

The Challenges of University Graduates in The Labour Market During The Industrial Revolution 4.0 Era

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Abstract

Purpose -This study aims to determine the relevance of the competencies acquired by university graduates in the labor market during the industrial revolution 4.0 era. This is necessary considering the fact that the evolution of this industrial era has triggered the creation of new types of works which require inexperienced college graduates to improve their competencies.

Methodology - Data were obtained from Faculty of Economics 2015-2019 alumni at Universitas Terbuka domiciling on Java Island. A total of 279 alumni were used as samples while the data was collected using a questionnaire and analyzed through Biplot.

Findings - The results showed that the graduates surveyed fulfilled several competencies required in the labor market but need to improve on some others such as digital, technological, and humanist literacies observed to be needed in industrial revolution era 4.0.

Originality - This study highlights some of the competencies possessed by graduates to operate in the labor market era 4.0 and several others to be improved in order to compete globally.

1. Introduction

Industrial revolution (IR) 4.0 era in the manufacturing technology combines automation with cyber intelligence and data exchange as indicated by the existence of cyber-physical systems, the Internet of Things (IoT), as well as cloud and cognitive computing, artificial intelligence, supercomputers, genetic engineering, nanotechnology, automatic cars, and innovation. These changes occur at an exponential rate and also have an impact on the economy, industry, government, and politics including education and the labor market. Moreover, the era is marked by the development of technology and new approaches which combine the physical, digital, and biological aspects with the ability to cause fundamental changes in the pattern of life and human interaction (Tjandrawinata, 2016). This further led to the transition from conventional learning methods (Aini et al., 2020) to a digitalization system with wider access.

This means the era caused significant changes in all aspects of life, including the educational environment (Chaka, 2020). It is important to note that one of the closest educational institutions to the labor market is the university due to its significant contribution to the development of superior and competitive human resources. The era demands that they become more adaptive, innovative, and agile in order to produce graduates with the competencies required to be owned by human resources to compete globally (Kemendikbud, 2020).

Some of the skills required to be improved for these graduates include computer technology, communication, collaboration, and continuous learning skills as well as those needed to be adaptive to environmental changes (Rosyadi, 2018). Moreover, apart from the efforts to prepare the graduates towards becoming employees in the industrial world, they also need to be trained to become independent entrepreneurs with several job opportunities for themselves and others (Kemenristekdikti, 2017). This means there is the need for a curriculum with the ability to integrate these changes in order to improve the work-readiness of the graduates. This is in line with the findings of Marope et al., (2017) that future curricula should reflect competencies that can prepare students for an unknown future.

Several studies have been conducted on the competencies required in the IR 4.0 era. An example is the focus of Kamaruzaman et al., (2019) on mapping out the framework comprising the skills considered to be essential for engineering graduates in Malaysia by 2022. The skills observed include analytical thinking and innovation, creativity, originality, initiative, technology design and programming, critical thinking and analysis, complex problem solving, leadership and social influence, emotional intelligence, reasoning, problem-solving, ideas, system analysis, and evaluation skills. Cotet et al. (2017) also showed that the systems and logistics students in Romanian universities studying robotics and machine tools need personal qualities (self-actualization) and interpersonal skills (empathy) in this era.

Demartini & Benussi (2017) found that some of the competencies needed in the 21st century include lifelong learning, adaptability, ability to find, organize, and use information, critical thinking, teamwork, communication, problem-solving, self-management, planning, organizing, technology management, and entrepreneurial skills. Eguchi (2014) also added thinking through observation, estimation, and manipulation, science process or problem-solving, social interaction or teamwork as well as critical academic skills which include writing, reading, research, creativity, collaboration, critical thinking, decision making, problem-solving, and communication skills. Elbeck (2018) focused on decision-making innovation, social or emotional skills, varied scientific skills, critical thinking, and creativity while Forsström & Kaufmann (2018) suggested problem-solving, creativity, and logical thinking skills as well as programming and mathematical thinking skills. Furthermore, Hecklau et al. (2016) classified these skills based on the aspect with the technical, media, and coding skills categorized as technical, creativity, problem-solving, decision making, and analytical skills as methodological, intercultural, language, communication, networking, ability to transfer knowledge, and leadership skills as social, and flexibility, tolerance for ambiguity, motivation to learn, ability to work under pressure, and a sustainable mindset as personal competence.

