Indonesian Journal of Education & Mathematical Science
Vol. 5, No. 2, Mei 2024, pp. 107~129
ISSN: 2721-3838, DOI: 10.30596/ijems.v5i2.19032

Increasing Lecturer Innovation through Strengthening Personality, Transformational Leadership, Organizational Culture and Work Motivation Using Path Analysis and SITOREM Analysis Techniques at Politeknik Negeri Jakarta

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ABSTRACT

This study aims to find out empirical data and find strategies and ways to increase lecturer innovation through efforts to strengthen personality, transformational leadership, organizational culture and work motivation. This study uses the path analysis method that is used to determine the direct and indirect effect between variables, then followed by SITOREM analysis to analyze the indicators of research variables so that efforts will be made to increase lecturer innovation through strengthening personality, leadership transformational, organizational culture and work motivation. The population of this study was a lecturer at the Jakarta State Polytechnic, totaling 398 lecturers with a number of research samples of 200 lecturers taken with random sampling techniques using the Slovin formula. The results of the path analysis shows that there is a significant positive direct effect of personality (X1) on lecturer innovation (Y) with βy1 = 0.205, there is a significant positive direct effect of transformational leadership (X2) on lecturer innovation (Y) with βy2 = 0.245, there is a significant positive direct of organizational culture (X3) on lecturer innovation (Y) with βy3 = 0.211, there is a significant positive direct effect of work motivation (X4) on lecturer innovation (Y) with βy4 = 0.344. There is a significant positive direct of personality (X1) on work motivation (X4) with βy41 = 0.239, there is a significant positive direct of transformational leadership (X2) on work motivation (X4) with βy42 = 0.301, there is a significant positive direct effect of organizational culture (X3) on work motivation (X4) with βy43 = 0.394. There is a significant positive indirect effect of personality (X1) on lecturer innovation (Y) through work motivation (X4) with βxy1 = 0.049, there is a significant positive indirect effect of transformational leadership (X2) on lecturer innovation (Y) through work motivation (X4) With βxy2 = 0.074, there is a significant positive indirect effect of organizational culture (X3) on lecturer innovation (Y) through work motivation (X4) with βxy3 = 0.083. And based on the SITOREM analysis, several efforts were made to increase lecturer innovation by improving indicators, are: 1) product development; 2) use of new models; 3) product improvement; 4) products produced; 5) communication with customers; 6) model improvement and 7) relationships with customers. Efforts to strengthen personality by improving indicators, are: 1) openness; 2) awareness; and 3) neuroticism, and maintaining or developing good indicators, are: 1) agreeableness and 2) extraversion. Efforts to strengthen transformational leadership by improving indicators, are: 1) exemplary; 2) inspiration; and 3) innovative behavior; and maintaining or developing good indicators, are: 1) creation; 2) trusted behavior; and 3) loyalty. Efforts to strengthen organizational culture by maintaining or developing good indicators, are: 1) the atmosphere felt by members in the life of the organization, 2) the most important (dominant) values that members, 4) patterns of organizational behavior, and 5) norms and standards of behavior at work; And efforts to strengthen work motivation by improving indicators, are: 1) achievement; 2) meeting affiliate needs; 3) work completion; and 4) participation, and maintaining or developing good indicators, namely; 1) morale; 2) opportunities and 3) utilization of expertise.

Keywords: lecturer innovation, personality, transformational leadership, cultural organization and work motivation.

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1. INTRODUCTION

Indonesia's Vision 2045 is an important guideline regarding the direction of Indonesia's development towards a Golden Indonesia, namely 100 years of Independent Indonesia, carried out with four main pillars, one of which is human resource development. In the era of globalization, labor market conditions are characterized by the integration of labor between countries and also accompanied by the emergence of various new types of work in line with innovation in the field of science and technology and increased creativity to provide answers to increasingly fierce competition.

McKinsey Global Institute (MGI) shows that in the global labor market in 2030 Indonesia is expected to experience a shortage of educated and skilled labor, but an excess of unskilled

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labor(Handayani, 2015). Referring to data released by the Asian Development Bank in 2015, it was recorded that Indonesia had 55 million skilled workers, but based on estimates in the Master Plan for the Acceleration and Improvement of Economic Growth in Indonesia (MP3EI), of this number, 113 million skilled workers will still be needed by 2030 with an average addition of 3.2 million per year. Changes in worker skills in Indonesia in the 2017-2030 period. Figure 1 Job Skills Goals in Indonesia 2017-2030 (Ministry of Manpower, 2017)

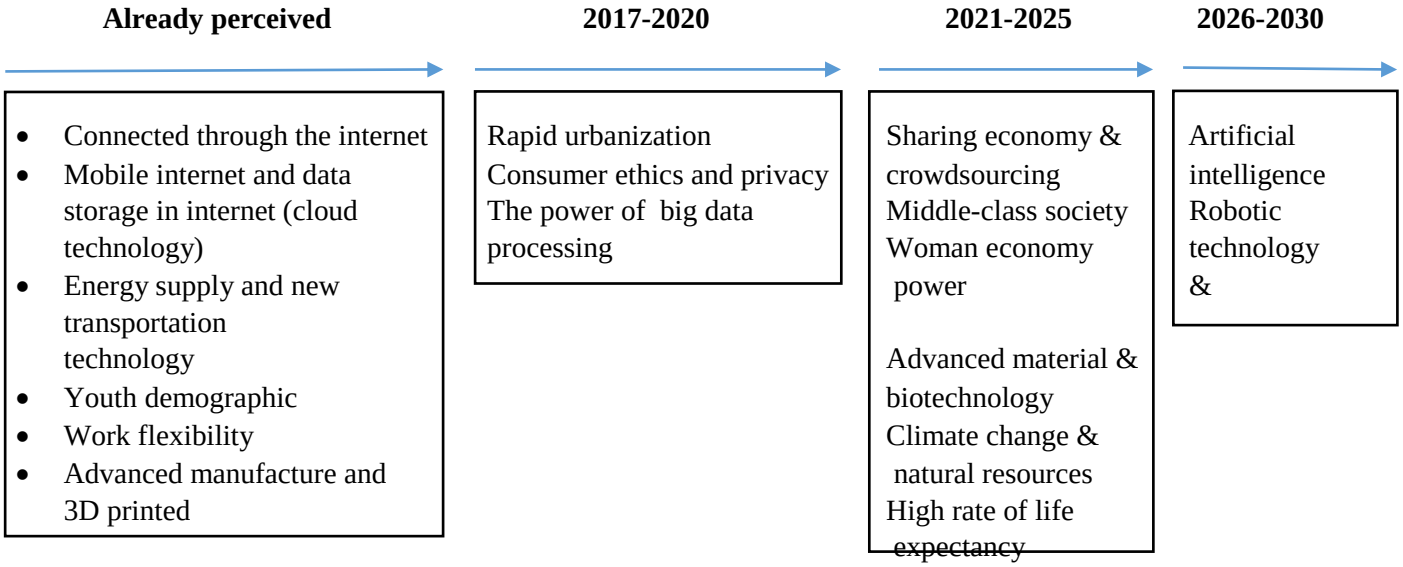

Fig 1. Global Human Capital Index by the World Economic Forum

Based on Global Human Capital Index by the World Economic Forum (WEF) 2017, Indonesia's HR ranking is in 65th position out of 130 countries, lagging behind Malaysia (33rd), Thailand (40th) and Vietnam (64th)(World Bank, 2017). Even though Indonesia's labor productivity has increased, namely from 81.9 million rupiah/person in 2017 to 84.07 million rupiah/person in 2018, Indonesian labor productivity is still lagging behind compared to Singapore and Malaysia. Apart from that, Indonesia's GDP growth was 4.9 percent in 2017, only 0.6 percent of which came from Total Factor Productivity (TFP). The remaining 2.8 percent of economic growth comes from capital and 1.5 percent from human capital. A review of these facts shows that Indonesian workers have very low work competency, which can provide an indication of how weak the human resource preparation system is in Indonesia.

