

ЭКОНОМИКА ВОСТОКА

DOI: 10.31857/S086919080009725-4

ASIAN CENTER OF DEVELOPMENT
OF THE FOURTH INDUSTRIAL REVOLUTION TECHNOLOGIES

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Abstract: For the first time since the First industrial revolution of the 18th century, Asian countries have become leaders in the technology race of the Fourth industrial revolution. This article analyzes main areas, in which Asian countries have emerged as leaders.

Several Asian countries have become leading exporters of computer and telecommunications equipment. Exporting digital equipment they enable digital transformation of other Asian and African countries. Powerful TNCs have emerged in the ICT sphere of these countries.

Within a short period of development of the Fourth industrial revolution, in the East Asia (Japan, China, the Republic of Korea), a center of industrial robots manufacturing and of robotics use has been established, these countries being ahead of both the USA and Western Europe. Such a significant technological leadership of a large group of Asian countries, both in terms of production indicators and the volume of production and use of new equipment, has been observed for the first time in the entire era of industrial development. Even with a much cheaper labour force than in developed countries, China has chosen the path of robotics development in industry with the risk of losing a large number of jobs.

Since the 1990s outsourcing and offshoring of IT services and business process outsourcing (BPO) have been rapidly developing in India; other Asian and African countries also develop this sector. At present, the sector of IT services and BPO outsourcing faces challenges of robotics and automation, with the risks of loss of jobs. However, the development of digital economy in Asian and African countries also offers new opportunities generating internal demand for these services.

Prospects of socioeconomic development of Asian countries in the context of the Fourth industrial revolution are analyzed. The shift in productive forces is destroying the catch-up model of developing countries as developed countries due to automation lose interest in their cheap labor. Capital and qualified labor in the production and maintenance of new equipment become the major productive forces, reducing the role of natural resources and of large masses of workers with medium and low qualification.

There is a risk that the world will disintegrate into a developed one and underdeveloped one by technological criteria, and it will be extremely difficult for the latter to break through into the category of developed. A new caste system can be formed, dividing the society into those who are able to develop or at least support new productive forces and all the others who are not needed for this.

Keywords: Asian countries, the Fourth industrial revolution, robotics, automation, computer and telecommunications equipment, IT services and business process outsourcing, TNCs, employment, prospects of socioeconomic development.

For citation: Akimov A.V., Tsvetkova N.N. Asian Center of Development of the Fourth Industrial Revolution Technologies. *Vostok (Oriens)*. 2020. No. 3. Pp. 108–121. DOI: 10.31857/S086919080009725-4

АЗИАТСКИЙ ЦЕНТР РАЗВИТИЯ ТЕХНОЛОГИЙ
ЧЕТВЕРТОЙ ПРОМЫШЛЕННОЙ РЕВОЛЮЦИИ

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Резюме: Страны Азии в ходе четвертой промышленной революции впервые за все время с начала промышленного переворота в XVIII в. оказались лидерами в технологической гонке. В этой статье анализируются основные направления, в которых страны Востока оказались лидерами.

Страны Востока стали ведущими экспортерами компьютерного и телекоммуникационного оборудования. Они во многом обеспечивают цифровую трансформацию других стран. В странах Востока сформировались свои собственные ТНК сферы ИКТ.

За короткий период развития Четвертой промышленной революции в Восточной Азии (Япония, Китай, Республика Корея) сложился центр производства и использования промышленной робототехники, который опередил как США, так и Западную Европу. Даже при гораздо более дешевой рабочей силе, чем в развитых странах, Китай избрал путь роботизации промышленности с риском потери большого числа рабочих мест.

Ряд стран Азии специализируется на аутсорсинге ИТ-услуг и аутсорсинге бизнес-процессов, Индия вошла в число ведущих экспортеров этих услуг, там сформировались свои ТНК сферы ИТ-услуг. Международный аутсорсинг ИТ-услуг и БПО стал развиваться и в других странах Азии и Африки. Цифровая трансформация может означать для сферы ИТ – БПО в странах с дешевой рабочей силой ликвидацию рабочих мест, сокращение экспорта ИТ-услуг. Однако развитие цифровой экономики открывает и новые возможности, порождает спрос на услуги специалистов по компьютерным технологиям.

В статье анализируются перспективы социально-экономического развития, в частности рынка труда, на фоне внедрения новых технологий. Изменение системы производительных сил разрушает модель догоняющего развития, поскольку при распространении автоматизации развитые страны теряют интерес к дешевой рабочей силе развивающихся стран. Капитал и квалифицированная рабочая сила становятся важнейшими в производительных силах, сокращая роль природных ресурсов и больших масс работников средней и невысокой квалификации.

Возникает риск распада мира на развитой и развивающийся по технологическому критерию, притом, что вырваться в категорию развитых стран будет чрезвычайно трудно. Образуется новая кастовость, разделение общества на способных развивать или хотя бы поддерживать новые производительные силы и на всех остальных, ненужных для этого.

Ключевые слова: страны Востока, Четвертая промышленная революция, роботизация, автоматизация, компьютерное и телекоммуникационное оборудование, аутсорсинг ИТ-услуг и бизнес-процессов, ТНК, занятость, перспективы социально-экономического развития.

