THE RELATIONSHIP AND INTERACTION BETWEEN
INDUSTRY 4.0 AND EDUCATION

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Abstract
The effects and results of Industry 4.0 are ubiquitous: in mobile applications and laptops, in sensor-driven technologies, in communication capabilities, in intelligent robots, in smart offices and in cyberspace. In the future, the most sought after skills will not only be technology-related, but there will be a huge demand for creativity, emotional intelligence, critical thinking, and interpersonal skills. Based on this knowledge, a whole new economic model and a change to the old system will be needed.

Keywords: competencies, Industry 4.0, industry expectations.

1. Introduction
With the advancement of the Fourth Industrial Revolution, robotic applications, cloud computing, artificial intelligence, 3D printing and all-in-one sensors have become ubiquitous. Industry 4.0 lays the foundations for smart cities and agriculture, makes transport calculable, and explores previously unknown or dangerous areas with drones [1]. A new sector has emerged: cyberspace and the security of personal data have become fragile. The intellectual-workforce is more appreciated, while the physical force in the industry devalued.

The first important characteristic of our present-day consumer society that we must mention is that this industrial revolution (the fourth one) is the first that could lead to the well-being, the economic and cultural flourishing of the masses [2]. The realization of civil democracy is manifested in fundamental human rights such as the right to vote, the right and the opportunity to acquire higher education, and social benefits.

While previously possessing raw materials was the only way to gain economic power, nowadays we generally accept the value and the superiority of intellectual capital as well as the value of the industrial advantages that come as a result of learning and research [3].

Like all new systems, Industry 4.0 has taught us that the relationship between people, systems, and objects will be more complex, dynamic, and a real-time optimized network. Thanks to this connection, an information structure is created and the data collected, stored and grouped in an intelligent cloud-based system, which is then used for artificial predictive and automated decision-making. Companies, manufacturing units, research sectors, and governments are implementing a variety of security practices. Because of this inherently unique paradigm, it is not only advancements and achievements that can occur, but also confusion, which means that “we live in the duality of great promise and great danger.” [4].

2. Tasks and challenges of education
Changes have also become inevitable in education. Traditional formal education systems can no longer respond to the most important expectations of smart cities and related societies. Most current education systems are based on the 20th century system and ignore 21st century industrial and labour trends and expectations [5]. The teaching of new competencies, the introduction of new educational models and structures have become inevitable. As a result, 35% of the skills and competences used today are also changed,
as they need to be in line with the current labour market requirements in order to speak of a functioning, efficient economy.

The state-of-the-art robotics, innovations, the presence of autonomous vehicles, info communication devices and networks, and the renewal of transport creates a need to redesign knowledge-seeking efforts. Students can no longer be prepared for the future with purely linear knowledge-based education, even less to compete with robots \cite{6}. Therefore, it is necessary to prioritize and develop skills and competences that robots are not yet capable of. The most important of these are creativity, critical thinking and alternative problem solving and consideration. In my own research – among other things –, I have found it important to ask the companies what suggestions they would put forward to make the collaboration between the industrial and academic sides more effective, and what suggestions they would make for the restructuring the present educational system.

Another important topic was the question of skills expected and used by industry. The aim of the exploratory research with questionnaires is to collect more in-depth knowledge, based on the opinion of the interviewees, with a relatively small sample size \cite{7}. Participants can be divided into two groups based on their workplace profile: one for those who develop their companies in the spirit of Industry 4.0, robotics, innovation for process organization modernization or the acquisition of the most innovative production lines. The other group was for insurance: one company specializing in the administration of sales and processes at an insurance company. The first group is related to the car industry, which is the most attractive and influential industrial sector in Hungary today, either in the field of component production or design \cite{8}. Respondents included four international companies and two medium-sized Hungarian companies.

I used the open-ended question-method to evaluate the answers. Five of the respondents would introduce “more hands-on training” in higher education institutions, while three suggested “involvement of business professionals in education”. Two reported lack of communication and presentation skills for students, who finished their studies, while in one case “trainers should be invited to outsource project work” or to introduce “technical-mathematical training in all areas”. Another recommended instead of outdated training plans, joint project work and case study competitions.

3. New corporate-organizational models

Not only the academic side and governments, but also companies, have to adapt flexibly to the challenges of the 21st century. In terms of manufacturing and technology, as well as in terms of human resources. Companies need to retrain their employees, adopt new work and organiza-

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**Figure 1. Digital Intelligence in the age of Education 4.0. (Source: World Economic Forum, February 2020.)**
tional models, and, in the light of the achievements of Industry 4.0, deal with new strategic workforce planning [9].

Industry 4.0 brings new types of interactions between people and machines - ones that will have a significant impact on the nature of work and organizational structures. To meet the growing variety of manufacturing schedules, companies need to consider new work models that include flexible office scheduling. In order to be successful in Industry 4.0, companies need to consider new approaches to recruitment and retention as well. [10]. Recruitment should focus on necessary skills and competences not qualifications, based on grades and titles. As workers will work on a broader range of non-core tasks, recruiters often need to take into account skills beyond formal training to find a workforce with the skills required for the job. “We need radically different thinking and platforms to focus on skills rather than qualifications” - notes Alexander Spermann. Taking into account the above research, I also asked the companies what skills they require for the workforce when hiring. Two of the respondents were very specific based on “knowledge in the engineering industry” and the other two on the “efficient problem-solving” aspect [11]. Half of the respondents, - three companies -, said that “teamwork”, “creativity” and “change management” have a decisive influence on their choices. Two of them felt it was important for the candidate to have the drive to work, while one respondent indicated that “mental balance”, “adaptability” and “critical thinking” played a role in who will be a successful candidate. Given the differences between the generations, one respondent considered "mixed age" important, while another respondent considered "flexibility" to be the same [12].

4. Conclusions

In the face of changing market expectations, it is becoming increasingly important for both employers, the market and workplaces to recognize an individual’s best abilities and to ensure non-specific learning processes and rankings; linear forms of education. Rather than abandoning previously acquired and important competencies, it is anticipated that a new system will be introduced that will use these old practices to teach new ones, adapting to the ever-changing market norms. Numerous studies have focused on the differences between digital natives and digital immigrants. It is becoming more and more evident that the majority of digital natives know how to use the latest technologies, but do not know how they can support their learning processes [13]. Far from having as much knowledge and experience as was first assumed, recent trends tend to combine and allow formal and non-formal learning, creating a transition between the next generation of technical know-how to educate citizens who are empowered but also have special human skills [14].

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