It is also important to note that previous studies discussed the relevance of graduate competencies to the labor market. This was confirmed from the argument of Lukita et al. (2020) that curriculum 4.0 which implements 4 (four) competencies including programming, data analysis, ability in artificial intelligence, as well as the flexibility of soft skills and sustainability systems needs to be assessed to guarantee the quality of higher education and produce excellent graduates. Boahin (2018) argued that the influence of the industrial world in aligning competencies with the existing curriculum in educational institutions is the decisive factor to improve the soft

skills of graduates. Moreover, Henrich (2016) discovered that the skill and competencies of graduates are not limited to the identification of higher education institutions but also extended to the involvement of business actors in determining the competencies required by companies. Anastasiu et al. (2017) showed that successful higher education is measured by the ability of the graduates to exhibit particular expertise competencies required by the job market. Ruth (2020) also asserted that a competency-based curriculum provides a platform to ensure students become more competent.

IR 4.0 was observed to have created a significant challenge for human resource (HR) management as indicated by the need to prepare and train employees to possess specific criteria and needs. This is mainly due to the need to combine human and machine competencies. Moreover, empirical studies showed that humans have a significant role in future production efforts of organizations (Gabriel & Pessl, 2016) but there is going to be a reduction in routine works which are to be replaced by the flexible response, problem-solving, and personalization responsibilities as reported by Lorentz et al. (2015). This means humans still have an important part in this era but need to acquire the relevant competencies and skills.

Universities are very important to the development of a highly competent workforce in line with the five aspects highlighted by Spencer & Spencer (2010) which include knowledge, traits, self-concept, knowledge, and personal skills. Meanwhile, Aulbur et al. (2016) defined personal skills as the essential competence related to individuals and are divided into the ability to change and adapt which are considered to be significantly needed in IR 4.0 era.

The increased competition in the labor market during this IR 4.0 era 4.0 is forcing universities to equip graduates with the competencies needed to become employable and successful. This is indicated by the focus of the universities to establish certified professional program units, improve their curriculum, and collaborate with external partners such as existing HR training institutions in addition to the development of HR development programs.

Universitas Terbuka (UT) is one of the universities in Indonesia that need to develop several innovations in academic thinking, research, and integrated programs to improve the competence of their graduates, starting from the Faculty of Economics (FE-UT). This is considered necessary due to the present transition to a period of millennial generation prospective and existing students as well as the incompetence observed in the labor market. It was also observed that students of this institution, specifically those in FE-UT, do not have working-class students anymore and this means there is a need to make adjustments and breakthroughs towards students becoming regionally, nationally, and internationally competitive after graduating from the school.

This can be achieved through the revision of the curriculum to ensure it is in line with the needs of the business and industrial world (Dudi). This is very reasonable considering the fact that curriculum is normally used as the reference for the existing learning process with the expectation that it will ultimately have a positive outcome for students (Yusof et al., 2013). It also needs to contain elements that have the potential to produce holistic graduates with technical and non-technical skills as well as good ethics and morals. This means it needs to be revised in the future to balance the hard and soft skills possessed by graduates to ensure they are independent and ready to compete anywhere and at any time.

The general curriculum designed by the Ministry of Education and Culture for higher education to indicate the emergence of the IR 4.0 era and also address the change in the needed competencies contains several skills including technology, data, and human literacies (Belmawa, 2018). Moreover, Ellahi et al. (2019) showed that universities need to improve their academic abilities in data analytics, artificial intelligence, augmented reality, the internet of things, and cloud computing to enhance the abilities of their graduates in this era. This spurred universities, in this

case, FE-UT, to formulate and develop curriculum content for future purposes. Therefore, this present study focuses on discussing the suitability of the competencies of college graduates, specifically the alumni of the Economics Faculty of Universitas Terbuka, with the requirement in the labor market during the IR 4.0 era. The suitability was also discussed in line with the type of industry as indicated in the following section.