K. Schwab who can be called one of the main ideologists of the Fourth industrial revolution, in his book “Technologies of the Fourth industrial revolution”, describes the prospects of new technologies and the actions the society should take to obtain positive results from their development:

“The Fourth industrial revolution offers hope for the continuation of the human development process, which has already led to a dramatic improvement in the quality of life for billions of people since 1800.

– To achieve this, numerous stakeholders must work together to attain three main objectives: to share equitably the benefits of technological breakthroughs, to limit their inevitable negative effects, and to ensure that new technologies will expand rather than limit the opportunities for all inhabitants of the Earth.

– The technologies, on which the Fourth industrial revolution is based, are interconnected in many ways: in the way they extend digital opportunities; in the way they are scaled, developed and integrated into our lives; in the way they complement each other; and in their ability to concentrate privileges and challenge existing management systems.

In order to take full advantage of the Fourth Industrial Revolution, we should consider advanced technologies neither as simple tools that are completely under our control, nor as external forces that cannot be controlled. Instead, we should try to understand how and where human values could be embedded in new technologies and how technologies can be applied for the common good, for the protection of environment and human rights.

– All interested groups should engage in a global dialogue on how the Fourth industrial revolution technologies are changing the systems around us and affecting the lives of every person on the planet. In particular, the three groups that are often omitted in discussions related to advanced technologies management and their role should be better represented: developing countries, environment protection organizations, and citizens of all the population groups by income, age and education.

K. Schwab is in general optimistic about the prospects for new technologies, he highlights their potential, but also calls for dialogue in order to respond to possible challenges [Schwab, Davis, 2018, p. 13–14].

DIGITAL EQUIPMENT MANUFACTURING

The widespread use of computer technologies began only in the 1990s, it was often referred to as the Information and Communication Revolution (ICR). But Western and Japanese TNCs began to create subsidiaries manufacturing electronic devices in countries with cheap labor force, in developing countries of Asia in the first place, in the 1970s.

The results of the process of relocation of electronics manufacturing can be judged by the fact that by 1995, Asian developing countries¹ accounted for 47.5% of world television sets exports, 64.4% of world radio exports, and 45.1% of recorders exports. In addition, in 1995, Asian developing countries accounted for 28.6% of exports of telecommunications equipment and components (in 1995 it was quite different from the present day telecommunications equipment), 31.4% of exports of computer equipment (“automatic data processing equipment”) and 33.6% of exports of components for computer equipment. The share of China in 1995 amounted to 1.7% of world computer equipment exports and 3.3% of telecommunications equipment exports. In 2015, China was the leading world exporter with 43.1% of world computer equipment exports and 38.2% of telecommunications equipment exports, practically 2/5 of world digital equipment exports (Calculations based on [Merchandise trade matrix, 2017]).

At the middle of 1990-s, developed countries were main exporters of digital equipment. But in the 1990s and the 2000s there was a large-scale relocation of computer equipment manufacturing, and later of telecommunications equipment manufacturing processes to the countries of Southeast and East Asia. American, Japanese, West-European transnationals have created their manufacturing affiliates there, but in digital equipment production they also use widely a non-equity form of international production: contract manufacturing. At present, a major part of electronic components is manufactured in Southeast and East Asia and assembly of digital equipment is performed there. The share of East Asian and Southeast Asian countries in world computer equipment exports increased from 41% to 65%, and in telecommunication

¹ The authors use UNCTAD definitions, according to which in Asia only Japan and Israel are considered as developed countries while all other countries are considered as developing countries, including those with very high per capita incomes: Singapore, South Korea, Taiwan and Hong Kong (Special Autonomous Region of China).

equipment exports, from 18% to 72% (*Figure 1*, in exports of electronic components for ICT goods, from 44.3% to 78.5% between 2000 and 2015 (see *Figure 2*). The countries of East and South-East Asia account for the major part of exports of digital equipment, and they contribute to digital transformation of many countries. The role of China is particularly important.

According to WTO data, in 2017 world exports of computer and telecommunication equipment reached \$1841 billion. Only 10 subjects of the world economy accounted for 91% of the exports (\$1672 billion). China was the leading exporter of computer and telecommunications equipment in 2017: its share in this exports was steadily increasing: from 4.5% in 2000 to 17.7% in 2005, 27.8% in 2010 and 32.2% in 2017 (see *Figure 3*).

