Examination of the Current Higher Educational System at the Industry 4.0 Among Students

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Abstract: Background. The Industry 4.0 is no longer fiction, it is reality nowadays. Although in recent years several measures, government activities, projects and increased R&D resources have motivated and assisted companies in their innovation activities. This resource will be not enough to the transition because the main resources, the qualified employees, are lacking from the system. The education shows a strong fallback compared to Industry 4.0. Research aims. The primary research examines the education system from Industry 4.0 point of view. What do students expect from educational institutions during the 4th Industrial Revolution? Methodology. A primary research was carried out among students in Hungary in 2018, which focused on education system from Industry 4.0. The research applied the focus group depth interview method. Key findings. Most of students think they do not have a chance on the job market nowadays because they just have general knowledge of study but not specific issues relating to the new industrial revolution. There are more opportunities for engineering students. The research identifies some factors of problems of current education system by students. There were: resistance to change, government policies, luck of collaboration of stakeholders, financial resources.

Keywords: *Industry 4.0; Education 4.0; Qualification, Human Resource*

1. Introduction

The Industry 4.0 is no longer fiction, it is reality nowadays. Although in recent years several measures, government activities, projects and increased R&D resources have motivated and assisted companies in their innovation activities. This resource will be not enough to the transition because the main resources, the qualified employees, are lacking from the system. The education shows a strong fallback compared to Industry 4.0. There is a notion that this revolution will impact societal activities and mode of living and economic trends is therefore something that not just a few 'players' should be concerned about but must be a

major concern for the entire society especially the providers of knowledge which are the educational institutions.

One can say that education and learning which prepares individuals to be equipped in their dispensation of both economic and civic duty to society and inventers of new ideas for societal development over many generations seem to lag behind the new era. Today, the educational system as has been affected over the years by trends of society that has somewhat a questionable form. Also, its level of complexity is not at par with the speed and scope of new trends of high technological advancement of society today.

The standardization and the modus operandi of the educational institutions over the years do not seem to be complex enough in giving students the requisite skill, competence and ability to be competitive on the economic spheres of society.

2. Review of Literature

2.1Brief History of the Industrial revolution

The term "Industrial Revolution" was coined by Auguste Blanqui, a French economist, in 1837 to denote the economic and social changes arising out of the transition from industries carried in the homes with simple instruments, to industries in factories with power-driven machinery in Britain, but it came into vogue when Arnold Toynbee, the great historian, used it in 1882.

The First Industrial Revolution used water and steam power to mechanize production. The Second used electric power to create mass production. The Third used electronics and information technology to automate production. Now a Fourth Industrial Revolution is building on the Third, the digital revolution that has been occurring since the middle of the last century. It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres. There are three reasons why today's transformations represent not merely a prolongation of the third Industrial Revolution but rather the arrival of a Fourth and distinct one: velocity, scope, and systems impact (Schwab, 2016).

2.2Defining Industry 4.0

Industry 4.0 is the vision of increasing digitization of production. The concept describes how the so-called Internet of things, data and services will change in future production, logistics and work processes (Acatech, 2014). In this context according to Buhr (2017) industry representatives also like to talk about a fourth

industrial revolution. They are alluding to a new organization and steering of the entire value chain, which is increasingly becoming aligned with individual customer demands. The value chain thus has to cover the entire lifecycle of a product, from the initial idea through the task of developing and manufacturing it to successive customer delivery as well as the product's recycling, all the while integrating the associated services. In another explanation MacDougall (2014) smart industry or industry 4.0 refers to the technological evolution from embedded systems to cyber – physical stems. He opined that put simply industry 4.0 represents the coming of a fourth industrial revolution on the way to internet of things, Data and services. MacDougall (2014) explained that decentralized intelligence helps create intelligent objects networking and independent process management with interaction of real and virtual worlds representing a crucial new aspect of manufacturing and production process. This simply means industrial production machinery no longer simply 'processes' the product but that the product communicates the machinery to tell it exactly what to do.

2.3Characteristics of Industry 4.0

Industry 4.0 is driven by Digitization and integration of vertical and horizontal value chains, Digitization of product and service offerings and Digital business models and customer access. Industry 4.0 digitizes and integrates processes vertically across the entire organization, from product development and purchasing, through manufacturing, logistics and service. All data about operations processes, process efficiency and quality management, as well as operations planning are available real-time, supported by augmented reality and optimized in an integrated network. Horizontal integration stretches beyond the internal operations from suppliers to customers and all key value chain partners. It includes technologies from track and trace devices to real-time integrated planning with execution (Pwc, 2015).

