

# Sustainability of Excellence in Education 4.0

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**Abstract**— Sustainability of excellent is a significant component in addressing the world's rising unemployment rate. Many researches predict that the advent of Industry 4.0 will cause unemployment by replacing current jobs with automated machines such as robots, while others projected that it would reduce unemployment by providing new jobs and possibilities. Education 4.0 must be introduced to the millennial generation in order to prepare them for the potential consequences of Industry 4.0. The purpose of this article is to study the potential factors of youth unemployment in the era of Industry 4.0, with the goal of identifying preventive measures or steps that may be implemented, particularly by the educational system, to lower the unemployment rate. As per root cause analysis (RCA), a lack of awareness of the significance of Education 4.0 and Industry 4.0 could be the source of the problem.

**Keywords**—Education, Education 4.0, Industry 4.0, Industrial Revolution 4.0

## I. INTRODUCTION

The definition of work, employment structure, and market competencies have all changed as a result of the fourth industrial revolution and technology has altered the job structure, affecting many workers and unemployed individuals in both positive and negative ways. Industry 4.0, often described as the Fourth Industrial Revolution, is the most recent technological advancement [1]. It emphasizes the present trend of mixing physical technology with concepts like the internet of things (IoT), big data, artificial intelligence (AI), robotics, and cyber-physical systems (CPS) to reduce job-related challenges and costs, especially in the manufacturing sector [2, 3, 4]. It's worth noting that IR 4.0 will not just apply to manufacturing; it also applies to sectors such as healthcare and agriculture. By generating thousands or perhaps millions of new jobs or by substituting present occupations with smart machines or robots, the expanding trend might either reduce or increase unemployment [5, 6, 7].

Unemployment rates are rising globally, especially among millennial, which is causing concern [8]. With the advent of Industry 4.0, various studies have proposed that IT skills, creativity skills, thinking skills, complex problem solving skills, decision-making skills, communication skills, and human skills may be required to thrive in this period [9]. Because of the potential for new employment to be created and present jobs to be displaced as a result of new technology. The Millennial Generation must be prepared for Industry 4.0's

potential consequences by strengthening the skills outlined above through education 4.0. The goal of this research is to explore the reasons of youth unemployment in relation to Industry 4.0 in order to develop preventative measures to reduce unemployment. These findings may aid millennial in preparing for work in the tough new industry 4.0 era.

The fourth industrial revolution has affected Education 4.0, which is defined by a greater use of digital technology (electronic systems) in the learning process. This technology allows the learning process to continue indefinitely in terms of location and time, i.e. it is not limited to classroom and study hours. Changes in students' learning, thinking, and acting in order to produce creative ideas in numerous disciplines are among the educational difficulties in the period of the industrial revolution 4.0.

## II. LITERATURE REVIEW

In this literature review, It focuses on an examination of the concept of education 4.0, as well as the function of educational technology in the education 4.0 era. In addition to being concerned about the qualifications and competencies of qualified teachers, learning media that support the learning process, curriculum that are in accordance with the needs of employment and technological facilitation that supports the teaching and learning process.

### A. Industry 4.0

Industry 1.0 have seen introduction of water and steam as a source of machine power, followed by industry 2.0, that has seen the beginnings of mass production using electricity, and finally, industry 3.0, that would see the introduction of automation and computerization [1, 10, 11]. In 2011, during the Hanover Fair, Germany was the first to introduce Industry 4.0. [12]. It highlights recent advances in combining physical technology with ideas such as the internet of things (IoT), big data, artificial intelligence (AI), robotics, and cyber-physical systems (CPS) to minimize job-related issues and expenses, particularly in the manufacturing industry [2, 4, 13, 14].

It's worth noting that Industry 4.0 encompasses not only the manufacturing industry, but also healthcare and agriculture, which are referred to as Health 4.0 and Agriculture 4.0, respectively [11, 15]. Both Health 4.0 and Agriculture 4.0 are created with the goal of tracking things in real time over the internet. One of the main objectives of Health 4.0 is to provide a platform that allows doctors and

nurses to monitor their patients in real time online regardless of their location, whereas Farmers 4.0 employs a platform to monitor and track the state of farming activities in real time online [11, 15, 16]. Agriculture 4.0 has several characteristics, including the use of robots to milk dairy cows and the use of autonomous vehicles for weed identification [17, 18]. Agriculture 4.0 benefits include the development of high-quality farm products as well as a reduction in production inputs, while Health 4.0 benefits include efficiency and more personalized treatment [11, 18].

