Readiness for the Industrial Revolution 4.0 Based on Optimizing the Use of Facilities Educational Infrastructure at Riau University

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Abstract Educational institution must have readiness in facing the industrial revolution 4.0, especially in terms of facilities and infrastructure. For this reason, this study aims to describe and analyze the level of readiness of students in facing the 4.0 industrial revolution and optimizing the use of infrastructure, as well as describing and analyzing the relationship and the effect of optimizing the use of infrastructure with readiness to face the industrial revolution 4.0 by students at Riau University. The research sample was 534 people taken by stratified random sampling. The instrument test was conducted on 20 students, lecturers and employees. Data were collected using a questionnaire with five choices and data were analyzed using descriptive statistics to find the optimal level of use of infrastructure and readiness to face the Industrial Revolution 4.0 and inferential statistics to find relationships and the magnitude of influence between variables. The results of this study found that there was a significant influence between the variable optimization of the use of educational infrastructure to the readiness to face the industrial revolution 4.0 at the University of Riau by 48.00%. This finding means that optimizing the use of educational infrastructure for readiness to face the industrial revolution 4.0 together to achieve the desired goals by developing critical thinking skills and creativity, improving communication skills, strengthening the ability to collaborate, and increasing and strengthening self-confidence.

Keywords: *industrial revolution, education, infrastructure, optimization.*

1. Introduction

The industrial revolution, before leading to the fourth generation which the whole world is currently working on, is starting in the 17th century. The first industrial revolution took place in the period 1750-1850, which was marked by the invention of cotton making machines into yarn, invented by James Hargreaves. Over time, a steam engine was born which marked the progress of civilization. The modes of transportation are motorized, agricultural equipment, telegrams, and flying coils, step by step coloring life at that time (Qin & Grosvenor, 2016).

The world seems to reject stagnation. From time to time, technology moves forward. Through the hands of scientists, the latest works are created in a sustainable manner, so that big industries emerge. Now, the era of the industrial revolution 4.0 is in sight. According to Schwab (2016) who first introduced the concept, in the 4.0 industrial era life and the way people work will change.

The development of quality human resources to deal with the industrial revolution 4.0, as explained Hermann & Otto (2016) and Yahya (2018) is an urgency, will experience demographic bonuses. Indonesia will experience an increase in the productive age population (aged 15-64 years) compared to the unproductive population in the next 2030-2040. If not prepared from now on, the soaring productive population will be a burden on the state in the development of increasingly sophisticated

technology. The hope, in addition to the quantity in the population of productive age, the increase must also be accompanied by comparable productivity (Zhou & Lifeng, 2015).

The study of the industrial revolution 4.0 always does not always focus on technological development, but there are also social, cultural and development aspects that are very important to study with human resource development, and how each institution can take advantage of opportunities with the fourth generation industrial revolution. The Industrial Revolution Era 4.0 is being felt by all Indonesian people, even throughout the world (Yahya, 2015).

Hartanto (2019) explained, that when the country entered Industry 4.0, comprehensive and sustainable industrial growth tended to occur, and four strategic steps to implement, namely: (1) encouraging the force to continue learning and improve skills to understand the use of internet technology of things or integrating internet capabilities with production lines in the industry. (2) the use of digital technology to spur productivity and competitiveness for small and medium industries. (3) national industries can use digital technology such as Big Data, Autonomous Robots, Cybersecurity, Cloud, and Augmented Reality. (4) technological innovation through the development of startups by facilitating business incubation sites.

The development of education in the world is inseparable from the development of the industrial revolution that occurred in this world, because indirectly changes in the order of the economy also changed the order of education in a country. The industrial revolution began with the Industrial Revolution 1.0 occurring in the 18th century through the invention of the steam engine, thus enabling goods to be mass produced, 2) the Industrial Revolution 2.0 occurred in the 19-20th century through the use of electricity which made production costs cheap, 3) the Revolution Industry 3.0 occurred in the 1970s through the use of computerization, and 4) Industrial Revolution 4.0 itself occurred in around the 2010s through intelligence engineering and the internet of things as the backbone of the movement and connectivity of humans and machines (Prasetyo & Trisyanti, 2018).

