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The Challenges of Higher Education Institutions in Facing the Industrial Revolution 4.0

ABSTRACT: *Challenges of High Education Institutions should respond as quickly and precisely by the entire stakeholder to be able to increase the power of competitiveness of the nation of Indonesia in the middle of the competition. For this reason, the Higher Education Institutions must formulate strategic policies in various aspects ranging from institutions, fields of study, curriculum, resources, as well as the development of cyber university, and developmental research to innovation. One of the primary steps that should be done by Higher Education Institutions is improve the management of Campus data and the information that must be conveyed to both for the educators and the educated. The system information that is reliable will increase the power of competitiveness against competitors and attraction for prospective students. This article – using qualitative approach and literature review method – tries to analysis on the challenges of Higher Education Institutions in one hand; and, in other hand, being correlated with the characteristics of industrial revolution 4.0, includes: digitizing, optimization and customization of production, automation and adaptation, the interaction between humans with machines, value added services and business, the automatic exchange of data and communication, as well as the use of information technology.*
KEY WORDS: *Challenges; Higher Education Institutions; Industrial Revolution 4.0.*

INTRODUCTION

The industrial revolution 4.0 is a concept that was first introduced by German economist, Professor Klaus Schwab in 2017. In his book, *The Fourth Industrial Revolution*, Klaus Schwab (2017) revealed the four stages of the industrial revolution, each of which could change the life and workings of humans. The industrial revolution 4.0 is the last stage in this concept after the stages of the 18th century, 20th century, and early 1970s (*cf* Schwab, 2017; Liao *et al.*, 2018; and Oke & Fernandes, 2020).

After going through the three stages of the industrial revolution, year 2018 is called the beginning of the industrial revolution 4.0 era marked by a cyber physical system. Now, various industries are starting to touch the virtual world, in the form of human objectivity, machines, and data better known as the IoT (Internet of Things). To deal with the industrial revolution 4.0 requires a variety of preparations, including appropriate

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learning methods (Lee *et al.*, 2018; Liao *et al.*, 2018; and Oke & Fernandes, 2020).

Many things must be changed by countries that want to advance. This also applies to Indonesia. Especially, now that Indonesia is facing the era of the industrial revolution 4.0 with increasingly fierce competition. Of the number of changes that must be made to improve HR (Human Resources) is one of the things that must be considered. One of the improvements can be done by changing the learning methods in the existing world of education (Nagy *et al.*, 2018; Malik, 2019; and Oke & Fernandes, 2020).

There are at least three things that Indonesia needs to change in terms of education. Firstly, the most fundamental is to change the nature and mindset of Indonesia's young people today. Secondly, the important role of Higher Education Institutions in honing and developing the talent of the nation's generation. Thirdly, develop the ability of Higher Education Institutions to change learning models that are in accordance with the needs of the current era (Rosser, 2018; Ariff, 2019; and Dilas *et al.*, 2019).

The global economy is currently at the cusp of major changes that are proportional to the appearance of the first industrial revolution or the development of production assembly, or even the discovery of microchips. Advances in technology have enabled automation to occur in almost all fields. Meanwhile, the ownership of smart devices in various parts of the world leads to an unimaginable level of interrelation with one another (Schwab, 2017; Anbumozhi & Kimura eds., 2018; and Liao *et al.*, 2018).

Among the challenges facing the world today, perhaps, the greatest is how to shape the fourth industrial revolution, also known as industry 4.0, which began at the beginning of this century. New technologies and approaches that combine the physical, digital, and biological world in a way that will fundamentally change humanity. There are many opinions that the health sector and biotechnology greatly benefit from this transformation. The extent to which this transformation will have a positive impact depends on how risk investigations and opportunities arise along the way (Schwab, 2017; Nagy *et al.*, 2018; and Oke & Fernandes, 2020).

In the Middle Ages, life in Europe was characterized by a system of feudalism that relied on the agricultural sector, commonly called *Latifundium* or closed agriculture. Trade relations between Europe and the Eastern world, i.e. the Middle East and other Asia, were closed after trade in the Mediterranean was ruled by Islamic traders from the 8th to the 14th centuries. With the outbreak of the Crusades (1096-1291), European relations with the East had revived. Trade cities emerged including Geonoa, Florence, and Venice in Italy, which were originally the center of the departure of the Crusaders to Jerusalem (Noonan, 2007; Harris, 2014; and Noble, 2016).