2.3.1Significance for the employment market

During the transition to Industry 4.0, the change in production structure will surely have consequences. With regard to the working and professional world, according to the assumptions, work will become more challenging and have more informal qualification requirements such as the ability to act independently, self-organization, abstract thinking-skills (Forschungsunion & acatech, 2013).In line with qualitative preliminary studies BIBB and IAB (2015) conducted with companies which have already intensively involved with the implementation of Industry 4.0, results show there will particularly be less need for simple, repetitive tasks and special knowledge applied. Key results of the study show that although the transition to Industry 4.0 can on one hand in fact yield an improvement in the

economic development, on the other hand, however, based on the assumptions made in ten years there will be 60,000 fewer jobs than in the baseline scenario. At the same time, 490,000 jobs will be lost, particularly in the manufacturing sector, and approximately 430,000 new ones will be created. To a great extent, jobs "switch" between sectors, occupations and qualifications (BIBB-IAB, 2015).

2.3.2 Impact of industry 4.0 on higher education

The core mission of higher education remains the same whatever the era. The goal of higher education is to ensure quality of learning via teaching, to enable the students to get the latest knowledge through exploratory research, and to sustain the development of societies by means of service (Bo Xing and Tshilidzi Marwala, 2017). They added that to sustain the competitive position among world higher education system, we need to radically improve educational services. In particular, we need to drive much greater innovation and competition into education.

But Wallner and Wagner (2016), questioned; how can we fulfill this obligation, when new professions pop up at an ever-faster rate and relatively stable professional profiles are increasingly replaced by generalized skill sets? They answered by giving out the suggestion that 'the complexity we find in the 'outside' world is reflected in each and every aspect of our academic work. When it comes to cope with complexity, standardization is always tempting. But standardization always means simplification, and thus standardized programs cannot deliver what we need'. Today, all graduates face a world transformed by technology, in which the Internet, cloud computing, and social media create different opportunities and challenges for formal education systems. Xing (2017), they further ascertained that as students consider life after graduation, universities are facing questions about their own destiny especially employment.

3. The method and sampling

The study achieves its goal with the method of qualitative research, of which results presents the opinions of students of the higher educational institutions.

The depth interviews were carried out in Gyongyos (Heves County) and Budapest with students of the Eszterhazy Karoly University and students of Budapest Business School. Among the participants were 24 students in four groups each from three faculties of the Eszterhazy Karoly University and 6 students from the Budapest Business School. All the interviews were carried out personally and based on questions complied and recorded beforehand. So, the study is based on the depth interviews of 30 participants from two universities in Hungary.

The data processing of the depth interviews and information processing were carried out in an oral way, however, the research to unveil the relationships examines frequency, causal relationships, processes and consequences and sets up structures (Babbie 2001).

4. Results of the research and findings

It is worthy of note that most of the respondent/ interviewees were so much aware of the era of the new industry revolution (industry 4.0).

4.1Conceptual definition of industry 4.0 among students

Like all concepts in the social sciences, it is a very difficult task to give a comprehensive definition of the concept Industry 4.0 which is adequate from every aspect. So, it is not surprising that the interviewees gave different definitions. However, these definitions, unambiguously, can be grouped around the Chart for the Industrial environment below:

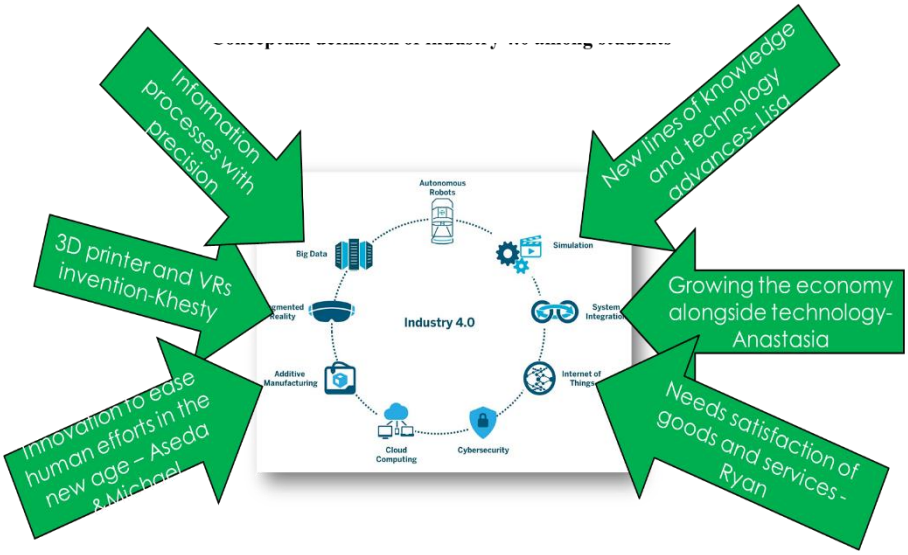


Figure 1
Conceptual definition of Industry 4.0 among students
Own construction 2018/N=30

