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How Robotics Influences Economic Development of Asian and North African States: The Main Trends

Cumulative effect of different technologies development for several decades has resulted in appearance of a great number of enterprises and even of industries which need very few personnel. The new reality greatly changes the existing social and economic relations.

Robotics is the most popular element of new labor-saving technologies but there are several other technologies that influence the labor market in the same way. They are numerical control tools (NCT), artificial intelligence (AI), additive technologies, and also big production complexes in mining and bulk cargo transshipment. Besides, there are accustomed technologies that became revolutionary several decades ago.

Robots have more axes for movement but NCT operating according to their programs result in the same effect as robots. They too replace qualified workers. AI replaces mainly white-collar workers, persons of intellectual labor, including low-qualified engineers, office personnel, and also medical doctors in diagnostics and even university professors in checking students' essays because AI is able to teach itself by reading essays that have been earlier checked by professors.

The most popular additive technologies are three-dimensional laser printers which can print three-dimensional article according to computer command by adding substance with various additives layer by layer. The final article is produced by agglutination or nodulization.

Big production complexes in mining have very high productivity, can remove huge amount of rock thus replacing mining by open-cast production and minimizing demand for miners.

Among accustomed technologies are mechanization of land cultivation, transport containers which have replaced dockers in ports, and self-service shops and vending machines that replace sellers, Internet banking and bancomats.

Thus, there are many technologies in modern economy that replace human beings, increase productivity and quality, eliminating human mistakes at the same time.

Labor-saving technologies are developing and their use is becoming wider. Thus, trends of their future influence on social and economic processes in various parts of the world economy become quite evident. For the main Asian economies and their groups the following trend can be considered the most important.

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Japan, Republic of Korea, Taiwan, and Singapore:

1. Japan has the largest number of installed industrial robots in the world and Japanese robot producers are leading in the world both in technology and output. Republic of Korea has the highest robot density in industry (531 robot per 10000 employed). Singapore follows Korea with 398 robots per 10000 employed and Japan is in the third place with 305 robots. Taiwan has 190 robots per 10000 employed in manufacturing and the most robotized European economy – Germany had 301 while the USA – just176 [4]. Despite the present high level of industry robotization Japan and Republic of Korea are increasing the number of installed robots with the annual surplus that is equal to North American (see table 1).
2. Japan is number one robot designer and producer in the world. It has worked out and implements robotics development program which is targeted at the introduction of robots in all spheres of everyday life. The aim of the program is to make Japan robotics superpower.

The target of Japan is to become innovation hub of the world in robotics, to be a leader in using robots in everyday life, to lead in robot Internet nets, and in creation of robots with artificial intelligence and in uniting them into nets.

As to robot use in manufacturing there are plans to increase their number in small and medium business as large firms already widely use robots. Services are also considered to be a promising field for robotics. Japanese strategy discusses no barrier environment for robots by 2020 that is wide robot home use.

The program is nationwide, it is targeted at technological leadership, and is based on present achievements. [5].

Table 1

Multi-purpose Robots Installation by Countries, Number of Robots

Year	2014	2015	2016	2019
China	57096	68556	90000	160000
India	2126	2065	2600	6000
Japan	29297	35023	38000	43000
Republic of Korea	24721	38285	40000	46000
Taiwan	6912	7200	9000	13000
Thailand	2657	2556	3000	4500
Other Asia and Australia	10635	6873	7600	13200
North America	31029	36444	38000	46000
Europe	45559	50073	54200	68800

Source: [2, p.18]

China:

1. China demonstrates the highest rate of robot increase in the world. Other labor-saving technologies are also developed there. China imports many technological items but still it is leading in the rate of increase of robots installed in manufacturing.
2. Labor-saving technologies will insure economic growth in China while the population there is aging. China has adopted five-year plan "Made in China 2025" [3]. Its aim is to make China one of the world technological leaders in the nearest future. According to the plan, by 2020 robot density in China will reach 150 per 10000 employed in industry. In 2015 robot installation in China was already greater than in the European Community. See table 1.
3. Labor-saving technologies decrease the labor market, especially for rural population that migrates to cities.
4. There is a threat of dividing the country into modern developed urban China and under-developed rural China.
5. Strong centralized political power in China can insure economic redistribution in society and solves the employment problem, which is created by labor-saving technologies.

India:

1. India is the international leader in off-shore computer programming and robots need programming thus producing new demand in this field. India is also the world leader in IT-services. According to N. Tsvetkova, India is already the biggest world exporter in this field, it has qualified specialists and high investor ratings in IT-services. [1, chapter 2].
2. Labor-saving technologies can increase productivity of labor in all sectors of economy. Currently, India develops open-cast mining and uses imported robots in automobile industry but robot density and the rate of increase of robot stock in Indian industry is considerably lower than that in China (see table 1).
3. There is an engineering school in India and qualified workers who are able to design and produce modern technologies are available. Currently, India produces many numerical program control machine-tools.
4. Labor-saving technologies can undermine labor market in India and provoke great social disorder. India has no central planning and governance in social and economic fields like China has and thus it is more vulnerable to threats which result from labor-saving technologies.

New industrial economies:

1. Manufacturing of these economies is already equipped with robots and other labor-saving technologies. For instance, Thailand installs more robots than India (see table 1). Industrial robots are numerous in auto and electronic industries. Divisions of multinationals install modern equipment in all the countries where they are located. According to the 2015 International Robotics Association annual report Malaysia, Singapore, and Vietnam demonstrated considerable increase in industrial robot stock [2].

2. World robotics is a threat to the main competitive advantage of the new industrial economies – their cheap labor. Manufacturing can lose competition with developed economies, export can decline, and the new industrial economies may face the necessity to shift to the markets of developing countries with a new market environment.

Rich oil exporters:

1. Robotics may partially replace important limitation to economic development of these countries that is unwillingness of the local labor to work in industry. Local manufacturing can be based on import of modern labor-saving technologies.

Poor countries with fast growing population (Pakistan, Bangladesh, Afghanistan, Yemen):

1. Imported labor-saving technologies can quickly increase production in all sectors of economy.
2. Labor-saving technologies can block social development as numerous low-qualified labor force will be of no demand in the world market.
3. Mass unemployment can stimulate emigration and social disturbance.
4. Foreign economic assistance may become the only stimulus for social and economic development.

It is evident that export oriented industrialization and catch-up development model are now under the threat since labor-saving technologies devaluate one of the main competitive advantages of developing countries – their cheap labor. Catch-up development may turn to home market or to South-South cooperation.

At the same time Eastern Asia is becoming the manufacturing center that is not only competitive to Europe and the USA but surpasses them in important technologies.

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