The rebirth of trading cities was followed by the emergence of home industry activities. From this activity, *Guild* was formed, an association of similar entrepreneurs who had a monopoly and business protection from the government. The *Guild* only produced if there was an order and only one type of item was produced, for example: bread *guild*, shoe *guild*, weapons *guild*, and others. Since 1350, or 14th century, a trade union organization in northern Europe had emerged, called *Hanseatic* League. The purpose of the *Hanseatic* League establishment was to jointly protect the trading business supported by the navy and its own forces (Maniatis, 2001; Thompson & Hickson, 2001; and Noble, 2016).

This revolution was marked by the spread of enlightenment, the success of philosophers and their works. Most importantly, in relation to the economy, they were determined to reduce and replace manual labor or human labor with machinery. With the abundance of raw material from the colony plus the tendency for labor efficiency to produce as much as possible, the existing trade had abolished the semi-static economy of the Middle Ages into a dynamic capitalism, which was controlled by traders, bankers, and shipowners. This

was the beginning of the rapid and harsh changes in the economic world, which later led to the industrial revolution, which not only engaged in trade, but also extended to production (Baran, 1953; Allen, 2006; and Knowles, 2017).

By using qualitative approach and literature review method (Dixon-Woods *et al.*, 2005; Cronin, Ryan & Coughlan, 2008; and Snyder, 2019), this article tries to analysis two things, namely Higher Education Institution's challenges in the currently situation, in one hand; and, in other hand, being related to the Industrial Revolution 4.0 phenomena in Indonesia.

RESULTS AND DISCUSSION

Higher Education Institution Challenges. Higher Education Institution is the level of education after secondary education, namely SMK/SMA/MA (*Sekolah Menengah Kejuruan/ Sekolah Menengah Atas/Madrasah Aliyah* or Vocational High School/Senior High School/ Islamic High School) in Indonesia. The programs in Higher Education Institutions are not only Bachelor (S1), but also Diplomas, Professional Education, Masters (S2), and even Doctorate (S3). Whereas the education unit, which organizes Higher Education Institution is PT (*Perguruan Tinggi* or College), both Public and Private Higher Education Institutions in Indonesia (Ibrahim, 2012; OECD/ADB, 2015; and Dilas *et al.*, 2019).

The Higher Education Institutions consisted of several forms, namely Universities, Institutes, Colleges, Polytechnics, Academies, and Community Academics. Higher Education Institution is more clearly and completely written in Law No.12 of 2012 concerning Higher Education, in article 1, paragraph (1) stated that:

> *Higher Education is the level of education after secondary education, which includes diploma programs, undergraduate programs, master programs, doctoral programs, and professional programs, as well as specialist programs, which are organized by higher education institution based on Indonesian culture.*[1]

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[1]See, for example, "Law on Higher Education Institutions". Available online at: https://likumi.lv/ta/en/en/id/37967 [accessed in Bandung, West Java, Indonesia; September 9, 2019].

Higher Education Institution has several functions, as stated in Law No.12 of 2012, article 4, that Higher Education has 3 (three) functions as follows: (1) Developing capabilities and shape the character and civilization of a dignified nation to educate the nation's life; (2) Developing an innovative, responsive, creative, skilled, competitive, and cooperative academic community through the implementation of *Tri Dharma*, or Three Obligations, nemaly Research, Education, and Community Service; and (3) Developing science and technology by paying attention and applying humanities values (*cf* Fisher, Yaniawati & Kusumah, 2017; Ariff, 2019; and Dilas *et al.*, 2019).

Aside from having a function, Higher Education Institution also has several goals. Like the definition and function of Higher Education, the purpose of Higher Education Institution is also contained in Law No.12 of 2012 on Higher Education, namely in article 5, there are 4 (four) objectives of Higher Education Institutions stated, as follows:

Firstly, the development of the potential of students to become human beings, who have faith and devotion to God Almighty and have noble, healthy, knowledgeable, capable, creative, independent, skilled, competent, and cultured for the benefit of the nation. Secondly, producing graduates who master the branches of science and/or technology to meet national interests and increase national competitiveness. Thirdly, the creation of science and technology through research that pays attention to and applies the value of the humanities to benefit the progress of the nation, as well as the progress of civilization and the welfare of humanity. Fourthly, the realization of community service based on reasoning and research work that is useful in advancing public welfare and intellectual life of the nation (Nihayah, 2014; Syafhendry & Utomo, 2018; and Mahmud, 2019).

