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Research Article

Mastery of Skills 4.0 Effect on The Readiness of College Students in Facing Revolution of Industry 4.0

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A B S T R A C T

Revolution of industry 4.0 initiated by the German government, starting from the development of individual innovation behavior especially in the fields of robotics, digital technology, and information, has caused distortions to the future skills requirements. Some of the skills needed a lot in the past are now starting to experience a shift towards less needed. Some are even unnecessary because they are replaced by automation and robots. The emergence of several new skills (skills 4.0) that are more dominant is needed to make every interested party to prepare themselves to face the challenges of the revolution of industry 4.0. Students are one of the interested parties who will face the challenges of the revolution of industry 4.0 after they graduates from the formal higher education. This study determines the readiness of students in facing the revolution of industry 4.0, influenced by the mastery of skills 4.0 and individual innovation behavior with their innovation behavior as a mediating variable. Respondents in this study are 233 undergraduate students of the Andalas University. Using a cluster sampling technique, the data is collected using Likert scale based-questionnaire after which calculations are then performed using the Smart-PLS Program software 3.2.8. The results show that skills 4.0 and individual innovation behavior have a positive effect on students' readiness in facing the challenges of the revolution of industry 4.0. It implies that the students need to improve their mastery of skills 4.0 in order to prepare themselves to face the challenges of the revolution of industry 4.0.

INTRODUCTION

In the era of revolution of industry 4.0, innovation is the main concept to face labor and global market [1]. The innovation process includes technology and psychology innovation [2,3]. Not only the implementation technology system as a technology innovation emergence, but the most important of these are the development of innovative behavior [4,5]. Innovation is a process of involving generation and implementation ideas [4]. Individual innovation is a process of multistage, including an introduction to problem and generation of ideas and solution, searching for a sponsor for ideas, building a coalition to support, and ideas settlement (for example, producing a prototype, model, and process) [4,6]. Thus, individual innovation behavior, including generation and implementation of new ideas [7].

One of the important aspects of individual innovation behavior is generating ideas related to product development, services, or new process in entering a new market, also to improve the work process nowadays and manage as well as to combine existing concepts to solve problems [8]. The level of individual innovation behavior, whether in managerial or non-managerial, is considered a fundamental trigger of organizational innovation [9].

The development of digitalization and robotics, which are technological innovations in the revolution of industry 4.0, does not only change the product development process but also impacts on losing some profession and jobs. The result of Yearly International Forum, with the theme "*Mastering the Fourth Industrial Revolution*" (2016), a revolution of industry 4.0 will cause disruption not only in the field of business in general but also in the labor market [10]. Of course, there will be many jobs losing and changed into robotic functions (artificial intelligence).

Human resources are strengths as well as challenges for Indonesia in facing a revolution of industry 4.0. Nowadays, one of the biggest challenges is to develop the right skills for labors because productions shift from intensive labor environment into an intensive knowledge environment [11]. It is due to digital

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strengths, which are technology innovation in the revolution of industry 4.0, change skills that need by future engineers. Skills are hard to be substituted by technology, among others, skills related to interaction in decision making (like in the government), skills to make decisions, planning, creative tasks, management human resources [12]. The demand for *skills* in 2018 which remains a trend in 2022 are analytical thinking, and innovation; complex problem solving; critical analytical thinking; active learning and learning strategy; creativity, originality, and initiative; emotional intelligence; reasoning, problem-solving and ideas, leadership and social influence [13].

Success in the revolution of industry 4.0 starts from the classroom, where innovation behavior needs to invest in students as productive human resources. Innovation is the driving strength behind the future of production [11]. Mastery of *skills* 4.0 requires to introduce early to students to be able to face the challenges of revolution of industry 4.0. Evaluation of readiness happened before getting involved [14], is done to guide students to take actions by identifying things to be done from now on so that they can implement the strategy of revolution of industry 4.0. E-learning, ICT competence, the openness of technology become options to prepare human resources in facing a revolution of industry 4.0 [15], in addition to new competencies in the field of information technology [16] as part of the data-driven operation in the model of readiness [17]. Culture, collaboration, knowledge sharing, and the value of ICT are parts of items needed in the availability of facing a revolution of industry 4.0 [14].

This study is aimed at determining the relationship between mastery of skills 4.0 on individual innovation behavior and readiness to face the revolution of industry 4.0, including indicators having significant effects in such a relationship. The study is done to students as part of society that will meet the challenges of revolution of industry 4.0.

In general, readiness is considered as the ability to take advantage of opportunities in the future, to mitigate risks and challenges, to get tough and flexible in responding to unknown disturbances in the future [11]. One of the guidances to be leaders of industry 4.0 in the model of readiness [17] is mastery of skills 4.0 consisting of skills and ability. Based on the demand trend for skills for the year 2022, indicators of variable skills and skills of industry 4.0 needed, are summed up in Tabel 1.

METHODOLOGY

The research method in this study uses the descriptive method, where several variables are manipulated to observe the effects on other variables by using a qualitative approach related to the evaluation of subjectivities of attitude, opinion, and behavior. Indicators reflecting skills 4.0 variable can be seen in Table 1, individual innovation behavior variable can be seen in Table 2, and readiness variable can be seen in Table 3.

Based on these variables and indicators of research, the proposed model is developed, and the visual presentation of the model is depicted in Figure 1.

