Entrepreneurship Education Influencing Technopreneurship for Student Innovation in the Industrial Revolution Era 4.0

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Abstract. Being in the era of globalization 4.0, all aspects of life have shifted to adapt to these developments. Including the world of education at the university, which is the spearhead of change. Entrepreneurship education, which is a university course that used to be taught conventionally, is now starting to include technology in entrepreneurship which is packaged with technopreneurship. This study aims to analyze entrepreneurship education influencing the ability of technopreneurship on student innovation in the industrial revolution 4.0 era. The subjects of this research are UNISSULA students. Sampling refers to Yount's table obtained by 252 UNISSULA students. The sample is grouped into two. Group I has received 162 students of entrepreneurship and technopreneurship learning materials. Group II has not received entrepreneurship and technopreneurship learning materials, totaling 90 students. Data collection was obtained through a questionnaire. Data analysis using Structural Equation Model (SEM). Based on the research, entrepreneurship education has a role in influencing students' technopreneurship abilities on student innovation in the era of the industrial revolution 4.0.

Key words: entrepreneurship education; technopreneurship; student innovation; industrial revolution era 4.0.

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INTRODUCTION

Entering the era of the industrial revolution 4.0 which has the main characteristics of using cyber-based technology in every aspect of life, including learning activities on campus and the work sector. If the process of transitioning the new job sector with industrial technology 4.0 takes place quickly, it will reduce the unemployment rate, and vice versa. According to data from the Indonesian Central Statistics Agency (BPS), the open unemployment rate as of February 2021 was 6.26 percent or 8.75 million, of which undergraduate graduates have not worked after graduation (Adhitya et al., 2021).

Job competition is getting tougher, in addition to having to master the technology of the 4.0 era as well as the impact of globalization, namely the entry of foreign workers into the Indonesian market (Rothlauf, 2014). Facing this, it is necessary to improve the quality of Indonesia's human resources. Universities as the spearhead of change have a role to participate in providing solutions to the impacts of globalization. Through entrepreneurship education that leads to technopreneurship, students are expected to be skilled in mastering technology that supports an entrepreneur.

Not only technological aspects but student innovation must also be honed during lectures. Students are the main actors in facing the development of industrial technology 4.0. Therefore, it is also necessary to align student skills which cannot be done by machines (Marchant et al., 2014). Innovation is included in the top 10 skills that are needed in entrepreneurship to continue to survive in various aspects of life (Lowe & Marriott, 2012).

To overcome unemployment through entrepreneurship education, students are directed to create an entrepreneur. Various skills that are provided to students during lectures should students be able to create their jobs or create jobs through entrepreneurship. After students create entrepreneurship, through entrepreneurship education, they are also directed to apply technology according to the development of industry 4.0 starting from production, distribution, to marketing. The use of shop applications Instagram, Facebook, Whatsapp is a small example of the application of technopreneurship. This is very important because the era of globalization demands a

change in the economy from resource-based to knowledge-based (Zhao, 2012).

There is a change in the economy to become knowledge-based, in entrepreneurship is also very necessary. After students are motivated to become entrepreneurs then develop their technology-based entrepreneurship, students can be directed to innovate in creating products that have added value based on their knowledge or research. So that it becomes a superior product that is beneficial to society and the country. Entrepreneurs who are supported by technology and innovation can create a leap to be able to compete at the international level (Secundo et al., 2015).

The application of technopreneurship in Kaliningrad, Russia shows technopreneurship in growing regional networks to global networks (Polyakov, 2021). An innovative business model called "AI" is a platform that was created to store consumer identities repeatedly so that the identities of customers will be known which makes marketing easier (Mishra & Tripathi, 2021). Technology and innovation that support each other in addition to adding value to selling products are expected to facilitate business activities and expand networks globally.