The future challenge for higher education institutions in Indonesia in facing competition is the ability of their educational institutions to position themselves at par with leading universities in the world. The development of a number of universities into world-class universities has been carried out in many countries. At the Asian level, Japan is ranked first, followed by Singapore, Hong Kong, China, Korea, while universities in Indonesia have still not reached the hundredth rank as world-class universities at the Asian level. (The Times Higher Education, Download, as of August, 2014). The Times Higher Education's world-class university ranking data is based on considerations of a university's mission, teaching methods, research, knowledge transfer and international insight. The development of higher education cannot be separated from the role of lecturers. Lecturers are university human resources who have a very central and strategic role in all activities at the university. The performance of lecturers will greatly determine the high or low quality of a higher education institution that can be realized if lecturers carry out their duties with full creativity through lecturer innovation.

The world of education is currently experiencing significant changes, especially in terms of technology. Technology experiences changes and developments in every era (Desy Irsalina Savitri, 2019). This development has an impact on the role of lecturers as educators in the learning process. In this case, lecturers must be able to create a pleasant learning atmosphere and produce student graduates

in accordance with educational goals. Student learning outcomes will of course also increase along with the innovations carried out by lecturers. Therefore, lecturers must have high innovation power and be able to create tools that are able to achieve learning goals. Lecturer innovation is very necessary in today's very rapid technological era. Lecturers as innovators must have the qualities of a true leader, namely the ability to influence and the ability to create sustainable changes in a situational manner adapted to the character of the students in the class they teach. With their ability to innovate, lecturers who are innovators always become reliable lecturers, always make students have hope and are able to make students motivated in learning, besides that, lecturers must also be able to provide solutions to achieve educational goals.

The importance of superior lecturers is that they are expected to be able to solve educational problems. As stated by the Minister of Education and Culture, the complexity of the future, if human resources are good, then educational problems will be overcome. The presence of platform 4.0 has an impact on innovation that needs to be implemented by lecturers. The presence of platform 4.0 which relies on cyber-physical systems, supported by rapid technological advances, information bases, knowledge, innovation and networking, heralds the emergence of a creative century.(Sirait, 2022). Apart from that, the weak mentality of students is also one of the challenges in creating quality education. Following up on these conditions, the Ministry of Education and Culture issued a policy, one of which was called the independent learning program. The independent learning program can provide opportunities for students to be able to master various soft skill competencies that can keep up with the needs of the times and can become moral and ethical individuals.(Simatupang & Yuhertiana, 2021). This is expected to improve the quality of human resources, and freedom of learning which can create a learning environment that is free for expression and free from psychological pressure. Therefore, lecturers are expected to be able to become people who are motivated in creating comfortable and enjoyable learning for their students in order to achieve learning goals in accordance with expectations.

Lecturers as people who have the task of providing facilities and motivation in changing student behavior from not knowing to knowing more, changing student behavior for the better. Lecturers can be said to be leaders of sections/units of several individuals who respect and are committed to the changes that will be made. The lecturer is a leader in a class. A successful leader is a leader who is an innovator and an indicator. The success of an innovator is being able to create team success by being a reliable team player, being able to work together, being able to make a big contribution to the team, being able to create sustainable change situationally according to the character of the team personnel and being able to motivate the team to innovate(Enadarlita, 2019). An innovator's innovation is highly demanded to be a creative individual in developing various things in the world of education. Lecturer innovation is the ability of an innovator to introduce new ideas, methods, tools or other things, as well as being able to realize creative, useful new ideas that can provide added value. However, in reality in higher education, innovation carried out by lecturers is still said to be low. Lecturers' understanding of innovating or creating learning processes that activate students is still not clearly visible. Lecturers still do not understand the meaning and importance of innovation in learning. Apart from this, lecturers' courage in changing the rules set by university leaders is also a trigger for the problem of low lecturer innovation. Facilities in the form of campus infrastructure that are lacking can result in the innovation power of lecturers also being low. This condition results in the weakness or lack of lecturers in carrying out innovation.

Weak system for preparing the Nation's Human Resources (HR).Indonesia is influenced by various factors, one of which is the education system. The education system should not only be the basis for every human resource development process, but should also be able to make discoveries towards education that is more aligned with the needs of society and industry. This is a challenge for the education sector, for this reason universities as places where the educational process takes place and producing graduates in meeting workforce needs in the global era are increasingly being required to be able to respond to the needs of a world of work that continues to move dynamically and complexly. The challenges and demands mentioned above are trying to be answered by the education sector by

presenting an educational concept where practical elements in the lecture process are carried out more than theoretical elements, which has become known as vocational education.

Referring to Law no. 20 of 2003 concerning the National Education System, the framework of the education system must be directed at national interests(National, nd). The Indonesian government, through the National Medium Term Development Plan (RPJMN) 2020-2024, launched five main directions as strategies in implementing the Nawacita mission and achieving the targets of the Indonesian Vision 2045 through economic transformation supported by industrial downstreaming by utilizing human resources (HR), infrastructure, simplification of regulations, and bureaucratic reform.

This development planning is then directed at Indonesia's achievement target of getting out of the middle-income trap so that it can become a developed country (top 5 in the world) by 2045. In connection with this, national laws and regulations mandate the importance of strengthening vocational education. Vocational education is in principle intended to provide mastery of certain applied skills and adapt to technological advances to create job opportunities. In practice, vocational education combines concepts/theories in the classroom, practice and internships in an integrated manner for students to be able and ready (directly) to meet the needs of the industrial world. Thus, vocational education should be one of the pillars of human resource development to achieve the targets set by the government.

Seeing the huge challenge of the need for an educated and skilled workforce in the future, and the condition of the existing educational system and institutions, the government finally focused on growing the components of the education sector, especially on vocational education, where vocational education is an educational model that carries excellence in the form of 70% practice and 30% % theory, with the hope that it can be one of the answers to the problem of preparing college graduates with the applied skills needed by the labor market. One form of the Government's commitment to supporting Vocational Education is by issuing a policy in the form of Presidential Instruction number 9 of 2016 concerning the Revitalization of Vocational Schools in the Context of Improving the Quality and Competitiveness of Indonesian Human Resources, where the Presidential Instruction is used as a strategic legal momentum for the development of vocational education in Indonesia (Khurniawan et al., 2021). However, the need for skilled workers in the industrial world is not only at the level of vocational school graduates, but also at the level of polytechnic graduates, both D3 and D4 graduates. For this reason, the revitalization of vocational education does not stop at vocational schools, but must also be continued with the revitalization of polytechnics.

