UDC 004.94=111 DOI: http://doi.org/10.31617/visnik.knute.2019(126)07

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DIGITIZATION IS CHANGING OUR WORLD

As aim of this article the author wants to motivate the reader to be prepared to solve all upcoming problems that will occur in nearly all fields of our life especially in the national and global economy, in social relations, international competition and politics. Especially countries like the Ukraine with its highly educated population can discover chances, to strengthen its economic power and position in the future world economy which will be disrupted by this evolution.

Keywords: Digitization, Digital Revolution, Artificial Intelligence (AI), Robotic, Life-long Learning, International Migration, Industry 4.0, International Competition

Ланг Ф. П. Диджитализация меняет наш мир. *Целью статьи является подготовка к решению всех предстоящих проблем, которые возникнут практически во всех сферах нашей жизни, особенно в национальной и глобальной экономике, в социальных отношениях, международной конкуренции и политике. Такие страны, как Украина, с ее высокообразованным населением могут использовать шансы укрепить свою экономическую мощь и положение в будущей мировой экономике, которая претерпевает эволюционные изменения.*

Ключевые слова: оцифровка, цифровая революция, искусственный интеллект, робототехника, обучение в течение всей жизни, международная миграция, индустрия 4.0, международная конкуренция.

Background. Digitization is changing the economy and society rapidly. This leads to considerable uncertainty, especially in the traditional industrialized countries, because in the first stages of this development, especially the manufacturing industry is heavily affected. The changes, however, will cover almost all areas of life and it will also change the structures of the global economy and the social systems. This article gives an overview of the expected changes.

The **aim** of this article the author wants to motivate the reader to be prepared to handle all upcoming problems that will occur in nearly all fields of our life especially in the national and global economy, in social relations, international competition and politics. Especially countries like the Ukraine with its highly educated population can discover chances, to strengthen its economic power and position in the future world economy which will be disrupted by this evolution, bringing new perspectives and new ways for political and economic reforms.

Materials and methods. The article is intended as a survey and uses sources in actual economic literature and the results of a research of a team of scientists from the FOM University of Economics and Management (Working Worlds of the Future, Wiesbaden 2018) and the Technical University of Braunschweig.

Results. *Digitization in the industrial sector.* Much attention was paid in 2013 to a study of the US industrial sector, where 47 % of employees work in occupations that are more than 70 % likely to automate over the next two decades [1]. In Germany, even 59 % of jobs would be threatened and around 42 % of existing jobs would be completely eliminated by digital production methods.

This finding has initiated a debate under the slogan "Industry 4.0". Industry 4.0 "describes the so-called" fourth industrial revolution ", which in turn stands for the general transition to digital control processes and for which the catchword "Digital revolution" is often used.

"Industry 1.0" describes the mechanization of production in the early history of industrialization. "Industry 2.0" describes the proliferation of factory-made production with large machines, accord work and flow production. "Industry 3.0" describes the use of the first computer based control systems of industrial production. "Industry 4.0" is now leading to digitally controlled systems in production, which are autonomously controlled using Information and Communication Technologies (ICT). This speeds up processes, increases productivity and quality, and reduces costs.

New business models can also be developed through digital networking within the value chains, but also between companies [2].

Mechatronics is an interdisciplinary field within engineering, which already places entirely new demands on the workforce on the basis of mechanical engineering, electrical engineering, electronics and computer science [3]. Mechanical and plant engineering are already characterized by a high level of qualification in this sense. In Germany 96 % of the employees have vocational training or a university degree. This suggests that they will master the challenges ahead. Already today, learning new and adapting to change is largely involved in a lifelong learning process in which educational institutions themselves play a significant role [4].

European industry seems to be well positioned here. However, it should be noted that this competitiveness is largely dependent on integration into the international division of labour with various upstream suppliers and

the international research and development networks; therefore, the openness of the economies is an important factor. However, digitization is not limited to the industrial sector. It covers all sectors of the economy and the society [5].

Digitization in the service sector. The service sector has long been the largest economic sector in terms of employment and turnover. The modern services sector includes transport, media, financial services, leasing, education, hospitality, culture, sports, social services, health care, education, church etc. [6].

