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THE MEANING OF THE NEW ERA OF INDUSTRY 4.0, HEALTHCARE 4.0 AND EDUCATION 4.0 CONCERNING THE DEVELOPMENT OF 5G NETWORKS, IOT AND SMART EVERYTHING

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Abstract: Industry 4.0 refers to the industry's revolutionary shift toward automation and digitalization. This revolution has an impact on every aspect of our lives. Most countries around the world lack a digital culture, which makes implementing Industry 4.0 difficult [1]. The Fourth Industrial Revolution will inevitably bring about changes in many aspects of human life. The education system is the most important. Reviewing various papers and publications in the field demonstrates that future curricula must take into account not only students' academic abilities but also practical skills and the ability to work in a group, as well as critical and creative thinking. A teacher must have a variety of skills. Aside from continuous education, one must also have certain transferable skills, such as globalization ability, expertise in new technologies and their applications, and future strategies and competency not only of professors but also of advisors. Education 4.0 provides all of this. Other aspects of life, such as health, have also been transformed by Industry 4.0. Healthcare delivery, like manufacturing, is changing and becoming smarter and more connected to healthcare, which we call Health Care 4.0 [2]. The definition of Industry 4.0 is the integration of physical and digital technologies. As seen above, 5G connectivity is critical to Industry 4.0. This is particularly evident in the rise in sales of automatic robots, wearable devices, and VR headsets, which have risen dramatically as a result of combining virtual reality with real-life, real-time production and where high data transfer speeds are required, such as remotely controlled production. To manage automatic robots and processes in Industry 4.0, a 5G network in conjunction with IOT is required. It will be impossible to participate in the technological development of production, health needs, and the new education system without the technologies mentioned in the paper.
Keywords: Industry 4.0, Education 4.0, Health 4.0, 5G, IOT, Smart Everything

1. INDUSTRY 4.0 CONCEPT

The concept of Industry 4.0 originated in Germany. It was established as a strategic initiative of Germany to support the development of the industrial sector. An automated and digitized approach to the industry was designed to maintain leadership in the production of various machines and cars. Industry 4.0 is the result of the German industry's development to maintain its position. [3].

This concept was first introduced at the Hanover Fair in 2011. Since then, Industry 4.0 has become a completely normal topic and development in Germany, while the majority of the rest of the world operates in an Industry 1.0 to 3.0 environment, as shown in Fig. 1. It makes use of the capabilities of new technologies such as availability of 5G networks, internet, and IOT,

- integration of all technical and business systems SAP, ERP in companies,
- digital mapping and virtualization of the real world,
- a smart factory where we have smart machines and smart products.

Industry 4.0 introduces automation and cyber-physical production systems are still evolving. [4].

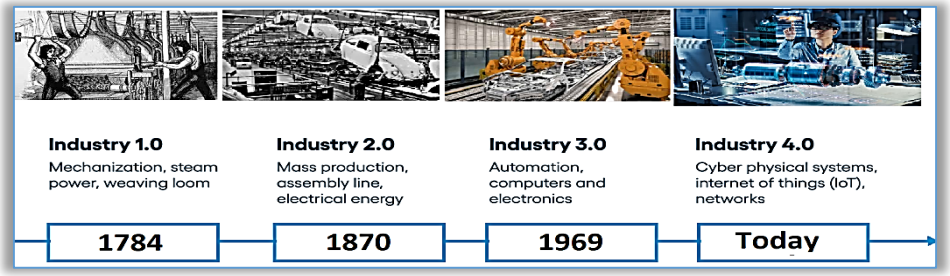

Figure 1. The Four Industrial Revolutions.

People use the most modern ICT tools to manage and control processes, as well as remarkable progress in augmented reality and intelligent robotics. Industry 4.0 cyber-physical systems, in collaboration with people, automate production processes and assist workers in their daily tasks. The most recent technologies are employed here: physical assistance exoskeletons

- context-adaptive fault diagnosis systems
- location-based maintenance and planning assistance systems,
- mobile teachable systems
- the most modern are those that adapt to the situation.

Artificial intelligence will be used to design such systems, which will be able to speak, track eyes, body language, physical actions, and so on. [5]

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2. HEALTH 4.0

From 2016 to 2018, the World Economic Forum's (GFC) Global Futures Panel on Healthcare discussed how the evolution of global healthcare will affect us all. They also took the development of Industry 4.0 into consideration. Following the coronavirus pandemic, it is abundantly clear that any global disparity is a failure of the entire healthcare system. It is not enough for the most developed countries to have good health care if diseases spread from developing countries to these same countries. Acting on a global scale is required, which is currently not possible. All of this comes back to bite developed countries and their lowest layers, who then contract various viruses and spread them to everyone. The world is one global village, and the virus can be transferred from one end of the world to the other in a matter of hours via plane flight. All of this must be addressed collectively and through the use of new technologies such as Health 4.0 [6].

