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Exploratory Research of 4IR Impact in Different Areas of Activity

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ABSTRACT: Recently, in last few months, due to the emergence and amplification of the COVID-19 crisis, Industry 4.0 or the so called 4IR has developed rapidly in various areas of activity such as economic, social, medical, environmental, education, military and not only. This spread of technology has went through among the pillars of sustainability creating new needs, new types of demand and new forms of employment. The labor market has suffered from the replacement of employees with robots and robot process automation (RPA) by eliminating errors, vanishing and generating new jobs. Developing collaborative platforms have led to a new employee salary payment system and to a new way of working among employees. Assisted artificial intelligence operates instead surgeons with high precision. Internet of Things creates a personal network of the individual through which all the objects with which he interacts daily are harmoniously correlated only using a simple Internet connection. Globally and according to the UNO 2030 Agenda, the direction set is to digitize and implement technologies and tools in the Industry 4.0 that will lead to technological progress and the growth of emerging economies and even more growth to the developed ones. The paper comprise an exploratory research, a comparison analysis conducted in different areas of activity to settle the implementation of industry 4.0 within the regions and countries, generating a development ranking progress and forecasts for 2025.

KEYWORDS: 4IR, exploratory research, sustainability, robots, labor market force.

Introduction

Industry 4.0 has infiltrated all areas of activity, bringing benefits especially in the development of sustainability, economic, social and environmental pillars. Currently, the pillars of sustainability are added to the pillars of health, agriculture, education and we have further addressed some of the most important implications that Industry 4.0 has brought with the progress and evolution of technologies. Industry 4.0 is a process of transforming industrial production and markets globally. It is an intertwining of the Internet and digital technologies with the elements of conventional industry. Globally, each country has applied the introduction of Industry 4.0 under various names. Germany supports the 4.0 industrial revolution through strong government and multinational programs such as Siemens and Bosch, the US called the initiative 4IR or Smart Manufacturing, China proposed Made in China 2025, Japan moved to Industry 5.0 and named the process Innovation 25 (www.ttonline.ro). The aim is to increase the speed of efficiency and profitability in the business environment but also the development and transformation of the business environment and industry at a higher level. Continuous digital transformation is the main driver of productivity, especially in an age of globalization, in which nations face competing and disruptive business models on a larger scale. 4IR and component technologies allow not only high-fidelity audio or video streaming, it provides an environment that allows remote surgical operations with dedicated robots, continuous online monitoring live mapping of land to be or are already cultivated 3D prints/D 4D, autonomous vehicles and others.