It provides both wholesale inputs to industry and consumer services for private consumers. Business services such as research and development, which are the real vehicles of growth and formerly of industry, have today been relocated to service providers such as research and development institutes. Nearly all "Industry 4.0 concepts" expect a further increase in the integration of industrial production with services such as marketing, financing, logistics and repair.

The European Union, increased mobility and improved means of communication are allowed, parts of jobs and entire jobs are also shifted to service providers abroad. The process of internationalization and globalization is also driven by this.

The growing importance of the service sector is also due to the growing share of public services in the education, health and social sectors, but also in the police and in military services (e.g. public-private partnership) [7].

A statistical distinction between jobs in industry and in the service sector is therefore meaningless from the point of view of digitization, since services are not less relevant to digitization than the industrial sector.

Digitization and the trade sector. In the trade sector, the use of computers early on (e.g. Walmart) initiated a process towards the digitization of warehouse and inventory management systems and impressively brought the industry under pressure to modernize [8].

The use of digital technology has greatly expanded the ability to capture information about customers and customer behaviour in the retail sector [9]. To enable large amounts of data on customer behaviour (big data), the systematic analysis of individual customer preferences is possible. It allows the design of individual assistance services or personalized advertising.

Electronic commerce is the logical continuation of this development. It is part of e-business and generally covers electronic commerce as well as the promotion, buying and selling of goods and services on the Internet. "Electronic Commerce" has already developed into one of the core business models in the WWW.

Corresponding repercussions on the traditional retail trade can be seen everywhere in the shopping streets of our cities in the form of empty shops and devastating shopping streets. These, in turn, have a significant impact on employment, landlords' revenues, commercial real estate returns, the bustle of downtown shopping areas, etc.

On the other hand, suppliers such as Amazon have established themselves, generating significant revenues and profits through e-commerce. They also are offering new but completely different jobs. These new jobs not only require appropriately adapted knowledge, but also the acceptance of changed working hours, work processes, etc.

They also include Jobs resulting from the significant increase in logistics activities in distribution of goods (including UPS etc.). These in turn have consequences for road traffic, environmental pollution, etc.

Digitization in private life. Ever since the advent of smartphones (launch of the iPhone in 2007), digitization has also become part of our daily lives. We receive "real time" personalized, customized information, share what's app, Facebook, Instagram, LinkedIn, etc. and pay with online banking and Paypal. The search in the large encyclopaedias, which still dust on our bookshelves, is also already largely displaced by Google and other "search engines".

"Amazon Echo" stands as an early representative of its kind in our homes and listens to what we speak, gathers this knowledge, and actively recommends to buy in the not-too-distant future, or even orders autonomously according to our habits registered by it. In addition, such systems will monitor the smart home, our health, our assets, in short our entire life.

A Chatterbot or simply Bot is a text-based dialogue system that allows to chat with a technical system. It is already undertaking information and sales talks and will take on many advisory activities via artificial intelligence (AI) in a few years' time [10]. Those affected will include not only call centre staff, sellers, brokers, financial advisers, but also teachers, doctors, lawyers, and so on. Nursing and care robots are already being used in the care of the sick and the elderly in some countries. They actively communicate with people and are in some cases already linked to active robots who undertake certain nursing and even pastoral work. In many cases, it is already difficult to see whether "on the other side" of our communication media is a human being or a computer.

"AlphaGo" (GO is a complex strategic board game with 361 squares), a self-learning computer that continues to expand its artificial intelligence (AI), has defeated the GO World Champion due to the complexity of the game [11].

"Intelligent, networked objects", self-driving cars, smart homes, networked walls, mirrors, etc., will make some "normal" business models obsolete today, because companies that have access to this information can now directly and much more effectively use their services without intermediaries. The range of such changes could be significantly expanded, and the accelerated product cycles in information technology are rapidly changing.

To what extent these developments in the private sphere can be judged positively or negatively, can only be answered from the personal view. But it is already certain that digitization in the private sphere will bring considerable changes.