Table 1. Variable and Indicators of Skills 4.0 of Industry 4.0

Variable	Code	Indicator
Abilities	AB1	Analytical thinking [10, 11]
	AB2	Initiative [11]
	AB3	Creativity [10,11]
	AB4	Responsibility [11]
	AB5	Autonomy [11]
	AB6	Originality [11]
	AB7	Idea Generation and Reasoning Abilities [11]
	AB8	Quantitative Abilities [11]
Skills	SK1	Active learning [10,11]
	SK2	Learning strategies [11]
	SK3	Programming [10, 11]
	SK4	Technology Design [10, 11]
	SK5	Critical Thinking [10, 11]
	SK6	Monitoring [10, 11]
	SK7	Complex Problem Solving [10, 11]
	SK8	Leadership [11]
	SK9	Social Influence [11]
	SK10	Concern for Others [10, 11]
	SK11	Cooperation [10, 11]
	SK12	Social Orientation [10, 11]
	SK13	Social Perceptiveness [10, 11]
	SK14	Judgment and Decision Making [10, 11]
	SK15	Systems Analysis [10, 11]
	SK16	Systems Evaluation [11]

Table 2. Indicators of Individual Innovation Behavior

Code	Indicator
IIB1	Exploring new opportunity [8, 4]
IIB2	New idea generation [4, 8, 9, 7]
IIB3	Ability to adopt new product/service [4, 6]
IIB4	Championing new idea [8]
IIB5	New idea implementation [4, 8, 9, 7]
IIB6	Problem-solving ability [4, 6]
IIB7	Network building [4, 6]

Table 3. Indicators of Readiness for Revolution of Industry 4.0

Code	Indicator
RE1	Collaboration [14]
RE2	Knowledge Sharing [14]
RE3	Data-Driven Operation [17, 15]
RE4	E-learning [15]
RE5	Openness to New Technology [14]
RE6	Value of ICT [14]
RE7	ICT Competence [14]
RE8	New ICT Skill [16]

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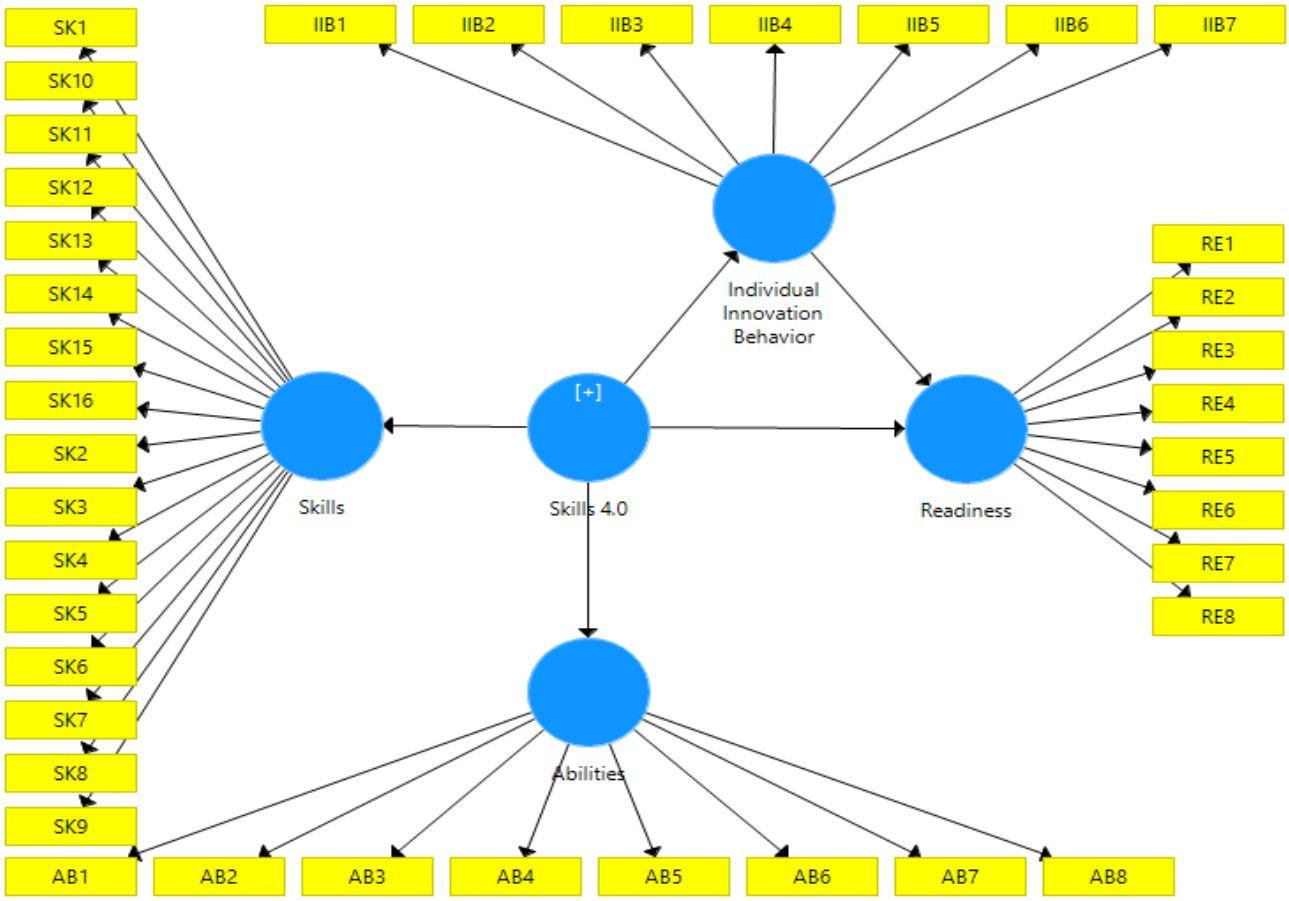

Figure 1. Model of Conceptual Relationship of *Skills* 4.0 and Individual Innovation Behavior and Readiness

The effects of mastery of skills 4.0 on readiness and individual innovation behavior are meausred using the method of SEM-PLS. This method is used in the study due to the fact that SEM-PLS has a higher level of statistical strength in the situation of the high complexity of model structure. SEM-PLS has many indicators and variables or small sample sizes [18, 19], estimates formally determined variables, and determines the score of the latent variable that can be implemented in the next analysis [19]. Correlation and effects among variables are examined by the aids of SmartPLS 3.2.8 software.