4.2Chance on the job market

It was also discovered that most students thought they do not have a chance on the job market without innovative and modern knowledge nowadays because:

a)They just have general knowledge of study but not specific issues relating to the new industrial revolution which is driving the job market now.

b)They think it is an area for engineering students and those in the applied sciences and not for the social sciences.

c)It is difficult to acquire such expertise now as most educational institutions focus on the social sciences subjects which is more of theory base.

d)Their knowledge in technological applications is not sufficient enough.

e)Some few students' participants also believed that not every job requires technology application hence their chance of securing a job opportunity

On the premise of which specific subjects will be appropriate for students in the new industry revolution era, interviewees opined that the 'STEM' which is the acronym for Scientific, Technology, Engineering and Mathematics be compulsory for students at all levels of the educational ladder.

Some also advised that schools should guide students at all levels to pursue subject where their passions are and help them nurture.

4.3Perception of the current educational system

On the issue of the perception of the current educational system, higher percentage of respondents has this to say:

Findings	Comments from students
It is still primitive in its content delivery and operations	'I think it must focus on the individual skill development rather than delivery of theory' 'The school must have laboratories to help us the student to engage in the practical application of the theory base learning which do not help us discover our areas of interest' 'I do not think we are been taught subjects that relate to the current trends in the world and on the job market'

It lags behind the current new economic and technological trends	'For me I think our schools teaches us random subjects which don't much new wave of society' 'I see us study selected subjects of past generations which do not match today's HR capacities'
Low investment into higher education by governments	'The higher education ten years ago has three times more money than today'
It has failed to churn out good 'products' for the current economic market	'To be honest the unversities are just generating 'puppets' right now because people complete their university education and still cannot have job'
The educational system is regid in its content delivery approach	'I think what is happenning to us with our educations is that we are given what teachers know not what we want to learn'

4.4 Identified problems of the current education system by students as shown in the diagram below:

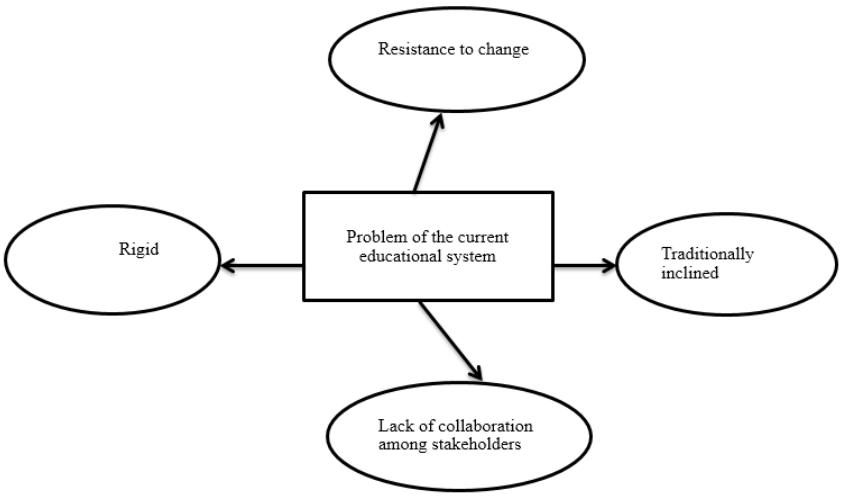
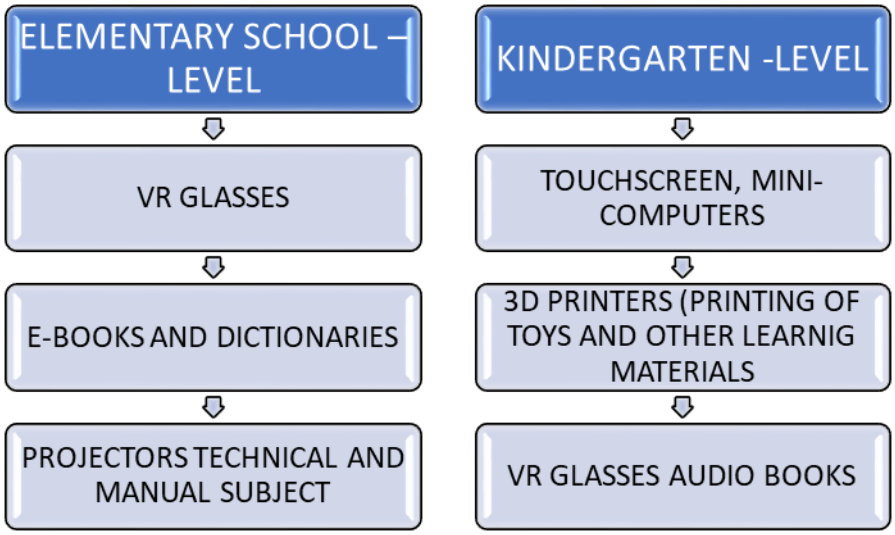


