The Empirical Analysis of Industrial Work Challenges in the Industrial Revolution 5.0 Towards a Grade Point Average (GPA) for Electronic Engineering Education Students

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Abstract—This study aims to analyze the challenges of industrial work in the industrial revolution 5.0 towards the grade point average (GPA) for electronic engineering education students. This study was conducted in accordance with the development of the industrial world with the entry of the 5.0 industrial revolution and the demands of the world of education that must be met to improve the quality of graduates. The research objects are Electronics Engineering Students'. Sampling in this study uses the Slovin formula. A total of 75 students were involved in this study, with a sample of 43 people. To analyze the research data uses SPSS Version 20. The result shows that (1) industrial work motivation has a positive and significant on students' grade point average (GPA) of electronics engineering students' (2) work readiness in the industry has a positive and significant on students' grade point average (GPA) of electronics engineering students' (3) industrial work motivation and work readiness in the industry together have a significant on students' grade point average (GPA) of electronics engineering students'.

Keywords—industrial work motivation, work readiness in industry, students' grade point average, industrial revolution 5.0

1 Introduction

Currently, the concept of industry 5.0 is slowly being introduced in the world. Society 5.0 is the concept of society introduced by the Japanese goverment [1]. When the industrial revolution 4.0 focused on developing the internet, industry 5.0 saw more of the rise of society. The rapid development of technology has an impact on the education sector. The world of education in Indonesia needs to respond quickly to these changes in innovation, especially the industrial revolution 5.0 that is starting to emerge. The birth of the next industrial revolution, namely industry 5.0 requires humans as the center [2][3]. Humans and technology will work together as a perfect symbiosis while remaining human-centered [4]. The development of technology and

information has added value in learning. An innovative way to improve learning outcomes is assist computers [5] and people who can technology are people who have high education and qualifications [6].

The public needs to prepare themselves to welcome and carry out industrial revolution 5.0 education with away of thinking that puts forward an analytical, critical and creative future [7]. In this modern digital era, the role of technology has dominated all sectors of society [8] especially in education, helping students learn independently. Students can learn anything and whenever they want. With the availability of all the information needed due to technological developments, students will be more motivated, active and critical in learning so that student learning outcomes will increase. In this digital transformation from the 4.0 to 5.0 industrial revolution, universities must be able to be responsive in preparing the quality of education so that the quality of graduates (increasing GPA values) [9] can compete, especially addressing how to increase industrial work motivation and work readiness in industry for electronic engineering students.

The world of work or the world of industry is the ultimates goal of education taken by students so far [10]. Students will study hard to get the workers the want. The industrial world not only uses work skills and technology to produce a product, but also requires work industry motivation [11]. The motivation of industrial work is not only to pursue money, status or other benefits but also how to create a friendly work environment [12][13]. The motivation of industrial work can provide encouragement to work more vigorously, meaning the greater the motivation of work that is in a person, the greater the motivation in him to work.

Starting from the entry of the industrial revolution 5.0, students need to have work readiness in the industry [14]. Work readines is the initial key for students to be able to compete in the world of work or industry [15]. One of the factors supporting work readiness is work motivation. With adequate work readiness, it is expected to be able to complete the given workload without experiencing difficulties or obstacles. Work readiness in industry is based on the knowledge, skills and mental readiness obtained by graduates in accordance with their respective expertise competencies. Work readiness in industry is also influenced by information obtained from the world of work and work experience [16][17].

To get quality graduates, University continues to follow the developments of the industrial world in improving the quality of learning and services. Qualified graduates can be successful if they can complete their education within the allotted time or on time. Learning outcomes are abilities or maximum results that can be obtained by students after carrying out learning activities. To become a professional workforce in the industrial world, students must have good learning outcomes. The accumulation of learning outcomes is in the form of a Grade Point Average (GPA) and is adjusted to academic or company standards. GPA is one of the initial assessments of competence when entering the world of work. A high GPA indicates that students understand the theory and application of the department well. At least, the GPA shows the willingness or motivation to work, dedication and commitment to achieve the desired results. Leading companies are often found to list an above-average GPA as one of the key requirements [18]. However, that does not mean graduates lose the

opportunity to get the desired job. The key is how graduates provide context for the value of the GPA by increasing knowledge about industrial work motivation and work readiness in the industry.