Research Hypotheses

Research hypotheses are as follows:

H_1 : Skills 4.0 has a significant effect on readiness.

H_2 : Skills 4.0 has a significant effect on individual innovation behavior.

H_3 : Individual innovation behavior has a substantial effect on readiness.

H_4 : Individual innovation behavior mediates the relationship between skills 4.0 and readiness.

Data Proceeding

The population of this study is undergraduate students of Andalas University. The minimum sample size should be the same or more than ten times the number of the most structural path that is directed to specific variables in the structural model [18]. Skills 4.0 has the most significant amount of structural paths in the research model, namely 16 structural paths. Therefore, the total minimum samples is 16 x 10 = 160.

The data is collected from each faculty in Andalas University using a cluster sampling technique, where sample taking in the population is divided into groups [20, 21]. The calculation of the sampling proportion and group sample size follows (1) and (2), respectively:

$$P = \frac{A}{N} \tag{1}$$

Group Sample size = P x total minimum sample (2)

In this study, proportion calculation is used as a reference in determining sample size at each faculty. For example, the sample proportion of Faculty of Agriculture is calculated as

$$P = \frac{A}{N} = \frac{2314}{22084} = 0.105$$

Sample size = 0.105 x 160 = 16.8

where the value of 16.8 is rounded up to 17. Accordingly, the sample size calculation of respondents for remaining faculty of Universitas Andalas is presented in Table 4.

Table 4. Number of Respondents of each Faculty in Andalas University

Faculty	Number of Students	The proportion of Each per Respondent Minimum Limit	Number of Respondents
Agriculture	2314	17	17
Medical	1666	12	12
Mathematics of Natural Sciences	1688	12	12
Law	1766	13	25
The Economy	2655	19	32
Animal Husbandry	1797	13	15
Technique	2764	20	32
Culture	1643	12	22
Social science and political science	2021	15	25
Pharmacy	547	4	7
Agricultural Technology	980	7	7
Public Health	885	6	10
Nursing	464	3	6
Dentistry	346	3	3
Information Technology	548	4	8
Amount	22084	160	233

The questionnaire is developed based on evaluation indicators. Each statement presents each of evaluation indicator. There are 16 statements to evaluate skills 4.0 variable, eight statements to evaluate abilities variable, seven statements to evaluate individual innovation behavior variable, and eight statements to evaluate readiness variable.

Evaluation of the proposed model using SEM-PLS is divided into two stages, namely the outer model and inner model. The result of the outer model determines the correctness of each indicator of the latent variable [18]. Evaluation of the inner model is carried out to determine the relationship between latent variables [18].

Evaluation of the outer model is based on the following [18]:

- Internal consistency (composite reliability): composite reliability should be more than 0.708 (in exploratory research where 0.60 to 0.70 is considered as accepted) by considering Cronbach's Alpha as internal consistency reliability measurement.
- Indicator reliability: an indicator of outer loading should be more than 0.708. Indicator with outer loading ranging 0.40 and 0.70 should be considered to be omitted if only the omission directs to the increase of composite reliability and AVE above the recommended threshold value.
- Convergent validity: AVE should be more than 0.50; the value of convergent validity pays attention to the loading factor (correlation between item score/component score and construct score).
- Discriminant validity: the value of discriminant validity is the value measured based on measurement of cross-loading with latent variables. The value of discriminant validity is determined using method of Average Variance Extracted/AVE with criteria of Fornell-Larcker. The least-square of AVE should be more than its correlation with other latent variables [22].
- Consistency reliability: Consistency reliability is calculated using composite reliability and Cronbach's Alpha. The value varies from 0 to 1, where 1 is perfect estimate reliability.

The variable of skills 4.0 as one of the variables that build the structural model in this study is the second-order variable, so the use of latent variable scores are done in two stages after the calculation of valid indicators [18,23]:

- In the first stage, the results of the calculation of valid indicators are used to get latent variable scores for the first order.
- In the second stage, the variable in the first order becomes an indicator in the second-order measurement model.

Evaluation of the relationship between latent variables in the inner model follows the following rules [18]:

- The coefficient of determination (R^2) is used to determine predictive accuracy of the model. Accurate interpretation of R^2 depends on the research model. The value of R^2 0.75 for the level of substantial predictive accuracy, the value of R^2 0.50 for the level of mediate predictive accuracy, and the value of R^2 0.25 for the level of poor predictive accuracy.
- Effect size (f^2) is used to evaluate the contribution of the exogen variable to the value of R^2 of the endogen latent variable. The higher the value or f^2, the more significant contribution of the exogen variable in describing the endogen variable. The value of f^2 0.02 demonstrates the level of small contribution; the value of f^2 0.15 demonstrates the level of mediate contribution, and the value of f^2 0.35 demonstrates the level of bigger contribution of exogen variable to endogen variable.
- Cross-validated redundancy (Q^2) is used to measure how a good path model can estimate the previous values. The value of Q^2 is obtained by using procedures of blindfolding. The value $Q^2 > 0$ indicates that exogen variables have predictive relevance with considered endogen variables.
- The value of path coefficients represents the hypothetical relationship between variables in the research model, which consists of the Coefficient Relevance Test and the Significant Test.
- The coefficient relevance test is obtained from the value of the Original Sample (O). The path coefficient has standard values ranging from -1 to +1. The Original Sample (O) path coefficient value near +1 indicates a strong positive relationship between the two variables, and the Original Sample (O) path coefficient value near -1 indicates a weak negative relationship between the two variables. The Original Sample (O) path coefficient value close to zero indicates the weaker relationship between the two variables.