In 2015, almost all over the country, various academic problems in Higher Education Institutions often haunted students, who were trying to survive with their critical reasoning. The student press was

intimidated, the institution was frozen, the revocation of the budget, the harassment, and the withdrawal of publishing that had been painstakingly pouring ideas and aspirations into writing (*cf* Hill & Kumar eds., 2009; Bernardo *et al.*, 2017; and Dilas *et al.*, 2019).

There are many bans that continue to roll over actions that are considered detrimental to Higher Education Institutions without consideration of truth and justice. Hard walls, academic community arrangements, stratification, and time control are all part of Higher Education Institutions' engineering to curb the ethical instincts of students, "murder" processes of the critical reasoning of students by Higher Education Institutions should be watched (Gunadi, 2014; Rosser, 2018; and Dilas *et al.*, 2019).

Higher Education Institutions, as a "truth" representation, proved unable to accept criticism as a dialogue between various thoughts, discourses, and ideas. Often, students accept repressive actions and discrimination, because of differences in views with Higher Education Institutions. Repressivity is the mask that defines Higher Education Institutions as being no longer able to "dialogue" in the midst of the various problems they face (Duchesne, 2011; OECD/ADB, 2015; and Dilas *et al.*, 2019).

According to Ahmad Syafi'i Ma'arif (2009 and 2018), and other scholars, it is emphasized that students are the generation of directors, not the follower generation, that is students are not the heirs of the existing national throne, but rather a generation with critical power, that is ready to correct and repair every nation's life that is crooked and untrue. From their knowledge, students are expected to be able to guide the community in facing changes and welcome the development of the times (Ma'arif, 2009 and 2018; van Klinken, 2014; and Ariff, 2019).

Higher Education Institutions did not need to threaten their students. Students did not need to be trained and drilled, like obedient barracks. College was not a machine that behave and act mechanically with a specified package. In the era of

democracy, Universities cannot justify their students without a judicial process (Rosser, 2018; Ariff, 2019; and Dilas *et al.*, 2019).

In the view of Paulo Freire (1972 and 1995), and other scholars, this system was referred to as an oppressive education system. A system in which a student was considered an object without any knowledge and must accept whatever the College know. The view that the Campus was an educational vehicle for "humanizing humans" was slowly fading. Of course, this was often with a variety of controversies in it (Freire, 1972 and 1995; Smith, 2002; and Bernardo *et al.*, 2017).

According to Paulo Freire (1972 and 1995), and other scholars, educational activities were activities that understand the meaning of reality being learned. Education demanded a critical attitude from the actors, namely learners (students) and educators (campus bureaucracy). Through guidance and assistance, students were required to actively understand the meaning of world reality to improve their lives (Freire, 1972 and 1995; Smith, 2002; and Philip, 2015).

Many students were only oriented to the high achievement index, want to immediately get a Bachelor's degree, and then were busy working serving Capitalist machines. Apparently, this was caused by the University's collaborative projects with various companies, as well as efforts to normalize Campus life, to match the character of the product it would produce, which was an obedient and skilled worker (Philip, 2015; Ariff, 2019; and Dilas *et al.*, 2019).

As a result, education only produces scholastic humans, intellectually intelligent, but lacking in full character as a person. If this condition continues, criticism is forbidden. Students will position themselves only as obliged to study and be prepared to become new workers (Dunn, 2001; Jamrah, 2016; and Ariff, 2019).

The Campus arena is a living environment full of intellectual dynamics and movement, the place and period of psychological, intellectual, and social transition. Various knowledge and discourse on Campus become the basis of intellectuality in the

process (Cheng, Chow & Mok eds., 2004; Ariff, 2019; and Dilas *et al*., 2019).

The students experience psychologically changes in the souls of adolescents, who are not yet fully independent of the adult soul that is independent. In the intellectual field, they changed and the *instructional* middle school learning model, centered on teachers in the school (pedagogy), and became a learning model that presented *self-directed* learning. It relies more on one's own ability (andragogy) to process information and evaluate it (Weeks, 2000; Suratno, 2014; and Rosser, 2018).

Colleges naturally continue to improve and evaluate that movement is a practical form as an application of the theories obtained in class, that is the dynamics of the creativity of their students as a form of searching for a truth, from the knowledge gained and a form of scientific evidence, and from a learning in the lecture hall. This movement is a strategic area of student development to appear in the embodiment of analytical critical reasoning power in expressing ideas in quality and realistic student activities (Tremblay, Lalancette & Roseveare, 2012; OECD/ADB, 2015; and Ariff, 2019).