To understand what Health 4.0 is, we must first understand the role of the patient, doctor, and other participants in introducing the concept of a smart hospital within the context of the aforementioned healthcare. First, we established the fundamental Health 4.0 environment in which patient healthcare is managed. Hospital processes and their modernization in light of the changes brought about by Industry 4.0, which automates and digitizes business processes from the manufacturer to the service provider with the goal of personalization for clients [7]. As part of Health 4.0, hospitals personalize this strategy by connecting patients and healthcare professionals to the organization, methodology, and digital technologies [8].

If we establish a system of simultaneous health monitoring and management, simultaneously with the application of new technologies, it will be possible to routinely monitor and manage health by moving and using virtualization and cyber-physical systems based on Industry 4.0 principles that connect the physical and virtual worlds in real-time [9].

The most important goal is to ensure the security and privacy of all Health 4.0 users. New network technologies, where the fifth generation (5G) main network provides a constant high-quality Internet data transmission speed of 1.5 Gb/s and allows real-time access to the patient, improve connectivity, and enables ad hoc management of services, integrating patients, caregivers, social workers, and doctors, can be seen in Fig. 2 and explained in Table 1.

Table 1. Explanation of Figure 2

Health 1.0	Health 2.0	Health 3.0	Health 4.0
X-ray	CT (Computer tomography)	CCD (Continuity of Care Document)	Medical Big Data
Ultrasound	MRI (Magnet Resonance Imaging	PACS (picture archiving and communication system)	Expert Systems
Film	Electronic Health Record	3D Imaging	Machine Learning
Health Record	CRF (Caring for Patients)	Telemedicine	IOT+Smartphone
	Computer for Doctor	E-Health	Personalized Medicine
		PubMed	eCRF and Bigdata
			Proton Therapy
		eCRF (electronic case report form)	3D Printing
		Robotics	3D Education
		Genome Sequence	Computer Brain

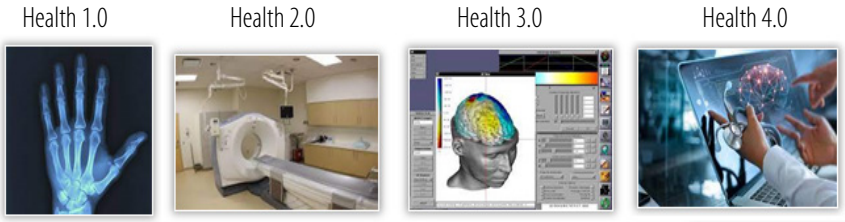

Figure 2. Healthcare Revolutions

The healthcare industry will be completely transformed by Health 4.0. With IOT, health care will be delivered in real-time as constant monitoring of the basic parameters of human health, with less emphasis on the clinic and more on prevention and early intervention. The provision of health care will apply to everyone and will be distributed with new technologies in such a way that everyone has quality preventive health care and impeccable prevention, but also when you need to go to a clinical center, which will be completely digitalized and will eliminate the need for queues and waiting. People will use health care, and they will not have to wait three months to be examined, because they will be monitored preventively with more and more parameters as technology advances. It will transport us to an entirely new virtual reality of health care intertwined with real life. This will result in people living longer lives, which have already been

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shortened by stressful lifestyles, various epidemics, pandemics, and everything else that shortens human life. [10]

3. EDUCATION 4.0

Fig. 3 depicts the evolution of education from Education 1.0 to 4.0, with an explanation in Table 2. As we can see, Education 1.0, which is still widely practiced around the world, is based on the professor lecturing the students with authority. The entire system revolves around the professor, and we have no technology. Education 2.0 necessitates greater collaboration between professors and students, which we can also refer to as an approach organized around student exams. The student becomes the focus of attention, but the focus remains on the professor. There is still talk of lecture classes, but there is also talk of learning classes. Education 3.0 emphasizes the importance of the student. The professor takes on the roles of coordinator, advisor, and learner. A researcher is a student. We have more discussions, and the student learns more from various sources and at home. There is no such thing as a traditional classroom.

Table 2. Explanation of Fig. 3.