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- Acceptance or rejection of H_1, H_2, and H_3 are determined based on significant test values. Hypothesis testing can be seen in the t-statistic and *p*-value. For testing hypotheses using statistical values, the reliability assumption is 95%, which means the significance level is 5%, and $\alpha = 0.05$ with $t = 1.96$. The *p*-value is a measure of the probability of strength of evidence to reject or accept a null hypothesis (H_0). The smaller the *p*-value obtained, the stronger it is to reject the null hypothesis. To find out whether the hypothesis is accepted or rejected, the *p*-value is used at the significance of $\alpha = 5\%$ or 0.05. If the *p*-value < 0.05 then H_0 is rejected. It means that there is a significant influence on the variable tested. But on the contrary, if *p*-value > 0.05, then H_0 is accepted, meaning there is no significant effect between the variables tested.

RESULTS AND DISCUSSION

The description of the general data of respondents in this study can be seen in Figure 2 - 4. In the Figure 2, it is known that students from the year 2015 are students who have taken eight semesters of study and represent the largest, meaning that 50.64% of all respondents in this study, who represent candidates of the workforce in the nearer time, will face a revolution of industry 4.0. Figure 3 shows that 57.94% of respondents whose age are 21 years and 22 years have entered adulthood and are very wise [24]. Figure 4 shows that 82.06% of respondents are planning to work as civil servants and employees of state companies after graduation, meaning that the majority of respondents need mastery of skills 4.0.

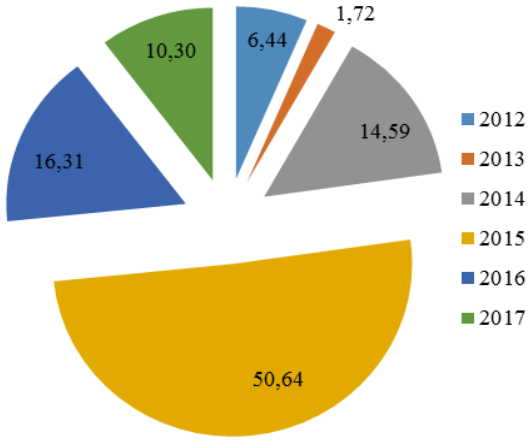

Figure 2. Distribution of Respondents Data based on Entrance Year in University

Understanding of students in eight statements indicator of abilities variable, sixteen statements indicator of skills variable, seven statements indicator of individual innovation behavior variable, and eight statements indicator of readiness variable are presented in Table 5. The calculation of the average respondent's answer to each indicator can be seen in Table 6.

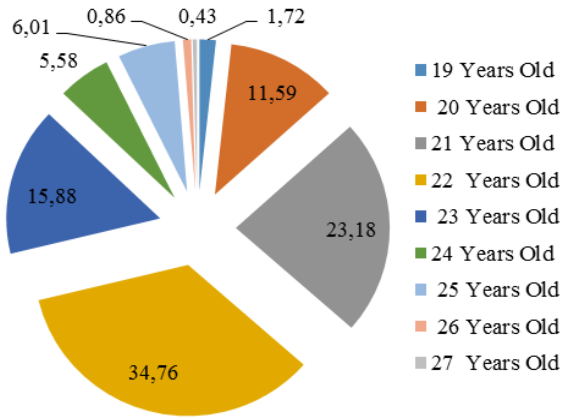

Figure 3. Distribution of Respondent Data by Age

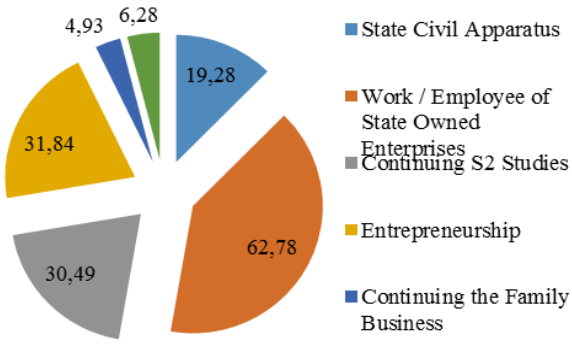

Figure 4. Distribution of Respondent's Planning after Graduate from University

Evaluating outer model with the SEM-PLS starts from the calculation of value of Cronbach's Alpha to test internal consistency reliability. The values of testing each of variable have given satisfied result with the value of internal consistency reliability shows more than 0.708. Table 7 demonstrates the value of internal consistency reliability.

The next outer model evaluation is to calculate the value of outer loading of each indicator to determine the value of the indicator reliability. After doing 5 iterations, the outer loading value is shown in Table 8. Some indicators have been considered ommited for the purpose of increasing composite reliability and the value of AVE in order to reach above recommended threshold. The ommited variables include 13 indicators of skills variable, 4 indicators of abilities variable, and 4 indicators of readiness variable. The value of loadings indicators ommited from skills variable are SK1, SK2, SK3, SK4, SK6, SK9, SK10, SK11, SK12, SK13, SK14, SK15, SK16 with loadings value of 0.535, 0.610, 0.389, 0.509, 0.666, 0.651, 0.557, 0.512, 0.550, 0.571, 0.638, 0.668 0.584, respectively; indicators of abilities variable are AB4, AB5, AB7, AB8 with loadings value of 0.696, 0.535, 0.571, 0.456, respectively; indicators of readiness variable RE1, RE4, RE5, RE6 with loadings value of 0.579, 0.640, 0.586, 0.624, respectively.