LITERATURE REVIEW

The definition of entrepreneurship written by the French economist, Jean-Baptiste states that entrepreneurship changes economic resources from areas of low productivity and yields to areas of higher productivity and greater returns. Entrepreneurs are innovators, therefore entrepreneurship includes a set of behaviors, skills, and traits that support the development of innovation and creativity. Entrepreneurship education in universities in Indonesia varies widely, as well as entrepreneurship education in universities in several countries. Entrepreneurship education in Singapore is facing the globalization of the knowledge economy uses a knowledge-based strategy for its economic growth. Through this strategy, there is a transition from an investment-driven economy to an innovation-driven economy, with an emphasis on intellectual capital development and its commercialization to create value and jobs. In this era of economic transformation, the role of universities is increasingly evident in stimulating economic growth through research relevant to industry needs, commercializing technology, developing high-tech, attracting talented individuals from abroad, and instilling an entrepreneurial mindset in scholars. The existence of technology entrepreneurs or abbreviated as technopreneurs who start new businesses by relying on innovation can be one of the keys to creating a knowledge-based economy. In addition, entrepreneurship innovation is needed to create new leaps from what is already known, thereby growing and competing internationally. Innovations that move very quickly and dynamically are highly reliable for future employment and the business world. Entrepreneurship education in influencing technopreneurship on student innovation is based on the Theory of Planned Behavior (TPB) that someone will think about the cause and effect of an action that will be taken first. A person's behavior is influenced by intentions. Intentions are influenced by (1) attitudes, (2) subjective norms, and (3) perceived behavior control. In line with the TBP theory, the application of technopreneurship-based entrepreneurship education and innovation in the industrial era 4.0 is influenced because it has greater positive implications if applied.

METHOD

Research Goal

This research is a quantitative study aimed at analyzing entrepreneurship education influencing the ability of technopreneurship on student innovation in the industrial revolution 4.0 era.

Sample and Data Collection

The population in this study was UNISSULA students. Determination of sample size based on percentage according to Yount's Table (Efobi et al., 2021). The sample of this study amounted to 252 students. A total of 162 students have received entrepreneurship lessons (group I). While 90 students have not received learning about entrepreneurship (group II).

This research instrument uses a questionnaire designed to contain statement items about technopreneurship abilities with a total of 26 items, innovative behavior 7 items, and skills in the industrial revolution 4.0 era totaling 24 items, which were obtained from several pieces of literature. Respondents filled out the questionnaires directly and online through the google form. This questionnaire consists of several parts:

a. Introduction, in the form of an explanation of the research topic and the purpose of data collection.
b. The first part contains a general information

sheet about the respondent's profile.

c. The second part, in the form of statements to obtain respondents' perceptions of technopreneurship abilities, innovative behavior, and skills in the era of the industrial revolution 4.0 (Villares et al., 2020).

Analyzing of Data

Based on the questionnaires that have been distributed, the data obtained is processed using the SEM method with the help of smart-PLS software (Ammad et al., 2021). In general, an SEM model will be divided into two main parts, namely the outer model and the inner model.

Evaluation of the outer model is carried out to check the validity of the measurements of each indicator used in the model. The criteria used in the outer model stage are presented in Table 1.

Table 1. Criteria for Outer Model Stages

Criteria	Value that Expected
Composite Reliability	> 0.700
Loading Indicator	> 0.700
AVE Value Indicator	> 0.700

(Peterson & Kim, 2013)

The evaluation of the inner model is carried out to assess the structural model estimates. The assessment on the evaluation of the inner model is carried out on the relationship between variables. Tests carried out at the inner model stage:

Coefficient of Determination (R2)

The coefficient of determination (R2) was used to determine the predictive accuracy of the model. The value of R2 is a measure of the variation that can be explained from each endogenous variable. A high R2 value indicates a greater degree of predictive accuracy. The critical values for R2 are 0.750 for a substantial level of prediction accuracy, 0.500 for an intermediate level of prediction accuracy, and 0.250 for a weak level of prediction accuracy (Piepho, 2019).

Path Coefficients' Strength and Significance

The path coefficients values are in the range -1 to +1. Two variables have a strong positive relationship if the path coefficient value between the two variables is close to +1. Conversely, if the path coefficient value between the two variables is close to -1 then the two variables have a strong negative relationship. The two variables have a weak relationship if the path coefficient value is close to 0. The critical t-value for the two-tailed test is:

1.65 (significance level 0.10)
1.96 (significance level 0.05)
2.58 (significance level 0.01)
(Farooq et al., 2014).

RESULTS AND DISCUSSION

Evaluation of the outer model is carried out to check the validity of the measurements f each indicator used in the model. The measurement model used is reflective.