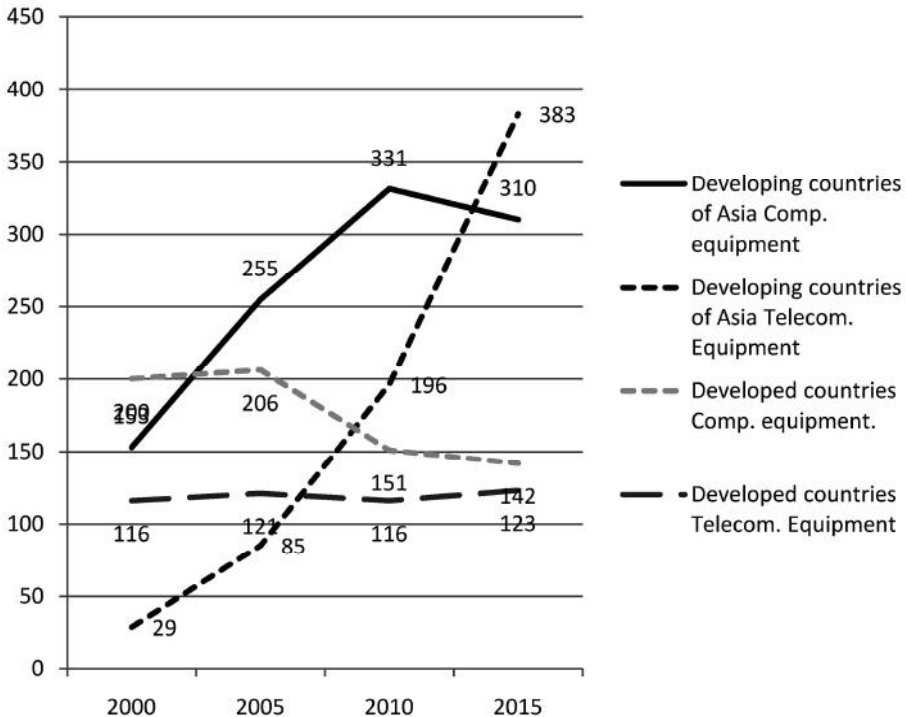


Figure 1. Exports of computer and telecommunications equipment from developed countries and developing countries of Asia, 2000–2015.

Source: Bilateral trade flows by ICT goods categories, annual, 2000–2013. Information Economy. <http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx> (accessed: 10.01.2018).

At minimal estimates, six Asian top exporters: China, South Korea, Singapore, Taiwan, Malaysia, Vietnam in 2017 accounted for more than 60% of world exports of computer and telecommunications equipment (*Figure 3*). East Asian and Southeast Asian countries are leading exporters of digital equipment that is used by new productive forces of the Fourth industrial revolution.

The majority of electronic components are imported by Asian countries from their own region. A detailed analysis shows that in 2000–2013 the share of mutual exports of 6 countries and territories: China, Hong Kong (China), South Korea, Singapore, Taiwan, Malaysia increased from 51.3% to 78% [Tsvetkova, 2016, p. 58–72]. It can be stated that an intraregional division of labor not limited by the framework of interstate regional economic organizations (such as ASEAN) has emerged in East and Southeast Asia.

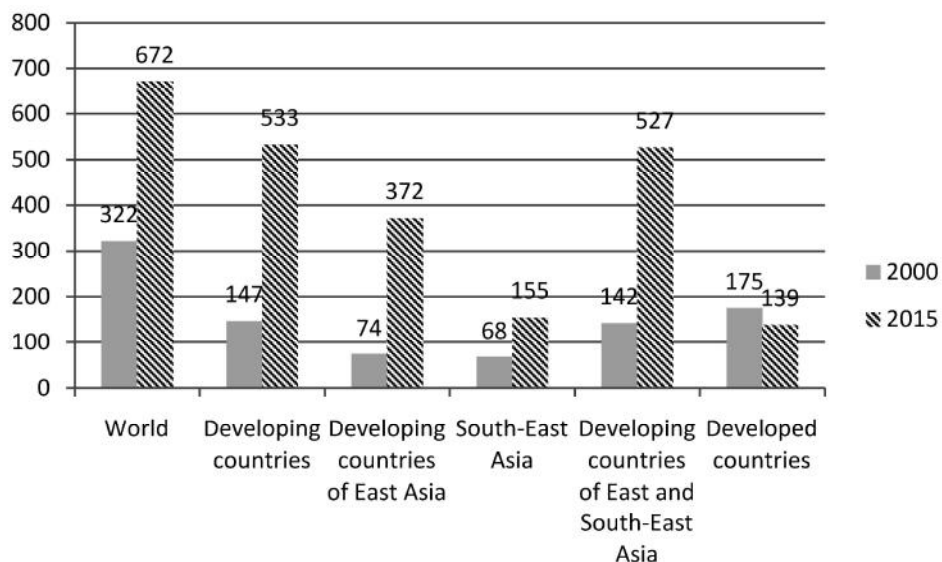


Figure 2. World exports of electronic components for ICT goods, groups of countries, 2000–2015 (\$ billions).

Source: Bilateral trade flows by ICT goods categories, annual, 2000–2015. <http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx=15850> (accessed: 12.01.2018).

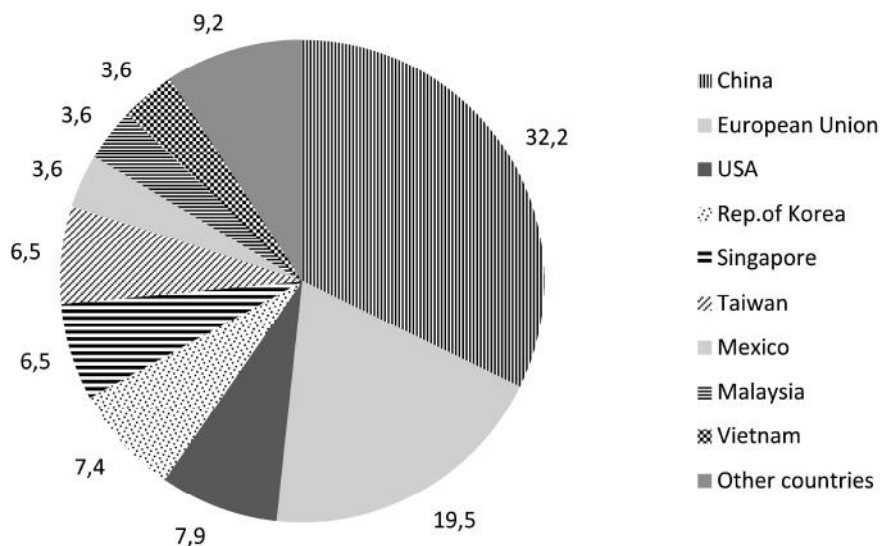


Figure 3. Exports of computer and telecommunications equipment in 2017, % of world exports.