Polytechnics are higher education institutions that only provide vocational-based education, so polytechnics do not provide academic education. Polytechnic with its vision and mission is to prepare students to become graduates with professional skills who are able to apply, develop and disseminate science and technology, so they can compete in the world of work. To produce vocational graduates with professional abilities, a lecturer profile with superior abilities is needed. Based on Law no. 14 of 2005, Lecturers are professional educators and scientists with the main task of transforming, developing and disseminating science, technology and art through education, research and community service (Pratama et al., 2022). And lecturers are required to have academic qualifications, competencies, and educational certificates, be physically and mentally healthy, and meet other qualifications required by the higher education unit where they are assigned, and have the ability to realize national education goals. Where the achievement of national education goals is greatly influenced by lecturer innovation.

Based on the Ministry of Research, Technology and Higher Education's Press Release Number: 147/SP/HM/BKKP/VIII/2019 concerning Higher Education Clusterization from around 4,670 HEIs which include: Universities, Institutes, Polytechnics, Colleges and Academies, the contribution to research and science and technology is still worrying. The Ministry of Research and Technology/National Research and Innovation Agency (Ristek/BRIN) recently announced the results of the assessment of higher education research performance for the 2016-2018 period (Simlitabmas data), namely: only 47 universities were included in the Independent group, 146 universities in the Main group, 479 universities in the Intermediate group, and 1,305 universities in the Assisted group. The number of new contributors reached 1,977 universities or only 42% of the total 4,670 universities in

Indonesia, although the number of contributors in the above period showed an increase from the previous 2013-2015 period which only involved 1,447 universities.

Of the number above, only 10 (ten) universities have the highest research performance. All ten are state universities. Where are the private universities, when compared with the number of large, medium, small and micro scale business entities which amount to 56,539 560 (BPS, 2012), then there are still many opportunities for academics from Indonesian universities, the number of which is still relatively small, 89.5 per one million people contributing to research and innovation(National Research and Innovation Agency, nd)

Based on this data, it can be seen that the research level of lecturers is still low, this can show the activeness of lecturers in innovating because research is a form of proof of innovation carried out by lecturers. Where higher education is the basis for the development of science and technology, not only achieving professional graduates in the engineering field who are able to compete with foreign workers, in this era of globalization, but also being able to become a hub for research, technology, smart networks, and creating world civilization. .

Fajar & Hartanto, (2019) revealed thatThere are still things that can be improved, such as increasing the competency of vocational lecturers, strengthening pentahelix synergy and collaboration, revitalizing vocational education by adding a teaching factory, rebranding through direct studies to industry and comparative studies to more advanced educational institutions both inside and outside country, as well as adding and improving the character of students. Thus, it is hoped that vocational education can play a real role in efforts to achieve government programs to make Indonesia developed by preparing superior human resources.

In order to fulfill the needs of vocational graduates in the world of work in the industrial era 4.0 along with technological developments, of course innovation is needed by Polytechnic lecturers in preparing vocational graduates. To improve the quality of vocational education, especially in facing technological advances in the era of industry 4.0 and society 5.0. So the need for quality teaching staff must be answered by increasing innovation, competence, personality, motivation, polytechnic conditions, communication, and others which are carried out on an ongoing basis.

Lecturer innovation can be measured, one of the ways, by the amount of research conducted, because innovation itself is essentially research that produces new findings. To see the new findings produced, one source is published journal data.

The research location taken was the Jakarta State Polytechnic, where the Politeknik Negeri Jakarta is a vocational education institution established to meet the needs of professional human resources in industry, both the service industry and the manufacturing industry. Based on clustering data released by the Ministry of Research, Technology and Higher Education through Press Release Number: 147/SP/ HM/BKKP/VIII/2019 concerning Higher Education Clustering, the Jakarta State Polytechnic is included in cluster 3.

The following is a table of the number of lecturers who support lectures with various educational qualifications and functional positions with the following data composition:

Table 1. Lecturer Composition Based on Functional Positions

No.	Functional	Lecturer Status	
		Still	**Not fixed**
1.	Without Position	58	28
2.	Expert Assistant	85	1
3.	Lector	110	-
4.	Associate Professor	115	-
5.	Professor	1	-
	Amount	369	29

Source: Higher Education Database, Ministry of Education, Culture, Research, and Technology

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Table 2. Lecturer Composition based on Education Level

No.	Educational level	Lecturer Status	
		Still	**Not fixed**
1.	S3	40	1
2.	Applied PhD	-	-
3.	S2	324	19
4.	Applied Masters	1	-
5.	Sp-1	-	-
6.	Profession	-	-
7.	S1	4	9
	Amount	**369**	**29**

Source: Higher Education Database, Ministry of Education, Culture, Research, and Technology

Based on the conditions above, research related to lecturer innovation is needed to reveal and analyze what factors influence and dominate, so that efforts can be made to increase lecturer innovation.

2. RESEARCH METHOD

The research was conducted on lecturers at the Jakarta State Polytechnic (PNJ) which was carried out for 6 months from February to August 2022.

This research uses a combination research method between Quantitative Research and SITOREM Analysis. This combined research methodology flow uses a quantitative research flow which is analyzed using SITOREM analysis. As stated by S. Hardhienata (2017: 166), For the purposes of operations research in education management, we need to add the scientific identification theory mentioned above with statistical model and steps to obtain an optimal solution (For the purposes of Educational Management research, we need to add the scientific identification theory mentioned above with a model statistics and steps to obtain optimal solutions).

In summary, this research design consists of two major stages, namely

a. This research consists of quantitative research to prove the research hypothesis
b. Verify quantitative research results through SITOREM analysis, as in the research steps in the image below.

The research population was 398 lecturers at Politeknik Negeri Jakarta. The total research sample was 200 lecturers determined using the Slovin Formula (Umar, 2014).

Research data was obtained using instruments in the form of questionnaires consisting of instruments to measure: 1. Lecturer Innovation, 2. Personality, 3. Transformational Leadership, 4. Organizational Culture and 5. Work Motivation. Respondents who filled out the five instruments were lecturers at Politeknik Negeri Jakarta. The instruments for each variable were developed successively from conceptual definitions, operational definitions and instrument grids. Testing the validity of the test items and the reliability of the instrument is based on the results of testing the instrument on 30 test respondents. The results of the validity test and reliability test of the research instruments are as described in table 2 below:

Table 3. Validity and Reliability Test Results of Research Instruments

Variable Name	Number of Question Items	Valid statement	Reliability value	Conclusion
Lecturer Innovation	40	36	0.944	*valid*and reliable

Personality	40	38	0.945	*valid*and reliable
Transformational leadership	40	36	0.942	*valid*and reliable
Organizational culture	40	36	0.937	*valid*and reliable
Work motivation	40	36	0.926	*valid*and reliable

