ANALYZING MARKET TRENDS IN THE AUTOMATION ERA FOR THE DEVELOPMENT OF INDEPENDENT CAMPUS CURRICULUM

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ABSTRACT

This research focuses on reading market trends for curriculum development conducted through library research. The development of automation technology, including artificial intelligence (AI), robots, and algorithms, has made the workforce undergo massive changes concerning workers and jobs. It is estimated that by 2030, 23 million jobs will be automated, 27 to 46 million new jobs will be created, and 10 million of these will be new types of work. The Ministry of Education and Culture of Indonesia has responded to the changes with the launch of the Kurikulum Kampus Merdeka (Freedom to learn curriculum), which aims to equip the graduates with industry-needed employability skills. In order to achieve this goal, higher educations need to know the job prospects and skills relevant to the workplace, so that the mismatch between what graduates learn in college and the skills demanded by the employers can be minimized.

Keywords: automation, curriculum, skills, higher education, work.

1. INTRODUCTION

As the world soon welcomes 2030, researchers have predicted that workforce around the world will experience major, fundamental change (Bakhsi, Downing, Osborne, & Schneider, 2017; CBI & Pearson Education, 2019; McKinsey Global Institute, 2017, 2018, 2019a; Microsoft & McKinsey, 2018; Pearson, 2018; Rivera, Zachariah, Mullin, & Willoughby, 2020). Countries such as Canada (Rivera et al., 2020), the U.S (Microsoft & McKinsey, 2018), the U.K (Bakhsi et al., 2017), Australia (Deloitte Access Economics, 2017), South Korea (Oh, Mardis, & Jones, 2020), and
Indonesia (McKinsey Global Institute, 2019a) need to be prepared as advanced technology such as Artificial Intelligence (AI), automation and 3D printing, will result in massive job lost, job gained, and job changed. Technological automation will replace human labor to complete certain jobs; one of the example that has been going on is payment. The emergence of digital money and online payment methods have now taken over offline payment platforms, so that types of jobs such as tellers and cashiers are now less and less common.

Figure 1. Sample of work with activity intensity that can be automated (McKinsey Global Institute, 2019)

McKinsey Global Institute research (2017; 2018; 2019) reports the potential for large-scale changes to occur in the world of work in 2030, where automation and artificial intelligence will result in job loss and the emergence of new jobs. As many as 70% of jobs such as collecting and processing data, as well as types of work with physical activity have a high potential to be replaced by automation. This phenomenon needs to be addressed immediately so that there is no mismatch between the skills that are trained and taught in education and the skills needed by industry and the business world.

Related to the above paragraph, a number of studies have reported this
discrepancy (Asai, Breda, Rain, Romanello, & Sangnier, 2020; Bartlett, 2013; Jonbekova, 2015; Kim & Choi, 2018; Mavromaras & McGuinness, 2018). To overcome the problem of incompatibility between education and workplace, as well as efforts to prepare graduates who are ready to work and on target, the Ministry of Education and Culture (Kemdikbud) launched the *Kurikulum Kampus Merdeka* (Freedom to learn curriculum) (Kemdikbud, 2020). The campus curriculum allows students to take courses (MK) outside the study program or outside the university. Students are also encouraged to galvanize themselves through internship programs that can be carried out at institutions or agencies that have collaborated with universities where the students study. Thus, students gain insight and experience about the world of work even before graduating from college, so they are expected to become work-ready figures when they graduate. Thus, the present study aims to analyze the global employment trend that will emerge in 2030?

2. LITERATURE REVIEW

2.1 Automation and its impact on the world of work

Embracing the soon arrival of 2030, automation will bring significant changes to the world of work (McKinsey Global Institute, 2017, 2018, 2019a; Microsoft & McKinsey, 2018) in all fields. These changes occur as a result of technological automation (McKinsey Global Institute, 2017, 2018, 2019a; Microsoft & McKinsey, 2018; Rainie & Anderson, 2017; Schwabe & Castellacci, 2020). Technological automation, including robotics and artificial intelligence (Artificial Intelligent), is able to replace human labor to complete certain jobs. An example is payment. The emergence of digital money and online payment methods has now taken over offline payment platforms, so that types of jobs such as tellers and cashiers are now less and less common.

