

# Triple Helix Relations to Develop Competence

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## Abstract

Prior studies document that the application of PBL bringing in unqualified and ineffective TVET lecturers. The current study explores the working environment of lecturers at a polytechnic in Central Java, Indonesia, specifically focused on classroom teaching schedules. The vocational lecturers have 2.5 to 3 working days available each week per semester, based on this situation will result in a vocational lecturer lacking time for applied research. The triple helix research relations play an important role in developing lecturer's competence in polytechnics. This study aims to reveal a significant of the relationship in the triple helix variables for developing lecturer's competence in polytechnics. This study used a quantitative method with a questionnaire that was distributed to 120 persons. WarpPLS 7.0 was utilized to analyze the data. The triple helix research relations for developing lecturer's competence have ARS value is 0.748 and APC value is 0.859, so the triple helix variables have a directly significant effect. The magnitude of the p-values is less than 0.05, so that industry and government variables, government and polytechnic variables and polytechnic and industry variables have significant influences. These results are robust to the collaborative studies using the triple helix relations framework. Collaboration on industry research with Polytechnic should be supported by government policy. Government regulation offers financial support for lecturer research, and it will also enhance lecturer's interest for applied research.

**Keywords:** Development Competence, Lecturer's Competence, Polytechnic, Research Collaboration, Triple Helix Relation, WarpPLS Analysis.

## Introduction

The availability of competent workers is still a main problem in Indonesia. The Central Statistics Agency recorded Indonesia's unemployment in February 2021 at 8.75 million, and 6.16% of them were in vocational education. This condition indicates that vocational and technical education systems must strengthen learning approaches that emphasize practical competence, problem-solving ability, and industry relevance.

Student-centered learning approaches have become increasingly important in higher education and Technical and Vocational Education and Training (TVET), particularly in developing higher-order thinking, problem-solving ability, and workforce readiness. Project-Based Learning (PjBL) emphasizes long-term projects that integrate theory and practice to produce authentic outputs, making it highly suitable for applied and technical disciplines where students demonstrate competence through tangible products (1). In contrast, Problem-Based Learning (PBL) focuses on structured problem scenarios that stimulate research, critical thinking, and collaborative

analysis rather than production of final projects, helping learners develop analytical reasoning and self-directed learning skills (2). Both models are constructivist in nature while PBL prioritizes systematic problem analysis and knowledge construction.

Integrating PBL into the technical and TVET framework of HE in Nigeria can improve the quality of graduate outcomes. The application of PBL involves bringing in unqualified and ineffective TVET lecturers (3). To solve this problem, collaboration between universities and industry is still necessary. Some evidence suggests that the industrial workforce from vocational schools is more favored by industry. This is closely related to the technical competency offered by vocational education graduates (4).

The quality of higher education can be enhanced by focusing on the development of competencies in scientific research and publications. The advancements in technology were produced by research initiatives within higher education institutions. It will inspire lecturers to pursue

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research that can produce innovations for the industry. Higher education institutions do collaborative initiatives to produce industry innovators. It will enable them to improve their abilities by evaluating research inputs from diverse fields (5). Variety of higher education institutions and sectors applied research initiative aimed at potential industry innovators and enhanced challenge for research collaboration. An evaluation study of expert proficiency growth of lecturers in technical fields at Malaysian Polytechnics, it can be done using three different delivery formats. First format was the formal format like a college or university graduate, where a category of certification was granted upon program completion. Second format was the nonformal format such as workshops, seminars, and conferences, where a certificate might or might not be provided. Third format was the informal format such as pursuing self-directed learning and reading journals through internet exploration (6).

Indonesia's higher education system has created funding avenues for college and polytechnic

lecturers to propose research aimed to produce innovation for industry. Indonesian Ministry of National Education has created funding prospects for the higher education, college and polytechnic lecturers to propose research aimed at fostering industrial innovation, ultimately producing a document of innovation applicable in industry, reflecting global trends, and thus informing the strategy for the higher education system in Indonesia.

Based on Table 1, Polytron is an electric vehicles manufacturer established in central java. The electric vehicles industry in Indonesia remains in the introduction phase of the industry life cycle, with early signs of growth only beginning to emerge in 2024 (7).

