robots, artificial intelligence and the Internet of Things (Iodine). That is followed by 5 future production trends. Simulation of product manufacturing stages helps reduce production time and ensure the production process goes according to the company's intention. At Flex, they are using technology solutions for remote support, allowing people in different parts of the world to connect with each other and solve problems together. This allows an engineer in China to consult an engineer in the United States on technical issues and receive quick, visual feedback through AR (Augmented Reality) glasses, help speed up problem solving and significantly reduce travel costs. 3D printing technology is an important milestone in the manufacturing world. Allow us to create tangible products seamlessly with just one tool. This will help you increase the ability to upgrade the design of your product. For example, if your design requires 6 pieces, 3D printing can be done in just one time without the need for additional processes like welding or screws. 3D printing technology helps reduce waste by recycling plastic and cutting wait times. The benefits it brings to manufacturing are diverse, increasing the feasibility of products from the toy industry to medical devices. Automation is another important aspect of the industry future. About 50% of Flex's manufacturing processes have been fully automated. Automation brings a higher level of accuracy and productivity. This technology can even do well in harsh environments that are not safe for humans. The new generation of robots is increasingly easier to use, with features such as speech recognition and images to perform complex human tasks. Another advantage of robots is that they will do exactly what you ask - no more.

III. CONCLUSION

In addition to robots and virtual reality technologies, factories are also pushing for improvements in cloud computing and smart sensors. Smart sensors can perform tasks such as converting data into different measuring units, connecting to other machines, storing statistics, responding and automatically disconnecting devices. Internet of Things (IoT) allows us to get the right information at the right time to make the right decisions. All of this data, as well as customer feedback, will have a significant impact on research and development activities, helping to bring a lot of user experience and drive innovation. Building a production area with robots, virtual reality technology and performing data analysis with smart devices, so what would humans do then? In other words, in the era of Industry 4.0, what would the labor force look like? Despite many challenges, there are still many predictions that machines will replace people. However, most automation technology is used for jobs that are considered unsafe for humans. As such, robots are irreplaceable, it's just an additional tool to help people get things done more efficiently. We still need people who can manage them. Like the transition from farm work to factory work in the early 20th century, almost every industry will need new forms of labor. And this is the time when the world needs a human resource that can build hardware and software; people who can design automation and build robots; as well as those who can adapt and manage those devices.

REFERENCES

[1] A. Moeuf, R. Pellerin, S. Lamouri, S. Tamayo-Giraldo, and R. Barbaray, "The industrial management of SMEs in the era of Industry 4.0," *Int. J. Prod. Res.*, vol. 56, no. 3, pp. 1118–1136, 2018.

[2] C. J. Bartodziej, "The concept industry 4.0," in *The Concept Industry 4.0*, Springer, 2017, pp. 27–50.

[3] M. M. Alani and M. Alloghani, "Security Challenges in the Industry 4.0 Era," in *Industry 4.0 and Engineering for a Sustainable Future*, Springer, 2019, pp. 117–136.

[4] Y. Lu, "Industry 4.0: A survey on technologies, applications and open research issues," *J. Ind. Inf. Integr.*, vol. 6, pp. 1–10, 2017.

[5] V. G. Frolov, D. I. Kaminchenko, D. Y. Kovylkin, J. Alex, and A. Alex, "The main economic factors of sustainable manufacturing within the industrial policy concept of industry 4.0," *Acad. Strateg. Manag. J.*, 2017.

[6] B. Shenglin, R. Bosc, J. Jiao, W. Li, F. Simonelli, and R. Zhang, "Digital infrastructure: overcoming the Digital divide in China and the European Union," 2017.

[7] H. Gruber, "Proposals for a digital industrial policy for Europe," *Telecomm. Policy*, vol. 43, no. 2, pp. 116–127, 2019.

[8] A. Ciffolilli and A. Muscio, "Industry 4.0: national and regional comparative advantages in key enabling technologies," *Eur. Plan. Stud.*, vol. 26, no. 12, pp. 2323–2343, 2018.

[9] A. Midttun and P. B. Piccini, "Facing the climate and digital challenge: European energy industry from boom to crisis and transformation," *Energy Policy*, vol. 108, pp. 330–343, 2017.

[10] Y. Liao, F. Deschamps, E. de F. R. Loures, and L. F. P. Ramos, "Past, present and future of Industry 4.0-a systematic literature review and research agenda proposal," *Int. J. Prod. Res.*, vol. 55, no. 12, pp. 3609–3629, 2017.

[11] L. Da Xu, E. L. Xu, and L. Li, "Industry 4.0: state of the art and future trends," *Int. J. Prod. Res.*, vol. 56, no. 8, pp. 2941–2962, 2018.

[12] K. Zhou, T. Liu, and L. Zhou, "Industry 4.0: Towards future industrial opportunities and challenges," in *2015 12th International Conference on Fuzzy Systems and Knowledge Discovery, FSKD 2015*, 2016.

[13] R. Kapoor, "Global Trends 2030," *World Futur. Rev.*, 2013.

[14] R. Morrar, H. Arman, and S. Mousa, "The fourth industrial revolution (Industry 4.0): A social innovation perspective," *Technol. Innov. Manag. Rev.*, vol. 7, no. 11, pp. 12–20, 2017.