Source: *World Trade Statistical Review 2018*. WTO. Geneva, 2018, p. 118.

At present Asian countries are not only manufacturing products with world-known brands of American, Japanese, West-European companies. There are also popular brands of Asian TNCs: South Korean Samsung Electronics, LG Electronics, Chinese Lenovo, Xiaomi, Huawei; Acer and Asus from Taiwan. These companies have become large TNCs that occupy an

important place in computers and telecommunications equipment markets. For several years we could observe a sky-rocketing growth of Chinese transnationals. Will it be stopped by the corona virus epidemics?

In 2019, five top companies on the world personal computers market were Chinese Lenovo (24.3%, 64768 units), American Hewlett Packard (HP) (23.6%; 62908 units), American Dell (17.5%) and Apple (6.6%), and Acer from Taiwan (6.4%) [*Traditional PC Volumes, 2020*]. The share of five leaders amounted to 78.4% of total sales.

Moreover, the major part of components for well-known American companies are manufactured and assembly of their products is performed in Asian countries. Some American companies have their manufacturing affiliates there while other American companies use contract manufacturing in Asian countries (Foxconn assembling i-phones in China is a classic example).

To develop digital economy a country can do without manufacturing digital equipment. It can be imported, main sources of imports being a rather narrow group of countries and TNCs, mainly Asian countries. By the start of the Fourth industrial revolution developing countries of Asia have occupied important positions as leaders in digital equipment manufacturing and they have the chances to use this advantage for their further advancement in the Fourth industrial revolution.

INDUSTRIAL ROBOTICS

Robotics has already a long history, but in recent years the spread of industrial robots has become particularly visible.

On the eve of the global financial and economic crisis of 2008–2009, the number of industrial robots in the world reached one million, and after that, despite the long recession, it continues to grow. It is estimated that in 2018 the fleet of robots reached two million and, according to the forecast, in 2020, it should amount to three million.

In addition to the automotive industry that traditionally uses robotics, poles of growth absorbing robotics comprised electrical machinery and electronic industries, metalworking, various sectors of mechanical engineering, and rubber, plastics industries and food processing.

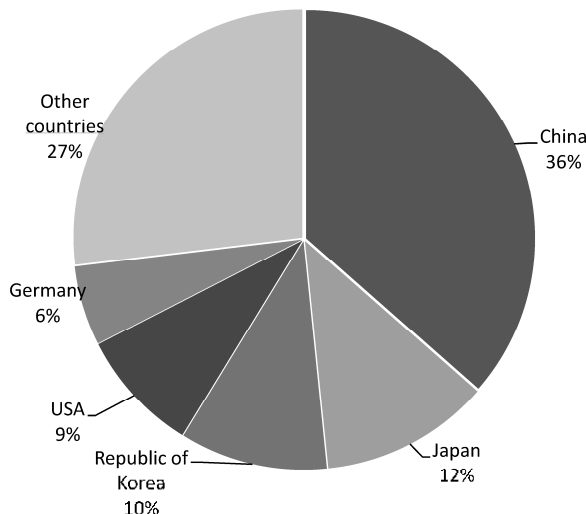


Figure 4. Deliveries of industrial robots by countries in 2017.

Source: Executive Summary World Robotics 2018 Industrial Robots.

China is the leader among countries; in 2017 it showed a record increase in robot sales, 59%. The robots fleet growth continues in Japan, the Republic of Korea and in Southeast Asia. The spread of robots to industries other than the automotive industry is forecasted [Executive Summary World Robotics 2018, p. 20–21].

While robots are being installed in these industries in all countries, there are five world leaders, accounting for almost $\frac{3}{4}$ of all industrial robots installed in the world. China accounted for more than one third of the robots installed in 2017. Three East Asian countries accounted for almost 60% of the robots.

For international comparisons of the spread of robots in the manufacturing industry, the number of multipurpose industrial robots per 10,000 people employed in an industry is used (Table 1).

Table 1

The number of industrial robots per 10000 employees, 2017

Country/ Region	Number of robots per 10000 employed, manufacturing industry	Number of robots per 10000 employed, automotive industry	Number of robots per 10000 employed, manufacturing industry without automotive industry
Republic of Korea	710	2435	533
Singapore	658	...	...
Germany	322	1162	191
Japan	308	1158	225
China	97	...	...
Europe	106	...	...
North and South America	91	...	...
Asia and Oceania	75	...	...
World	85	...	...
Canada	...	1354	
USA	...	1200	117
France	...	1156	...
Austria	...	1083	117
Slovenia	...	1075	...
Spain	...	990	...
Thailand	...	974	...
Taiwan	...	940	164
Sweden	...	...	180
Italy	...	...	160
Other countries of Europe, China	...	...	30–90

Source: made by Akimov on the data of Executive Summary World Robotics 2018. Industrial Robots, p. 18–19.