2. Research Methods

This study used a descriptive qualitative approach and competency variables which include knowledge in the field or discipline, information technology, creativity, problem-solving skills, time management, teamwork, critical thinking skills, tolerance, ability to appreciate different views, leadership, responsibility, initiative, communication skills, emotion management, serving, negotiation skills, and the ability to divert the mind according to the necessary needs and analyze data and information into something useful. The samples used were alumni of the Faculty of Economics at Universitas Terbuka (FE-UT) from 2014–2019 who live in cities of Java such as Serang, Jakarta, Bogor, Bandung, Semarang, Yogyakarta, and Surabaya. These areas were selected based on the assumption that the impact of the IR 4.0 era is felt significantly in these cities. Moreover, the questionnaire distributed was designed using a Five-point Likert Scale with very poor to very good statements while the data were analyzed using Biplot analysis to determine the positioning and perception mapping of a group of objects.

3. Results and Discussions

This study used 18 indicators developed from the World Economic Forum (2018) and Cai et al. (2017) which are designed to indicate the required competencies of the business world IR 4.0 era that need to be integrated into higher education. The results obtained from the response to the questionnaires using frequency tabulation are presented in the following Table 1.

Table 1 shows that more than 50% of FE-UT graduates have a good level of competence in the eighteen criteria listed while only approximately 20% have a fairly good level. The average value was observed to be 3.5 which is categorized as good while the highest was recorded in the ability to appreciate different views with an average of 4.007 followed by tolerance and responsibility with 3.9391 and 3.9283, respectively.

Table 1. Competencies of FE-UT graduates

No	Alumni Competence	Competency Level									
		Very poor (1)		Less (2)		Quite good (3)		Good (4)		Very good (5)	
		N	%	N	%	N	%	N	%	N	%
1	Knowledge in the field or discipline	3	1,1	8	2,90	105	37,6	151	54,1	12	4,3
2	Information Technology	3	1,1	8	2,90	76	27,2	165	59,1	27	9,7
3	Creativity	2	0,7	10	3,60	108	38,7	140	50,2	19	6,8
4	Ability to solve problems	2	0,7	3	1,10	87	31,2	167	59,9	20	7,2
5	Time management	2	0,7	16	5,70	79	28,3	150	53,8	32	11,5
6	Teamwork	4	1,4	8	2,90	72	25,8	169	60,6	26	9,3
7	Critical thinking	0	0,0	13	4,70	86	30,8	162	58,1	18	6,5
8	Tolerance	1	0,4	3	1,10	57	20,4	169	60,6	49	17,6
9	Ability to appreciate different views	0	0,0	2	0,70	44	15,8	183	65,6	50	17,9
10	Leadership	3	1,1	13	4,70	95	34,1	139	49,8	29	10,4
11	Responsibility	1	0,4	4	1,40	57	20,4	169	60,6	48	17,2
12	Initiative	2	0,7	8	2,90	76	27,2	163	58,4	30	10,8
13	Communication skills	3	1,1	6	2,20	76	27,2	165	59,1	29	10,4
14	Ability to regulate emotions	1	0,4	5	1,80	93	33,3	154	55,2	26	9,3
15	Ability to serve	1	0,4	3	1,10	58	20,8	175	62,7	42	15,1
16	Negotiation ability	3	1,1	13	4,70	93	33,3	146	52,3	24	8,6
17	The ability to divert the mind according to the need required	1	0,4	10	3,60	100	35,8	148	53,0	20	7,2
18	The ability to analyze data and information becomes something useful.	1	0,4	9	3,20	72	25,8	162	58,1	35	12,5

