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# Global Trends in the Information Civilisation and the Labour Market in Poland

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## ABSTRACT

The article is devoted to the impact of information civilization on the Polish labor market. The main milestones in development processes related to technological changes are presented and the implications of these changes for the traditional production activities are discussed. Using the example of the US economy potential changes on the Polish labor market are discussed.

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The more advanced the growth of elements of information civilisation in Poland, the greater is the urgency to find an answer to the question "How will the development of the information civilisation of the future influence the situation on the labour market in Poland?".

In order to answer this question one could refer to two main stages in the development of this information civilisation, identified by professor A.P. Wierzbicki, one of the most eminent Polish experts on these issues. According to his most recent work <sup>1</sup> the first initial phase of development of the aforementioned civilisation on a world scale encompasses three periods of technological changes. The demarcation dates of this division reflect the point at which the main break-through technologies were introduced. These brought about fundamental changes in the way society functions. In applying this criterion prof. Wierzbicki singles out:

1. invention and widespread use of personal computers /PC's/ which took place in the years 1980-1990,
2. invention and widespread use of mobile telephones, *which occurred in the years 1990-2000,*
3. invention and expansion of the Internet in the decade between 1990 and 2000.

If we examine these processes from the point of view of their impact on the labour market, we note, that none of these three new technologies decreased the global demand for work, either on a world scale, or in the most developed countries which had made the most headway in the process of creating an information civilisation.

Therefore, at this stage of its development, the information civilisation didn't pose a direct threat to the labour market. Moreover, this stage didn't conflict with the needs of the said market. Personal computers, mobile telephones, and ultimately, the internet, did not result in a decrease in the demand for labour.

Quite to the contrary, some of these processes, as for example, the Internet, in the initial stage of its development, even increased the demand for workers with new qualifica-

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<sup>1</sup> Andrzej P. Wierzbicki, "Information civilisation and the Labour Market", typescript, Warsaw, Poland 2015.

tions which were required, as well as those with traditional qualifications. Introduction of information technology in the state administration can be quoted as a classic example here. Initially, there was an increased demand, in general, for workers who had these new qualifications, accompanied by a simultaneous growth in employment in the traditional occupations.

This theory is borne out by empirical data. In the most advanced country in the development of both information civilisation and of tele-information technologies, that is, the U.S., the total level of employment increased from 136.8 million people in the year 2000 to 139.1 million in 2010, i.e., by 2.3million<sup>2</sup> over a 10 year period. This growth contradicted the earlier projections, which suggested a decrease in employment. Moreover, the growth took place in spite of the financial crisis of 2008-2010.

The employment in public administration in the U.S. increased simultaneously from 6.1 million to 7.0 million, even though the public administration sector was almost completely computerised. The growth was more rapid than that observed across the entire national economy, and took place despite exceptionally intensive attempts by the neo-liberally oriented economists to push the state out of the economy.

In the same period when the employment in the US was expanding, there was a fall in the total of the population in employment in Poland from 15.0 million in the year 2000 to 13.8 million in 2010<sup>3</sup>. This means, that Poland didn't take advantage of the opportunity to expand employment at the initial stage of the information civilisation.

In the face of such a situation on the world market we can conclude that since Jeremi Rifkin's theoretical formula of "the end of work"<sup>4</sup> didn't materialize in the economic reality of that period, it should be discarded. However, this would be premature. In fact, we face a somewhat delayed impact of the information civilisation on the labour market.

This doesn't mean, however, that we can completely avoid this scenario becoming a reality. The introductory analysis of the impact of the second, higher stage of the development of the information civilisation indicates that it can radically change the situation. Many signs point to the fact that the second stage of this civilisation could create many more threats for the labour market than the first.

Professor A. Wierzbicki distinguishes 3 future technological breakthroughs in this second stage, namely:

1. Acceleration and diffusion of the robotization process on a scale never predicted before. Its main peak is expected to occur before 2040 and it may have a similar effect as the expansion of the internet,
2. The use of "artificial intelligence" technology on a broader scale, although this term continues to be controversial, since it doesn't cover the entire area of human intellectual potential,

<sup>2</sup> Statistical Abstract of the United States 2012, U.S. Census Bureau, p. 398.