Higher Education Institution now needs to continue to keep the spirit of intellect and movement in balance, to achieve the goals of Education, namely *cognitive learning* and *practical competence*. Because College orientation is a transition of knowledge and psychological, if only the intellectual aspect is prioritized, then, the aspect of the development of every student is only in the field of science, potential, and intellectual power. Conversely, if the movement is prioritized, then, the development only includes the ability of social adaptation and fertilizing the sensitivity of social problems without any aspect of knowledge (Cheng, Chow & Mok eds., 2004; Tremblay, Lalancette & Roseveare, 2012; and OECD/ADB, 2015).

Agus Suwignyo (2013) had stated earlier in "Kosongnya Kampus Kita" (the Empty of Our Campus), published as an opinion in the newspaper of *Kompas* in Jakarta,

Indonesia, on October 30, that Universities in Indonesia today began to be empty. The exodus was carried out by academics (lecturers) from the teaching profession into politicians and government bureaucratic officials, and from the profession of lecturer to a campus structural officer. Career administration demands as reaching the peak of productivity. All of that has weakened the spirit of Higher Education Institutions (*cf* Suwignyo, 2013; Pincus, 2015; and Rosser, 2018).

Turning professions into party politicization, fighting over Campus structural positions and ranks, certifications and worksheets that are used as the highest productivity reference are a complete picture of the decline in the professional quality of lecturers as academics. The Author agrees with Agus Suwigyo (2013)'s opinion, and other scholars, that the strengthening of the power lust in Universities makes academics lose their intellectual identity (Suwignyo, 2013; Pincus, 2015; and Komara, 2017 and 2018).

It is natural if there is a lot of noise in Universities and unconsciously dragging students to the interests of Campus political power. The occurrence of intellectual dynamics and other debates in Higher Education that lead to debates of views and interests, especially between students and other academics, is a dangerous thing. Repressivity practiced by Universities, which incidentally is the holy *qiblat* (direction) of moral knowledge, is an interpretation of what Friedrich Nietzsche (1966) conveyed: "*the will to power gives birth to the will to be right*", and further strengthens the shift in will in the practice of education in Higher Education Institutions (*cf* Nietzsche, 1966; Pincus, 2015; and Popova, 2018).

What will happen to Higher Education Institutions in the future will become the choice of the actions of current education practitioners. The choice is for the tertiary institution to remain a printing machine for workers from capitalist machines, or become a bridge that can mediate the needs of the patterns of life development of the times (OECD/ADB, 2015; Rosser, 2018; and Dilas *et al*., 2019).

Student typology is formed from the

education climate created by the Campus. The Campus environment contributes greatly to changing one's mindset and actions, because, according to Jean-Jacques Rousseau (1979 and 1997), and other scholars, basically humans are innocent, love themselves spontaneously, and not selfish. Civilization and culture are what make humans lose their original nature (Rousseau, 1979 and 1997; Delaney, 2017; and Komara, 2018).

Helena Adri (2008), and other scholars, are so extreme as to say, the tendency of education which today appears in education is narrowed down to schooling, which is then narrowed again by teaching. The development of Higher Education Institution from time to time is so dynamic, even in the future. Education always changes from the orientation, strategy approach, and management of education (Adri, 2008; Hill & Kumar eds., 2009; and Komara, 2018). This is relevant to the opinion of John Dewey (1938 and 1939), and other scholars, who definitively viewed education as a process of intellectual and emotional formation towards nature and fellow human beings (Dewey, 1938 and 1939; Williams, 2017; and Schmidt & Allsup, 2019).

Every decision has its own consequences. The series of policies becomes a symbiosis of mutualism in the form of a derivative of each policy in the Campus community. According to the opinion of the writer, the maximization and optimization of character education – both moral knowing, moral feeling, and moral action – need to be improved, so that all elements of education can dialectic in order to minimize repressive actions and arbitrariness in the realm of Higher Education Institutions.

Industrial Revolution 4.0. The industrial revolution is a rapid change in the economy, namely from agrarian economic activities to industrial economies that use machines in processing raw materials into ready-to-reach materials. The term "Industrial Revolution" was introduced by Louis-Auguste Blanqui (1837) and Frederick Engels (1975) in the mid-19th century. The first revolution took place in England around 1760 (*cf* Blanqui, 1837; Engels, 1975; and Malik, 2019).