McKinsey Global Institute research (2017; 2018; 2019) reports the potential for large-scale changes to occur in the world of work in 2030, where automation and artificial intelligence
will result in job loss, join gained, and changing forms of work (job changed). As many as 70% of jobs such as collecting and processing data, as well as types of work with physical activity have a high potential to be replaced by automation.

Such conditions will potentially increase the mismatch or mismatch between education and type of work. This mismatch can be vertical, or a mismatch of education level with work, as well as a horizontal one, or a mismatch of educational background with work (Tentua & Winarko, 2020). Therefore, educational institutions need to address the development of employment trends in the automation era in order to develop a curriculum that is in accordance with the needs of the world of work (Moorthy & Suseendran, 2017).

### 2.2 Mismatch between education and work

Skill mismatch has been reported happening around the world either in Africa (Morsy & Mukasa, n.d.), Asia (Fellman, 2009; Maclean, Jagannathan, & Panth, 2017; Mok & Qian, 2018; Nambiar, Karki, Rahardiani, Putri, & Singh, 2019), America (Microsoft & McKinsey, 2018), Europe (J. I. M. Allen & Weert, 2007; Jonbekova, 2015; Santos & Sequeira, 2014), or Australia (CEDA, 2021; Jones & Sloane, 2011; Mavromaras & Mcguinness, 2018; Piller & Lising, 2014). Some studies observed the phenomenon from the employers’ perspective (Brenčič & Pahor, 2019; Nambiar et al., 2019), and some others explained it from the employees’ sides (J. I. M. Allen & Weert, 2007). ADB (E. R. Allen, 2016) summarizes the mismatch between education and work in Indonesia based on data from BPS (2015). The report shows that the number of discrepancies, both under qualification (under qualified) and above qualification (over qualified), is quite large.

A number of studies have reported this discrepancy (Asai et al., 2020; Bartlett, 2013; Jonbekova, 2015; Kim & Choi, 2018; Mavromaras & Mcguinness, 2018; Tentua & Winarko, 2020). Tentua and Winarko describe the relationship between education and work in the diagram below.
This mismatch between workers' skills and the skills needed by the workplace (Asai et al., 2020; Bartlett, 2013; Jonbekova, 2015; Kim & Choi, 2018; Mavromaras & Mcguinness, 2018; Tentua & Winarko, 2020) has, in some cases, been the cause of the job problems complained by the employer (Cappelli, 2018). Cappelli (2018, p. 252-253) describes the complaints of employers in the United States, which are summarized into 3 causes: 1) skills gap, 2) skills shortage, and 3) skills mismatch. A skills gap occurs when the education system is perceived as failing to provide and train their graduates with the basic skills expected by employers. Skills shortage occurs when an industry or job provider lacks workers with certain skills, such as IT experts or doctors. Skills mismatch occurs when skilled workers are either oversupply or undersupplied. The whole problem related to these skills is referred to as a skills problem (Cappelli, 2018, p. 253).

To overcome this, the Indonesian government through the Ministry of Education and Culture issued a new policy, which is expected to overcome the problem of incompatibility between education and the world of work. The new policy is called Kurikulum Kampus Merdeka (Freedom to learn curriculum).
2.3 **Kurikulum Kampus Merdeka**  
(Freedom to learn curriculum)

The Freedom to learn curriculum (Kemdikbud, 2020) is a policy issued by the Minister of Education and Culture that aims to encourage students to master various relevant sciences so they can be ready when entering workforce (Dirjen Dikti, 2020). The curriculum is a step to give autonomy to students to determine what kind of skills they want to master. One of the visions of this policy is to provide students with additional knowledge and skills beyond their basic knowledge that can provide added value when they graduate (Sentneg, 2020). Through this curriculum, it is possible for students to take outside the study program or outside the university. Students are also encouraged to galvanize themselves through internship programs that can be carried out at institutions or agencies that have collaborated with universities where students study. Through this curriculum, the definition of credit, which was previously only translated as face-to-face learning hours in class, is now expanded into various activities such as internships, entrepreneurship, research, social activities and various other activities. Thus, students gain insight and experience about the world of work even before graduating from college, so they are expected to become work-ready figures when they graduate.