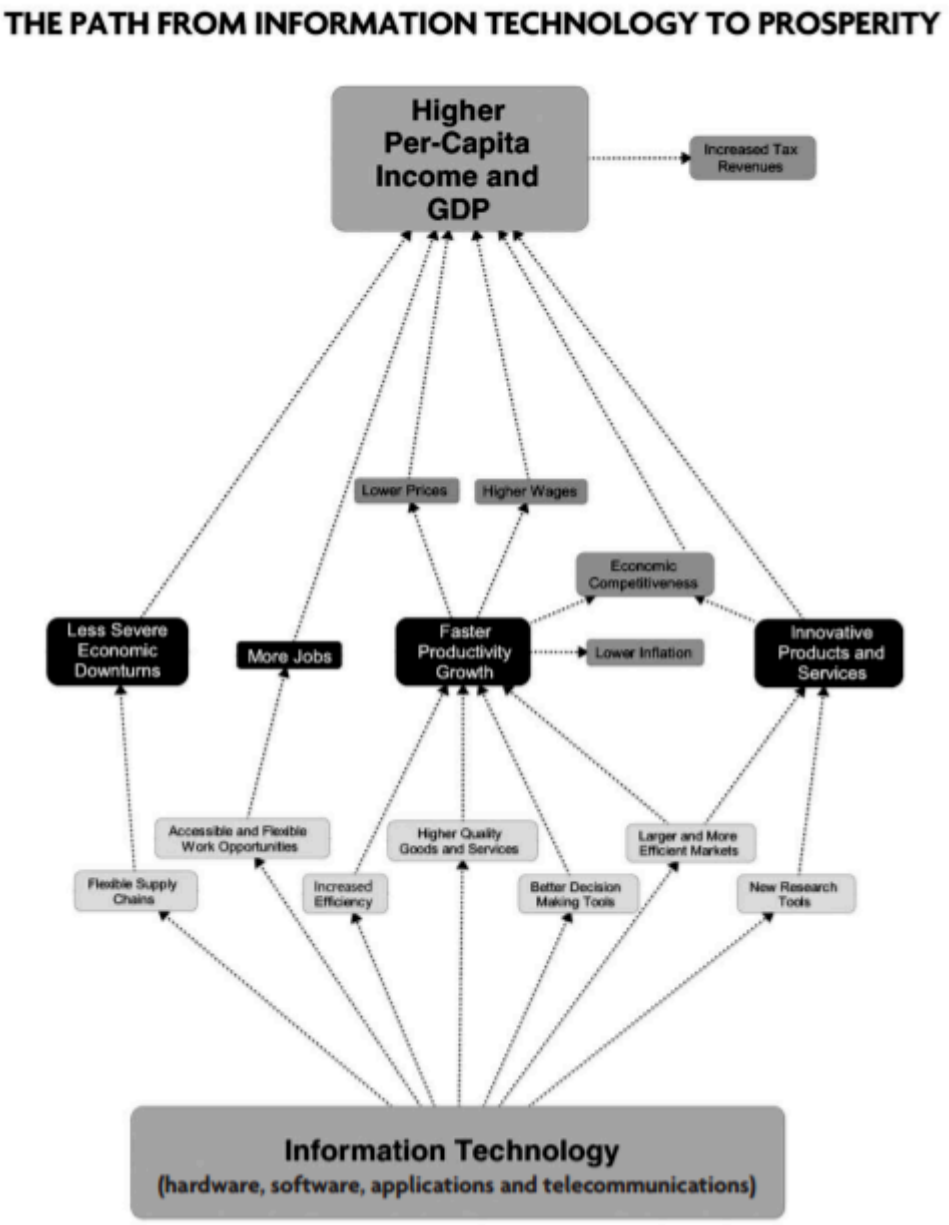

Figure 1. Prosperity growth strategy using information and communication technology
Source: Adapted from Atkinson & MCKay, Digital Prosperity, 2007a

Industry 4.0 is composed of cyber-physical systems (CPS), the Internet of Things (IoT) and the Internet of Systems and "cloud computing". 4IR is an industrial revolution of networks, platforms, people and digital technology. "According to university professor Klaus Schwab, the founder and executive director of the World Economic Forum, this phenomenon blurs the boundaries between the physical, digital and biological spheres" (Jademy.ro 2020).

The rapid pace of change in Industry 4.0 and the accompanying disruptions to business models have a major impact on the labor market now and in the future. Distortions due to rapid and successive changes lead to a continuing need to develop new skills and competences requiring considerable adaptation efforts.

In this continuous change, there is the possibility that the organizations will not be able to adapt, and the Romanian labor market will not be prepared for the 4.0 industrial revolution. It is necessary to find a way to regulate new technologies in order to get the most out of them.

This transfer of technology from traditional to digital will generate new needs and concerns about security, increasing inequity and disrupting society.

The evolution due to progress is spreading exponentially bringing changes of impact in each sector of industry. In Romania, depending on the degree of Internet penetration, the changes that the new economy brings are less relevant for the country as it is still considered poorly developed according to Eurostat statistics.

Depending on the development potential of the country, the 4.0 revolution can create phenomena of social inequity, disturbing the balance on the labor market which experts believe that in the future the more skills and competencies they will lead to a higher salary this leading to social tensions. "Information and communication technology (ICT) is an important factor that has contributed to the stagnation of income or its decline for the majority of the population in high-income countries. Demand for super-skilled staff has intensified, while employees with a basic level of education have declined. The result is a labor market with strong demand at both ends, but with gaps in the middle segment" (Jademy 2020).

Technologies cause behavioral changes so that people become addicted to them, and in their absence negative emotional states appear not being able to control without using them. This has a direct effect on consumption and implicitly in the economy. "Transformation and disruptive challenges have something very interesting in terms of human problems, both are human problems, not technological problems" (Li 2015).