Industry 4.0, according to several researchers, may increase unemployment rates by replacing current jobs with automated technologies such as robots [12, 19]. Employees who perform typical activities, such as manufacturing workers, bookkeepers, and product testers, are more likely to be unemployed, according to [5]. Traditional financial sector jobs such as banking and accounting could be replaced by current technologies such as Blockchain technology [5]. Workers with a primary education or less are more likely to be replaced by robots, according to Görmüş (2019), while those with a PhD degree or more are less likely to be replaced [12]. Additionally, automated machines are in serious danger of replacing 47 percent of US occupations [20].

On the bright side, several researchers have claimed that Industry 4.0 will cut unemployment by producing millions of new jobs [6, 12, 21]. Although if technology advances result in the loss of millions of employment, new jobs will be created as a result of new innovation and economic growth [21]. The Revenue Effect occurs when, as a result of the usage of robots or AI, a company earns more money and customers save more money, resulting in increased purchasing power [22, 23].

People were encouraged to spend their money on a range of other goods and services as their purchasing power expanded, resulting in the indirect creation of more jobs. Individuals working in new occupations produced by Industry 4.0 will almost certainly need to be proficient in IT, creativity, thinking, sophisticated problem solving, decision-making, communication, and, most significantly, human skills, especially if the jobs require human-relations or customer service [24]. As a result, education institutions must hone the aforementioned skills in order to better prepare students, especially millennials, for Industry 4.0 by exposing them to education 4.0.

#### B. Education 4.0

Education 4.0 is the integration of sophisticated technologies into traditional learning to promote smart thinking in the classroom [25, 26]. It serves as a link between students and Industry 4.0. Nine education 4.0 trends include the use of eLearning to facilitate traditional learning, more personalized learning, modification of learning processes that students choose freely, more project-based learning, increased exposure to field experience within courses, increased exposure to data interpretation, changes in student assessment, consideration of students' opinions in curriculum design, and more independent learning with teachers acting as facilitators [27].

Several researchers have identified a number of advantages and disadvantages related with Education 4.0. [28, 29]. Education 4.0 implementation level is directly related to student learning outcomes since it improves communication between students and teachers, provides more effective learning as compared to traditional learning, and stimulates

students' interest in learning [25, 26]. On the other side, there are a number of issues with Education 4.0, such as the high cost of implementation and the difficulty in recruiting qualified personnel. Another challenge of Education 4.0 is a lack of excitement as well as reluctance to change, particularly among senior instructors [29].

### III. METHODOLOGY

Exploratory research is frequently used to gain a better understanding of a topic of interest. The study's objective is to highlight the degree of readiness and general issues that tertiary educational institutions are facing as they transition to Education 4.0. In keeping with this, this study took the same (exploratory) strategy, employing a qualitative research method in particular. Then, in order to identify preventative measures, Root Cause Analysis (RCA) was used to explore the reasons of negative events [30, 31]. Sakichi Toyoda developed it in 1958 as part of the development of Toyota's production processes [32]. This method begins by defining the problem, then collecting data such as the problem's impact, identifying possible causal factors using methods such as the 5 whys, which eventually leads to root cause identification, and finally recommending a solution to the problem and putting that solution into action [33]. The key advantages of this procedure are its cost effectiveness and the fact that it identifies the cause of the problem rather than the symptoms, allowing the prospective problem to be avoided in the future [34].

### IV. ANALYSIS

One of the concerns or challenges of Industry 4.0, according to the root cause analysis, is the continued rise unemployment rate, particularly among millennial. According to several researchers, this problem has a negative influence on unemployed people, society, and the economy [35, 36]. Unemployment has a negative influence on the health of jobless people due to psychological concerns like as depression, according to a study involving 300 unemployed men [36]. Depression is well-known to be a leading cause of suicide [37]. Furthermore, because they have no source of income, unemployed individuals are more prone to push off medical treatment, which will eventually lead to further worsening of their health [38, 39]. A number of family-related concerns that might arise as a result of unemployment, such as domestic violence and divorce, which can lead to psychological disorders for both the unemployed and their family members [40]. One of the societal effects of unemployment is an increase in crimes such as burglary and robbery. The relationship between GDP growth and unemployment in the Western Balkan countries, he discovered an inverse association between unemployment and economic growth [35].