Education 1.0	Education 2.0	Education 3.0	Education 4.0
Authoritarian	Communication and collaboration started to grow. Exam-based approach.	Student-Centered approach The teacher is transformed into the coordinator	Co-creation and innovation in the center. Flipped classroom applied (Hybrid Learning Environments)
The student is a passive recipient	An understanding of the student-centered approach.	The student is researching. Classical-style classrooms no longer exist.	Interactive practical exercise online. Learning is done at home or outside school, while in school students develop skills.
Teacher-centered system Technology is forbidden in the classroom	The schools are still talking about hours of teaching. . .	More dialogue, technology is everywhere, the student is self-learning and everywhere.	Development of personalized teaching and learning.
		The classical style classroom no longer exists	

Figure 3. Education from 1.0 to 4.0.

Education 4.0 employs a hybrid of physical and virtual classrooms. Practical examples are interactive and can be completed online using appropriate cloud software or in a real university laboratory. Learning can take place on campus, at home, or anywhere else.

The primary emphasis is on customized teaching and learning. This distinguishes the best students, who work at a higher level, from the rest of the students, who work at a medium or lower level and are not prepared for the highest levels. Everyone must have some defined minimum knowledge to pass an adequate course, but the best do not stop developing and do not need to learn what they already know, but rather go further. We personalize learning in this way, and by utilizing the Internet and new virtual technologies, we enable unlimited development of those who are the best and who will change, manage, and improve society in the future. [11]

4. 5G NETWORKS, IOT, AND SMART EVERYTHING

After explaining all of these technologies, without which future development will be impossible, we must also explain how these technologies are linked with high-speed Internet and sensor networks such as 5G networks and IOT to achieve a smart environment in which these above technologies can work in tandem. Why are we discussing the 5G network when we are discussing the future of 4.0 technologies, as shown in Fig. 4? Because you need a digital infrastructure to implement Industry 4.0, Education 4.0, and Health 4.0. There are modern conspiracy theories, so many people, including fellow professors, are opposed to 5G networks.

Fig. 4 depicts the fundamental structure of IOT and wireless sensor networks, which explains everything [12]. To have real-time management, it is necessary to have a fast network without radiating too much, so we limit its range to one area, so that each 5G antenna covers only one part of the area, we connect to the first next active antenna using a change of IP address and protocol, we are constantly on the Internet with a speed of 1.5 Gb, and we can satisfy the management in real-time. This is the primary goal and support for the technologies mentioned previously.

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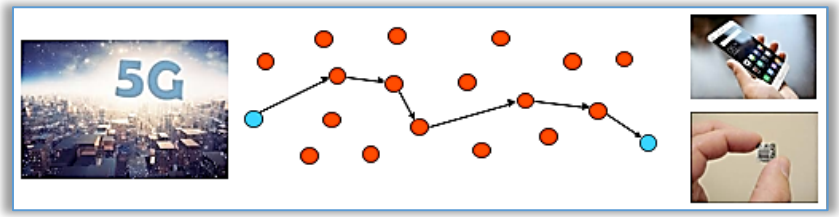

Figure 4. The basic infrastructure of IoT: Wireless Sensor Networks

The current situation in the Western Balkans will be discussed in this paper. Fig. 5 shows that there are no 5G networks and that no digital infrastructure is required to establish real-time management. This means that all of the stories about digitalization are meaningless because they are not accompanied by a digital infrastructure comparable to highways. If you want to drive at 200 km/h, you must have a highway. The same can be said for digital infrastructure. The current internet speed ranges from 1.5 Kb to 1 Mb, while the 5G network has a speed of 1.5 Gb.