The data then was analysed through quantitative data analysis and SITOREM analysis. The quantitative data analysis was done through some stages such as:

a. The research data were analyzed using descriptive statistics, analysis prerequisite tests which included the Estimated Standard Error Normality Test (Liliefors), the Homogeneity of Variations Test (Barlet),
b. Linearity Test (if Fcount < Ftable with a significance level of 0.05)
c. Hypothesis testing using Linear Regression (calculations are entered into the ANOVA list to obtain Fcount), Multiple Regression (Model Summary, namely r value) (F Test) and Path Analysis Test using the SPSS Ver 26 tool

The SITOREM analysis was carried out to derive recommendations from the results of quantitative research and to determine the priority order for improvements that need to be carried out. The basic considerations used to derive recommendations and priority order for handling improvements include 3 (three) criteria, such as:

a. Strength of influence between independent and dependent variables
b. Priority order of indicators of the variables studied
c. Indicator values obtained from research results in the field

The research hypothesis is as follows:

a) Direct influence positive between personality (X1) and lecturer innovation (Y)
H0: $\beta y1 \leq 0$ There is no effect direct positive between personality (X1) and lecturer innovation (Y)
H1: $\beta y1 > 0$ There is influence direct positive between personality (X1) and lecturer innovation (Y)
b) Direct influence positive between personality (X1) and lecturer innovation (Y)
H0: $\beta y1 \leq 0$ There is no effect direct positive between personality (X1) and lecturer innovation (Y)
H1: $\beta y1 > 0$ There is influence direct positive between personality (X1) and lecturer innovation (Y)
c) Direct influence positive between organizational culture (X3) and lecturer innovation (Y)
H0: $\beta y3 \leq 0$ There is no influence direct positive between organizational culture (X3) and lecturer innovation (Y)
H1: $\beta y3 > 0$ There is influence direct positive between organizational culture (X3) and lecturer innovation (Y)
d) Direct influence positive between organizational culture (X3) and lecturer innovation (Y)
H0: $\beta y3 \leq 0$ There is no influence direct positive between organizational culture (X3) and lecturer innovation (Y)
H1: $\beta y3 > 0$ There is influence direct positive between organizational culture (X3) and lecturer innovation (Y)
e) Direct influence positive between organizational culture (X3) and lecturer innovation (Y)
H0: $\beta y3 \leq 0$ There is no influence direct positive between organizational culture (X3) and lecturer innovation (Y)
H1: $\beta y3 > 0$ There is influence direct positive between organizational culture (X3) and lecturer innovation (Y)
f) Direct influence positive between organizational culture (X3) and lecturer innovation (Y)
H0: $\beta y3 \leq 0$ There is no influence direct positive between organizational culture (X3) and lecturer innovation (Y)
H1: $\beta y3 > 0$ There is influence direct positive between organizational culture (X3) and lecturer innovation (Y)
g) Direct influence positive between organizational culture (X3) and lecturer innovation (Y)

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H0: βy3 ≤ 0 There is no influence direct positive between organizational culture (X3) and lecturer innovation (Y)
H1: βy3 > 0 There is influence direct positive between organizational culture (X3) and lecturer innovation (Y)

h) Direct influence positive between organizational culture (X3) and lecturer innovation (Y)
H0: βy3 ≤ 0 There is no influence direct positive between organizational culture (X3) and lecturer innovation (Y)
H1: βy3 > 0 There is influence direct positive between organizational culture (X3) and lecturer innovation (Y)

i) Direct influence positive between organizational culture (X3) and lecturer innovation (Y)
H0: βy3 ≤ 0 There is no influence direct positive between organizational culture (X3) and lecturer innovation (Y)
H1: βy3 > 0 There is influence direct positive between organizational culture (X3) and lecturer innovation (Y)

j) Indirect influence positive between organizational culture (X3) and lecturer innovation (Y) through work motivation (X4)
H0: β34y ≤ 0 There is no influence whatsoever direct positive between organizational culture (X3) and lecturer innovation (Y) through work motivation (X4)
H1: β34y > 0 There is no influence direct positive between organizational culture (X3) and lecturer innovation (Y) through work motivation (X4)

Based on the constellation of research variables above, a statistical mathematical model can then be prepared as follows:

a. Substructural Equation 1
$\hat{y} = y1 + y2 + y3 + y4 + y$
b. Substructural Equation 2
$\hat{y} = x1 + x2 + x3 + y$

3. RESULTS AND DISCUSSION

A. Descriptive Statistics

Based on the results of the analysis of statistical descriptions for research variables, symptoms of data concentration can be revealed as listed in table 3 below:

Table 4. Summary of Statistical Description of Research Variables

No.	Description	Personality (X1)	Transformational leadership (X2)	Organizational culture (X3)	Work motivation (X4)	Lecturer Innovation (Y)
1.	Average (Mean)	142,815	136.27	134,295	141.51	138,095
2.	Standard Error	1.94	1.57	1.66	1.43	1.52
3.	Middle Value (Median)	144.5	136.5	135	138.5	140
4.	Mode (Mode)	143	148	136	174	142
5.	Standard Deviation (Stand. Deviation)	27.40	22.16	23.49	20.27	21.45

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6.	Sample Variance (Sample Variance)	750.99	490,922	551.78	410.94	459.91
7.	Kurtosis	-0.076	-0.269	-0.430	-0.165	-0.568
8.	Curve Slope	-0.541	-0.042	-0.221	-0.067	-0.060
9.	Range	129	110	125	111	105
10.	Smallest Score (Minimum)	61	70	55	69	75
11.	Biggest Score (Maximum)	190	180	180	180	180
12.	Amount (Sum)	28563	27254	26859	28302	27619
13.	Number of Respondents (Count)	200	200	200	200	200

Data Source: Processed

B. Normality Test

Based on the overall calculation results of the error normality test in this study, it can be seen in the summary in table 4 below:

Table 5. Estimated Standard Error Normality Test

No	Estimate Error	N	Lcount	Table		Decision
				α = 0.05	α = 0.01	
1	Y–X1	200	0.004	0.063	0.073	Normal
2	Y–X2	200	0.004	0.063	0.073	Normal
3	Y–X3	200	0.006	0.063	0.073	Normal
4	Y–X4	200	0.009	0.063	0.073	Normal
5	X4–X1	200	0.004	0.063	0.073	Normal
6	X4–X2	200	0.004	0.063	0.073	Normal
7	X4–X3	200	0.006	0.063	0.073	Normal

Normal distribution requirements: Lcount < Ltable

Data Source: Processed

C. Homogeneity Test

Based on the overall calculation results of the error normality test in this study, it can be seen in the summary in table 5 below:

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Table 6. Summary of Data Variance Homogeneity Test

No	Grouping	X2count	X2 table α = 0.05	Conclusion
1.	Y on the basis of X1	5794.38	9668.15	Homogeneous
2.	Y on the basis of X2	4526.26	7346.81	Homogeneous
3.	Y on the basis of X3	4919.64	8098.77	Homogeneous
4.	Y on the basis of X4	4062.72	6373.13	Homogeneous
5.	X4 on the basis of X1	5687.55	9668.15	Homogeneous
6.	X4 on the basis of X2	4463.92	7346.81	Homogeneous
7.	X4 on the basis of X3	4864.84	8098.77	Homogeneous