The industrial revolution 4.0 is a formidable challenge for education including tertiary institutions. If we don't change the way we educate and teach, the next 30 years we will experience great difficulties. Education and learning that is conditional on the content of knowledge overriding the content of attitudes and skills as currently being implemented, will produce students who are unable to compete with machines (Prasetyo & Trisyanti, 2018). The dominance of knowledge in education and learning must be changed so that later colleges will educate students to be able to surpass machine intelligence while being able to be wise in using machines for human benefit (Suarman et al, 2018).

At tertiary institutions, education requires a reform movement to respond to the industrial era 4.0. One of the movements launched by the government is the new literacy movement as an amplifier even shifting the old literacy movement. The new literacy movement which is intended to focus on three digital literacy literacy, technological literacy, and human literacy (Aoun, 2017). These three skills are predicted to be skills that are urgently needed in the future or in the industrial era 4.0. Digital literacy is directed at the aim of increasing the ability to read, analyze, and use information in the digital world (Big Data), technology literacy aims to provide an understanding of the workings of machines and technology applications, and human literacy is directed at improving communication skills and mastery of design science (Aoun , 2017). The new literacy provided is expected to create competitive graduates by perfecting the old literacy movement which only focuses on improving reading, writing and mathematics skills. Adaptation of the new literacy movement can be integrated by making adjustments to the curriculum and learning system in response to the industrial era 4.0 (Yahya, 2018).

Zhou et al (2015), in general, the readiness to face the Industrial Revolution 4.0 is related to five major challenges that will be faced, namely the aspects of knowledge, technology, economics,

social, and politics. In order to answer these challenges, strong or high, planned and strategic preparedness is needed from the regulator (government), academics and practitioners. 4.0 era education is a phenomenon that arises in response to the needs of the industrial revolution 4.0, where humans and machines are aligned to obtain solutions, solve various problems encountered, and find various possible innovations that can be utilized for the improvement of modern human life. In this regard, an educational institution must have supporting facilities and infrastructure. Building new facilities certainly requires cost and time, but optimizing the use of existing educational facilities and infrastructure is the solution that should be (Effendy, 2018). Educational infrastructure will not mean anything if it is not used optimally in preparing students for the industrial revolution 4.0. Syaodih (2009) explained that educational facilities are all that is needed in the process of education and teaching both mobile and non-mobile in order to achieve educational goals, run smoothly, regularly, effectively and efficiently.

Optimizing the use of educational facilities and infrastructure in order to have the ability to deal with the Industrial Revolution 4.0, said Sidik (2001) and Megasari (2014) must be able to bring the aspirations of educational institutions, such as bringing higher education into an educational institution of interest, because graduates are able to face competitiveness of resources human being broadly, because of the readiness of the teaching staff and their study programs, which in turn brings faculty readiness that illustrates the readiness of a University. This readiness is also illustrated by the increase in productivity of graduates as labor to multiply compared to an increase in labor costs. Optimization explained Bahri (2010) is a process in realizing ideal results.

Considering the importance of infrastructure in educational activities especially in Perguan Tinggi, proper management is needed with optimizing its use. Usman (2016), and Hoy (2014) say that good infrastructure will help the success of achieving the quality of education. The more complete and optimally utilized, the infrastructure of an educational institution, will certainly make it easier for students (students) to achieve their goals together (Wahyuningrum, 2000).

2. Methodology

This research is intended to describe and analyze the optimal level of use of educational infrastructure and readiness to face the industrial revolution 4. students at the University of Riau. In addition, the factors that influence it will be analyzed, both faculty leaders, staff, study programs and lecturers, as well as respondent demographic factors such as faculty, study programs, and gender. The main objective of this research is to describe and analyze the level of readiness to face the industrial revolution 4.0, the level of optimization of the use of educational infrastructure at the University of Riau. In addition, describing and analyzing the relationship and between optimizing the use of infrastructure and readiness to face the industrial revolution at the University of Riau.

This research was conducted in all study programs and faculties at the University of Riau, with a total sample of 534 people consisting of students and their organizational representatives, lecturers and study program representatives, faculty leaders and administrative leaders or employees. Samples were taken by stratified random sampling technique. Data was collected using a questionnaire with five choices. Research data were analyzed using descriptive statistics and inferential statistics.