Table 5. Recapitulation of Understanding of Respondents of the variable of Skills 4.0, Individual Innovation Behavior and Readiness

Skills 4.0 Abilities

Statement to-	Strongly Agree	Agree	Ordinary	Disagree	Strongly Disagree	Amount
1	30	126	72	4	1	233
2	45	129	57	2	-	233
3	41	117	67	7	1	233
4	30	96	86	20	1	233
5	38	132	58	5	-	233
6	32	114	81	6	-	233
7	11	72	95	49	6	233
8	8	48	105	60	12	233

Skills 4.0 Skills

Statement to-	Strongly Agree	Agree	Ordinary	Disagree	Strongly Disagree	Amount
1	30	121	76	5	1	233
2	21	96	102	14	-	233
3	11	61	117	36	8	233
4	7	40	72	89	25	233
5	22	104	90	14	3	233
6	34	114	75	9	1	233
7	13	101	107	11	1	233
8	41	104	77	9	2	233
9	21	123	81	8	-	233
10	68	115	48	2	-	233
11	64	127	41	1	-	233
12	43	111	67	10	-	231
13	45	140	47	1	-	233
14	27	137	66	3	-	233
15	26	103	92	12	-	233
16	15	88	118	12	-	233

Individual Innovation Behavior

Statement to-	Strongly Agree	Agree	Ordinary	Disagree	Strongly Disagree	Amount
1	33	102	94	4		233
2	25	83	113	10	2	233
3	30	123	73	6	1	233
4	23	114	89	6	1	233
5	21	119	86	7	-	233
6	15	101	105	12	-	233
7	47	119	62	4	1	233

Readiness 4.0

Statement to-	Strongly Agree	Agree	Ordinary	Disagree	Strongly Disagree	Amount
1	71	127	29	6	-	233
2	92	107	29	5	-	233
3	51	143	37	2	-	233
4	46	127	53	6	1	233
5	97	95	37	2	2	233
6	106	107	19	1	-	233
7	83	116	34	-	-	233
8	67	113	50	3	-	233

Table 7. The Value of Internal Consistency Reliability

Variable	Cronbach's Alpha
Abilities	0.773
Readiness	0.736
Individual Innovation Behavior	0.833
Skills	0.734
Skills 4.0	0.833

Table 6. Value of Mean of Respondents' Answers for Each Indicator.

Indicator	Mean	Median	Min	Max	Standard Deviation
AB1	3.773	4	1	5	0.702
AB2	3.931	4	2	5	0.684
AB3	3.815	4	1	5	0.767
AB4	3.575	4	1	5	0.836
AB5	3.871	4	2	5	0.694
AB6	3.738	4	2	5	0.721
AB7	3.142	3	1	5	0.889
AB8	2.914	3	1	5	0.894
SK1	3.747	4	1	5	0.718
SK2	3.532	4	2	5	0.741
SK3	3.133	3	1	5	0.851
SK4	2.635	3	1	5	0.985
SK5	3.549	4	1	5	0.796
SK6	3.734	4	1	5	0.768
SK7	3.489	3	1	5	0.694
SK8	3.742	4	1	5	0.820
SK9	3.674	4	2	5	0.685
SK10	4.069	4	2	5	0.726
SK11	4.090	4	2	5	0.678
SK12	3.785	4	1	5	0.822
SK13	3.983	4	2	5	0.642
SK14	3.807	4	2	5	0.643
SK15	3.614	4	2	5	0.750
SK16	3.455	3	2	5	0.693
IIB1	3.704	4	2	5	0.725
IIB2	3.511	3	1	5	0.776
IIB3	3.751	4	1	5	0.722
IIB4	3.652	4	1	5	0.708
IIB5	3.661	4	2	5	0.681
IIB6	3.511	3	2	5	0.694
IIB7	3.888	4	1	5	0.750
RE1	4.129	4	2	5	0.718
RE2	4.227	4	2	5	0.744
RE3	4.043	4	2	5	0.640
RE4	3.906	4	1	5	0.747
RE5	4.215	4	1	5	0.800
RE6	4.365	4	2	5	0.649
RE7	4.210	4	3	5	0.677
RE8	4.047	4	2	5	0.743

Evaluation of convergent validity is carried out to the modified model. AVE values from the total respondent's data are presented in Table 9 wherein the result of testing show the value of AVE has been higher than 0.50. This means that, by average, there exists more than 50% variance of indicators. Therefore, skills 4.0 variable, individual innovation behavior variable, and readiness variable are valid, which indicates the evaluation can be continued to the subsequent stage.

Evaluation of discriminant validity is seen from the criteria of Fornell-Larcker for each variable and carried out by comparing the value of loading indicator with the value of cross loading. Criteria of Fornell-Larcker and the comparison of loading value of an indicator with the value of its cross loading can be seen in Table 10 and Table 11.

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Table 8. Value of Outer Loading Fifth Iteration of Total Respondent Data

Indicator	*Abilities*	Readiness	Individual Innovation Behavior	*Skills*	*Skills4.0*
AB1	0.757				
AB1					0.693
AB2	0.844				
AB2					0.774
AB3	0.758				
AB3					0.673
AB6	0.726				
AB6					0.689
KES2		0.801			
KES3		0.796			
KES7		0.698			
KES8		0.641			
PII1			0.752		
PII2			0.637		
PII3			0.676		
PII4			0.815		
PII5			0.760		
PII6			0.681		
PII7			0.618		
SK5				0.785	
SK5					0.679
SK7				0.844	
SK7					0.740
SK8				0.795	
SK8					0.698

Table 9. AVE values of the Total Respondent Data.

Variable	Average Variance Extracted (AVE)
Abilities	0.596
Readiness	0.543
Individual Innovation Behavior	0.502
Skills	0.653
Skills 4.0	0.500

Table 10. Criteria of Fornell-Larcker

	Abilities	Readiness	Individual Innovation Behavior	Skills
Abilities	0.772			
Readiness	0.423	0.737		
Individual Innovation Behavior	0.614	0.434	0.709	
Skills	0.608	0.456	0.603	0.808

Colored cells in the table represent the highest value of each indicator. From the result of the value of discriminant validity, it can be seen that the modified model meets all criteria of outer model evaluation.