... – no data available

The Republic of Korea became the first in 2010, and rapidly built up its fleet of robots in the electronics and automotive industries. In Singapore, 84% of robots are installed in the electronics industry [Executive Summary World Robotics 2018, p. 18]. Japan had the highest

robot density rate in the world until 2010. Japan even experienced a slight decline in 2016, which may signal that the saturation of robots in a large economy may have a certain limit.

China shows the most rapid growth of robotics application. In 2009, China had only 11 installed robots per 10,000 workers in the manufacturing industry, i.e. in eight years the growth was almost 10 times.

The most robot-intensive industry is the automotive industry. In *Table 1* for all the countries, for which comparative data are available by sector, the leadership of the automotive industry is noticeable, but there are other situations. In Singapore, the electronic industry takes the first place.

The potential for robotics outside the automotive industry is estimated at 1/5 of the level of the automotive industry [Executive Summary World Robotics 2018, p. 19].

The development of robotics in recent years clearly shows the revolutionary nature of changes in the manufacturing industry. China's success in this area indicates that the changes will be global in nature. Even with a much cheaper labor force than in developed countries, China has chosen the path of robotics development in industry with the risk of losing a large number of jobs. The technological advantages of new technologies have been so noticeable that there is no alternative to robotics.

Japan has been and remains the leader in industrial robotics manufacturing, being ahead of many other countries, including the United States. The global robotics market is going through a period of growth, but there are recognized leaders who have been manufacturing robots for decades. These leaders in industrial robotics include the Big Four: two European companies – ABB and Kuka, and two Japanese companies – Yaskawa and Fanuc [*Robot companies*, 2017]. ABB is an association of Swedish and Swiss companies and Kuka is a German company that was recently acquired by Chinese investors.

China has also developed a national robotics industry. Already in 2014, almost a third of robots installed in China were made in China, which amounted to about 17 thousands units worth \$474 million. That is, by 60% more than in 2013. The China Robotics Industry Alliance, an association of robotics manufacturers, includes over 400 companies [Tobe, 2015].

An analytical study of the Chinese robotics industry by foreign economists has identified 47 companies manufacturing industrial robots, as well as five other startups in the sector. Another 26 firms provide services for integrating robotic equipment and special equipment. 34 companies manufacture components, including sensors required in robotics. As a whole, 107 Chinese companies are involved in the manufacture of industrial robots [Tobe, 2015], creating a necessary technological and business environment for successful development of the industry. Still, the authors of the report emphasize that many of these companies can produce products only for the Chinese market as their capabilities and products quality are still far behind the world level.

In addition to manufacturing industrial robots, China is also developing service robots manufacturing. There are 48 companies producing robots functioning in the air, on land and under water, used for space exploration and military purposes. In addition, domestic service robots are produced, in particular vacuum cleaners, the sales of which by e-commerce company Alibaba are estimated at tens of thousands units [Tobe, 2015].

The report identifies the following main factors contributing to development of robotics manufacturing in China: government incentives and support for development of the industry and exports of its products, cheap financing, tax incentives for robots manufacturers who use local labor, influx of skilled engineering personnel from Chinese universities and research centers, rising wages, declining number of people of working age, ageing labor force due to the demographic policy of single-child families, high cost of training skilled workforce, the necessity to raise the quality of products of China automotive industry, large investments in robotics by such companies as Foxconn and Apple operating in China and also the growth of

incomes of the Chinese middle class willing to spend money on high quality goods [Tobe, 2015]. It should be noted that these factors are sustainable, which predetermines the long-term development of Chinese robotics.

Within a short period of development of the Fourth industrial revolution, in the East Asia (Japan, China, the Republic of Korea), a center of industrial robots manufacturing and of robotics use has been established, these countries being ahead of both the USA and Western Europe. Such a significant technological leadership of a large group of Asian countries, both in terms of production indicators, the volume of production and use of new equipment, has been observed for the first time in the entire era of industrial development.

The competition of technological leaders in the field of robotics is developing all over the world. In Japan, the Headquarters for Japan's Economic Revitalization (HQ for Japan's Economic Revitalization), which operates under the Prime Minister, issued in 2015 a document entitled "Japan's Robotics Strategy". (Japan's Robotics Strategy – Vision, Strategy, Action Plan). The strategy was developed for the period until 2020 and, in several aspects, until 2025. Its main goal is to integrate robotics into all the spheres of Japanese society [New Robot Strategy, 2015]. Japan is declared "as a Robotics superpower"; robotics should be used to solve the country's problems, in particular the problems of the ageing population due to low fertility and high life expectancy.

Japan intends to become a world innovation hub of robotics, a world leader in use of robots in everyday life, a leader in the Internet of things, and a leader in building robots with artificial intelligence and integrating them into networks.

In general, this national program is aimed at technological leadership of Japan and based on existing achievements. Its goals seem to be achievable, and Japan is able to maintain its technological leadership in robotics, to perform a technological revolution in this sphere and to extend the use of robotics to many spheres of society.