Indicator Reliability

Testing the reliability indicator, which is determined based on the value of the loading of each indicator. The loadings indicator value must be greater than 0.700, where this value indicates that the variable can explain more than 50% of the indicator variance. Reflective indicators having values less than 0.700 should be removed from the model. This shows that the indicator is not valid, so it is necessary to then retest. This process is repeated until the entire loading indicator value is greater than 0.700. The group of respondents who have received entrepreneurship education is re-estimated 3 times, and the group of respondents who have not received entrepreneurship education is re-estimated 4 times to obtain a large loading indicator value of 0.700.

Valid indicators in group I are 6 indicators of technopreneurship ability, 6 indicators of innovative behavior, and 10 indicators of skills in the 4.0 industrial revolution era. While the valid indicators in group II are 7 indicators of technopreneurship ability, 6 indicators of innovative behavior, and 10 indicators of skills in the Industrial Revolution 4.0 era.

Internal Consistency Reliability

Internal consistency reliability is determined based on the value of composite reliability. From Table 2 it can be seen that the composite reliability value is greater than 0.700 for each variable. This shows that the variables used in the model can be used and can be relied upon in testing the hypothesis. In other words, all the variables or variables of this study have become a fit measuring tool, and all the questions used to measure each variable have good reliability.

Table 2. Composite Reliability Value

Variable	Composite Reliability	
	Group I	Group II
Innovative Behavior	0.914	0.91
Skills of the Industrial Revolution 4.0	0.941	0.959
Technopreneurship Ability	0.924	0.942

(Peterson & Kim, 2013)

Convergent Validity

The convergent validity of the model is determined based on the Average Variance Extracted (AVE) value. The AVE value must be greater than 0.500, which indicates that on average the variable can explain more than 50% of the indicator variance. From Table 3 it can be seen that the AVE value is greater than 0.500 for each variable.

Table 3. Average Variance Extracted Value

Variable	Composite Reliability	
	Group I	Group II
Innovative Behavior	0.639	0.629
Skills of the Industrial Revolution 4.0	0.571	0.702
Technopreneurship Ability	0.637	0.729

(Afzali et al., 2018)

The assessment on the evaluation of the inner model is carried out on the relationship between the test variables carried out:

Coefficient of Determination (R2)

The value of R2 is a measure of the variation that can be explained from each endogenous variable. A high R2 value indicates a greater degree of predictive accuracy. The critical values for R2 are 0.750 for a substantial level of prediction accuracy, 0.500 for an intermediate level of prediction accuracy, and 0.250 for a weak level of prediction accuracy. The value of r-square can be seen in Table 4.

Table 4. R-Square Value

Variable	Nilai R-Square Value	
	Group I	Group II
Innovative Behavior	0.712	0.411

(Piepho, 2019)

The close relationship between constructs in the research model can be shown by the value of R2. The value of the determinant coefficient/r-square (R2) of the innovative behavior variable in group I was obtained at 0.712. It is interpreted that the variable of innovative behavior can be explained by the variable of technopreneurship ability and variable skills of the industrial revolution 4.0 era of 71.2% while the remaining 28.8% is influenced by other variables. In group II, the determinant coefficient/r-square (R2) variable for innovative behavior was obtained at 0.411. This means that only 41.1% of the variables of technopreneurship ability and variable skills of the industrial revolution 4.0 era explain innovative behavior variables while the other 58.9% are influenced by other factors. The difference in values between group I and group II shows that entrepreneurship education has an important role in influencing the ability of technopreneurship to students' innovative behavior mediated by skills in the industrial revolution era 4.0.

Path Coefficients' Strength and Significance

The path coefficients values are in the range -1 to +1. Two variables have a strong positive relationship if the path coefficient value between the two variables is close to +1. Conversely, if the path coefficient value between the two variables is close to -1 then the two variables have a strong negative relationship. The two variables have a weak relationship if the path coefficient value is close to 0.

Table 5. Path Coefficient Value

Path	R-Square	
	Group I	Group II
Industrial Revolution 4.0 Skills → Innovative Behavior	0.57	0.511
Technopreneurship Ability → Innovative Behavior	0.339	0.146
Technopreneurship Ability → Industrial Revolution 4.0 Skills	0.707	0.865

(Farooq et al., 2014)

The variable of technopreneurship ability has a positive relationship with innovative behavior. This means that by increasing the ability of technopreneurship, innovative behavior will also increase. The calculation results in group I and group II there are differences, this shows that

entrepreneurship education contributes to the relationship between the variable ability of technopreneurship and innovative behavior.