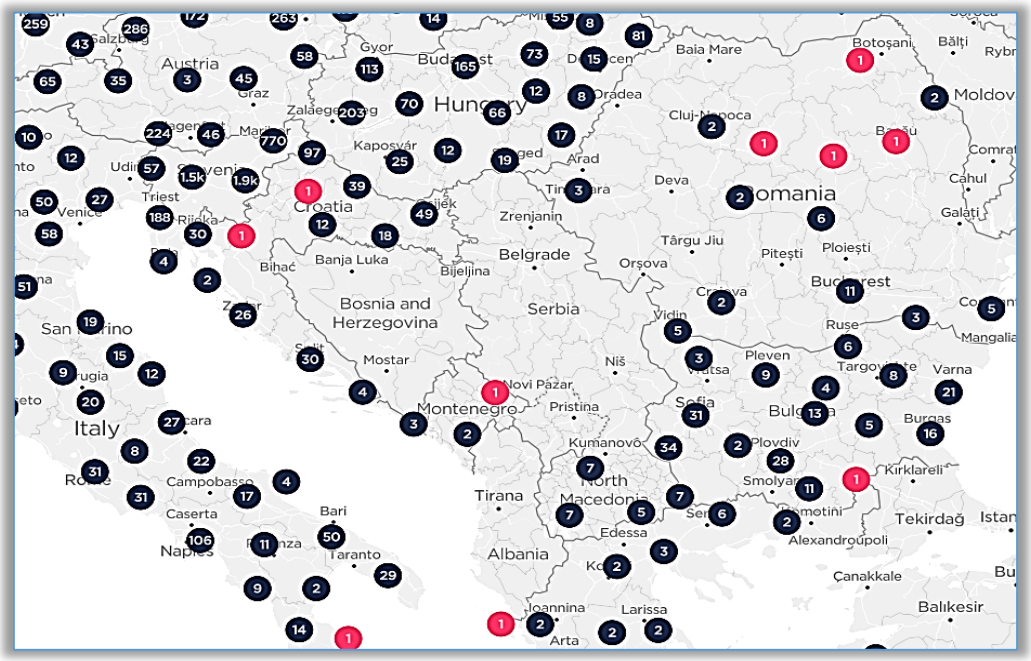

Figure 5. The interactive Ookla 5G Map tracks 5G rollouts in cities across the globe

Finally, let's combine everything in Fig. 6, which shows what IOT is in smart cities. To achieve all that we have stated in a smart city, we must have smart management of traffic, parking, water quality, smart buildings, smart vehicles, smart energy grids, environmental monitoring, water distribution lines, wearable sensors, citizens' health, education of the young, old, sick, persons with special needs, floods, fires and everything else in real-time and internet speed of 1.5 Gb.

Figure 6. IoT in Smart Cities

We require IOT in the form of a massive network of connected things and people, all of which collect and share data about how they are used and the environment around them [13]. To have big data for

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monitoring any kind of process in a smart town or smart everything, we need a lot of sensors and actuators. Then we use new technology, such as a Neural Network of Fuzzy Logic, to determine what is good or bad and send commands to actuators to correct it. If there are major traffic problems in a town, we locate open streets and direct traffic in other directions. This is just one of the many decisions that must be made in a Smart city. If we have a problem distributing energy from renewable sources such as photocells, the network must figure out where to send this energy because we haven't accumulated it.

5. CONCLUSIONS

This paper contributes to the importance of all of these 4.0 technologies, particularly for countries that have yet to implement them. Industry 4.0 envisions a future production system. Industry 4.0, Health 4.0, and Education 4.0 are unavoidable revolutions that will encompass a wide range of new technologies, including cyber-physical systems, RFID technologies, IoT, cloud computing, big data analytics, advanced robotics, smart factories, and so on. Industry 4.0 is transforming many industries, including automotive, aviation, and transportation. Industry 4.0, Health 4.0, and Education 4.0 are processes that integrate information and communication technologies with a digital network, the internet, and IoT. With monitoring and quality control, dynamic design, competitiveness, and productivity, the product can be adapted to the customer, the doctor must adapt to the patient, and the professor must adapt to the student. Collaboration and horizontal and vertical integration of schemes is key features of Industry 4.0, Health 4.0, and Education 4.0. Information and communication technology (ICT) is integrated into various hierarchical levels of the organization in vertical integration, ranging from floor-level control to production, operations, and management levels. The same is true for Industry, Health, and Education. ICT is used in horizontal integration to exchange information among many users. The integration of these systems for seamless collaboration, integration, and data exchange with all stakeholders is a complex scenario [14]. Implementing Industry 4.0, Health 4.0, or Education 4.0 apps help to reduce costs while increasing productivity, efficiency, and flexibility.

Organizations, sectors, and countries all rely on innovation and technological advancements. However, advances in digital transformation and rising interconnectivity will pose new challenges to societies, as Industry 4.0, Health 4.0, and Education 4.0 will significantly alter the quality of products, life, or student knowledge, depending on manufacturing systems, hospitals, or faculty processes, operations, and services. Industry 4.0, Health 4.0, and Education 4.0 all make use of advanced tools and technologies to help redefine traditional processes. Industry 4.0 has enormous potential in many areas, and its implementation will have an impact across the entire value chain, improving manufacturing and engineering processes, improving product and service quality, optimizing customer-organization relationships, bringing new business opportunities and economic benefits, changing educational requirements, and transforming the current work environment. Digitalization and interconnection have the potential to improve all three dimensions of sustainability [15].

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