Requirements for a homogeneous population $\chi 2$ count < $\chi 2$ table

D. Linearity Test

The overall calculation results of the linearity test of the regression model in this study can be seen in the summary in table 6 below:

Table 7. Summary of Regression Model Linearity Test Results (t Test)

No	Linearity Test	Fcount	Ftable	Sig	Conclusion
1	Lecturer Innovation (Y) → Personality (X1)	0.841	0.193	0.009	Linear
2	Lecturer Innovation (Y) → Transformational Leadership (X2)	2,316	1,390	0,000	Linear
3	Lecturer Innovation (Y) → Organizational Culture (X3)	2,233	1,819	0,000	Linear
4	Lecturer Innovation (Y) → Work Motivation (X4)	1,084	0.052	0.007	Linear
5	Work Motivation (X4) → Personality (X1)	1,011	0.824	0.004	Linear
6	Work Motivation (X4) → Transformational Leadership (X2)	1,908	0.937	0.001	Linear
7	Work Motivation (X4) → Organizational Culture (X3)	1,959	0.593	0,000	Linear

Data source: Data processed

E. Multicollinearity Test

Multicollinearity testing aims to determine whether the regression model found any correlation between independent variables or independent variables. Testing uses the Spearman Test. The effect of this multicollinearity is that it causes high variability in the sample. This means that the standard error is large, as a result, when the coefficient is tested, tcount will be a smaller value than ttable. The overall calculation results of the multicollinearity test are as follows:

Table 8. Summary of Multicollinearity Test

Variable	Tolerance	VIF	Precondition	Conclusion

Free

Personality (X1)	0.485	2,064	H0: VIF < 10, there is no multicollinearity H1: VIF > 10, there is multicollinearity	Ho is accepted. There is no multicollinearity
Transformational Leadership (X2)	0.353	2,831	H0: VIF < 10, there is no multicollinearity H1: VIF > 10, there is multicollinearity	Ho is accepted. There is no multicollinearity
Organizational culture (X3)	0.368	2,718	H0: VIF < 10, there is no multicollinearity H1: VIF > 10, there is multicollinearity	Ho is accepted. There is no multicollinearity
Work Motivation (X4)	0.317	3,159	H0: VIF < 10, there is no multicollinearity H1: VIF > 10, there is multicollinearity	Ho is accepted. There is no multicollinearity

Source: Processed Data

F. Heteroscedascity Test

In this research, to test whether there is heteroscedascticity using testGlejser where if the significant value is <0.05 then heteroscedasticity occurs, if on the contrary the significance value is ≥ 0.05 then homoscedasticity occurs. The overall calculation results of the heteroscedasticity test in this study can be seen in the summary in table 8 below:

Table 9. Summary of Heteroscedasticity

Variable	Sig.	α	Precondition	Conclusion
			H0: significant value < 0.05 means there is no	Ho accepted

	0,000	0.05		heteroscedasticity.	None heteroscedasticity
Personality (X1)			H1:	mark significant ≥ 0.05 then there is heteroscedasticity.	
			H0:	significant value < 0.05 means there is no heteroscedasticity.	Ho accepted
Transformational Leadership (X2)	0,000	0.05	H1:	mark significant ≥ 0.05 then there is heteroscedasticity.	None heteroscedasticity
			H0:	significant value < 0.05 means there is no heteroscedasticity.	Ho accepted
Organizational culture (X3)	0,000	0.05	H1:	mark significant ≥ 0.05 then there is heteroscedasticity.	None heteroscedasticity
			H0:	significant value < 0.05 means there is no heteroscedasticity.	Ho accepted
Work Motivation (X4)	0,000	0.05	H1:	mark significant ≥ 0.05 then there is heteroscedasticity.	None heteroscedasticity

Source: Processed Data

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G. Correlation Test

The complete correlation between variables tested using SPSS is shown in table 9 below:

Table 10. Correlation Test between Variables

		Lecturer Innovation_ Y	Personality_ X1	Transformational Leadership_X2	Organizational Culture_X3	Work Motivation_X 4
Lecturer Innovation_Y	Pearson Correlation	1	,720**	,783**	,765**	,815**
	Sig. (2-tailed)		,000	,000	,000	,000
	N	200	200	200	200	200
Personality_X1	Pearson Correlation	,720**	1	,663**	,599**	,675**
	Sig. (2-tailed)	,000		,000	,000	,000
	N	200	200	200	200	200
Transformational Leadership_X2	Pearson Correlation	,783**	,663**	1	,725**	,745**
	Sig. (2-tailed)	,000	,000		,000	,000
	N	200	200	200	200	200
Organizational Culture_X3	Pearson Correlation	,765**	,599**	,725**	1	,756**
	Sig. (2-tailed)	,000	,000	,000		,000
	N	200	200	200	200	200
Work Motivation_X4	Pearson Correlation	,815**	,675**	,745**	,756**	1
	Sig. (2-tailed)	,000	,000	,000	,000	
	N	200	200	200	200	200

**.Correlation is significant at the 0.01 level (2-tailed).

H. Path Analysis

The influence of the path as a whole by combining the results of the analysis on each substructure can be described as follows:

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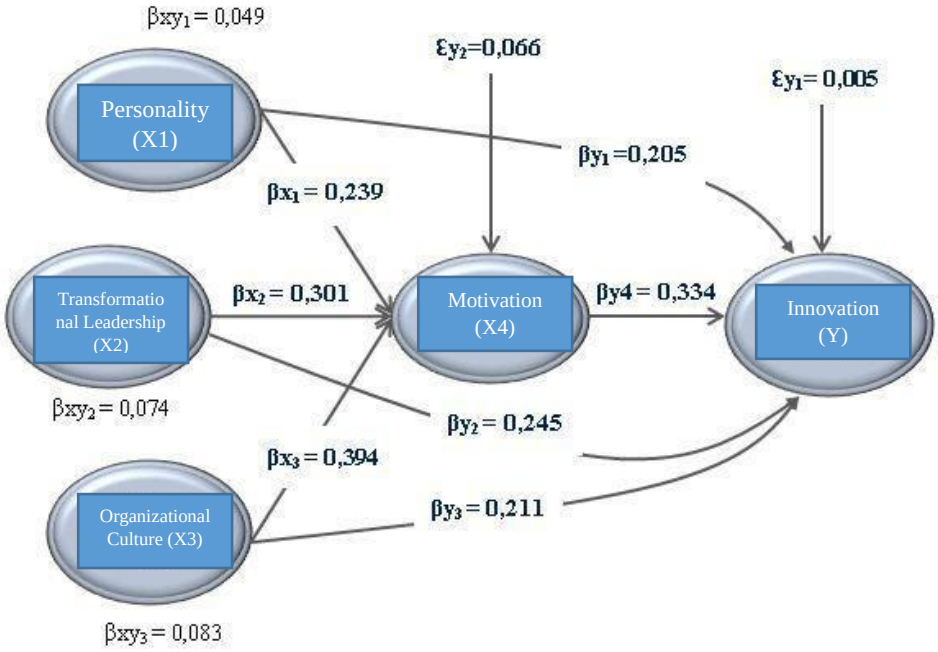