<sup>3</sup> Statistical Yearbook 2014, GUS, Warsaw, p. 42-43.

<sup>4</sup> J. Rifkin, *The End of Work: The Decline of the Global Labour Force and the dawn of the Post-Market Era*, Jeremi Tarcher-Putnam, New York 1995.

3. The application of biomedical technologies on a mass-scale, based on applying the results of genetic research on the human genome to meet the future needs for prophylaxis and diagnostics in healthcare,

Research conducted worldwide reveals that all three future breakthroughs – as apposed to the former three characteristics of the first stage of information civilisation – will come into fundamental conflict with the needs of the labour market. They may pose real threats and the danger of loss of work for broad bands of the population.

It would appear that public opinion throughout the world including Poland, even in scientific circles, doesn't realise the scale of these threats.

Of the three above-mentioned breakthrough technologies of the future, the effects of the mass-scale use of robots, unthought of 20 or 30 years ago, could have the most significant impact on the labour market. According to results of the worldwide debate on this subject, which the "The Economist" covers in its articles entitled "The Race of the Robots"<sup>5</sup> or "The Rise of the Robots",<sup>6</sup> the greatest changes in this respect could take place in the services sector. It is estimated that "in 30 years time the majority of jobs could be replaced by automation. It is the use of robots which will bring about a real technological and social revolution with unexpected consequences"<sup>7</sup>.

In industry alone, in the next 30 years robots could be substituted for almost 70% of the workers, at present engaged in the process of serial production in the industry. This could result in 200-250 million people in the industry worldwide losing their jobs. It's estimated that one industrial robot operating on the production line in industry can replace 15-20 workers.

However, it is the services sector where the decrease in employment could become a reality even sooner than in industry. For the expansion of robots in services was much more rapid than in industry. Forecasters have been completely taken aback by the scale of this expansion. In the 1980s it was predicted that in the year 2000 the number of robots used in industry would total 2 million. In fact, the actual number was only 750 thousand. On the other hand, the number of robots "employed" in the service sector exceeded 2 million. This wasn't anticipated on such a scale. One of the consequences of that outcome has been a fundamental change in the situation of workers in industry who lost their jobs. Previously they would have been able to find new employment in the services. Now such people can be pushed out from the services sector as well. This can happen in particular in such occupations as drivers, waiters, shop assistants, social workers, nurses, postmen, bookkeepers and many others. As a rule, these are the most work-intensive professions.

But the effects of robotization also have a more positive side, as it creates new occupations on a larger scale connected with the production of robots, with their operation and with specific services which have emerged in connection with robotization.

<sup>5</sup> "The Economist", 13 March 2004, "Technology Quarterly", p. 3.

<sup>6</sup> "Rise of the Robots", Special Report, "The Economist", 29 April 2014, p. 31.

<sup>7</sup> "Przegląd", 2 February 2014, p. 56.

So far the robotization process has pushed out mainly the staff with middle-skills qualifications. "The Economist" states that "In recent decades, for example, computerisation and automation have displaced "middle-skilled" workers at the same time as employment among high- and low-skilled workers has increased"<sup>8</sup>.

The second future breakthrough is linked with the invention and application of new "artificial intelligence" technologies. This change isn't yet as clearly identifiable as the robotization process. However, we already know that it could for the first time substitute and push out the workers with the highest qualifications, even those with university level qualifications. This is an important difference compared to the first stage of the second phase of the information civilisation.

Finally, the third future breakthrough, that of biomedicine, could result in a greater decrease of demand than the former, due to the substitution of highly labour-intensive diagnostics-related occupations in the healthcare services.

The fact that in the above-mentioned American forecast regarding demand for given occupations up to 2018 in the U.S. it is the "biomedicine engineers" who are in first place with the highest growth rate (72% over 10 years), can be perceived as one of the signs of the dawn of the biomedicine profession.

The acceleration of the decrease in future employment is also borne out by the forecasts for the US. for the next 10 years from 2018, that is for the period 2019-2028. Working on the basis of projections for given occupations and sectors, and making provisional calculations for missing data, derived from the relevant past relations, a diversion of trends is noticeable, that is, a decrease – instead of an increase – can be seen on a nationwide scale in the U.S. in the decade 2001-2010. In the decade 2019-2028 the level of total employment in the U.S. could decrease, according to the most cautious calculations, by 2-3 million workers, compared with the increase of 2 million in the decade 2001-2010.