Figure 2
Identified problems of current education system
Source: Own construction 2018/N30

Findings on the related issues regarding the level at which to start imbibing science and technological knowledge; most of the respondents proposed that it should start right from kindergarten with the view that the more children play with these tools the better they become at it and that will help them develop strong interest and further pursue it at all levels. Others are of the opinion that the introduction should be at the high school level where the students can understand the use of these tools in a more 'controlled' way. A few participants were of the view that exposing the children to these tool at these levels poses lots of danger as some may engage in the wrong use of it and therefore suggest the best place to introduce should be at the college/University level. Proposed techology tools for teaching by student participant at the various levels as shown below:



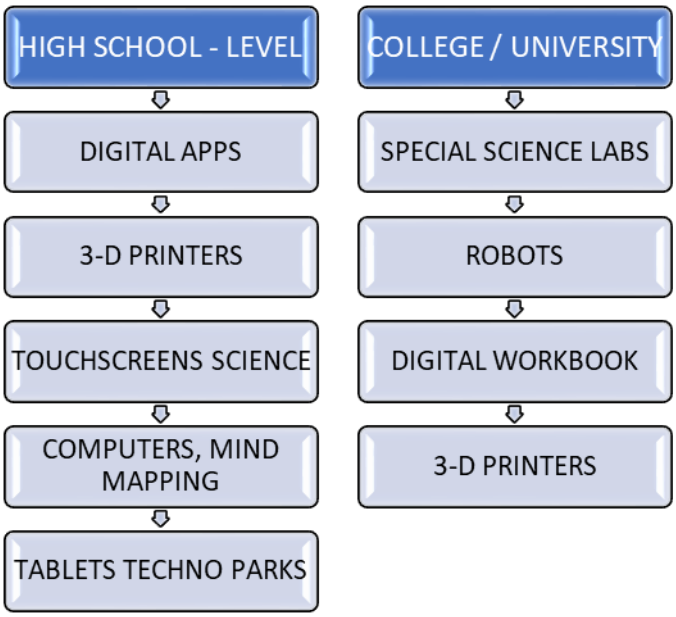


Figure 3
Identified problems of current education system
Source: Own construction 2018/N30

5. Conclusion

The results of the research show that most students are very much aware of the new industrial trends as shown in their various definitions of Industry 4.0 above. However, none of the students gave any definition in relation to cybersecurity and cloud computing and I find this quiet unusual as almost all students are constantly using this applications.

The results of the research also showed that students of the current educational system do not have the prerequisite practical innovative knowledge to prepare them for the modern corporate world. This is as a result of the over reliance of the general knowledge acquisitions method which the education provides student instead of specific vocational training for the latest things and expectations.

It is evident that the new industry revolution (industry 4.0) will /has great impact on the educational system in the preparation of students, content delivery and curriculum design or development of courses. This confirmed the major modern tools identified by interviewees, which cut-across the levels of the education ladder – 3D printers and projectors, Computers of all forms, Virtual reality

glasses, Robotics and Cloud computing among others. The result shows that educational system over the years has kept the old standards hence its inability to provide students with modern practical knowledge.

The complexity we find in the 'outside' world is reflected in each and every aspect of our academic work. When it comes to cope with complexity, standardization is always tempting. But, standardization always means simplification, and thus standardized programs cannot deliver what we need. (Wallner, 2012).

It is also evident from the research results that if the current education system will/can:

Be flexible in its content and delivery approach to student learning.

Allow students to be responsible for their learning

Allow students to take more practical learning on contemporary subjects and

Research made compulsory to all students at the various levels with high supervision, it will enhance the preparedness and employability of students for the current job market.

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