Fig 2. Path Analysis Results

The influence between the independent variable and the dependent variable when viewed from path analysis, then this relationship is a functional relationship where Lecturer Innovation (Y) is formed as a result of the functioning of the functions of National Personality (X1), Transformational Leadership (X2), Organizational Culture (X3) and Motivation Work (X4). Discussion of research results can be described as follows:

Table 11. Research Hypothesis

No	Hypothesis	Path Coefficient	Statistic Test	Decision	Conclusion
1	Personality (X1) on Lecturer Innovation (Y)	0.205	H0: $\beta y1 \leq 0$ H1: $\beta y1 > 0$	H0 is rejected H1 is accepted	Influential direct positive
2	Transformational Leadership (X2) on Lecturer Innovation (Y)	0.245	H0: $\beta y2 \leq 0$ H1: $\beta y2 > 0$	H0 is rejected H1 is accepted	Influential direct positive
3	Organizational Culture (X3) on Lecturer Innovation (Y)	0.211	H0: $\beta y3 \leq 0$ H1: $\beta y3 > 0$	H0 is rejected H1 is accepted	Influential direct positive
4	Work Motivation (X4) on Lecturer Innovation (Y)	0.334	H0: $\beta y4 \leq 0$ H1: $\beta y4 > 0$	H0 is rejected H1 is accepted	Influential direct positive
5	Personality (X1) on Work Motivation (X4)	0.239	H0: $xy1 \leq 0$ H1: $xy1 > 0$	H0 is rejected H1 is accepted	Influential direct positive
6	Transformational Leadership (X2) on Work Motivation (X4)	0.301	H0: $xy2 \leq 0$ H1: $xy2 > 0$	H0 is rejected H1 is accepted	Influential direct positive
7	Organizational Culture (X3) on Work Motivation (X4)	0.394	H0: $xy3 \leq 0$ H1: $xy3 > 0$	H0 is rejected H1 is accepted	Influential direct positive
8	Personality (X1) on Lecturer Innovation (Y) through Work Motivation (X4)	0.049	H0: $xy1 \leq 0$ H1: $xy1 > 0$	H0 is rejected H1 is accepted	Influential direct positive

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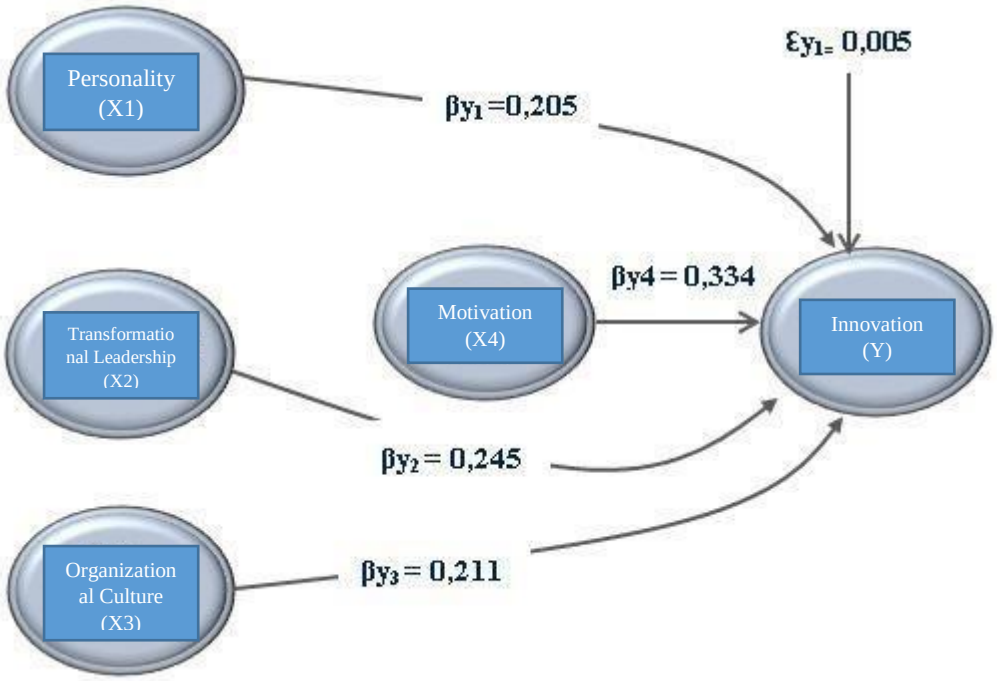
9	Transformational Leadership (X2) towards Lecturer Innovation (Y) through Work Motivation (X4)	0.074	H0: βxy2 ≤ 0 H1: βxy2 > 0	H0 is rejected H1 is accepted	Influential direct positive
10	Organizational Culture (X3) on Lecturer Innovation (Y) through Work Motivation (X4)	0.083	H0: βxy3 ≤ 0 H1: βxy3 > 0	H0 is rejected H1 is accepted	Influential direct positive

Data source: processed

I. Statistical Mathematical Models

Based on the constellation of influences between variables, a statistical mathematical model is produced as follows:

1) Substructural Equation 1



Based on the results of path analysis, the path model in substructure-1 is as followsŷ = 0.205x1 + 0.245x2 + 0.211x3 + 0.334 x4 + y1

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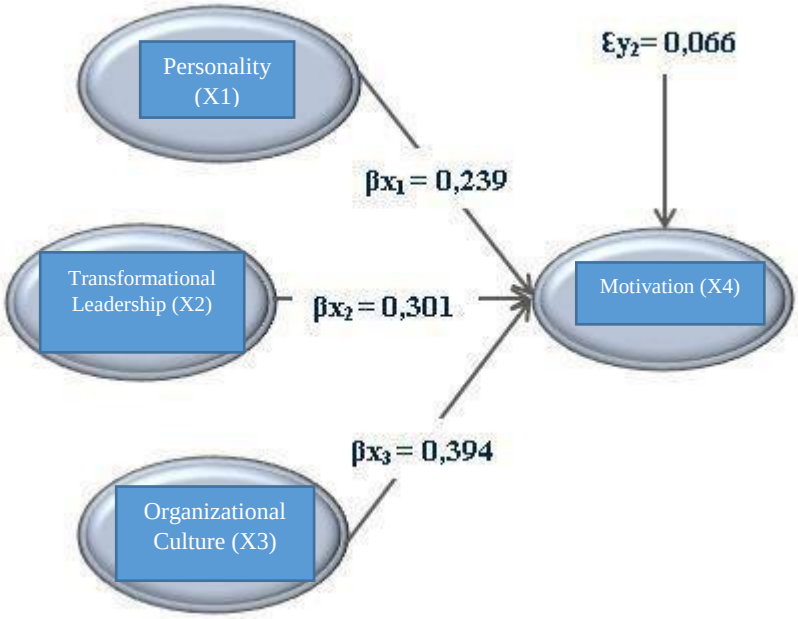
2) Substructural Equation 2



Based on the results of path analysis, the path model in substructure-2 is as follows ŷ=0.239x1+0.301x2+0.394x3+ y2

J. Indirect Effect Test

The indirect effect test is used to test the effectiveness of the intervening variable which mediates the independent variable and the dependent variable. The results of the indirect influence test can be seen in the following table:

Table 12. Research Hypothesis

No	Influence indirect	Zcount	Ztable	Decision	Conclusion
1	Personality (X1) on Lecturer Innovation (Y) through Work Motivation (X4)	5.619	1.966	H0 is rejected H1 is accepted	There is a significant indirect effect of personality (X1) on lecturer innovation (Y) through work motivation (X4)
2	Transformational Leadership (X2) towards Lecturer Innovation (Y) through Work Motivation (X4)	6.686	1.966	H0 is rejected H1 is accepted	There is a significant indirect effect of transformational leadership (X2) on lecturer innovation (Y) through work motivation (X4)
3	Organizational Culture (X3) towards Lecturer Innovation (Y) through Motivation Work (X4)	5.612	1.966	H0 is rejected H1 is accepted	There is a significant indirect effect of organizational culture (X1) on lecturer innovation (Y) through work motivation (X4)

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K. Optimal Solution for Increasing Lecturer Innovation

Based on the results of statistical hypothesis testing, determining indicator priorities, and calculating indicator values as described above, a recapitulation of research results can be made which is the optimal solution for improving lecturer innovation such as the following:

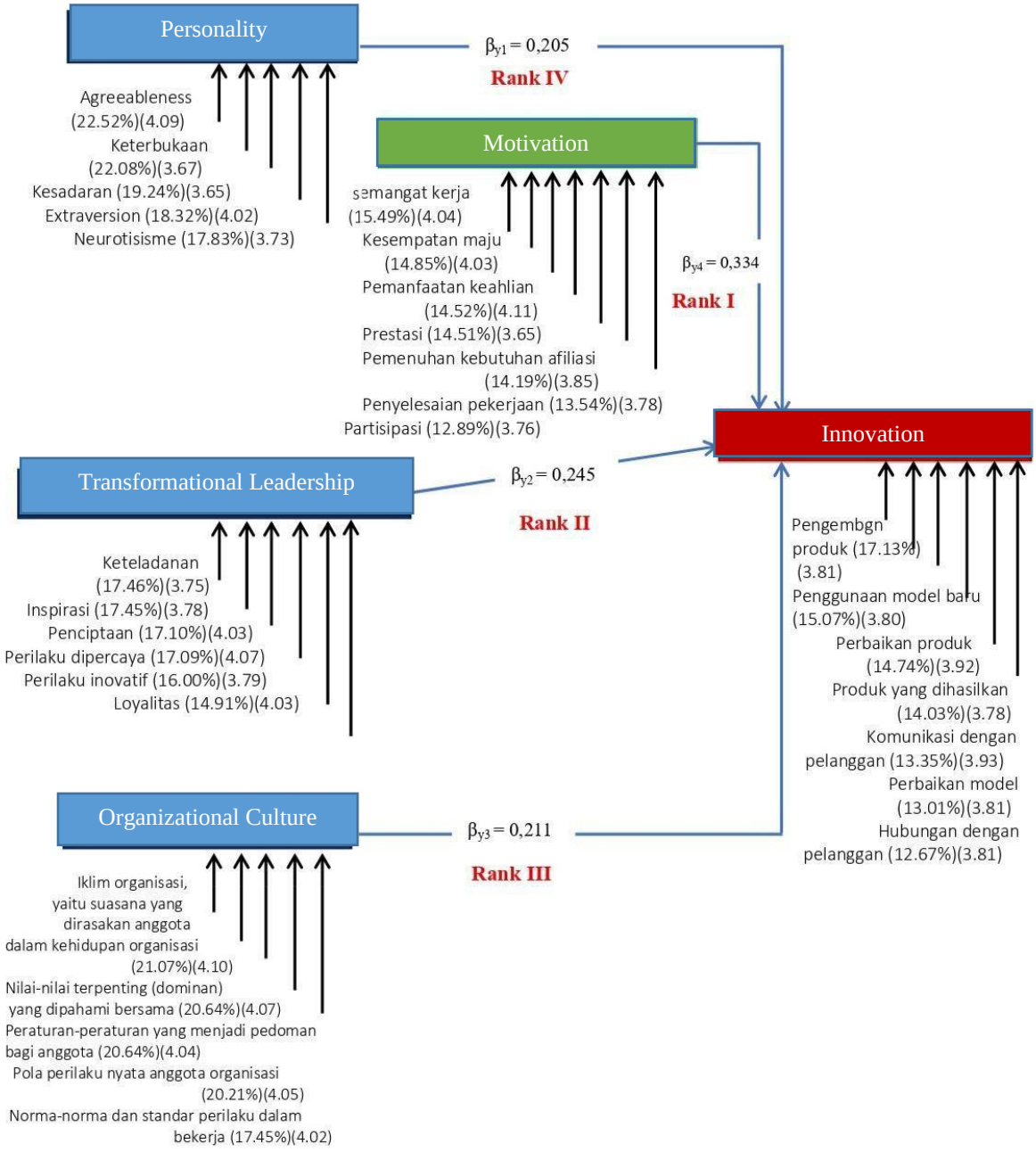

Fig. 3 Constellation of Research Variables and Indicators

Based on the results of the SITOREM analysis, we can know the value for each variable and the final results of the variables that are a priority for improvement and the variables that are a priority for improvement, as follows:

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Table 13. SITOREM Analysis

Lecturer Innovation			
Indicators in Initial State		Indicator after Weighting by Expert	Indicator Value
Products produced	1st	Product development (17.13%)	3.81
Product improvements	2nd	Use of new models (15.07%)	3.8
Product development	3rd	Product improvement (14.74%)	3.92
Use of new models	4th	Products produced (14.03%)	3.78
Model improvements	5th	Communication with customers (13.35%)	3.93
Communication with customers	6th	Model improvements (13.01%)	3.81
Relationship with customers	7th	Relationship with customers (12.67%)	3.81

Personality (βY1 = 0.205)(IV)			
Indicators in Initial State		Indicator after Weighting by Expert	Indicator Value
Awareness	1st	Agreeableness (22.52%)	4.09
Agreeableness	2nd	Openness (22.08%)	3.67
Neuroticism	3rd	Awareness (19.24%)	3.65
Openness	4th	Extraversion (18.32%)	4.02
Extraversion	5th	Neuroticism (17.83%)	3.73

Transformational Leadership (βy2 = 0.245)(II)			
Indicators in Initial State		Indicator after Weighting by Expert	Indicator Value
Exemplary	1st	Exemplary (17.46%)	3.75
Trustworthy behavior	2nd	Inspiration (17.45%)	3.78
Inspiration	3rd	Creation (17.10%)	4.03
Creation	4th	Trustworthy behavior (17.09%)	4.07
Innovative behavior	5th	Innovative behavior (16.00%)	3.79
Loyalty	6th	Loyalty (14.91%)	4.03