Source: processed data, 2021

The findings related to the ability to appreciate different views was observed to be consistent with the opinion of Schleicher (2018) that individuals need to learn to think and act in a more integrated manner considering the interrelationships between ideas, logic, and conflicting or inappropriate positions, both from short- and long-term perspectives. This means every graduate is required to possess this ability while studying and apply it both within the learning environment and the wider community. Moreover, it is more honed in the labor market which is characterized by a very varied diversity in terms of culture, ethnicity, language, habits, and others. The ability can be demonstrated through group and face-to-face learning that involves discussions with different views and perspectives in analyzing certain problems. However, this cannot affect them negatively since it is an additional insight.

This study also concurs with the findings of Renninger & Hidi (2016) that the development of passion usually starts in certain situations and normally drives individuals to make and strive to pursue smart choices independently. It shows that graduates learn based on different perspectives. This creates an additional dynamic and democratic learning process and promotes students to become motivated in improving the relevant skills and attitudes such as teamwork, confidently exploring ideas with others, as well as developing personality from the ethical, social, and professional perspective. Tessier (2021) also emphasized that one of the skills needed to be

developed is teamwork which can be significantly acquired through experience associated with group diversity and the development of learning communities.

The results on tolerance were confirmed by Baklashova et al. (2015) which showed that the combination of education with sports and social events has an important role in developing the personality of students as well as their internal potential to form personal, ethnic, and social tolerance. It was also discovered that tolerance needs to be possessed by graduates after study due to its ability to reflect peaceful coexistence, open-mindedness, and respect for others despite the differences in ethnicity, social status, beliefs, or the ability to create a peaceful and harmonious environment.

It is possible to implement tolerance in the work environment and community and it is usually developed during the process of solving problems with other classmates during the learning process. Moreover, the learning group facility also fosters communications with the administrators usually serving as the liaison between students and UT representative offices in their regions. It is also important to note that tolerance is normally formed and developed based on the diversity of cultures, interests, education, economic, social status, and other backgrounds of each graduate.

Aubakirova et al. (2016) defined tolerance as the ability to understand important aspects including culture as well as the spiritual and moral values of every society and every citizen regardless of gender, age, profession, or ethnicity (Aubakirova et al., 2016). It is important to note that education has an important role in restoring the behavior of an individual, including tolerance. One of the methods usually used to build and strengthen this behavior is through religious teachings (Juwita et al., 2018). Naumenko & Naumenko (2016) also emphasized the positive impacts of the dynamics associated with the establishment of confessional tolerance for students and elements of multicultural awareness.

The result on the responsibility competence was found to be consistent with Carpenter & Pease (2013) which showed that the concept has a better impact on self-regulation, collaboration, and academic mindset. It was observed in the learning process of FE-UT which involves non-curricular activities such as annual sport and art events usually conducted through the participation of student representatives from all offices and sections in the school. This sporting activity is one of the gathering events normally conducted between students in Indonesia.

Another strategy normally used to shape this responsibility is through the provision of certain tasks during the learning process either through face-to-face or online tutorials. The process involves stimulating the FE-UT students through discussions material and assignments to be studied and submitted within a specified period. This is in line with the findings of Erikson (2019) that peer and self-assessment have the ability to increase the sense of responsibility of individuals in relation to learning. Abdou Ndoeye (2017) also argued that most students 1) believe they are more responsible for their own learning than the need to support their peers, 2) have the ability to identify specific tasks that require them to take responsibility for their studies, and 3) can recognize the benefits of being responsible for their learning process and being supportive to others. It is important to note that these behaviors are irregular. Another study by Ayish & Deveci (2019) also showed that team-based courses can be used to develop the personal responsibility of students in the learning process.

The perception of students concerning personal responsibility and its impact on their learning activity is important to be studied due to the lack of this attribute as well as the ignorance of young adults entering university on how their attitudes and behavior affect the learning process of others (Dallas & Hatakka, 2016; Deveci & Ayish, 2017). Figure 1 showed more details on the competence level of FE-UT graduates.