2.4 **Adaptive curriculum**

A number of studies have investigated the role of curriculum in linking education to the world of work (Acedo, 2012; Billett, 2006; Mileva et al., 2012; Mohd Yunus, Bakar, Hamzah, & Wan Jaafar, 2016; Ritter, Small, Mortimer, & Doll, 2018). One that has been done is implementing an adaptive curriculum (Mileva et al., 2012). Adaptive curricula incorporate the skills needed by the world of work, as is the case in a number of European universities (Mileva et al., 2012).

Through a curriculum that is oriented to the skills needs of the world of work, the mismatch between education and work, and the problems caused by the mismatch are expected to be minimized.
3. **METHODOLOGY**

As the study aims to get a global picture of job trends and skills, some countries from each continents are taken to get some views how the regions prepare for automation. In addition, to understand the trend for each country involved in this study, some socio- economical aspects will be presented before moving on to 2030 projection of potential jobs and skills in those countries. The present study is a library-based, which was conducted with the following criteria:


2. The keywords used to gather the data include: skills, employment, automation, jobs, and other keywords relevant to this research.

4. **FINDINGS AND DISCUSSIONS**

The present study break down the finding based on the countries where the researches were conducted. As some have predicted (see (CBI & Pearson Education, 2019; McKinsey Global Institute, 2018, 2019a; Microsoft & McKinsey, 2018; Rivera et al., 2020), there will be massive disruption to the workforce as a huge chunk of occupation disappear, change into new forms, or grow. The data below show countries’s future employment trends, with their potentials and challenges, as the world is embracing automation.

**ASIA**

**China**

McKinsey Global Institute (2021) presented a thorough report on how China, currently the world’s largest workforce and second largest economy, is in its way to become a postindustrial economy, moving from an export-, manufacturing-, and investment-led economy towards one directed by domestic consumption, service and innovation. Paying specific attention on the
country’s educational system, the report was based on MGI’s extensive research on China’s economy and global analysis of the future of work.

The report divided China’s workforce into six categories to get a better look for each of them: a) frontier innovators, b) skilled professionals, c) administrative white-collar workers, d) frontline service labor, e) manufacturing workers, and f) construction and agriculture workers. The demand for frontier innovators, skilled professional, and frontline service labor is predicted to rise, with frontier innovator being the most, while manufacturing workers and construction and agriculture will see a decline.

MGI sees that China needs to reinvent the education and skills development, to equip the workforce for a postindustrial phase. MGI proposes “three Es”, everyone, everything, everywhere. Education and training should be available for everyone. Content of education and training should be relevant with the change today. Education and training should be available throughout people’s lives.

**Indonesia**

A thorough observation on Indonesia’s promising future for its 2030 workforce was presented by McKinsey Global Institute (2019). The report displays the country’s potential of raising productivity, growing the GPD, and creating 25 million fresh new jobs by 2030. With the country’s success story in developing “decacorn” startups (Oxford Business Group, 2020), coupled with its soon harvested “demographic dividend”, as the country’s working-age population reaching its peak in 2050 (Hayes & Setaryonuri, 2015), it is expected that Indonesia will soon become world’s top 7 economy by 2030 (Agarwal, Santoso, Tan, & Wibowo, 2021).