The problems that occur in electronics engineering education study program students are 75 people, there are 35 students (47%) students have a GPA above 3.00 which is the standard in the world of work or industry and the rest are below 3.00 as many as 40 people (53%). The achievement of learning outcomes obtained has not been maximized while graduates are required to be able to achieve learning outcomes that are in accordance with the competencies of the world of work and industry. Based on the results of surveys and interviews with several students conducted in the electronic engineering education program, the competence of teachers (lecturers) as well as facilities and infrastructure have met the requirements to support student learning outcomes. In this regard, it is suspected that there are other factors that influence student GPA, namely industrial work motivation and work readiness in industry. Graduates who are motivated to work in the industry will strive to achieve or take actions that lead to that achievement, including increasing their cumulative grade point average. Graduates with a high cumulative GPA will have self-confidence that will lead them to be ready to enter the world of work. This factor becomes a reference for researchers to see how significant it is on learning outcomes.

2 Relevant Literature

2.1 Industrial Work Motivation

Motivation is a driving force or driving force that creates a spirit to work together, effectively and structured in achieving job satisfaction [19]. Motivation is a form of activity that produces, distributes, and maintains human behavior [20]. Humans are basically shy and lazy, to motivate them is to provide stimulation from the outside [21]. Industrial work motivation not only wants to do the given task but also has the desire to work and get maximum results [22]. Thus, a person's performance in completing the tasks assigned by the leader does not only depend on knowledge and skills but is also influenced by industrial work motivation. Industrial work motivation is also influenced by an attractive work environment [23] and good career prospects [24].

Based on the above opinion, industrial work motivation plays an important role in carrying out an action or behavior to achieve a goal or desire. To achieve maximum results at work, students need to study hard and diligently in order to acquire high skills when entering the world of work.

2.2 Work Readiness in Industry

Work readiness is the knowledge, skills, and attitudes that graduates must possess in order to work productively in the industry [25]. Work readiness is an indispensable ability to survive in the workplace [26]. Work readiness is also defined as the extent

to which graduates have attitudes that can make them work-ready and ready to succeed in the work environment [27]. To be able to survive in the world of work requires skills that have been trained from an early age. Work readiness in the industry, especially with the entry of the industrial revolution 5.0, students must have high technology skills, good team attitude and adequate knowledge [28]. Readiness to work in industry is indicated by a person's ability to complete work with predetermined conditions without any difficties and obstacles and achieve maximum results and in accordance with predetemined targets [29]. Work readiness in industry that has been fostered during college will increase professionalism in work [30].

Based on the opinion above, to be ready to work in the world of work, students need to prepare theoretical abilities, skills and also how to behave in the world of work. Employment skills can be acquired during education in practical learning and teamwork.

2.3 Students' Grade Point Average

In higher education, Grade Point Average (GPA) is one indicator of a student's success in pursuing education [31]. GPA is the result of student achievement or learning obtained per semester or at the end of the semester [32]. GPA is one of the requirements to graduate from college with a limit value that must be achieved. One of the basic requirements in applying for a job is to look at the student's GPA. Engineering students need to have a good GPA in order to compete in the world of work with all its advantages and challenges [33].

2.4 Framework

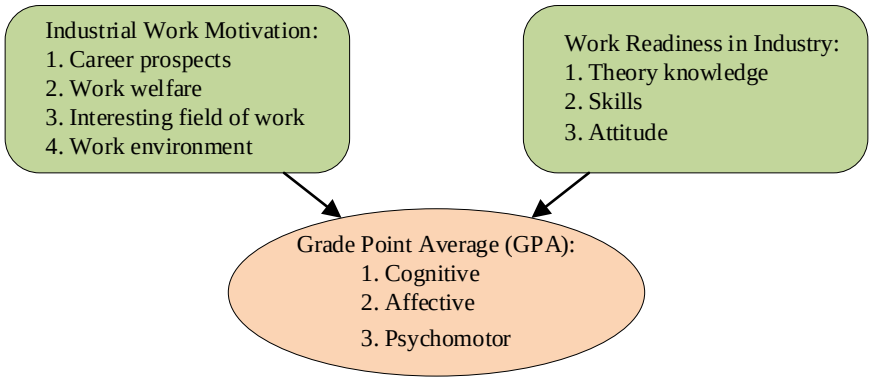

Fig. 1. Research Thinking Framework

2.5 Hypotesis

The initial hypothesis in this study is determined as follows: (1) There is an influence of industrial work motivation on the GPA of electronic engineering

students. (2) There is an effect of job readiness in the industry on the GPA of electronic engineering students. (3) There is an influence of industrial work motivation and industrial work readiness on the GPA of electronic engineering students.

3 Method

3.1 Research design

Research classification according to the method can be grouped into research: historical, descriptive, correlational, causal comparative, experimental and quasi-experimental. Based on these problems, this research is included in correlational research, because it aims to explain the influence of industrial work motivation and work readiness in industry on the GPA of electronic engineering students. The aim of correlational research is to identify the influence of predictions using correlation techniques or more sophisticated mathematical (statistical) based methods [34].

3.2 Variable operation

The operational definition is a way for researchers to describe the variables to be studied and their measurement parameters.