Based on Table 1, Indonesia Power operates as a subsidiary of Perusahaan Listrik Negara (PLN). To meet the electricity demand, approximately 92 operational power plants are distributed across various islands in Indonesia by 2023. The Indonesian government plans to phase out conventional steam and subcritical coal plants by 2030 and 2035 (8)

**Table 1:** Product Development by Industrial Partners in Central Java

Manufacturer	Product	Element
Polytron	Electric Vehicles	Professional Competence
Indonesia Power Central Java Region	Power Distributed Generators	Professional Competence

Universities must respond to advancements in science and technology within the industry to enhance knowledge which it is termed a crucial strategy (9). Following the establishment of an industrial partnership, the vocational colleges will employ a research collaboration strategy to determine the knowledge development requirements within the industry. Knowledge will be enhanced through knowledge management approaches. Knowledge is refined perpetually and it is adjusted through a "dialogue" involving a logical input from reasoning and real-world understanding shaped by practical perspectives (10). Polytechnic adjusted to the advancement of technology and science in the industry to cultivate

expertise, and this was deemed an essential Industrial partners engaged in product development and based in Central Java as indicated in Table 1.

This study explored the working environment of lecturers at a polytechnic in Central Java, Indonesia, specifically focused on classroom teaching schedules. This study distributed questions to sample of 23 vocational instructors from five polytechnic programs in Central Java, including accounting, business administration, civil engineering, electrical engineering, and mechanical engineering. The findings of the survey are displayed in Table 2.

**Table 2:** Overview of the Working Environment for Classroom Teaching Schedules

Programs	3 Classes Parallel Each Semester	Hours Per Seven Days (60 Minutes)	Instruction (Hour)	Assessment of Test, Mentoring, Study and Civil Servant (Hour)
Electrical Engineering	Odd and even	6	3 up to 3.5	2.5 up to 3
Mechanical Engineering	Odd and even	6	3 up to 3.5	2.5 up to 3
Civil Engineering	Odd and even	6	2.5 up to 3.5	2.5 up to 3.5
Business Administration	Odd and even	6	1 up to 2	4 up to 5
Accounting	Odd and even	6	1 up to 2	4 up to 5

According to the information in Table 2, it can be inferred that the vocational lecturers in civil,

electrical, and mechanical engineering have 2.5 to 3 working days available each week per semester

for three parallel classes. If a polytechnic program consists of four or eight classes, based on this situation will result in a vocational lecturer lacking time for applied research.

The analytical framework of the developmental lines is not intended to form a universal framework for innovation development, in which components are established, for example, among university-industry-government (12). Research-related innovation initiatives at the University of Applied Sciences progressed along six paths: enhancing researcher expertise, advancing projects, improving organizational frameworks, development of research, developing fields, and establishing funding models and policies (13).

This study aims to reveal a relationship within triple helix framework for developing competence in polytechnics. The triple helix relations are polytechnic, industrial and government. Therefore, this study hypothesizes that an influence on industrial collaboration is supported by government regulation (H1), an influence on government regulation provides funding support for lecturer research (H2), and an influence on lecturer's research accordance to industry based (H3).

## Methodology

Earlier research noted that reasonable results could be obtained in SEM analyses when samples are above 100 (14). This paper investigated the description of data collected using a questionnaire from 120 persons who were members of polytechnic, industrial, and governments in central Java in June 2024 and used a quantitative approach.

The public-private partnership is a crucial role of European innovation strategies, involving collaboration among public research, technology transfer, private innovative firms, and suitable policy frameworks. A structure of industrial networks and collaborative that encompasses long-lasting connections among knowledge, consumers, and providers of products and services. The public-private partnership is along with various alternatives and other intermediary entities. This type of partnership typically outlines the creation of collaborative research ventures with an equal split of expenses and investment returns, along with sharing of information and knowledge. This type of model can foster the

creation of methodologies or technologies by the private sector within public scholarly organizations, consequently enhancing or establishing a dependable institutional capacity (15).

Selected works from 2007-2013, the European Commission emphasized on the advancement of society based on knowledge and established a triangle of knowledge - education, innovation and research. This triangle requires a favorable environment for development, which may be investment, legal, organizational and economic. With the organizational environment and investing in development, an increasingly important role is given to PPPs. During the new programming phase from 2014 to 2020, the trend towards enhancing the significance of PPPs as a key factor for the competitive growth of the fundamental component - technology exchange.