The final evaluation of the outer model is the calculation of the value of composite reliability to test reliability consistency. The test value of each variable has given satisfactory results with a composite reliability value of more than 0.800 which means that the estimated reliability is near perfect. Table 12 shows the composite reliability values.

Table 11. The Comparison of the Value of Loading and Cross Loadings

Indicator	Abilities	Readiness	Individual Innovation Behavior	Skills
AB1	0.757	0.286	0.404	0.465
AB2	0.844	0.371	0.520	0.511
AB3	0.758	0.312	0.472	0.415
AB6	0.726	0.335	0.497	0.483
RE2	0.399	0.801	0.397	0.395
RE3	0.346	0.796	0.368	0.444
RE7	0.201	0.698	0.164	0.197
RE8	0.231	0.641	0.269	0.204
IIB1	0.515	0.317	0.752	0.496
IIB2	0.300	0.226	0.637	0.342
IIB3	0.406	0.304	0.676	0.409
IIB4	0.478	0.325	0.815	0.424
IIB5	0.474	0.385	0.760	0.439
IIB6	0.443	0.293	0.681	0.379
IIB7	0.385	0.277	0.618	0.480
SK5	0.475	0.240	0.423	0.785
SK7	0.514	0.412	0.552	0.844
SK8	0.484	0.448	0.481	0.795

Table 12. The Value of Composite Reliabity

Variable	Composite Reliability
Abilities	0.855
Readiness	0.825
Individual Innovation Behavior	0.875
Skills	0.850
Skills 4.0	0.875

The result of outer model demonstrates that persists indicators after modifiying the research model are indicators influencing the relationship of skills 4.0 on the readiness and individual innovation behavior. Some indicators of skills 4.0 which have significant roles in such relation are SK5, SK7, SK8, AB1, AB2, AB3, and AB6. For indicators of readiness, variable that have significant roles are RE2, RE3, RE7, and RE8. Indicators of individual innovation behavior variable having significant roles are IIB1, IIB2, IIB3, IIB4, IIB5, IIB6, and IIB7 (Figure 5).

Hypothesis testing is performed on inner model calculations (structural models). After calculating by means of a second order variable, the structural model is shown in Figure 6. Evaluation of inner model starts from the calculation of coefficient of determination (R^2). The result of testing R^2 can be seen in Table 13. The value of R^2 of readiness variable shows that contribution of the effect of skills 4.0 on the readiness is weak is 25.90%. Accordingly, the value of R^2 individual innovation behavior variable demonstrates the level of prediction accuracy mediate, meaning that mastery of skills 4.0 has enough contribution on individual innovation behavior is 46.10%.