Table 1. Variable Operation Definitions

Varible	Definition	Dimentions	Indicators	Measuring Scale
Industrial Work Motivation (X_1)	Driving force capable of creating morale by generating, directing, and working behavior and expending the level of effort to make the greatest contribution to the success of the organization in achieving its goals.	Career prospects	Desire work in Industry	Likert
			Develop yourself in the world of work	
			Career status	
		Work welfare	Improve the standard of living	
			Promising income	
		Interesting field of work	Working in the industry is more interesting	
			Work in accordance with the knowledge gained	
			Develop your knowledge	
		Work environment	Expanding relationships	
			Nice work environment	
Work Readiness in Industry (X_2)	Something that was owned before entering the world of work and industry	Theoretical knowledge	Basic knowledge of electronics theory	Likert
			Knowledge of electronic circuits	
			Knowledge of electronic measuring instruments	
		Skills	Basic practice of electronics	
			Proficient with measuring tools	
		Attitude	Work discipline	

			Good working relationship with co-workers	
			Electronic device maintenance	
Students' Grade Point Average (GPA) (Y)	The final result of learning that determines the success of students towards the learning objectives that have been set	Cognitive Affective Psychomotor	Take all lessons individually, in groups and actively	Likert

3.3 Population and samples

The population is an area consisting of: objects that have the qualities and characteristics determined by the researcher to be studied and then draw conclusions [35]. The population in this study were electronic engineering students as many as 75 people.

The sample is part of the number and characteristics possessed by the population [35]. In this study, the sampling technique was carried out using a simple random method using the Slovin formula with a significance level of 10%.

$$n = \frac{N}{1 + Ne^2}$$

Based on the formula above, 43 samples will be investigated.

3.4 Data analysis

The research data were analyzed using a statistical program on a computer, namely SPSS version 20. In the analytical instrument, the validity and reliability of the instrument was developed from several indicators into questions. Furthermore, the analysis requirements test is carried out in the form of normality, linearity and multicollinearity tests so as not to deviate from the truth that should be.

Finally, testing the three hypotheses consisting of:

H1. There is a significant influence between industrial work motivation on the GPA of electronic engineering students

H2. There is a significant influence between job readiness in the industry on the GPA of electronic engineering students

H3. There is a significant influence between industrial work motivation and work readiness in the industry together on the GPA of electronic engineering students

4 Result and Discussion

Before analyzing the data, the normality, linearity and multicollinearity tests were first carried out. The results of the normality test on the residuals using the Shapiro Wilk and Lillifors test method with a significant level = 5%, sig value = 0.289 > 5%

(normally distributed data). The linearity test obtained the Deviation from Linearity Sig value of industrial work motivation = 0.189 > 5% and Sig of work readiness in industry = 0.114 > 5%, it can be concluded that there is a significant linear relationship between industrial work motivation and work readiness in industry with the GPA of engineering students electronics. Then from the results of the multicollinearity test, the value of VIF = 1.428 < 10, it can be said that there are no symptoms of multicollinearity so that there are no problems between variables.

Table 2. R Correlation Value

	Influence Beteween Variables	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	Industrial work motivation → GPA	.654	.428	.414	.15670
2	Work readiness in industry → GPA	.677	.458	.445	.15249
3	Industry work motivation and work readiness in industry together → GPA	.757	.573	.552	.13706

Table 3. F value

Variables		F	Sig.
GPA	Industrial work motivation	30.671	.000a
	Work readiness in industry	34.683	.000a
	Industry work motivation and work readiness in industry together	26.840	.000a

Based on the table above, the following is an explanation of the results of testing the research hypothesis:

4.1 The Influence Between Industrial Work Motivation on the GPA of Electronic Engineering Students

Industrial work motivation affects the GPA of electronic engineering students. It can be seen from Table 2, that the value of the correlation coefficient R = 0.654 and the coefficient of determination R2 = 0.428, which means that industrial work motivation affects the GPA of electronic engineering students by 42.8% and the rest is influenced by other factors. variable. From Table 3, the value of F = 30,671 with a significance of 0.000, means that industrial work motivation has a significant influence. The existence of high industrial work motivation will have a good impact on student learning outcomes [36]. Thus, the hypothesis H1 in this study is declared accepted. In conclusion, industrial work motivation has a positive and significant effect on the GPA of electronic engineering students.