Digitization and digital transformation cannot be achieved without digitization. Digitization refers to the automation of a process by digitizing information and managing technology for the purpose of automation.

While digitization refers more to recording systems, digitization refers to engagement systems and insight systems, which use digitized data and processes. This shows the transition from digitization to digitization. The resulting effects materialize in the digitization of an "environment" or a business area, i.e. the digital workplace, where the employee strives to reduce the paper, but the digital workforce also means that everyone works differently, using digital tools such as be mobile devices and technologies that make them mobile and/or using social collaboration platforms and unified communications, digital systems that allow them to work on digital media.

The results are new employment opportunities that are different from the classic ones that require more than digitized data. Business digitalization leads to the development of digital business. Supply chains, storage, delivery, etc. can be digitized. Conceptually, 4PLP (fourth party logistics) appears, i.e. integrative supply chains that manage all the resources, capacities and technologies of the SC (supply chain) of the company and the entire network of suppliers. In general, digitalization is seen as a path to digital business and digital transformation, to the creation of new digital revenue streams and offers at the same time.

All these changes require time, adaptation, to change the data medium but also to the infrastructure being generators of different behaviors. Digital transformation consists of digital data, process automation, connectivity and customer accessibility to the digital environment.

"Digital transformation involves the profound and accelerated transformation of activities, processes, skills and business models to fully capitalize on the changes and opportunities of digital technologies and their impact on society in a strategic and priority manner" (Roy 2015). The process of Digital transformation has a direct impact on the social and economic pillars.

4IR in economics

"The digital economy is the widespread use of information technology (hardware, software, applications and telecommunications) in all aspects of the economy, including the internal operations of organizations (business, government and non-profit); transactions between organizations; and transactions between individuals, acting both as consumers and as citizens, and organizations" (Atkinson and McKay 2007b).

General purpose technologies have three characteristics (Bresnahan and Trajtenberg 1995), are ubiquitous in that they come to be used by most sectors, their performance and price improve

over time and facilitate the invention and production of new products, processes and models business. Technologies such as steam engines, railways, electricity and internal combustion engines are all examples of general purpose technologies that have led to transformation and economic growth in the past called disruptive technologies and they are disruptive to current technologies.

Nano-technology plays an important role at the moment but does not have such a big impact on the economy. The evolution and involvement of ICT technologies have a high impact on the economy, compared to nano-technologies that are not mature enough to stimulate the growth of the global economy.

Basic technologies (memory, processors, storage, sensors, displays and communications) continue to become more powerful, faster, cheaper and easier to use, allowing new applications to be introduced on a regular basis.

As technology continues to improve, it will allow for improvements in a wide range of areas, such as better voice, handwriting, and optical recognition; smarter agents who routinely filter and process information based on user preferences; and expert systems software to help make decisions in medicine, engineering, finance and other fields.

New software applications, such as service-oriented architecture and Web services, allow organizational functions to be broken down into standard, reusable components, significantly improving efficiency. The adoption of digital technologies continues to grow.

Supply chain 4.0 was applied because the COVID-19 pandemic disrupted the supply chain globally. Delivery companies were assailed by long-distance deliveries and the multitude of orders generated during the quarantine period. Many businesses have gone bankrupt unable to survive and keep up with new technologies that would have created development opportunities for them.

There is still a strong reflex to write or print everything on physical media, and in Romania there is no visibility of data on platforms due to the lack of focus on digital technologies but which, nevertheless, courier companies have managed to adapt to the new constraints.

4IR in medicine

Individual IoT devices can continuously monitor vital signs and update the patient's digital medical record in real time. Chatbots can make diagnoses based on the symptoms reported by patients, they can issue prescriptions on request. This system is also implemented in Romania in the Ponderas Academic Hospital in the Regina Maria chain.

3D printing technology has been implemented to provide flexibility in production, being able to produce from different materials, produced for different needs, no need to purchase components, given that quarantine has blocked exports. This means that the delivery time of the product. However, there are also disadvantages, the production of materials used in medicine must be subject to medical regulations and tests for approval. 3D prostheses can be made of bone-like materials to make the patient's limbs functional and responsive.