Digitization requires lifelong learning. Even if mass loss of jobs is not to be expected as a result of digitization, it is clear that automation and process orientation in production will change tasks and require beyond the industrial sector new qualification profiles which in turn will require a constantly need of updating.

In terms of qualification companies and employees as well as educational institutions close to companies are required to develop adapted educational formats and create space for training and further education. This must be done in conjunction with the companies. Vocational education and training, a fundamental adaptation of curricula and study programs will be inevitable. Vocational training will be much more important than it is today, as it must enable people to keep up with the rapid pace of development.

Furthermore, the digital media will change the educational landscape itself profoundly. Thus, the profession of traditional teacher at schools and colleges, similar to other professional groups (see above), will largely change through "Machine Learning" [12]. Machine learning is a fast-growing area of computer development and part of so-called artificial intelligence (AI). Computer programs based on "machine learning" can use algorithms to independently find solutions for new and unknown problems.

Machine learning is already used in online marketing in web analytics and in many other applications. Long-distance learning and other online educational offerings will also largely change the traditional mix of teaching and learning methods. The concepts and equipment of the teaching institutions will also change enormously.

Therefore, new media-based forms of teaching have to be developed that meet the requirements of the digital age.

Digitization requires a political framework with flexibility and social security. This unstoppable accelerated by artificial intelligence (AI) will only be achieved in companies if the legal, economic and in particular the employment and social policy conditions are adapted to the requirements of the digital future. If this does not happen, the development will significantly reduce international competitiveness of the whole economy and lead to considerable losses of prosperity.

Digitization also considerably facilitates the international transfer of knowledge and creates the preconditions for knowledge-based competitive advantages in other countries. In order to avoid a further decoupling of technological progress on the one hand and the development of the institutional framework of political and legal regulations on the other hand, a consistent modification of the existing framework is necessary.

In addition to needs-based education policy, this includes a forward-looking labour market policy and a modern labour law. The latter must also be seen as a particularly important location factor in the age of increasing international labour mobility. To quickly set the course for the modernization of the information technology infrastructure, including: appropriate support measures, investment-friendly depreciation, simplified approval procedures etc. must be established.

Also innovative solutions for the social protection of the people must be found. For example, Social insurance claims and occupational pension schemes are decoupled from a long-term employment in the same company and validated transnationally. It must be ensured that employees do not lose any rights if they use the new flexibility operationally or internationally. At the same time the private pension plan must be protected against extreme fluctuations for example in the financial markets.

Given the unavoidable job losses caused by the "digital revolution", at least during the introductory phase, concepts such as an "unconditional basic income" need to be discussed. This is understood as a living income that is paid to every citizen of a society regardless of whether it has paid into the social system or not [13]. Especially people with low skills who are no longer able to participate in the increase in productivity due to digitization will be adversely affected. This also applies to cities and regions where such people live in large numbers (e.g. Wolfsburg in Germany or Detroit in the US). Without such a social security, they cause a considerable social problem for the future.

The existence of many companies is based on the fact that there is sufficient mass purchasing power. For this reason, the purchasing power of the people permanently or temporarily becoming unemployed through the digitization process need not be safeguarded solely in their interest. The discussion about the unconditional basic income thus gains a completely new meaning against the background outlined here [14]. At the same time, it is clear that not only social welfare systems but also taxation systems need to be adapted to the new conditions of the digitized economy.

New actors on the stage of the global economy. The "Digital revolution" is global and affects all connected regions of the world. One important indicator is the fact that the People’s Republic of China and the Indian Union are also heavily relying on the use of industrial robots in their industrial sectors. They are proactively accepting the challenges of the "digital revolution". China and India are already established as major players in hardware and software markets and are therefore selected as good examples of developing economies (emerging markets) on the way into the digitalized future.

Their traditional competitive advantage of being a "low-wage country for standard products" has long ceased to exist in China. The shortage of skilled workers in industrial production is already a significant impediment to growth [15]. In India, conditions in the industrial sector are similar. In both economies hotspots of digitization have already developed at various locations, which exist alongside traditional industrial regions and underdeveloped regions. Such economies are therefore also referred as "dual economies".