Although the decrease on such a scale doesn't pose a threat of Rifkin's "end of work" vision materializing, it nevertheless indicates, that in the next twenty years (2016-2035) the megatrends in employment could change radically.

In Poland the decline in the demand for work, due to the information civilisation, may take place a little later than in the most developed countries because of the country's delay in developing this civilisation, however, not later than by the year 2035.

Nevertheless, it is fairly certain that the world labour market will be much closer to the scenario envisaged by John Maynard Keynes almost 100 years ago, who proclaimed at a Madrid conference in 1930, that "we are being afflicted with a new disease ..... namely technological unemployment (...)"<sup>9</sup>. He perceived this situation as a serious social threat, for he considered that "for a long time yet, the old Adam (probably meaning Adam Smith – note - A.K.) will be so ingrained in us, that everyone will need to work to be happy and satisfied"<sup>10</sup>.

<sup>8</sup> "The Economist", 2 March 2013, p. 66.

<sup>9</sup> "Population and Quality of Life Independent Commission", No 1, October 1993

<sup>10</sup> As above.

What kind of solutions could be put forward to resolve this problem? There are at least two. The first one is a radical cut-back in the official and compulsory working time. In the same aforementioned speech Keynes foresaw that "working hours of 3 hours per day and 15 hours per week eliminates this problem"<sup>11</sup>.

The second one is the "rationing" of work, which is the realization of the vision which J. Rifkin already presented, and which was included in the social debate in Poland by professor Adam Shaff. Reference was made to it in his thesis about the inevitable transition from the currently dominant civilisation of salaried work (in German "Lohnarbeit Zivilisation") to the "activity civilisation" in the future (in German "Beschaeftigungs Zivilisation").

It will signify the inevitable end of the current framework of paid work.

In the future it may be necessary to introduce a "minimum guaranteed income level" for each member of society. This idea was first put forward by Milton Friedman already at the turn of the 1970s and 1980s. Later, he had many successors, among whom the representatives of the political left played a leading role,

They saw in it the best way to narrow the currently excessive disparities in income and in social conditions. Now, in the first decade of the 21<sup>st</sup> century, these differences have reached a scale, which could constitute a threat to social equilibrium and consequently could lead to a manifestation of social protests. Therefore, they could threaten the whole development process. The latest supporter of these opinions is Thomas Picketty, which are contained in his work "Capital in the Twenty First Century".

At present, this book has provoked the most widespread controversies and conflicts and has met with the broadest response throughout the world, although not yet in Poland.

Introducing "the minimum guaranteed income level" may result in a new approach to the individual and collective factors in the economic development process. It could ultimately strengthen the significance of the orientation towards common interests and of more collectivist solutions. It could create barriers to extreme individualist solutions, which encourage a selfish and even greedy orientation which is dominant nowadays in the higher echelons of banking and financial institutions, even at the cost of individual competition, which forms the basis of a free market economy. The relations between "shareholders" and "stakeholders" can change in favour of the latter.

One person who envisaged the reaction against excessive individualism was the Polish writer Stanislaw Ignacy Witkiewicz, who, as early as in the 1920s, in his drama "They" (1923), identified this tendency. We don't know yet how to deal with this problem.

Now that the global problems which will influence the world labour market have been identified, we can examine the conclusions for the Polish labour market. Since, as mentioned above, the opportunities for expansion of the level of total employment arising from the information civilisation were not sufficiently harnessed in Poland, we should now concentrate on increasing the country's employment level in order to make up for past delays. This determines the specific features of the Polish labour market, which were not observed in other countries, where the employment level was more stable.

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<sup>11</sup> As above.