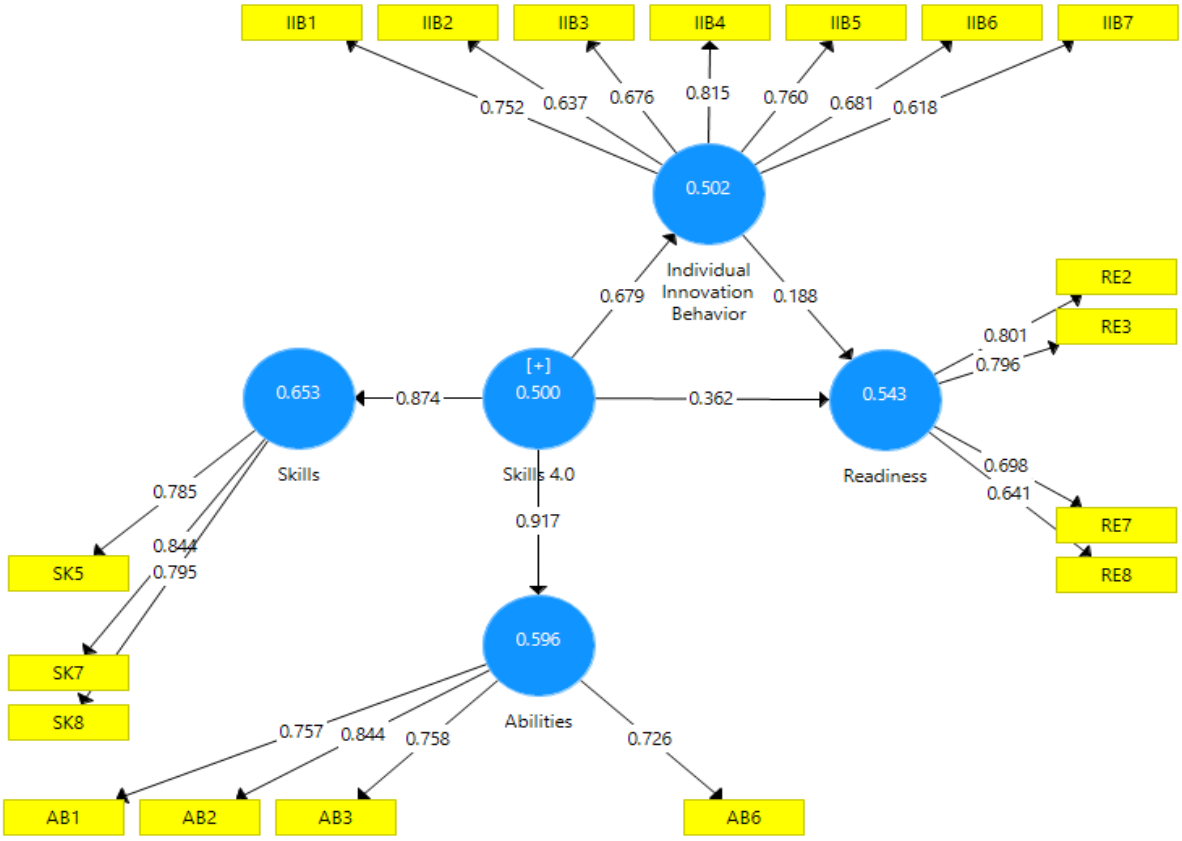

Figure 5. The Result of Calculation with Algorithm PLS

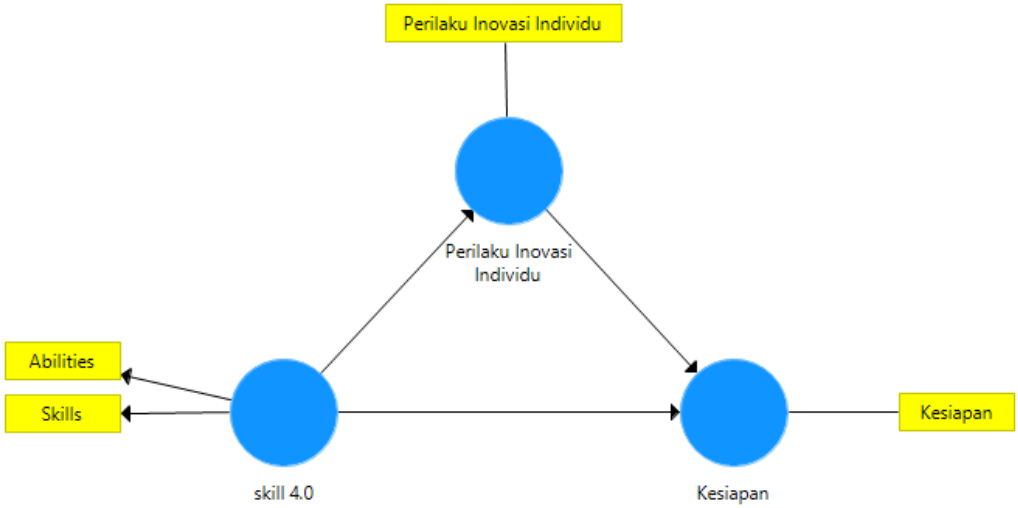

Figure 6. Significant Relationship of Structural Pathways

Table 13. The Result of Testing Coefficient of Determination (R^2)

	R Square
Readiness	0.259
Individual Innovation Behavior	0.460

For the result of testing effect size (f^2) can be seen in Table 14. Of the calculation of f^2, it can be concluded that the effect of skills 4.0 variable and individual innovation behavior is low on the readiness, namely near to 0.02, while the effect of skills 4.0 variable is very high on the individual innovation behavior, namely > 0.35.

Table 14. The Result of Testing Effect Size (f^2)

	Readiness	Individual Innovation Behavior
Individual Innovation Behavior	0.026	
skills 4.0	0.096	0.852

The result of testing cross-validated redundancy (Q^2) can be seen in Table 15. Evaluation of Q^2 shows that all endogen variables > 0, concluding that the skills 4.0 can be used to predict readiness and individual innovation behavior.

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Table 15. The Result of Testing cross-validated redundancy (Q^2)

	Q^2 (=1-SSE/SSO)
Readiness	0.234
Individual Innovation Behavior	0.447

Based on the result of the testing, it can be explained that though skills 4.0 can be used to predict readiness and individual innovation behavior (based on the value of Q^2), the contribution of the effect of skills 4.0 is low on the readiness (based on the value of R^2) with the effect of skills 4.0 and individual innovation behavior is low on the readiness (based on f^2). The value of path coefficients determines acceptance and rejection of research hypotheses. The results of the relevance test of the coefficient of Original Sample (O) can be seen in Table 16.

Table 16. Value of Original Sample

	Original Sample (O)
Individual Innovation Behavior -> Readiness	0.187
Skills 4.0 -> Readiness	0.363
Skills 4.0 -> Individual Innovation Behavior	0.678

The effect of individual innovation behavior is weak and minimal on the readiness based on the value of the Original Sample (O), which is close to 0 is 0.187. It means that the readiness of students of Universitas Andalas to face the Revolution of Industry 4.0 is not so strongly influenced by individual innovation behavior. Skills 4.0 has a moderately positive effect on individual innovation behavior. However, the skills 4.0 adequately influence the readiness.

The result of the calculation of the value of path coefficients can be seen in Figure 7. The three variables have positive relationships. The highest value of path coefficients is in the skills 4.0 path to individual innovation behavior, which is 0.678, while the lowest value of path coefficients is in the individual innovation behavior path to the readiness.

Determining the level of significance of the path coefficient statistically uses t-value and p-value. The calculation of t-value and p-value is carried out after using the technique of bootstrapping with 5000 samples of bootstrap with the level of significance equals 0.05. The resulted t-value and p-value is presented in Table 17. The t-value with the level of significance of 0.05 is 1.96 [18]. Thus, based on Table 17 and Figure 5, it can be seen that the statistical value of t > critical value (1.96), and the value of $p < 0.05$. This indicates that H_1, H_2, and H_3 are accepted, meaning that the skills 4.0 has a significant effect on the readiness and individual innovation behavior. Also, individual innovation behavior has a significant effect on readiness.