Organizational Culture (βy3 = 0.211)(III)			
Indicators in Initial State		Indicator after Weighting by Expert	Indicator Value
Real behavior patterns of organizational members	1st	Organizational climate is the atmosphere felt by members in organizational life (21.07%)	4.10
Norms and standards of behavior at work	2nd	The most important (dominant) values that are mutually understood (20.64%)	4.07
The most important (dominant) values that are mutually understood	3rd	Regulations that serve as guidelines for members (20.64%)	4.04
Rules that serve as guidelines for members	4th	Real behavioral patterns of organizational members (20.21%)	4.05
Organizational climate is the atmosphere felt by members in organizational life	5th	Norms and standards of behavior at work (17.45%)	4.02

Organizational Culture (βy3 = 0.211)(III)			
Indicators in Initial State		Indicator after Weighting by Expert	Indicator Value
Real behavior patterns of organizational members	1st	Organizational climate is the atmosphere felt by members in organizational life (21.07%)	4.10
Norms and standards of behavior at work	2nd	The most important (dominant) values that are mutually understood (20.64%)	4.07

The most important (dominant) values that are mutually understood	3rd	Regulations that serve as guidelines for members (20.64%)	4.04
Rules that serve as guidelines for members	4th	Real behavioral patterns of organizational members (20.21%)	4.05
Organizational climate is the atmosphere felt by members in organizational life	5th	Norms and standards of behavior at work (17.45%)	4.02

Work Motivation (βy4 = 0.334)(I)			
Indicators in Initial State		Indicator after Weighting by Expert	Indicator Value
Performance	1st	Work morale (15.49%)	4.04
Utilization of expertise	2nd	Opportunity to advance (14.85%)	4.03
Spirit at work	3rd	Skills utilization (14.52%)	4.11
Completion of work	4th	Achievement (14.51%)	3.65
Fulfillment of affiliate needs	5th	Fulfillment of affiliate needs (14.19%)	3.85
Opportunity to advance	6th	Job completion (13.54%)	3.78
Participation	7th	Participation (12.89%)	3.76

SITOREM Analysis Results			
Priority order of indicators to be strengthened		**Indicator remains to be maintained**	
Work Motivation (βy4 = 0.334)(I)			
1st	Achievement (14.51%)(3.65)	1	Work morale (15.49%)(4.04)
2nd	Fulfillment of affiliate needs (14.19%)(3.85)	2	Opportunity to advance (14.85%)(4.03)
3rd	Job completion (13.54%)(3.78)	3	Skills utilization (14.52%)(4.11)
4th	Participation (12.89%)(3.76)		
Transformational Leadership (βy2 = 0.245)(II)			
5th	Exemplary (17.46%)(3.75)	4	Creation (17.10%)(4.03)
6th	Inspiration (17.45%)(3.78)	5	Trustworthy behavior (17.09%)(4.07)
7th	Innovative behavior (16.00%)(3.79)	6	Loyalty (14.91%)(4.03)
Organizational Culture **(βy3 = 0.211) (III)**			
		7	Organizational climate, namely the atmosphere felt by members in organizational life (21.07%) (4.10)
		8	The most important (dominant) values that are mutually understood (20.64%) (4.07)
		9	Regulations that serve as guidelines for members (20.64%) (4.04)
		10	Real behavior patterns of organizational members (20.21%) (4.05)
		11	Norms and standards of behavior at work (17.45%) (4.02)
Personality (**βY1 = 0.205**) (IV)			
8th	Openness (22.08%) (3.67)	12	Agreeableness (22.52%)(4.09)
9th	Awareness (19.24%) (3.65)	13	Extraversion (18.32%)(4.02)
10th	Neuroticism (17.83%) (3.73)		
Lecturer Innovation (Y)			
11th	Product development (17.13%) (3.81)		
12th	Use of new models (15.07%) (3.80)		

13th Product improvement (14.74%) (3.92)
14th Products produced (14.03%) (3.78)
15th Communication with customers (13.35%) (3.93)
16th Model improvements (13.01%) (3.81)
17th Relationships with customers (12.67%) (3.816)

Source: Data processed

4. CONCLUSION

This research has succeeded in finding ways and strategies to increase lecturer innovation through identifying strengths influence between research variables. Furthermore, this research has produced findings regarding research variable indicators that need to be improved and maintained. Based on the results of the analysis, discussion of research results and hypotheses that have been tested, it can be concluded as follows:

a. There is an immediate positive influence personality (X1) towards lecturer innovation (Y), with path coefficient (y1) = 0.205, so personality strengthening (X1) can improve lecturer innovation (Y).
b. There is influence positive direct transformational leadership (X2) towards lecturer innovation (Y), with the path coefficient value (y2) = 0.245, so that transformational leadership is strengthened (X2) can improve lecturer innovation (Y).
c. There is Influence positive direct organizational culture (X3)towards lecturer innovation (Y),with path coefficient (y3) = 0.211, thus strengthening organizational culture (X3) can improve lecturer innovation(Y).
d. There is influence positive direct motivation Work(X4) towards lecturer innovation (Y), with the path coefficient value (y4) = 0.334, so it is strengthening motivation Work(X4) can improve lecturer innovation (Y).
e. There is influence positive direct personality (X1) on motivation Work(X4), with a path coefficient value (βy41) = 0.239, so it is strengthening personality (X1) can improve motivation Work(X4).
f. There is influence positive direct transformational leadership (X2) on motivation Work(X4), with the path coefficient value (y42) = 0.301, so it is strengthening transformational leadership (X2) can improve motivation Work(X4).
g. There is influence positive directly organizational culture (X3) on motivation Work(X4),with the path coefficient value (y43) = 0.394, so it is strengthening organizational culture (X3) can improve motivation Work(X4).
h. There is influence positive indirect personality (X1) towards lecturer innovation (Y) through motivation Work(X4), with the path coefficient value (xy1) = 0.049, so it is strengthening personality (X1) can increase lecturer innovation (Y) through motivation Work(X4).
i. There is influence positive indirect transformational leadership (X2) towards lecturer innovation (Y) through motivation Work (X4), with the path coefficient value (xy2) = 0.074, so it is strengthening transformational leadership (X2) can increase lecturer innovation (Y) through motivation Work (X4).
j. There is influence positive indirectly organizational culture (X3) on lecturer innovation (Y) through motivation Work (X4), with the path coefficient value (xy3) = 0.083, so it is strengthening organizational culture (X3) can increasing lecturer innovation (Y) through motivation Work(X4).
k. Based on the SITOREM analysis, the optimal solution is obtained as follows:
    1) Priority order for handling indicators that will be strengthened
        - 1st Achievement (14.51%) (3.65)
        - 2nd Fulfillment of affiliate needs (14.19%) (3.85)
        - 3rd Job completion (13.54%) (3.78)
        - 4th Participation (12.89%) (3.76)
        - 5th Exemplary (17.46%) (3.75)
        - 6th Inspiration (17.45%) (3.78)
        - 7th Innovative behavior (16.00%) (3.79)

- 8th Openness (22.08%) (3.67)
- 9th Awareness (19.24%) (3.65)
- 10th Neuroticism (17.83%) (3.73)
- 11th Product development (17.13%) (3.81)
- 12th Use of new models (15.07%) (3.80)
- 13th Product improvement (14.74%) (3.92)
- 14th Products produced (14.03%) (3.78)
- 15th Communication with customers (13.35%) (3.93)
- 16th Model improvements (13.01%) (3.81)

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