In their developed segments, they have problems that also occur in the traditionally industrialized countries. For example, the "medium-sized enterprises" established in China since the 1980s are now confronted with the same problems (rising labour costs, high employee turnover, skilled labour shortages, succession in the entrepreneurial families, etc.) as old industrialized

countries. This reflects the fact that the reformed Chinese economy is already in a "normal" state [16]. In India, this situation has existed for a long time already in the middle class, since a medium-sized economy exists on a largely market-based system at least since the colonial era.

In addition to these problems, in both economies from their economically backward regions there is a huge number of poverty-driven, low-skilled migrant. They cannot operate in modern industries, as they often lack all the basic knowledge necessary to acquire the necessary expertise for a qualified job. That is why they represent a huge potential especially of urban poverty, which will increase with the expansion of digitized sectors through further immigration and digitization-related releases.

The Chinese government wants to solve this technological and social problem by accelerating modernization and urbanization in the backward regions. The latter assumes that urban centres will benefit from economic development and growth through the benefits of agglomeration (proximity of companies and workers, use of a common infrastructure, efficiency of larger education and training facilities, cultural and sports facilities, etc.) [17].

Today, however, the Chinese leadership does not rely on the "masses of the people", but on a consistent modernization of the existing industries and their further development on a high-tech level. However, it retains its traditional central planning system for which it hopes that the new perspectives of digital and intelligent control will give better results than in the past. The fact that robots and state-of-the-art computer technology are used throughout the country is taken for granted.

The political aim is to promote prosperity through economic growth in such a way that the remaining problems of the backward regions and urban slums are casually resolved by emerging economic dynamics and increasing international competitiveness [18].

Global migration in the digital age. The recent reflections make it clear that the labour market pressure due to the "digital revolution" globally is likely to be rather higher than lower. In the emerging economies and the still underdeveloped regions of the global economy, demographic factors are the main cause of this, all of which add up globally to the job-destroying effects of the "digital revolution" in all regions of the world [19].

At the same time, it becomes clear that the "digital revolution" is a development that can trigger quite different effects and deepen the social division of societies. In any case, migratory pressure on the growth poles of the global economy will increase, especially since the new information and telecommunication media make existing regional differences in development levels more transparent than in the past, and the increased mobility of today facilitates migration.

However, modern means of communication will reduce the need for migration in the hands of professionals and specialists, since working in a modern IT network with its communication media (e.g. Skype, etc.).

But there will still be those people who migrate for social reasons who are not among the much-needed specialists. Without generating social disruption effects in the target regions of migration, this will only be possible if an adequate integration policy, which must primarily be education and training policy, can be established.

Without prejudice, it would undoubtedly make sense to take measures that would enable potential migrants to be educated in their home country, either making them wished-for immigrants in the labour market or, ideally, enabling them to secure their livelihood in their home country at one level that makes migration unnecessary. The teaching and learning systems of the digital revolution (see above) are useful for such a strategy because the development of translation robots and "machine learning" etc. help to overcome language problems.

However, this requires considerable efforts to restructure the training systems because the necessary equipment and concepts are missing.

Conclusion. The "digital revolution" is under way, it affects almost all areas of our lives and it is happening globally. It is a result of the evolution of information technologies ranging from telecommunications to robotics to artificial intelligence (AI) and the resulting hybrid techniques. An industrialized country that wants to be modern and internationally competitive has to join in this development, or it has to leave the society of the leading industrialized countries. In the national economic relations, the working world, but also in the private life, serious changes will emerge within a short time, which will demand adaptability, flexibility and willingness to learn.

For companies, this raises the fundamental question of how their "disruptive business model", which they want to operate in the age of the digitized world, will look like, or whether they will even exist.

For workers, digitalization raises the fundamental questions of what skills and capacities they will need in the future to secure their livelihood, whether they can acquire them and what should happen to those workers who do not have the skills they need now and in the future. Especially where these effects will be locally massive, where e.g. traditional automobile production is concentrated, this will also be a regional problem.