Another example of the introduction of 4IR is the aging population in Asia, such as Japan and China, generating a growing need in the medical technology sector, creating a niche market for service robots. Japan's Ministry of Internal Affairs and Communications said there are about 36.2 million people who should be 65 or older by 2020. This involves a significant investment in products for 65-year-olds in the region.

The faster the population ages, the more companies will focus on purchasing robots and Artificial Intelligence to take care of such people. An example is the Paro robot designed to treat patients with Alzheimer's (Lillian Hung et al. 2019). On the occasion of the pandemic, in Europe and on the Globe in developed countries, any institution or company seeks to invest in the purchase of disinfectant robots, being necessary to prepare them for specialization for commercial and hospital purposes.

Geekplus Technology Co. this year it launched "Jasmin" and "Lavender" disinfection robots internationally. Lavender is equipped with ultraviolet light for disinfection, Jasmin uses liquid agents for fast and automated sterilization, automatically avoiding obstacles and non-stop in spaces, including warehouses, offices, schools, shops, transport stations and hospitals (The Robot Report 2020).

4IR in Agriculture

According to a study this year in the UK, the demand for agricultural robots will increase by 24.1% by 2024. Several agricultural robotic applications have emerged, including biomorphic drones that model the behavior of bees, which have been demonstrated in the UK. Kingdom.

Robots and drones have major effects on agricultural productivity. Robot applications and biomorphic drones can model the behavior of bees, monitor crops, analyze soils and moisture, automatic tractors that can sow, fertilize and harvest. This technological advancement gives people the chance to dedicate themselves to heavier tasks that require creativity. Small village farms in China have begun to use heavy industrial drones to cultivate water in hard-to-reach areas. There are a number of advantages such as reducing fuel, eliminating workers and transporting them, sprayers are not wasted but calculated accurately.

From trying to reduce the economic impact to responding to increased competition in new markets and meeting customer demand for new products and services, we can expect to see greater international expansion in 2020. de Vuealta (www.vuealta.com) showed that at the beginning of this year 74% of global enterprises were looking to expand into new markets. The future of agriculture is represented by agriculture of extreme precision, autonomous, artificial intelligence, mobile robots, autonomous tractors, machine vision to be able to identify areas or other indicators which will lead to a new way of doing agriculture.

4IR in the military field

By monitoring and observing human behaviors, robots can develop perfect skills by copying human abilities, thus eliminating errors. Specialists have generated an algorithm that allows improvements to the navigation system just by tracking a human-driven vehicle.

The future assumes that the soldier and a joystick can educate robots to better develop human skills by overcoming them. Military researcher Dr. Garrett Warnell gives an example: "When he was in a narrow corridor, the human driver slowed down and drove carefully. After noticing this behavior, the autonomous system learned to reduce its maximum speed and and increase the calculation budget in similar environments, this eventually allowed the vehicle to be able to navigate autonomously on other narrow corridors where it had previously failed" (ScienceDaily 2020). "By using autonomous off-road robots such as APPLD, current soldiers in existing training facilities will be able to help improve autonomous systems, simply by operating their vehicles normally" (Xuesu et al. 2020).

Also recently, the use of drones has been found to prevent improvised explosive devices in Iraq and airstrikes in Afghanistan, Pakistan, Yemen and Somalia. Military robots are supposed to play a much more important role in US military operations.

In addition to explosive detection devices, unmanned aerial vehicles are also used, such as Northrop Grumman's Global Hawk surveillance drones and General Atomics' Predator and Reaper armored drones. The equipment listed is expensive and does not have to survive for longer periods of time. The US Air Force has created an anywhere and anytime target attack program called the Global Strike Program (PGS). This program has the ability to attack any target in an hour around the world. The Pentagon has also made a statement that will continue to focus on technologies and capabilities relevant to conflicts of intensity such as the ongoing war on terrorism (Robohub 2014).

Conclusions

On the world map, increasing the number of autonomous robot units also requires a slight remote monitoring to change the economy of car design that allows the elimination of the driver on the vehicle and which underlies the concept of ROI.

So, whether it's production lines, surgical theaters or theaters of war operations, in agriculture, health, robot applications help provide innovative and reliable working methods for everyone involved. 2020 is the year of far-reaching global development and expansion of robots.

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