IT SERVICES IN THE CONTEXT OF THE FOURTH INDUSTRIAL REVOLUTION

Since the 1990s, outsourcing and offshoring of IT services and business process outsourcing (BPO) have been rapidly developing in India. Initially, foreign companies entrusted simple labor-intensive operations to Indian companies that were small at that time. TNCs also located their affiliates in India, providing services to various divisions of their parent corporation (they are called captives). Among the top 20 exporters of computer services in 2016 the European Union was the first (28 countries taken together), India was second, Singapore, the United Arab Emirates, the Philippines and South Korea were also on the list of top ten (no information on China was provided in WTO's table).

India continued to be the first in the AT Kearney Global Services Location Index in 2019. In March 2018, there were more than 1,140 global in-house captive centers there, almost half of the top 500 global companies work in India [2019 Global Services Location Index]. The turnover of the IT – BPO industry in 2018 reached \$180 billion. In 2018, 2,700 companies, of which 57% were involved in providing IT services, 42% in software products, 27% in BPO 17% in R&D were members of NASSCOM (Indian Association of IT and BPO services companies) [*Has Nasscom lost its way?*, 2019]. In India TNCs in the sphere IT services have emerged, which occupy important positions in world ratings. These companies have a network of affiliates abroad.

Among Asian countries, the Philippines also specialize in the IT services and BPO exports of. In 2016, computer services exports from the Philippines amounted to \$5.3 billion (*Table 3*). The main specialization of the Philippines is call centers, mainly focused on the US market. The Philippines specialize in financial, medical, legal services, animation, and online English lessons via Skype. The employment in the BPO industry in the Philippines in 2020 is "around

1.3 m workers and the industry contributes approximately 9% to GDP when its indirect and induced multiplier impacts are factored in” [What does, 2020]. The Philippines have more than 1,000 BPO companies conducting call center and back office work in the country. Hundreds of thousands of Filipinos work in the BPO industry as freelancers [2019 Global Services Location Index].

Table 2

Top 10 exporters of computer services, 2016 (\$ billion, %)

	Exports (\$ billions)	Share in the top ten exports
European Union	204.3	65.4
India	51.5	16.5
USA	17.3	5.5
Singapore	9.8	3.1
Israel	9.8	3.1
Philippines	5.2	1.7
Canada	5.0	1.6
UAE	4.5	1.5
Russia	2.7	0.9
South Korea	2.4	0.8
All mentioned above	312.4	100

Source: World Trade Statistical Review 2018, WTO. Geneva, 2018, p. 168.

China was always the second in 2007–2019 AT Kearney ratings. As early as 2006, China was already ahead of India in software and IT services output. However, China, like the Republic of Korea, is developing its IT services industry mainly for the domestic market. One of the largest software and software products manufacturers in China is Huawei. The company, like many other Chinese companies, offers end-to-end solutions, from project development to provision of IT infrastructure and related software applications.

IT services and BPO outsourcing is developing in other Asian countries: Singapore, Malaysia, Sri Lanka, Bangladesh, Nepal, Jordan, UAE; in African countries such as Egypt, South Africa, Morocco, Tunis, Ghana, Senegal, Mauritius. Developing this sector many countries hope to resolve the problems of unemployment, what is more important, unemployment of educated youth. Will these hopes come true?

At the present time, the sector of IT services and BPO outsourcing faces the challenges of robotics and automation. Routine IT services that were given out for outsourcing such as accounting, software testing, medical transcription can be automated.

In the AT Kearney “Global Services Location Index 2019” report, along with the previously used three groups of indicators: 1) financial attractiveness, 2) availability and skills of personnel, 3) business environment, was added the 4th indicator – digital resonance. “It includes: 1) digital skills of the labor force; 2) the extent to which the legal framework national legislation takes digital business models into account, including cybersecurity protection; 3) the amount of corporate activity defined as the amount of capital invested in start-ups and the number of deals by venture companies in 2018; 4) digital outputs, including creative outputs, as well as knowledge and technology outputs”. The countries with the highest level of digital resonance are the USA, the UK, Israel, Canada, Singapore and Germany. China is 7th by this

indicator, India is 12th, Malaysia is 15th, UAE is 16th, Russia is 18th, Indonesia is 19th [2019 Global Services Location Index].

Asia continues to dominate the AT Kearney Index. Asian economies represent six of the top seven spots, and India, China, and Malaysia hold the first three spots, Indonesia, Vietnam, Thailand and the Philippines are also in the top ten, Egypt, UAE, Sri Lanka, Bangladesh, Singapore, Pakistan, Turkey are also on the list [2019 Global Services Location Index].

According to Tholons Services Globalization Index 2019 (TSGI), the leading 5 global cities, IT and BPO outsourcing centers, in 2019 were Bengaluru, Manila, Sao Paulo, Mumbai and Dublin [Tholons, 2019].

The main challenges in outsourcing are automation and information security. A new generation outsourcing agreements are spread, where outsourcing is combined with robotic process automation (RPA). There is a more complex structure - a combination of work of people and robots, work in the cloud and in office, reshoring and outsourcing. Routine work is automated and creative functions are expanded [2019 Global Services Location Index].

Up to now, offshoring is still ahead of reshoring. However, there are several factors in favor of reshoring: development of robotics and automation, synergy from localization, proximity to clients, availability of qualified personnel, reduction of risks in global value chains, decrease in time to market products.