Readiness to deal with the Industrial Revolution 4.0 is meant is the opinion of students, lecturers, employees, and leaders towards their awareness and readiness to face the industrial revolution 4.0. The indicators used are based on Effendy's opinion (2018), namely: (1) critical thinking; (2) creative and innovative; (3); communication skills (4) working together and collaborating; and (5) have confidence. Optimizing the use of educational infrastructure that is intended is the opinion of students, lecturers,

employees, and leaders regarding the use of existing educational infrastructure as well. The indicators used are based on the opinion of Mulyasa (2012) and Law No. 20 concerning the National Education System article 35 and the Minister of National Education Regulation No. 24 of 2007 concerning the standards of educational infrastructure, namely: (1) Study space; (2) Office space; (3) Library Room; (4) Other supporting rooms; and (5) Field or yard, and the like.

3. Result and Discussion

3.1. Descriptive Statistical Analysis.

The results of descriptive data analysis of the variable readiness to face the Industrial Revolution 4.0 are as in the following table:

Table 1: Mean Values and Standard Deviations in the Variable Readiness for Facing the Revolution Industry 4.0 (Y) Based on Each Indicator

No	Indicator	Mean	SD	Interpretation
1	Think critically	4.17	0.97	Very high
2	Creativity	4.15	0.96	Very high
3	Communication skills	4.18	0.96	Very high
4	Collaboration	4.12	0.96	Very high
5	Confidence	4.14	0.94	Very high
Average		4.15	0.96	Very high

Based on the above table it can be explained that the mean value (average value of indicators) for the variable readiness to face the 4.0 Y industrial revolution is 4.15 and SD is 0.96. This shows that the readiness to face the industrial revolution 4.0 at the University of Riau based on each indicator is very high. However, it still needs an increase in the lowest indicator, namely collaboration, which is a mean of 4.12 and SD, which is 0.96.

The results of descriptive data analysis of the Optimization of Educational Target Facilities are as shown in the following table:

Table 2: Mean Values and Standard Deviation of the Usage Optimization Variables Educational Target Facilities (X) Based on Each Indicator

No	Indicator	Mean	SD	Interpretation
1	Study room	4.33	0.68	Very high
2	Office room	4.28	0.72	Very high
3	Library room	4.30	0.75	Very high
4	Other supporting rooms	4.29	0.72	Very high
5	Field or yard, and the like	4.50	0.62	Very high
Average		4.34	0.70	Very high

Listening to the table above, it can be explained that the mean value (the average value of the indicator) for the optimization of the use of educational infrastructure X is 4.34 and SD is 0.70. This shows that the optimization of the use of educational facilities at the University of Riau based on each indicator is very high. However, there still needs to be an increase in the lowest indicator, namely office space which is a mean 4.28 and SD which is 0.72.

3.2. Inferential Statistical Analysis.

Table 3: Pearson Correlation Test between Optimizing the Use of Infrastructure Facilities,Education with Readiness to Face the Industrial Revolution 4.0.

Variabel	n	Pearson Correlation	Sig (2-tailed)
X-Y	534	0,148**	0,000

**. Correlation is significant at the 0,01 level (2-tailed)

Based on Table 4.3 about the Pearson correlation test between optimizing the use of educational infrastructure against readiness to face the industrial revolution 4.0, the Pearson correlation obtained by 0.148 shows that there is a significant relationship between optimizing the use of educational infrastructure against the readiness to face the industrial revolution 4.0. The correlation between the optimization of the use of educational infrastructure to the readiness to face the industrial revolution 4.0 is a strong enough interpretation, this is indicated by the correlation value is very far from the number 1.0. With P value / Sig equal to 0.000 <0.05. it can be concluded that there is a significant relationship between the two variables.

Based on the t-test optimizing the use of educational infrastructure to the readiness to face the industrial revolution 4.0, that the value of a = 4,590 and b = 0,101 is obtained so that the regression equation becomes Y = 4,590 + 0,101 so that the regression equation can be interpreted that the relationship between the two variables is significant and linear. This means that every 1 unit increase in the variable optimization of the use of educational infrastructure will be followed by an increase in readiness to face the industrial revolution 4.0 of 4,590 units.