MGI (2019) lists down how automation can affect Indonesia’s workforce: 23 million jobs displaced, 27-46 million new jobs gained, and 10 million jobs that never exist before. Healthcare, constructing, manufacturing, and retail are the areas that will enjoy benefit from labor demand.
However, the report emphasizes what Indonesia needs to prepare in order to maximize its potentials and rise its economic status. As workers with secondary education or college degree are predicted to be the group who will benefit most, it gives challenges to education and policy makers to provide proper trainings and equip them with relevant skills, in order to help them keep up with fast change of technological advancement.

**EUROPE**

**The U.K**

Compared to the other studies, this research by UKCES was done much earlier in 2014. After reviewing comprehensive literature, interviewing experts, conducting high-level workshops, and reading a comprehensive analysis of trends and disruptions, the study came with four scenarios of future jobs and skills in 2030: 1) Forced Flexibility, 2) The Great Divide, 3) Skill Activism, and 4) Innovation Adaptation. Each scenario provided a different picture of what workforce would look like in 2030.

Forced Flexibility indicated a greater business flexibility and additional innovation, but this might result in low-skilled workers facing fewer opportunities and weakened job security. High-skilled workers, in opposite, would get greater autonomy. It was noted that the study predicted many middle-skilled workers would lose their jobs. The second scenario, The Great Divide, saw how society was divided into those who “have” and those who “have nots”. Similar to the previous scenario, The Great Divide also saw how high-skilled employees earned greater autonomy while middle and low-skilled workers competed to “poorly-paid temporary positions”. Skills Activism, the third scheme, predicted that technological innovation would result in automation, which led to large-scale job loses. This situation would bring political pressure for the government to create extensive skill-developing programs. The last scheme, Innovation Adaptation, saw a stagnant economy and productivity was boosted through a systemic implementation of ICT solutions. This sce-
nario predicted that workers might face insecurity of employment, as a lot of them were demanded to develop portfolios of project-based jobs.

NORTH AMERICA

Canada

Rivera et al (2020) conducted a large-scaled survey that employed interdisciplinary methodology to get a clear picture of what Canadian workforce would look like in 2030. Involving foresight research, expert insights, and machine learning in its methodology, the research observed: occupation’s skill, ability, knowledge requirements, and by data collected from six cross-country workshops. The findings concluded that jobs in health, natural sciences, applied sciences, service orientation, and technical expertise would grow, while occupations in manufacturing and utilities are predicted to decline.

The U.S

Even though this report by McKinsey Global Institute (2019b) was published before “The Big Resignation” or “The Big Quit” where millions of Americans resigned from their jobs in such rapid and abrupt way (Bureau of Labor Statistics, 2022; McKinsey Global Institute, 2021a), it is still worth noting how the report show the potentials as well as the challenges that American workforce will face in the automation era of 2030.

In the report, MGI started by showcasing the uniqueness of the U.S., in terms of area and the occupants’ diversity. 30% Americans live in urban core, consisting of megacities and high-growth hubs in 63 counties; 16% in urban periphery (271 counties); 24% in mixed middle which covers stable cities, independent economies, and America’s makers (325 counties); a small amount of 6% in niche cities that consists of small powerhouses, silver cities, and college-centric towns (89 counties), and the last 24% (2,365 counties) are people living in low-growth and rural areas, consisting of trailing cities, Americana, Distress Americana and Rural outliers. Each area has specific characteristics in the matter of access to education and employment.

As the report suggests, automation in the U.S will affect some of
the largest occupations such as office support, production work, food service, retail, and customer service. It is said that 40% of present jobs in the US are the ones that will be displaced between now and 2030. Still, doors open for more new jobs. More occupation will arise from areas such as healthcare, STEM jobs, creative and arts management, and business services.

**SOUTH AMERICA**

**Latin America and the Caribbean**

ILO and IDB’s projection on Latin America and the Caribbean’s future of workforce centers a lot at the countries’ continues effort to be net-zero emissions by 2050 (ILO & IDB, 2020). The efforts include encouraging more people to have healthier diets by consuming less meat-based and more plant-based food and changing fossil fuel energy sources with carbon-free power sources such as wind and solar power. The change on dietary alone is seen to affect the workforce, especially workers in poultry, dairy, livestock herding and fishing, with 4.3 millions jobs get cut in this area. Still, the number of jobs created from plant-based agriculture is predicted to reach 19 millions in 2030.