The development of science and technology in the UK (United Kingdom) was very advanced, because it was supported by British security and political factors. Many scientific studies, which were assisted by large capital, were carried out, so that large factories can also be built. Another factor was the discovery made by Abraham Darby, a British engineer who successfully used coal (coke) to melt iron and obtain a more perfect iron value. These developments became the driving force for the emergence of modern society (*cf* Cannadine, 1984; James, 2010; and Wrigley, 2018).

In further developments, with the discovery of a steam engine that can be used as a heavy engine drive, the factory system was growing. In turn, the working system of the machines in this factory, then, gave birth to new machine inventions that led to the birth of the next big industry (Kapas, 2008; Wrigley, 2018; and Mohajan, 2019).

Factors underlying the Industrial Revolution were the scientific revolution in the 16th century with the emergence of scientists, such as Francis Bacon, Rene Descartes, Galileo Galilei, and the development of research with the establishment of research institutions, such as the Royal Improving Knowledge, the Royal Society of England, and the French Academy of Science. There were also internal factors, such as domestic political resilience, the development of entrepreneurial activities, the vast British colony, and the rich natural resources (Ames *et al.*, 2009; Nnaji, 2013; and Mohajan, 2019).

In addition to the above factors, other factors causing the Industrial Revolution include: the creation of political stability; Britain was rich in minerals, such as coal, iron ore, lead and wool; new discoveries in the field of technology make it easier to work and increase production; the advance of services and trade that can provide large capital for the business sector; the government provides legal protection for new discoveries (patents), thereby encouraging scientific research activities; and the current urbanization as a result of the Agrarian Revolution in rural areas

(Cannadine, 1984; Wrigley, 2018; and Mohajan, 2019).

The impact of the Industrial Revolution includes: firstly, the economic sector, in which abundant goods and low prices, small companies out of business, trade was growing, and transportations were getting smoother. Secondly, the social sector, in which the development of urbanization, low labor costs, the emergence of employers and labor groups, the gap between employers and workers, the emergence of social revolution, the strength of individualism, and the depletion of a sense of solidarity. Thirdly, the political field, in which the rise of socialist movements, the rise of political parties, and the rise of modern imperialism (Cannadine, 1984; Hirschman & Mogford, 2009; and Mathis, 2018).

So, the Industrial Revolution was a huge leap in the development of science and technology, which has changed the face of human civilization throughout the world. The Industrial Revolution is also an engine of innovation that continues to work, so that it becomes the foundation for further scientific and technological developments, including the Industrial Revolution 4.0, 5.0, and other new industrial revolutions in the future (Schwab, 2017; Liao *et al.*, 2018; Haqqi & Wijayati, 2019; Savitri, 2019; and Sima *et al.*, 2020).

CLONCLUSION

Higher Education Institutions experienced change, starting from orientation and approach to strategy to education management. Education is as a process of forming fundamental skills, both intellectually and emotionally toward nature and fellow human beings. The maximization and optimization of character education need to be improved, so that all elements of education can dialectically to minimize repressive actions and abuse in the realm of Higher Education Institutions.

Side effects of Industrial Revolution 4.0 include five clusters. Firstly, economic clusters, with significant changes in the foundation of growth, employment, and nature of work. Secondly, business clusters, with significant changes in consumer expectations as well as production adjustments with better data processing and presentation, profitable collaboration innovations, and the presence of operating models in business. Thirdly, the cluster of national-global relations of government, there are changes in the pattern of national and global relations and with government, in which this new pattern refers to state, region, and city actors, as well as to understanding in the concept of national security. Fourthly, community clusters, increasing inequality and the middle class, and increasingly crowded new communities. Fifthly, individual clusters, there are changes in orientation in the identity, morality and ethics of individuals, changes in the pattern of connections between people, and management of public and private information that changes.[2]

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[2]**Statement:** I, undersigned, declare truthfully that this article is my own academic work. It is not the result of plagiarism, because the sources that I quoted and used in this article are clearly referred in the Bibliography or the References. I am also willing to receive the academic sanctions, if what I declare turns out to be, later on, not in accordance with the actual statement.

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Among the challenges facing the world today, perhaps, the greatest is how to shape the fourth industrial revolution, also known as industry 4.0, which began at the beginning of this century; new technologies and approaches that combine the physical, digital, and biological world in a way that will fundamentally change humanity. There are many opinions that the health sector and biotechnology greatly benefit from this transformation. The extent to which this transformation will have a positive impact depends on how risk investigations and opportunities arise along the way.