Furthermore, this motivation is a person's encouragement to do something, this condition is influenced by several factors. In the world of work and student internships, this motivation arises due to the demands of learning. Besides that, the working conditions are conducive and comfortable, some companies also provide compensation and lunch. Some really good quality companies often provide insurance facilities and the like. These conditions foster student motivation. Indirectly, this condition has

an impact on student learning outcomes. However, sometimes this motivation is also not always stable, sometimes there are also obstacles, such as lack of discipline and a less conducive work environment. The distance from the work location which is quite far also places more demands on students to be more committed and more disciplined. Most large companies, have implemented very strict standard operating procedures so that lack of discipline in work has an impact on reprimands and penalties, both small and severe. This motivation must be treated properly not only from the side of students but from all stakeholders, be it lecturers, workers, and the work environment.

4.2 The Influence Between Job Readiness In The Industry on the GPA of Electronic Engineering Students

Work readiness in industry affects the GPA of electronic engineering students. It can be seen from Table 2 that the value of the correlation coefficient R = 0.677 and the coefficient of determination R2 = 0.458, which means that work readiness in the industry affects the GPA of electronic engineering students by 45.8% and the rest is influenced by other variables. From Table 3, it is obtained that the value of F = 34,683 with a significant 0.000, meaning that work readiness in the industry has a significant influence. Work readiness in industry will increase if students and universities provide up-to-date information [37] that is developing in the world to provide practical and theoretical knowledge and learning [36]. Thus the hypothesis H2 in this study is declared accepted. In conclusion, job readiness in industry has a positive and significant effect on the GPA of electronic engineering students.

Readiness according to the meaning of educational psychology is the level of development of maturity or favorable maturity to practice something. Another meaning is the overall condition that makes it ready to respond and respond in a certain way to a tendency to respond. Conditions include at least three aspects, namely: (a) physical, mental and emotional conditions, (b) needs, motives, and goals, (c) skills, knowledge, and other understandings that have been learned. Then, work is defined as any set of activities that occur at relatively routine times, and have certain goals and results. Job readiness for students is the extent to which students are considered to have the skills and attributes that make them ready and successful in internships and are increasingly recognized for their potential in supporting career performance and abilities. So that students must have mature work readiness, such as theoretical knowledge and good skills. There is a classification of several groups of skills that must be possessed by students, namely: (a) organizational effectiveness/leadership; (b) teamwork/negotiation/interpersonal; (c) self-development/motivation to determine goals/personality and career development; (d) creative thinking/problem solving; (e) able to communicate: listening and verbally; (f) able to read, write, and calculate; (g) motivation/desire to always learn. There are several characteristics of someone who has vocational work readiness which includes: (a) knowing, and understanding what will be done in his job according to the position he holds; (b) knowledgeable about job requirements by dimension; factual knowledge; conceptual knowledge; procedural knowledge; and interrelated knowledge; (c) know how to behave as competent personnel; (d) have a positive perspective, interest, and motivation towards any rules

that apply in the work environment; (e) be positive and accept risks as a result of work and the environment; (f) understand and be able to solve work-related problems. So that if the student's work readiness is mature, it will have a positive impact on their learning outcomes.

4.3 The Influence Between Industrial Work Motivation And Work Readiness In The Industry Together on the GPA of electronic engineering students

Industrial work motivation and work readiness in industry affect the GPA of electronic engineering students. It can be seen from Table 2 that the value of the correlation coefficient R = 0.757 and the coefficient of determination R2 = 0.573 which means that industrial work motivation has an influence on the GPA of electronic engineering students by 57.3% and the rest is influenced by other variables. From Table 3, the value of F = 26,840 with a significance of 0.000, means that industrial work motivation and work readiness in the industry together have a significant influence. Students who are successful in their studies are students who have high work motivation and have work readiness. Industrial work motivation can be increased by always doing assignments on time and having the will to work hard. Work readiness in industry is influenced by motivation, ability (vocational competence), experience, work environment and family environment [38]. Thus the hypothesis H3 in this study is declared accepted. In conclusion, industrial work motivation and industrial work readiness together have a positive and significant effect on the GPA of electronic engineering students.

5 Conclusion

The application of technology in teaching will be able to motivate students to get a more collaborative and conducive learning experience [39]. With the rapid development of technology, universities must quickly adapt to these changes so that all the needs of the world of work can be met. The existence of information about the development of the industrial world will make students see more in learning. The results of this study indicate a positive influence of motivation and work readiness together on student learning outcomes. Student motivation, driven by the desire to get good learning outcomes and to gain field experience in the world of work provides good motivation, besides that the work environment and additional facilities from the company's internship place also have a major influence on student motivation, this condition is in line with the readiness of the campus to provide provision of theory and practice so that students can be ready and capable in the world of work [40]. Besides hard skills, higher education [41-45], in this case, engineering education, also provides soft skills, such as communication skills, working in teams, and problem-solving. However, sometimes not all higher education think about soft skills for their students. So it is very important that engineering education pays attention to the curriculum and learning that prepares graduates who have the competence and soft skills [46-47].

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