The 5 whys technique was used to determine the likely root reason of a high young unemployment rate in the Industry 4.0 era. "Why is the employment rate high in the era of Industry 4.0?" is the first question raised by the problem, followed by "why are youth not hired?" "why were the youth lacking in required skills and qualifications?" "Why did the youth education system not prepare the youth with the skills?" and finally, "why did the education system did not implement Education 4.0?". These five causes indicate to an underlying problem: a lack of understanding of the value of Education 4.0 and Industry 4.0. In regard to Industry 4.0, Figure 1 outlines the five reasons for the high unemployment rate.

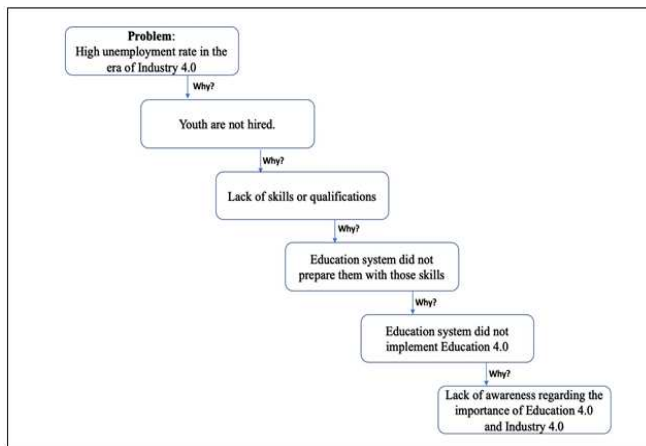


Fig. 1. 5 whys analysis of high youth unemployment in Industry 4.0

As previously stated, the displacement of manual employment may result in the Income Effect, which leads to the hiring of more workers to create more outputs [22]. Individuals who work in the new jobs created by Industry 4.0 will almost certainly need to be skilled in information technology (IT), creativity, thinking, complex problem solving, decision-making, communication, and, most importantly, human skills, especially if the jobs involve human-relations or customer service [10, 24, 41]. These are the skills that cannot be encoded into robots, which is why they are in such great demand in Industry 4.0. As a result, the Income Effect will most likely benefit youth who are well-versed in these abilities.

It is advised that New gen, be prepared for Industry 4.0 by incorporating Education 4.0 into their educational system. This can be accomplished by following Fisk (2017)'s nine education 4.0 trends, which include the use of elearning tools to facilitate traditional learning, more personalized learning, modification of learning processes that students choose freely, more project-based learning, increased exposure to field experience within courses, increased exposure to data interpretation, alteration of students' assessments, and the consideration of students' viewpoints in designing curriculum [27]. Several other countries have also begun to implement Education 4.0 in order to better educate their kids for the future. The University of Northampton, for example, has been using Active Blended Learning (ABL) in its classrooms [42, 43]. A chatbot named Becky was created at Leeds Beckett University to convey information to potential students going through clearing [44]. Last but not least, at Bolton College, a chatbot named Ada was created to assist students by answering inquiries about the university.

## V. DISCUSSION

Industry 4.0 will impact the roles in which all students in this generation will be educated for their future careers, as per the relationship between Education 4.0 and Industry 4.0. The Industrial Revolution 4.0 is reshaping the world, with innovations affecting major industries and occupations. This means that Industry 4.0 will have an impact on not only industries, but also on how jobs and education are seen. Educational institutions must generate a workforce capable of

working in this technologically altered era of Education 4.0. As a result, the current workforce will be required to improve their skills and expertise in order to match the newly formed job responsibilities. A revolution in education is required to enable people all around the world to take advantage of the opportunities presented by these technologies. As a result of this transition, the education business will become more peer-to-peer, personalized, and ongoing. As per the review of the literature, there are linkages between Industry 4.0 and Education 4.0. Education 4.0 clearly supports Industry 4.0, and both must be implemented at the same time. Unless the educational side of Industry 4.0 is well-equipped, it will fail.

In other words, Industry 4.0 is built on the foundation of Education 4.0. As a result, if a country decides to implement Industry 4.0, that country must begin this transformation with its educational system, ensuring that the educational system in place is fit and adaptable to the changes that occur as a result of Industry 4.0. It will be challenging to adapt to Industry 4.0 if their educational system is not ready for the changes. Fortunately, they can still implement Industry 4.0, albeit the success rate will be lower than in nations that have already implemented Education 4.0 in preparation for Industry 4.0.