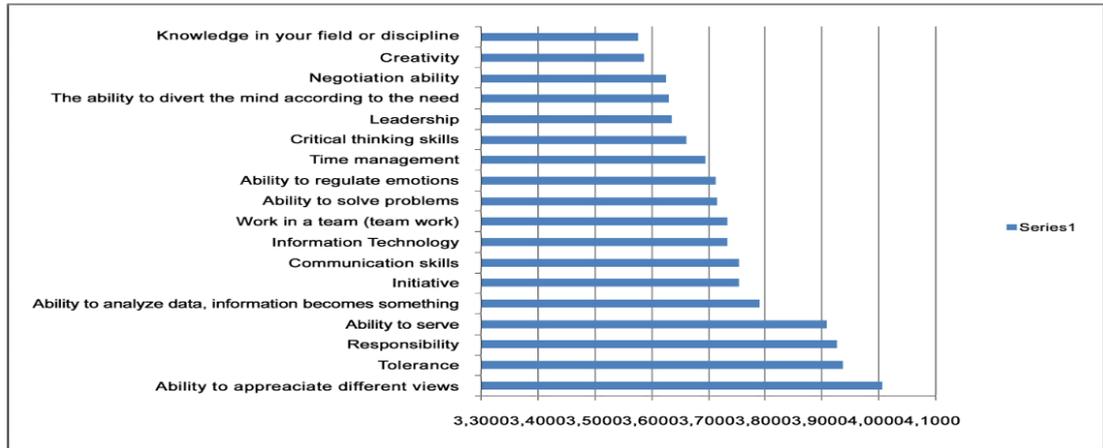


Figure 1. FE-UT graduate competency level

The competence level required by graduates based on user opinions is presented in Figure 2.

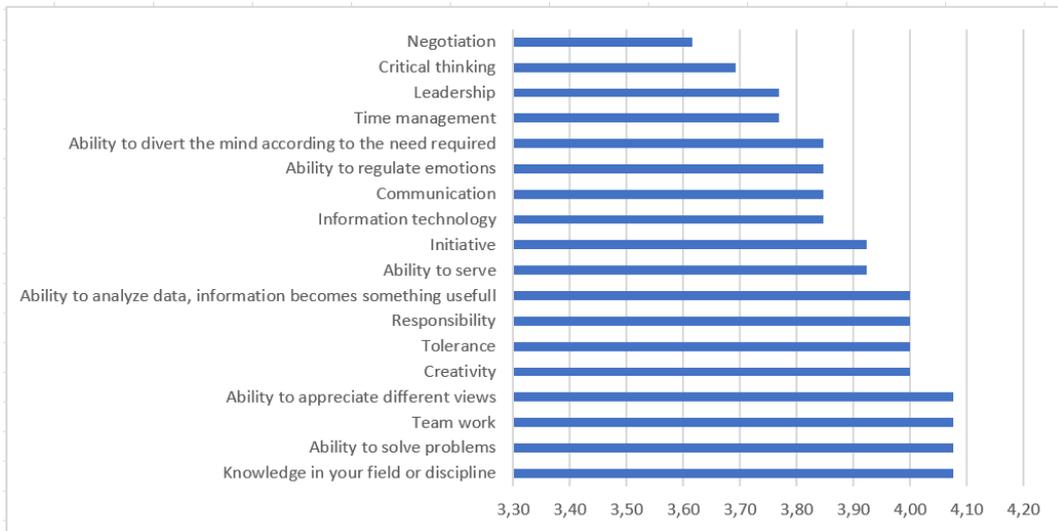


Figure 2. Competency level of graduates based on user needs

The competencies of the graduates in line with their type of work are presented in Biplot distribution analysis in Figure 3.