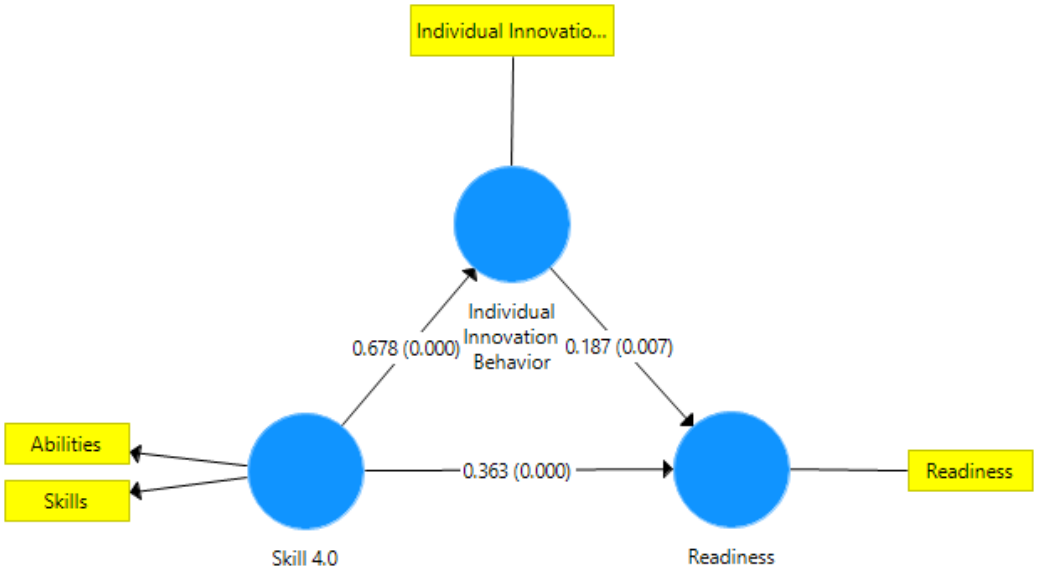

Figure 7. The Result of Calculation of the Value of Path Coefficient

Table 17. t value and p-value for each Path Coefficients

	t-value	p-value
Individual Innovation Behavior -> Readiness	2.694	0.007
skills 4.0 -> Readiness	5.08	0.000
skills 4.0 -> Individual Innovation Behavior	18.673	0.000

Testing hypotheses for the mediation variable is made by using the method of Sobel. Sobel test is carried out to examine the effect of the relationship of skills 4.0 on the readiness mediated by individual innovation behavior. The value of the mediating variable is the value $z_{hit} > z_{tabel}$ (1.96). Those relationship is shown in Figure 8.

Hypotheses testing for the mediation variable is measured using the Sobel test online calculator. The result of the calculation can be seen in Figure 9. Based on Figure 9, it can be seen that the result of calculation with Sobel test of 2.64495257 > z_{tabel} (1.96). It demonstrates that the individual innovation behavior as mediating variable is able to mediate skills 4.0 with readiness.

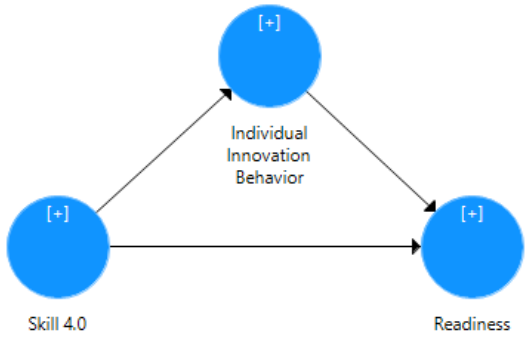

Figure 8. The Relationship *Skills* 4.0 with Readiness Mediated by Individual Innovation Behavior

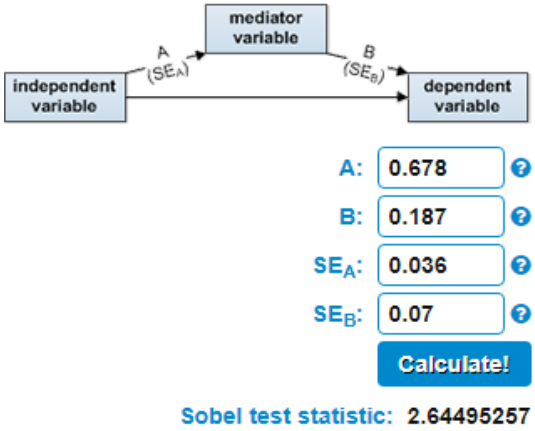

Figure 9. Sobel Test Online Calculator

CONCLUSIONS

The result of the study shows that skills 4.0 has a positive effect on readiness and individual innovation behavior. Indicators of skills 4.0 having a significant impact on that relationship are critical thinking, complex problem solving, and leadership which are correlated to behaviors of analytical thinking, initiative, creativity dan originality. For indicators of readiness variable having a significant effect, among others, Knowledge Sharing, Data-Driven Operation, ICT Competence, and New ICT Skills. All indicators of individual innovation behavior in the preliminary study have a significant effect on the relation. The indicators are Exploring New Opportunity, New Idea Generation, Ability to Adopt New Product/Service, Championing New Idea, New Idea Implementation, Problem Solving Ability, and Network Building. The built model in this study can be used to describe the relationship between skills 4.0 on readiness and individual innovation behavior, even though the level of accuracy of prediction is categorized weak and mediate. Study on students' readiness in facing a revolution of industry 4.0 is limited, examined from mastery of skills 4.0 and individual innovation behavior. Hence, for further research in wider scopes, whether usable variables or research samples so that it can minimize the weaknesses of the study. To be ready to face the challenges of revolution of industry 4.0, students of Universitas Andalas need to improve their mastery of all indicators contained in the variable of skills 4.0, including indicators of Idea Generation And Reasoning Abilities, Quantitative Abilities, Programming and Technology Design.

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NOMENCLATURE

AB	Ability
SK	Skill
IIB	Individual Innovation Behavior
RE	Readiness
P	Proportion of sample
A	Total population in each group
N	Total all population
AVE	*Average Variance Extracted*
R^2	*Coefficient of Determination*
f^2	E*ffect Size*
Q^2	*Cross-Validated Redundancy*
O	Original Sample