In order to compete in this new era of Industry 4.0, students and teachers must equip themselves with knowledge and skills. Industry 4.0 requires people who can apply theoretical knowledge in the real world; controlling machines and other technology cannot be done by people who lack the necessary qualifications and capabilities. Education 4.0 is a higher level of education that entails changes to standard university teaching in which students are taught about technology while also being taught how to use it [45]. Education 4.0, on the other hand, focuses on the possibilities of digital technology, individualized data, open-source content, and humanity's current state of technological connectivity [27].

Education 4.0, which is based on the aforementioned framework, is a new way of teaching pupils that uses technology to replace traditional methods of instruction. Aside from that, via their education, Education 4.0 exposes students to technology-related challenges such as cyber-physical systems. Education 4.0 is crucial in today's society because it prepares students for a future when technological advancements are the norm.

Both Education 4.0 and 4IR place a strong emphasis on the use of technology. As a result of the need for human and technical alignment to create new opportunities, 4IR has given rise to Education 4.0. As a result, the rise of 4IR has ushered in disruptive innovation across a wide range of industries, including education, where implementing Education 4.0 is crucial to keeping up with 4IR. This is hugely essential for the next generation's success in life.

The educational learning system is then built as a way of keeping track of students' attendance and academic performance, as well as allowing students who are registered into the system to use the internet with a less restricted data allowance that they can use for educational purposes. Students must also register with the educational learning system, which is recognized by each of their separate internet providers, in order to gain access to a Student Edition of the internet. Students will be given access to a more lenient data quota whenever they connect into their respective account, with the constraint that all of the information that may be accessed is

only educational content. Teachers and students' guardians can check in to their individual accounts via the educational learning system to keep track of their youths' progress and online attendance.

Industry 4.0 will change the roles in which all students in this generation will be educated for their future careers, according to the relationship between Education 4.0 and Industry 4.0. The Industrial Revolution 4.0 is reshaping the world, with innovations affecting major industries and occupations. This means that Industry 4.0 will have an impact on not only industries, but also on how jobs and education are seen. Educational institutions must generate a workforce capable of working in this technologically altered era under Education 4.0. As a result, the current workforce will be required to improve their skills and expertise in order to match the newly formed job responsibilities. A revolution in education is required to enable people all around the world to take advantage of the opportunities presented by these technologies. As a result of this evolution, the education business will become more peer-to-peer, individualized, and continuous.

Improvement of human resources especially educators is one thing that must be highly considered in the era of education 4.0. Generational differences between educators and students assessed as the main factors causing the failure in education. Why is that? Educators who teach the majority come from generations who have different characteristics from students who are sticking with digital tools that do not fit the learning methods offered by educators. The use of conventional methods in learning for millennials is something that is not interesting.

Educators must upgrade their competence in facing the era of Education 4.0 as the students today are more familiar with the digital world. Because of their familiarity with information flow and industry 4.0, graduates must be capable of meeting the demands of industry 4.0 and developing exceptional generations to fill the industrial revolution 4.0.

Education 4.0 is demanded to produce students who have competences that answer the needs in industry 4.0. The competency requested skills on critical thinking and problem solving. This is a critical skill for learners in 21st-century learning. 4.0 educators must be able to blend curriculum so that students can explore this ability.

Second, qualities in communication and teamwork. As a capability essential in the twenty-first century, this talent must be able to be developed through learning. To develop communication and collaboration abilities, the instructor must employ a learning model based on information and communication technology.

The ability to think creatively and innovate is the third requirement. In the fourth industrial revolution, students must always think and act creatively and innovatively. Students must put up this effort in order to compete and create industry-based employment 4.0. This criterion is necessary in light of the fact that the fourth industrial revolution has already taken numerous lives. Computerized robotic robots, for example, have supplanted many occupations. E-tolls, for example, can be used to pay for toll roads.

Finally, familiarize all stakeholders with Education 4.0, some appropriate seminars and workshops will be held, where teaching staff, parents, and students will be informed about

Education 4.0, the benefits of incorporating it into the current academic process, and what each stakeholder must do to ensure that students fully benefit from it. All stakeholders will receive hands-on training on the many platforms that are required to implement Education 4.0, in order to familiarize them with how to operate each platform.

## VI. CONCLUSION

The root cause analysis found that a lack of understanding of the value of Education 4.0 and Industry 4.0 could be a possible issue in the era of Industry 4.0, leading to a high unemployment rate. To prepare youth for Industry 4.0, it is advised that they implement Education 4.0 into their educational system. This can be accomplished by following the nine education 4.0 trends. Many authorities have made steps to prepare for Industry 4.0, which is a good thing.

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