The shift of jobs in dietary and energy areas will require reskilling the workers and the companies. There will be 22.5 million jobs in agriculture and plant-based food production, renewable electricity, forestry, construction, and manufacturing. The number of jobs that need medium-level of skills is 13.5 millions, 8 millions in the low-skill, and 1 million in high-skill group. This figure surely gives a lot of job opportunity to millions of unemployed youth and underutilized laborers. Looking at how greener lifestyle directs the huge shift in employment, the report emphasizes the role of education to keep up with the change and modernize the curriculum to make sure the graduates receive up-to-date trainings and skills needed in the changing workforce.

**AFRICA**

**South Africa**

Magwentshu, Rajagopaul, Chui, & Singh (2019) in their report for McKinsey Global Institute, exposed the problems South Africans have to deal
with today: declining GDP, highest rates of unemployment of the decade, gender and income inequality, low rates of education completion, and inadequate training for workers.

Digitization, machine learning, and automation can help the nation overcome these problems by boosting the productivity with less errors and greater efficiency. 4.5 million new jobs will be created, and healthcare and construction are predicted to receive a net gain from more than 570,000 jobs and 260,000 jobs, respectively. On the other hand, manufacturing and retail are seen to experience more job loss than gained.

The benefits of digitizations can only be gained if South African decision-makers make sure that workers are equipped with sufficient re-skilling to ensure they perform well and efficiently. Also, education system need to be strengthened so that graduate rates can improve. That way South Africa can maximize its potentials from digitization and automation, and the nation’s income can get significant gain.

AUSTRALIA

Australia

Innovation and Science Australia (2008) truly emphasises the word “innovation” in its report and does see this as a center of change for an automated era 2030. Through innovation, Australia can tackle some problems such as ageing society that soon bring “retirement boom”. It is even said that when 2030 comes, Australia will be dealing more with shortage of workers than shortage of jobs. Innovation will also be the way to maintain Australian’s standard of living.

To achieve the prosperity that innovation cause, the report emphasizes 5 imperatives that will guarantee the success of innovation, science and research system. The five imperatives are: a) Education, b) Industry, c) Government, d) Research and Development, and 5) Culture and ambition. It is also highlighted that each of Australian child should have access to world-class education and that education provide skills relevants to 2030. Some areas that are predicted to be thriving are healthcare
and agriculture, while types of works that physically predictable will decrease.

As the data from various reports above suggest, automation will lead to job loss, gained, and changed. Global employment trend might vary in terms of areas that will flourish and those that will decline, depending of the region’s characteristics. Agriculture in some country might be having less and less worker demands, but country like Latin America and the Caribbean the demand will be high as the industry move from meat-based to plant-based agriculture and food production. Similarly, manufacturing seems to be declining in many places like Canada and South Africa, but it is predicted to boost in Latin America. Still, one that is true is all places is the important of skills. All countries agree that future workers and companies have to commit themselves in education and training, skilling and reskilling, to allow smoother transition to a more automated era. Also, education system need to upgrade and update themselves with more recent and relevant skills and knowledge, so that graduates are better equipped when they finally step into the world of work.

5. CONCLUSION

As the graduates of today will surely be part of the 2030 workforce, it is necessarily essential for universities and other higher educational institutions to design well-thought curriculum that truly shape the learners’ skills so that they become work-ready by the time they graduate from schools. To reach that goal, curriculum designers do not only need to evaluate existing curriculum based on the skill needs today, but they have to look far ahead and beyond. This study hopes to give a little foresight of what probably happen in the future and urges curriculum designers and other educational policy maker to use this opportunity to do a massive reformation to the educational system, so that the graduates coming out from such system possess the necessary skills used to compete among the global workforce in 2030.

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