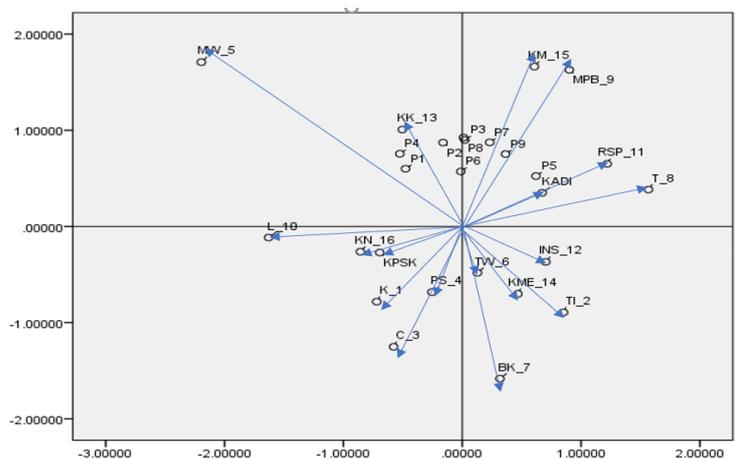


Figure 3. Biplot distribution of competency levels for graduates of FE-UT

P1 in Figure 3 shows the FE-UT graduates that not yet working in companies, P2 indicates those in state-owned enterprises, and P4 represents those in other establishments. Moreover, MW_5 shows the ability to analyze data and convert information into something useful while KK_13 is the critical thinking skills. P3 represents those in the education industry, P6 involves government employees who are not civil servants, P7 indicates those in private companies, P8 is civil servants, and P9 is self-employed. It is also important to note that MBP_9 represents the ability to work in teams and KM_15 is the ability to divert the mind according to the necessary needs. Furthermore, those working in non-profit institutions or NGOs were observed to have RSP_11 which is the ability to regulate emotions and Kadi_18 which is the knowledge in their respective field or discipline.

Biplot analysis was also used to map the competency level in line with the type of industry as shown in Figure 4.

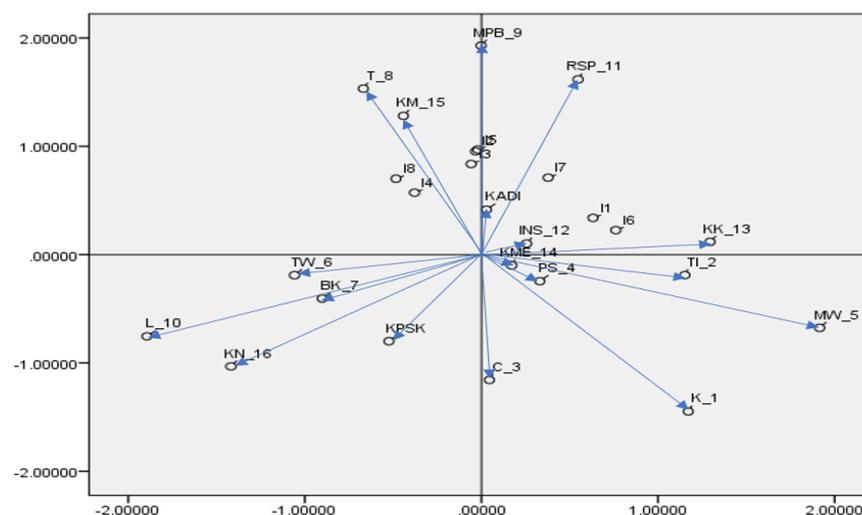


Figure 4. Employers biplot distribution of FE-UT graduates

It was discovered from Figure 4 that those working in I8 (property, real estate, and building construction) and I4 (chemistry including pharmaceutical industry) have competencies T_8 (information technology) and KM_15 (according to the required needs). Moreover, those in I2 (finance, financing institutions, insurance, securities companies, and investment), I3 (infrastructure, utilities, and construction (telecommunication, energy supply, transportation facilities, etc.)), I5 (trade, services, and investment (large or small trade)/retail, hotels, restaurants, computers and their devices, advertising and media printing), and I7 (agriculture, plantation, livestock, fisheries, forestry) have competence MPB_9 (working in a team (teamwork)), RSP_11 (ability to regulate emotions), and Kadi_18 (knowledge in the field or discipline), respectively. The findings also showed that the graduates in I1 (manufacturing of heavy or light machinery) and I6 (mining) have the competencies of INS_12 (time management), KK_13 (critical thinking ability), KME_14 (leadership).