**Table 1. The real and hypothetical level of employment in selected sectors in Poland**

Specification	Employment in the US.			Employment in Poland		
	2008 (in thousands)	In % of total employment	Dynamics foreseen for 2009-2018 in %	2008 (in thousands)	The hypothetical level (in thousands). <sup>c)</sup>	The scope of reserves in employment (in thousands)
1. Electronic professional elements and computer manufacturing <sup>a)</sup>	615	0,44	-33	28	62	+44
2. Computer services <sup>b)</sup>	2 109	1,51	+43	103	211	+108
3. Environment protection sector - environment protection equipment industry <sup>d)</sup>	3 560	2,52	+24	218	355	+136
	1 250	0,89	+60	64	125	+61
4. Health service - biomedical	12 271	8,77	+24	568	1 230	+663
	39	0,3	+50	1<	5	+4
5. Science and R+D	731	0,52	+25	53	75	+22
6. Social care of the elderly	1 066	0,76	+43	10-15	110	+95

a) Encompasses: Semiconductor and other electronic components and computer and peripheral equipment manufacture, b) data processing, hosting, related services and other information services, computer system design, c) based on the equivalent share in total employment in the US., d) estimates

Source: "Statistical Yearbook of the US", 2012, op. cit., p. 399-400.

The higher the level of employment at the initial point of this new stage, the easier it will be for the labour market to overcome all difficulties resulting from the development of the second, higher phase of information civilisation. Otherwise, the greater the scope of unemployment at the initial point, the more difficult it will be to resolve all problems. The above observation applies to all forms of unemployment: overt, hidden and potential (as, for example, people who currently work abroad returning).

In the event that there is no increase in employment and unemployment is not restrained, it could prove very difficult to eliminate the "social exclusion" phenomenon, which must be overcome. And this creates the basic condition required to build the information civilisation of the future.

Therefore, the increase in employment could delay the negative consequences of the second phase of the development of the information civilisation for the labour market in Poland. All potential possibilities of expanding employment within economically and socially rational bounds should therefore be maximally utilized before the situation becomes much more problematic.

In light of the above, the crucial question which needs to be asked is “where are the greatest employment reserves located in Poland?”. In searching for an answer it is useful to consider certain comparisons with the American forecasts on the employment level that were cited earlier.

Although the development conditions are quite different in the U.S. than in Poland, the general trends of the American labour market are, to a great extent, of an objective nature. Similar trends can be expected in other countries, for they are for the most part determined by technological changes. And the latter are of a universal nature, although the specific features of a given labour market should be taken into account every time.

In drawing conclusions from the American forecasts, we note that the greatest attention should be paid to 6 areas of the Polish labour market, where the most dynamic and accelerating processes could take place. It is these areas where the greatest possibilities of increasing the general level of employment lie concealed.

Several important conclusions can be drawn from the table above :

There are still strong potential reserves for increasing employment in the Polish economy. If we reproduce the proportions and structure of labour distribution in the US. on the Polish labour market this could allow, taking into account only the 6 above-mentioned areas, creation of over 1.1 million new work places, and if high technology industries are included, 1.2 million.

But the probability of implementing these forecasts, even in these very 6 fields, is very slight. The chances of reproducing the trends observed in the US. economy are best in the tele-information sector. The tendency to increase employment linked with this sector can already be observed in Poland. And the occupations which are needed in these technologies are located in the mainstream of creation of a material base of the information civilisation,

**Table 2. The forecasts in demand for selected occupations in the tele-information sector in the US.**

Specification	Employment in the US. 2008 in thousands.	Forecast of growth in this demand during 2009-2018 in %
Network systems and data communication analysts	292	+53
Data processing, hosting related services and other information services	395	+45
Computer software engineers, applications	515	+36
Computer software engineers, systems software	395	+30
Survey researchers	23	+30
Software publishers	264	+30

Source: As in table 1, p. 398.

that is, in the knowledge-based economy. All signs indicate that they will remain in this privileged situation for the next 20-30 years. Even the highest growth rate of productivity per employee in this field will not forestall this tendency, although one can foresee a quantum leap of productivity in this area.

Based on the American forecasts for the period up to the year 2018 it can be illustrated using the data below.

During the 10 years (2009-2018) the number of jobs in these occupations could increase in the U.S. by 0.7 million, that is by 38%. If a similar growth rate is observed in Poland this will mean the creation of nearly 45 thousand jobs in two industries alone, that is, in professional electronics and the informatics industry. It also means that the number of people employed in these industries would reach a level two times higher than that noted at present.

The situation in the high technology industries is more complicated. On the one hand, a decline of employment in the US in the electronic and informatics industry can be observed, due to the highest rate of labour productivity growth in these industries. But at the same time a rapid growth in employment is noticeable in the manufacture of robots, automation equipment, environmental protection equipment, special chemicals and biotechnology and nano products, as well as in space industries.