In addition, there will be increased regional and global migration from "losers" of development to growth regions, which will have significant educational and social challenges, as they can only be prevented through prosperity in all nations, including those where development has not brought wealth to wider sections of the population. If one wanted to stop this migration by foreclosure and closed borders, then one would exclude oneself from the group profiting countries at the same time. So the digital revolution has globally significant social consequences that need to be mastered in the interests of securing social peace and prosperity. The problem seems to be known, but out of different perspectives it is well known since many years [20]. But in our days we are confronted with a growing speed of this development which now named "Digital Revolution".

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The article submitted to editor's office on 12.08.2019.

Ланг Ф. П.. Диджиталізація змінює наш світ.

Постановка проблеми. *Цифрова революція швидко змінює економіку та суспільство, що призводить до значної невизначеності, особливо в індустріальних країнах, оскільки на перших етапах найбільше потерпає обробна промисловість. Зміни, однак, охоплять майже всі сфери життя, а також змінять структуру глобальної економіки та соціальних систем. У статті надано огляд очікуваних змін.*

Метою *статті є виокремлення майбутніх проблем майже у всіх сферах життя, особливо в національній та глобальній економіці, соціальних відносинах, міжнародній конкуренції та політиці.*

Матеріали та методи. *Використано економічні джерела та матеріали дослідження групи вчених з КЕМ Університету економіки та менеджменту (Робочі світи майбутнього, Вісбаден 2018) і Технічного університету Брауншвейга.*

Результати дослідження. *Цифрова революція є результатом еволюції інформаційних технологій, починаючи від телекомунікацій до робототехніки, штучного інтелекту та пов'язаних з цим гібридних технологій. Диджиталізація не обмежується промисловим сектором, охоплюючи всі галузі економіки та суспільства. Завдяки їй збільшується мобільність, щороку покращуються засоби комунікації, цифрові технології в процесі європейської інтеграції, що дає змогу залучати робочу силу з-за кордону, тобто створюються нові робочі місця в абсолютно новому форматі, який вимагає не тільки відповідних знань, а й зміни сприйняття робочого часу, робочих процесів тощо. Цифрова трансформація охоплює й робочі місця, які виникають внаслідок значного розширення логістичної діяльності з розподілу товарів, що, в свою чергу, має наслідки для дорожнього руху, забруднення навколишнього середовища тощо. Все це також сприяє прискоренню процесів інтернаціоналізації та глобалізації.*

З огляду на це, збільшиться регіональна та глобальна міграція – від аутсайдерів розвитку до центрів зростання, які здатні будуть прийняти значні освітні та соціальні виклики. Держави, що спробують зупинити цю міграцію закриттям кордонів, будуть вилучені з кола країн, що отримують прибуток.

Інтелектуальні цифрові системи та більш інтенсивні мережі також сприятимуть кращому поєднувати сімейні та професійні вимоги. Домашній офіс, вільний час, довірчий робочий час, облік робочого часу або обмін робочими місцями, які вже існують, дедалі частіше ставатимуть оперативною практикою для окремих рішень. У результаті створення цифрових мереж міжнародні економічні відносини стають все тіснішими, водночас, через появу нових учасників на світовому ринку та високих технологій посилюється міжнародна конкуренція.

Висновки. *Діловий світ, як і приватне життя кожного, незабаром серйозно зміниться. Ці трансформації вимагатимуть від людей здатності до адаптації, гнучкості та готовності вчитися, а перед компаніями постануть фундаментальні питання: як виглядатиме їх бізнес-модель у зміненому світі і чи взагалі вони існуватимуть у ньому.*

Щодо працівників, то вони мають бути готовими опановувати нові знання та навички, що знадобляться їм для збереження або підвищення конкурентоспроможності у зміненому світі. Це ж стосується і націй, які також змушені будуть шукати власні шляхи виживання і досягнення успіху на ринках.

Ключові слова: диджиталізація, цифрова революція, штучний інтелект, робототехніка, навчання протягом життя, міжнародна міграція, промисловість 4.0, міжнародна конкуренція.