A primary goal of the European Union is to provide effective and simple access to financing, a greater diversity of minimize the risk of their usage and funding sources. Investments as a crucial element for more innovation through increasing the value of inputs and better research, strongly influence the effect of science and innovation activities. In this line of reasoning, another type of triangle may be suggested, one that has an impact on the development of the economic and social climate in modern society - business (private sector), scientific technological solutions and public sector. Higher education efforts to continuously improve quality by fulfilling stakeholder customer needs can adopt the Public-Private Partnership model of technology transfer in higher education. Innovative technology transfer involves three institutions according to the Triple Helix Relations, namely higher education, industry and government through existing regulations (16). The mutual information in three dimensions is positive for partial correlation, and the third factor operates as a latent variable in the case of a spurious correlation that can decrease uncertainty in the system of relations. There are variations in the Triple Helix relations structure between universities, governments, and industry in developed and developing countries. The Triple Helix indicator showed that the interactions among the three subsystems university-industry-government became less negative over time in both developed and developing nations. The Triple

Helix model provides a reference point for the analysis of technical innovation systems; interactions among universities, industries, and governments provide valuable information for understanding the innovation systems aggregated at the national level. The distribution of University-Industry-Government relations across different countries.

Countries such as Indonesia might benefit from globalizing their systems of innovation by loosening local university-industry-government relations. Various nations appear to have different university-industry-government patterns, and quantitative research allows to uncover trends in the progression of this evolution.

Innovative technology transfer entails three institutions based on the Model of Triple Helix. The Triple Helix represents the collaboration among business, government and university, which are the essential components of an innovative system. The Model of Triple Helix presents interaction between specific institutions at each phase of innovative product development. Governments and universities interact at the initial stage, that is, formation of an idea. Thereafter, the university cooperates with businesses in technology transfer. Finally, a final product is commercialized in the market by a joint effort of the government and business. The role of universities in the Triple Helix model is undeniable. Most nations today are in transition to a knowledge economy, where a country's competitiveness is mainly determined by expertise and advanced technologies. Consequently, universities carrying out development and research have become an essential resource in science-intensive production. The Model of Triple Helix reflects the evolution of interactions and roles within the developing main

institutional triad of universities, industry, and government. Universities, government, and industry are viewed as interlinked spirals, each having distinct relationships within the traditional innovation framework. As universities embrace new roles in fostering innovation, they undergo changes. As industries embrace their new roles in constantly evolving and enhancing their technological capabilities, they undergo transformation. When governments act as public entrepreneurs, they start to resemble the academic and industrial sectors by acknowledging the significance of knowledge in developing a new society and economy. Utilizing the "triple helix" model in local spatial contexts leads to a climate conducive to innovation, as it encourages the growth of its elements, specifically the buildup of innovative capacity in turnover through the engagement of all stakeholders in the model of resource, whose integration creates a synergistic effect by enhancing innovative activity achieved through lowered transaction costs and diminished risks associated with innovation (17).

### Results

Indicators of Triple Helix variables are formulated from the characteristics of lecturer competence by the National Education Standards Agency of the Indonesian Ministry. Indicators of triplex helix variables are referred to in the description of the professional competence development of Malaysian Polytechnic technical lecturers (6). The enhanced research and development efforts of universities have significantly influenced their quality of teaching (18). Indicators of triplex helix variables are shown in Table 3.

**Table 3:** Indicators of Variables

Variables	Indicators	References
Government, Polytechnic, Industry	Government Regulation About Funding Support for Research Collaboration Between Polytechnics and Industry.	(6, 17)
	Government Regulation About Web-Based Proposal Submission Can Be Accessed by Polytechnics and Industry.	
	Lecturers Research Accordance to Industry Based.	
	Instructors Engage in Their Practical Research.	
	Lecturers Conduct Applied Research in Collaboration with Industry, Which Can Be Utilized for Educational Purposes.	
	Lecturers Generate the Industry Advancement.	
	Lecturers Release Articles on Potential Industry Innovations.	
	Industrial Consistently Provides Various Research Ideas to the Lecturer.	
	Industry Select the Solutioned Proposals.	
	Industry Supervise and Accept the Results of Lecturer's Proposal.	

According to the data survey, it reveals 10 variable indicators and the questionnaire spread through 40 industrial practitioners, 40 administrators in

the research center college as government staff, 40 polytechnic lecturers. 10 variable indicators as the research instrument, they must be validated and

the relationships between the variables studied must be significant. Correlation analysis was

conducted by utilizing SPSS 16.0 as shown in Table 4.