In Poland in these industries as a whole (HT) the increase of employment in this entire area seems more probable, since these industries are profoundly lagging behind in development as compared to highly developed countries and there is an urgent need to catch up with the more developed countries in this field.

One can assess the forecasts for employment in the ecological sector as at least equally probable, that is, all kinds of products and services assuring protection of the natural environment and safeguard against ecological catastrophes. This also applies to production of equipment for environmental protection purposes. In Germany, the country with the most developed ecological industry in the world, this industry employed about 450 thousand people in 1994, of which 80 thousand were employed in the engineering industry alone. Since then, production and employment have increased two-fold. This industry is now estimated to be one of the fastest growing sectors in the world industry of the 21 century.

Similarly, one can assess as highly probable the forecasts of a quantum leap in employment involving the care of the elderly. The number of people over 65 is increasing rapidly – due to progress in medicine – in the majority of the countries that prepare relevant demographic forecasts.

The probability of increasing employment in healthcare, due largely to an influx of practical applications of newly discovered methods of therapy, including biomedicine, is less certain. However, the increase in the demand for employment in prophylactics and diagnostics could be equally high. But a more rapid decrease in employment as a result of information civilisation, mentioned earlier, will occur in Poland case not earlier than in 10-15 years time.

Yet another, more important conclusion can be drawn from the American forecasts for the U.S. labour market presented above.



Contrary to previous forecasts, employment in the mining industry in the US. has expanded. It can't be entirely ascribed to the commencement of the exploitation of shale gas, although the latter has played a significant role. Also in Europe deceleration has ceased and a fall in employment figures in this area has also been noticed.

The decrease in the general level of employment, measured in thousands of the population, in the decade 2009-18 in its predominant part, concentrates on the typical heavy industry branches and traditional services. The portion in this decline of consumer industries will, according to these forecasts, be much smaller than foreseen earlier. This may be influenced by projected growth in the total world population by 1.5 billion people up to the year 2030. It will cause an equivalent increase in the potential number of consumers of industrial goods.

However, we must bear in mind, that before modern technologies reach consumers and users and are disseminated across the entire world economy they must first be produced by industry. Since the bulk of these technologies will be produced in the high technology industries, it is to be expected that the role of these industries out of the total, will increase and a boom in this area can be expected. It can create a new stimulus for growth and for acceleration of modernisation of the world industry as a whole. It could be a reason behind the growing popularity, in recent times, of the so called "reindustrialisation". It will be an expression of the process of the adaptation of the world to the industrial revolution, which is facing the world economy in the future.

For Poland this will also create new opportunities for reconstruction of this part of our industry from the remnants of the transformation process of a centrally planned economy to a market economy after the year 1989.

These opportunities should be taken advantage of to the full. Therefore, in order to prepare for these changes there is an urgent need to set up special groups of experts to recognize the areas and branches of specific importance from this aspect as early as possible. This also applies on an international scale, primarily in the European Union, where it is a condition for survival among 29 member states.

From this point of view identification of the main directions in the use of robots in the economy and in social life, which will play a similar role to the internet in the 1990s, is of paramount importance. And this expansion of robots will largely depend on the structure of the national economy. Therefore, this problem can't be solved by the general recommendations of international organisations in the belief that "one size fits all" alone.

The most crucial national aim for Poland for the next 30 years is, at this moment, to rebuild its industry, to modernise the structure of the national economy with an emphasis on high technology industries, to commence the process of transition to the modern information civilisation, as the bridge to the space civilisation of the future.

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## Spółeczeństwo informacyjne a rynek pracy w Polsce

### STRESZCZENIE

Artykuł prezentuje wpływ cywilizacji informacyjnej na polski rynek pracy. W artykule przedstawiono główne punktu zwrotne w rozwoju związane ze zmianami technologicznymi a także skutki tych zmian dla tradycyjnych działalności produkcyjnych. Wykorzystując przykład gospodarki Stanów Zjednoczonych poddano dyskusji potencjalne zmiany na rynku pracy w Polsce wynikające z trendów rozwojowych gospodarek wiodących.

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