Table 4: T-test Variable Coefficient Optimization of the Use of Educational Infrastructure Facilities with Readiness to Face the Industrial Revolution 4.0.

Model	B	t_{hitung}	t_{tabel}
(Konstan)	4.590	11,523	1,5362
Optimizing the Use of Infrastructure Facilities (X)	0,101	1,101	

a. *Dependent Variabel: readiness to face the industrial revolution 4.0* (Y)

From the coefficient table, the value of t test (thitung) is 11.523 while the value of t table is 1.5362 or it can be said that the value of tcount> ttable, this means that Ho is rejected and Ha is accepted so that there is an optimization of the use of educational infrastructure against readiness to face the industrial revolution 4.0 at Riau University. That is, the hypothesis that there is an effect of optimizing the use of educational infrastructure to the readiness to face the industrial revolution 4.0 at the University of Riau was accepted.

Based on testing the hypothesis that was accepted, it is also necessary to know how much influence the optimization of the use of educational infrastructure on readiness to face the industrial revolution 4.0, as in the following table:

Table 5: Contribution of the Optimization of Variables in the Use of Educational Infrastructure to Readiness in the Face of the Industrial Revolution 4.0.

R	R Square	Sig, F Change	Pengaruh (%)	Interpretation
0,148[a]	0,480	0,000	48,00	intermediate

a. *Predictors: (Constant): Optimizing the Use of Infrastructure Facilities X*
b, *Dependent Variable: Readiness for the Industrial Revolution 4.0 Y*

Based on the rabel above, it can be explained about the effect of optimizing the use of educational infrastructure to the readiness to face the industrial revolution 4.0. Pearson Product Moment correlation can be seen between the optimization variables of the use of educational infrastructure to the readiness to face the industrial revolution 4.0 at the University of Riau is 0.148.

Based on these correlation values, it is obtained R Square (r2) = 0.480 or 48.00%, meaning that the influence of optimizing the use of educational infrastructure on readiness to face the industrial revolution 4.0 at the University of Riau is 48.00%, while the remaining 52.00% is determined by other factors that were not part of this study. It can be concluded, that the effect of optimizing the use of educational infrastructure on the readiness to face the industrial revolution 4.0 is with a moderate level of influence.

As the results of this study there is a significant relationship between the variables optimizing the use of educational infrastructure to the readiness to face the industrial revolution 4.0 at the University of Riau with a value of influence of 48.00%, while the remaining 52.00% is determined by other factors not part of this study. The findings of this study are strengthened by the results of research conducted by Hassim (2016), that the fourth generation industrial revolution is marked by the emergence of supercomputers, smart robots, vehicles without a driver, genetic editing and the development of neurotechnology that allows humans to better optimize brain function. This was conveyed by Klaus Schwab, Founder and Executive Chairman of the World Economic Forum in his book The Fourth Industrial Revolution. The toughest challenge is precisely the market leaders who usually feel superior and feel disruptive attacks are only directed at minor competitors whose performance is not good. Therefore, incumbent companies need to continue to move quickly and aggressively to follow the direction of the changing business environment in welcoming the era of the fourth generation industrial revolution (Industry 4.0).

The results of Prasetiantono's research (2018) concluded that Industry 4.0 is the latest technological trend in such a sophisticated way, which has a big influence on the production process in the manufacturing sector. These advanced technologies include artificial intelligence (AI), e-commerce, big data, fintech, shared economies, and the use of robots. The combination of projections of economic growth that does not increase rapidly and the declining role of manufacturing has left questions about the greatness of industry 4.0. Not to mention that industry 4.0 still has a dark side, namely its negative impact on job creation. Industry 4.0 is not just jargon ready not ready. In fact, until now ... Indonesia still needs to transform IT infrastructure, uphold data sovereignty and finally the personal data protection law.

Whereas the study conducted by Abdillah (2018) concluded that the influence of advances in information technology has entered various aspects of life, including in the field of Education. Educators and students are required to have teaching and learning abilities that are appropriate for this 21st century. The progress of education is the main trigger for the progress of human civilization today. Science and technology have encouraged humans to continue to innovate. The progress was marked by the development of the industrial revolution which began from the first industrial revolution until the time it reached the level of the industrial revolution 4.0. The principles of learning that are appropriate and must be fulfilled in the 21st century education process are contained in the 21st century national education paradigm book published by the National Education Standards Board (BNSP) which outlines there are 16 learning principles.