Companies operating in the sector of IT services and BPO in India are adapting to new conditions. They develop and implement RPA solutions themselves.

Digital transformation may mean for the IT – BPO sector in countries with cheap labor force elimination of jobs, reduction of IT services exports. Nevertheless, the development of the digital economy in Asian and African countries offers new opportunities. The spread of smartphones, the work of data centers, cloud services, e-commerce, electronic payments, telemedicine, Internet of things generate a considerable demand for IT services. New products, areas and opportunities are emerging. However, this sector in many Asian and African countries will focus more on the domestic market and the markets of neighboring countries with less developed IT sphere or more expensive workforce.

ROLE OF HUMANS IN PRODUCTION IS CHANGING

New technologies, which have been developing for several decades, are changing the manufacturing apparatus of developed countries and spreading to developing countries. Developing countries have been successful in their economic and social development thanks to their integration in the world economy as suppliers of manufacturing products to developed countries. But the shift in productive forces is destroying this catch-up model as developed countries lose interest in cheap labor of developing countries because their automated industries have higher productivity and produce higher quality products.

New technologies are resolving a major demographic problem in developed countries, where the far-reaching process of population ageing has significantly reduced the labor force. At the same time, these technologies can block the traditional solutions to the demographic problems of developing countries, which consist of a transition to an urban way of life, employment in industry and other modern sectors of the economy, increasing incomes and education levels. Traditional high birth rates are being reduced on this basis.

There are two views on the prospects for employment under the influence of new technologies. One opinion is that the employment will change but not decrease, as new professions and spheres of employment will appear. The other opinion warns that new technologies are reducing the effective use of human labor.

The previous development experience shows that there were new areas of employment for people who had been released from old industries as technologies developed. It is impossible to

state at present what variant of labor market development will take place. We shall try to identify possible development options without giving preference to any one of them.

The essential question is how the labor market will be formed, with labor saving technologies of the Fourth industrial revolution. It seems the following basic options are possible.

The first variant is a narrow market for creative workers and a small number of manual labor specialists engaged in machinery maintenance. The rest of the population will live on welfare allocations, and for their service high quality specialists (such as physicians) are needed. Those living on benefits can spend their time on hobbies, and volunteer work is developed.

The second option is also a narrow market of creative professionals, but it coexists with a market for a very cheap labor force, mainly in the service sector with fierce competition for access to services for the elite with high incomes. In contrast to the first option, the welfare benefits are minimal. The subsistence economy is widespread, which helps the majority of people who have not entered the elite labor market to survive.

The third option may be of a mixed type, where again, a narrow market for creative workers coexists with subsistence economy. At the same time, there are welfare benefits for everyone.

In any of these options, the role of state management of social processes will be great as the established market mechanisms will collapse because of the changing role of the labor force in production. The possibility of expanding the sphere of creative labor remains an important issue. It is possible that if the educational system changes, leaving the routine operations for robotics and artificial intelligence, the creative work will involve a much larger number of people than it is currently the case, since the present educational system is aimed at the established labor market, where there is a large share of routine activities, for which students should be trained.

New technologies create great opportunities for economic development in all countries, including Asian countries. They significantly increase the productivity of equipment, as automation leads to displacement of humans from the production process, and automatic machines are capable of working as long as necessary, with the technical characteristics, rather than the physiological parameters, of a tired and distracted human operator. A smaller humans' role eliminates the human factor by improving product quality. The production process becomes more homogeneous and the products are more similar in their properties. The quality of products depends mainly on the level of equipment and raw materials and the organization of production.

The ability to quickly reconfigure robotic machines leads to greater flexibility in the production process. If it is simple and inexpensive enough to reconstruct the equipment, small series and customized products become cheaper, the era of mass products created on conveyor lines becomes a thing of the past. Efficiency of order execution is increased due to flexibility of equipment and minimization of live labor.

Humans are no longer engaged in harmful, monotonous, exhausting work. Only work associated with creativity or making difficult decisions remains. There are branches of industry where humans are just physiologically not able to create necessary products, for example, manufacturing microcircuits for electronics.

New technologies are becoming more and more international. The ease of information transfer and the low cost of transports make a broad international division of labor appropriate. With global value chains, TNCs spread new technologies around the world while optimizing production and distribution costs.

In general, the technological level of production, its quality characteristics and product quality, and the ability to execute orders, which are customized for consumers, including individuals, companies, government authorities and civil society, are increasing.

At the same time, competition is intensifying in two directions. There are the competition between the old and new systems of productive forces, on the one hand, and competition between the subjects of the new system, on the other hand. This situation generates certain risks.

The biggest risk of introducing new technologies is their main achievement, elimination of humans from the production process. If there are no humans in production, there are no consumers with earned money, which they are ready to spend on goods and services. Humans remain, but they are not economic agents – consumers with demand and economic possibilities to satisfy it. As a result of the elimination of the producer, the role of redistributive processes controlled by the state grows. The market as a tool for regulating needs and resources loses its significance.

The high role of information in production makes it vulnerable to hackers' attacks. The strength of the new system of productive forces is the information connectivity of individual enterprises, their systems and the world as a whole. The same characteristic carries in itself a huge danger.