The variable of technopreneurship ability has a positive relationship with industrial revolution 4.0 skills. This means that by increasing the ability of technopreneurship, the skills of the industrial revolution 4.0 will also increase. However, in this section, the value of group II is higher than the value of group I, so there is not enough evidence that entrepreneurship education contributes to the relationship between the variable of technopreneurship ability and the skills of the industrial revolution 4.0.

In concluding whether the hypothesis is accepted or rejected, the p-value is used at the significance of = 5% or 0.05. If the p-value <0.05, then H0 is rejected, meaning that there is a significant effect on that variable. On the other hand, if the p-value > 0.05, then H0 is accepted, in other words, there is no significant effect between these variables. The value of t-statistics and p-value on the total data of respondents can be seen in Table 6.

From Table 6, it can be seen that the value of t Statistics in group I is higher than the value of group II for all elements. For p values, obtained p-value <0.05 for both groups. So it can be concluded that there is a role for entrepreneurship education in influencing students' technopreneurship abilities on individual innovation behavior with skills in the 4.0 industrial revolution era as a mediating variable.

Table 6. T Statistics Values and P Values

Path	Group I		Group I	
	T Statistics	P Values	T Statistics	P Values
Industrial Revolution 4.0 Skills → Innovative Behavior	10.324	0	3.11	0.002
Technopreneurship Ability → Innovative Behavior	5.667	0	0.756	0.45
Technopreneurship Ability → Industrial Revolution 4.0 Skills	15.473	0	13.132	0

(Hair et al., 2011)

Discussion

Based on the results of the coefficient of determination (R2) test, it was found that there was a difference in value between group I, the variable of technopreneurship ability, and the variable of skills in the industrial revolution 4.0 era of 71.2%, the rest was influenced by other factors. group II determinant coefficient/r-square (R2) value is only 41.1%, the rest is influenced by other factors. Based on the results of the path coefficients test, the skill variable in the 4.0 industrial revolution era is positively related to the innovative behavior variable. The variable of technopreneurship ability has a positive relationship with innovative behavior. The variable of technopreneurship ability has a positive relationship with industrial revolution 4.0 skills. So that it can be concluded that based on the p-value there is a role for entrepreneurship education in influencing students' technopreneurship abilities towards individual innovation behavior with skills in the 4.0 industrial revolution era. Based on the conclusion of the study, entrepreneurship education can be implemented for all students, because entrepreneurship education materials are related to forming entrepreneurial character, innovative behavior in buying value-added products that are needed for all professions. Therefore, entrepreneurship education can be implemented in universities and applied to all students regardless of the field of knowledge studied (Maydiantoro, 2021). For this reason, it is necessary to pay attention to the implementation of entrepreneurship education with the right curriculum, supported by adequate facilities and infrastructure for entrepreneurial practice, a competent teaching team, and institutional policy support (Fernández-Nogueira et al., 2018).

The focus of the development of technology-based entrepreneurship education is innovation. Technological innovation is directly related to the thinking, application, and creation of technology in solving various problems. Innovation Leadership Study, surveyed aspects that determine innovation strategy. The survey results show 80% (N = 98 respondents) that the innovation strategy must be in line with the corporate strategy. Other aspects that rank second and third are technology (64%) and market (62%). In addition, other aspects that influence the innovation strategy include: innovation culture (58%), innovation process (55%), internal capabilities (47%), targets (44%), and partners (40%). Although the "partner" aspect has the lowest effect on innovation strategy, the ability to work effectively with external partners will differentiate between innovation leaders and followers (Alsolami et al., 2016).

There is a difference between innovative thinking and traditional business thinking. The

Center for Creative Leadership states that innovative thinking is a crucial addition to traditional business thinking (Lazarova, 2014). It allows you to bring new ideas and energy to your role as a leader and paves the way to bring more innovation into your organization. Unlike business thinking, a leader who thinks innovatively does not rely on his past experiences. However, innovative thinking is always oriented towards looking ahead (a desirable future state). Innovative thinking uses intuition and holds on to all possibilities, even leans on ambiguity as an advantage (Kelley & Kelley, 2013). Implementation of the learning process to produce graduates who can innovate and entrepreneurship, applying learning by doing. so that later they can produce graduates who have practical competence and are ready to work.

CONCLUSION

The conclusion from this study is that there is a role for entrepreneurship education in influencing students' technopreneurship abilities towards innovative behavior with the skills of the Industrial Revolution 4.0 era as a mediating variable.

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