Facing the industrial revolution 4.0 must be prepared, as Zubaidah (2016) study said that life in the 21st century requires various skills that must be mastered by someone, so that education is expected to prepare students to master these skills to become successful individuals in life. Important skills in the 21st century are still relevant to the four pillars of life that include learning to know, learning to do,

learning to be and learning to live together. 21st century skills must be explicitly taught. In short, 21st century learning has the main principle that learning must be student-centered, collaborative, contextual, and integrated with society. The role of teachers in implementing 21st century learning is very important in realizing a better future for the nation's children.

Educational facilities and infrastructure are very important in the face of the industrial revolution 4.0 in Higher Education (Kagermann & Helbig, 2013). Infrastructure means national education standards that relate to the minimum criteria regarding learning spaces, places to exercise, places of worship, libraries, laboratories, workshops, playgrounds, places to be creative and recreation, as well as other learning resources, which are needed to support the learning process, including the use information and communication technology.

Optimization is the results achieved in accordance with the wishes, so optimization is the achievement of the results according to expectations effectively and efficiently. Optimal which means best, highest. Much optimization is also defined as a measure by which all needs can be met from the activities carried out. Each education unit must have facilities which include furniture, educational equipment, educational media, books and other learning resources, consumables, and other equipment needed to support an orderly and continuous learning process. In addition, each education unit is required to have infrastructure that includes land, classrooms, educational unit leadership space, teaching space, administrative space, library room, laboratory room, workshop space, production unit room, canteen room, power installation and services, a place to exercise, a place of worship, a place to play, a place to be creative, and other spaces / places needed to support an organized and continuous learning process.

In connection with this discussion, an institution or institution must be sensitive and do self-introspection, so that it can detect its position in the midst of the development of science and technology. McKinsey (2016) has formulated four stages of the company's position in the midst of a disruptive era of technology, namely: first, the signal amidst the noise. second, the change in the business environment seems clearer (change takes hold). third, the inevitable transformation (the inevitable transformation), and fourth, adaptation to the new balance (adapting to the new normal).

An educational institution must prepare themselves, or have readiness in facing the 4.0 industrial revolution. This readiness must be done by improving the quality of human resources through a process that must be faced with the industrial revolution. Leadership, infrastructure facilities, administrative staff and teaching staff must debate themselves with the industrial revolution 4.0, so that in welcoming various forms of change they can be welcomed by the emergence of new ideas.

Readiness to face the industrial revolution 4.0 not only has tremendous potential in overhauling industrial aspects, it is also capable of changing various aspects of human life. Educational institutions, including universities, must have talents from a number of existing universities, so that a pool of talent is available, with the initial step being to improve human resource competence through a link and match program between education and industry.

4. Conclusion

Significant influence was obtained between optimizing the use of educational infrastructure (X) to the readiness to face the industrial revolution 4.0 (Y) at the University of Riau with an influence of 48.00% with moderate interpretation, while the remaining 52.00% was determined by other factors not part of from this study. this influence is illustrated by each increase in one unit on the variable will be followed by an increase in the optimization of the use of educational facilities for readiness to face the

industrial revolution 4.0 of 4,590 one unit. This means that optimizing the use of educational infrastructure for readiness to face the industrial revolution 4.0 together to achieve the desired goals by developing critical thinking skills, developing creativity, improving communication skills, strengthening the ability to collaborate, and increasing and strengthening trust self.

Efforts to improve the optimization of the use of educational facilities for readiness to face the industrial revolution 4.0 at the University of Riau as follows, that based on the effect of optimizing the use of educational facilities for the preparation of facing the industrial revolution 4.0 at the University of Riau, lecturers through university policy can increase activities that are improve students' views on optimizing the use of educational facilities for readiness to face the 4.0 Y industrial revolution at the University of Riau by: 1) critical thinking, (2) creativity, (3) communication skills, (4) collaboration, and (5) self-confidence.

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