These results are consistent with Handayani (2015) which showed that the improvements in the education and training system have the ability to assist Indonesia in equipping its workforce with the technical skills needed to meet the current and future labor market demands. It was also reported that this can be achieved through the enhancement of the accessibility and relevance of higher education institutions by collaborating with the business and industrial world, both nationally and internationally.

The relevance of the existing curriculum for universities to the competencies required in the labor market is necessary to boost the productivity of human resources. This is considered important because several university graduates cannot be absorbed into the business and industrial world due to the fact that they do not have appropriate competencies. Therefore, it is important to review the curriculum in order to improve the work-readiness of the graduates by including competency training in their learning activities. These standard competencies are considered important even when graduates do not want to work or become entrepreneurs.

The curriculum content needs to be harmonized with the need of the industry and this means education and industry should be combined to provide the graduates with the latest competencies. This is necessary in order to fulfill the role of each stakeholder in the system as expected by the government.

Pang et al. (2020) also showed similar findings that the competencies required in the labor market include ability and willingness to learn, teamwork and cooperation, hard work and willingness to do extra persevering work, as well as self-control and analytical thinking. These are considered the five most significant competencies needed to achieve success in the labor market. Moreover, hard and soft skills are rated equally important by employers and this was confirmed by Abas & Imam (2016) that teamwork skills are related to employee contextual performance. This implies the competencies and skills owned by graduates can be beneficial in arranging work procedures and implementation. Gawrycka et al. (2020) also reported that graduates entering the job market are expected to acquire different professional and generic competencies. However, several employers face difficulties in recruiting employees due to the lack of professional competence while some college graduates are also observed not to have generic competencies such as communication and interpersonal skills which are considered important in the recruitment and job search process.

Figure 4 shows the curriculum applied at FE-UT is relevant to the presence of graduates in industries and this simply shows the importance of the contents of this curriculum to the development and shaping of soft skills for graduates during the learning process. This was further supported by the findings of Marope et al. (2017) that university curriculum needs to be adaptive and futuristic in line with the need of the industry according to each era. This means it needs to be designed to be flexible and adaptive to equip graduates with the skills demanded in the business and industrial world. On a macro level, the compatibility between universities, businesses, and the industrial world can reduce the level of open and educated unemployment.

4. Conclusions

The suitability of the curriculum in meeting the competencies needed in the business and industrial world is required to be a benchmark for its design and development in the 4.0 era and the future. This is in line with the findings that flexible and adaptive curriculum applied in universities has the ability to increase the competence of graduates and reduce the level of educated unemployment. It was also supported by Marope et al., (2017) that future curricula should reflect competencies that can prepare students for an unknown future. This is necessary to ensure graduates have the competencies required before entering the labor market and become more competent and qualified to work in line with the technological advancement of the present era.

Some of the competencies discovered to be important in operating in the IR 4.0 era include technological, data, and human literacies. These abilities can be provided in the learning process through apprenticeships and project-based learning. This was supported by the findings of Lukita et al. (2020) that curriculum 4.0 which implements 4 (four) competencies of programming, data analysis, ability in artificial intelligence, and flexibility of soft skills and sustainability systems need to be assessed to guarantee the quality of higher education and produce excellent graduates.

These results are expected to enable researchers and education practitioners to acquire a better understanding of important competencies to prepare graduates for the labor market in the 4.0 era and beyond. It is also important to note that the perception of graduates concerning the required competencies is necessary in designing and developing a curriculum to prepare future graduates.

4.1 Recommendation

There is a need for more in-depth and detailed studies using more faculties and universities in Indonesia. It is also necessary to use more samples in future studies due to the fact that the small sample used in this present study makes it impossible to generalize the findings.

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