At the same time, the risk of creating a large number of oligopolies and monopolies is growing. The complexity of creating new technology will contribute to the emergence of specialized firms that will be the best in the world in their narrow niche. It will be incredibly difficult for other firms to reach the same level (it will be too expensive or too long). Such monopolists may not necessarily be large firms, but they will be able to gain power over the market due to the uniqueness of their products or services. Firms that have successfully developed new technologies will be able to maintain their market leadership due to the large gap in human resources, experience, know-how and patents protection.

There is a risk that the world will disintegrate into a developed one and underdeveloped one by technological criteria, and it will be extremely difficult for the latter to break through into the category of developed countries. As mentioned above, a low-quality workforce will have minimal prospects on the world market.

Not only developing countries, but also developed countries will have a minority that works to solve real problems of technological and social development and this minority is necessary for the production and functioning of the economy, and next to it there is a majority that lives on welfare benefits or does work that is only needed to employ the unemployed. A new caste system is formed, dividing the society into those who are able to develop or at least to support new productive forces and all the others who are not needed for this.

Technological dependence can become a crucial factor in international relations. The pattern of development described above may lead to the emergence of a new technological core and periphery in the world economy on the technological level. Naturally, transition to the core from the periphery will be possible, but difficult, because in the context of globalization countries of the technological core will be able to get required specialists through immigration (brain drain).

At the same time, the possession of capital and the opportunity to buy new technologies can become a factor of rapid economic growth and modernization of the economy, even for the countries that are unable to create their own national mechanism of modern production due to the small size of the economy and/or the low quality of human capital and lack of national engineering staff. Purchase of modern equipment, which does not require a large number of unskilled workers for its work, with the involvement of a small number of foreign engineers and qualified middle-level specialists can enable the necessary production in the buyer's country. Elements of such development are already visible in the Gulf oil exporting countries.

Thus, capital and qualified labor in the production and maintenance of new equipment become the most important of the productive forces, reducing the role of natural resources and of large masses of medium and low-skilled workers.

Thus, one can agree with K. Schwab's point of view on the positive potential of technologies of the Fourth industrial revolution. However, the agenda for a global dialogue on the prospects for their development has not yet been defined, as there are sharp contradictions between countries on a number of aspects.

REFERENCES / СПИСОК ЛИТЕРАТУРЫ

- 2019 Global Services Location Index (GSLI). AT Kearney 2019. <https://www.atkearney.com/digital-transformation/gсли/2019-full-report> (accessed: 12.06.2019).
- Bilateral trade flows by ICT goods categories, annual, 2000–2013. Information Economy. <http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx> (accessed: 10.01.2018).
- Bilateral trade flows by ICT goods categories, annual, 2000–2015. <http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx=15850> (accessed: 12.01.2018).
- Executive Summary World Robotics 2018. *Industrial Robots*. https://ifr.org/downloads/press2018/Executive_Summary_WR_2018_Industrial_Robots.pdf (accessed: 10.06.2019).
- Has Nasscom lost its way?* <https://economictimes.indiatimes.com/tech/ites/has-nasscom-lost-its-way/articleshow/68314569.cms?from=mdr> (accessed: 15.06.2019).
- Merchandise trade matrix – product groups, exports in thousands of dollars, annual, 1995–2015. <http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=24739> (accessed: 2.02.2017).
- New Robot Strategy. Japan's Robot Strategy – Vision, Strategy, Action Plan – The Headquarters for Japan's Economic Revitalization. 10/2/15. http://www.meti.go.jp/english/press/2015/pdf/0123_01b.pdf (accessed: 01.03.16).
- Robot companies*. <http://industrialrobot.info/robot-companies> (accessed: 11.10.2017).
- Schwab K., Davis N. *Technologies of the Fourth industrial revolution*. Moscow: Eksmo, 2018 (in Russian) [Шваб К. Дэвис Н. *Технологии Четвертой промышленной революции*. М.: Эксмо, 2018].
- Tholons Releases. 2019 Services Globalization Index – Innovation at Scale! Top 100 Super Cities and Top 50 Digital Nations* <https://www.newswire.com/news/tholons-releases-2019-services-globalization-index-innovation-at-scale-20852985> (accessed: 15.06.2019).
- Tobe F. 194 *Chinese Robot Companies*. August 12, 2015. <https://www.therobotreport.com/194-chinese-robot-companies/> (accessed: 11.10.2017).
- Traditional PC Volumes Close Out an Impressive 2019 with Fourth Quarter Growth of 4.8%, According to IDC*. <https://www.idc.com/getdoc.jsp?containerId=prUS45865620>. 13 Jan 2020 (accessed: 15.05.2020).
- Tsvetkova N. *ICT in Asian countries: ICT goods and IT services production*. Moscow: IOS RAS, 2016 (in Russian) [Цветкова Н.Н. *Информационно-коммуникационные технологии в странах Востока: производство товаров ИКТ и ИТ-услуг*. М.: ИВ РАН, 2016].
- What does the Covid-19 outbreak mean for the Philippines' BPO industry?* <https://oxfordbusinessgroup.com/news/what-does-covid-19-outbreak-mean-philippines-bpo-industry>. April 22, 2020 (accessed: 15.05.2020).
- World Trade Statistical Review 2018*. WTO. Geneva, 2018.

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