**Table 4:** Correlation Test Results of the 10 Variable Indicators

Indicators of variables	Industry	Government	Polytechnic
Indicator-1	0.18	0.10	0.36
Indicator-2	0	0	0
Indicator-3	0	0	0
Indicator-4	0	0	0
Indicator-5	0	0	0
Indicator-6	0	0	0
Indicator-7	0	0	0
Indicator-8	0	0	0
Indicator-9	0	0	0
Indicator-10	0	0	0

### Analysis of Correlation

The data collected for underwent validity and correlation analysis. The values of the indicator variables were analyzed against 5% of the critical R person standards using SPSS 16.0. The key value exceeded the 0.050 probability level on indicator-1, making this tool invalid. The important values were below the 0.050 probability level on various indicators. All indicators are valid and significant for using as research instruments. The indicator-1 is variable about "government regulation about funding support for research collaboration between polytechnics and industry".

#### Analysis of Indicator-1

According to the recommendations of effective research for determining sample size (19). The results of the reliability testing were contrasted with the reliability from the r Table, based on an

expert count of  $n = 120$  and a question count of  $DB = 10$ . The reliability value was acquired from the r Table through the correlation coefficient of interpretation value, with reliability being  $r = 0.312$ , categorized as "Medium" interpretation (20). The values of the indicator variables for scale reliability were derived from test results using SPSS 16, and these values were compared with the 0.5 probability level in the r Table. The significant relationship values were less than the 0.5 probability level on indicator-1, indicating that this instrument does not have a relationship with other instruments. However, the significant values exceeded the 0.5 probability level on indicators 2-10, demonstrating that these instruments are significant and exhibit a positive relationship with the other instruments. Reliability analysis were conducted by utilizing SPSS 16.0 as shown in Table 5.

**Table 5:** Reliability Test Results of the 10 Variable Indicators

Triple Helix	Cronbach's Alpha	Number of Items
Industry	0.832	10
Government	0.810	10
Polytechnic	0.770	10

### Analysis of Reliability

Based on Table 5, the Cronbach's Alpha values are 0.832, 0.810, and 0.770. Cronbach's Alpha values can be concluded that all items (10 items) have the values greater than 0.70 so indicators of variables can be used have passed the reliability test (19).

WarpPLS (PLS-SEM) is well suited for medium samples, complex latent constructs, and non-normal survey data. PLS-SEM provides stable parameter estimation and stronger predictive capability when the research focuses on explaining variance and developing theory rather than strict model confirmation (21). The data analysis in Table 4 was conducted using WarpPLS-SEM software. This software is utilized because it can

directly display the impact of mediating variables, eliminating the need for manual calculations. This study gathered information through a survey from instructors in polytechnic, industrial, and governmental sectors. They may be selected randomly as the population is uniform. The population information is gathered and selected randomly, comprising 40 industrial professionals, 40 administrators from the research center college as government employees, and 40 polytechnic instructors.

Analysis results using WarpPLS-SEM software as depicted in Table 6, General SEM analysis results include model fit indices. Two model fit indices are provided: average path coefficient (APC), average R-squared (ARS) and P-values are also provided.

**Table 6: General SEM Analysis**

Fit Indices of Model	Value	Break-off	Decision
Average Path Coefficient (APC)	0.859 (< 0.001)	0.05	Significant
Average R-squared (ARS)	0.748 (< 0.001)	0.05	Significant
Average Adjusted R-squared (AARS)	0.742 (< 0.001)	0.05	Significant

Based on Table 6, the P-values for the APC and ARS are 0.001 and both lower than 0.05. That is significant. The ARS value is 0.748 and APC value is 0.859, the ARS value is lower than APC value in terms of model fit. In the context of WarpPLS structural equation modeling, the Average R-squared (ARS) index is to be generally lower than the Average Path Coefficient (APC) index. While both are used to evaluate model fit, they measure different aspects of the model. ARS measures the average predictive power, and APC measures the average strength of paths. ARS is often lower than APC.

The overall assessment of the model's fit is guided by the Fit Model and Quality Indices as outlined in the WarpPLS 7.0 User Manual. Among the indices mentioned are APC, ARS, and AARS. According to the parameters outlined in Table 6 and the heuristic assessment of the model following (22).

It can be inferred that the structural model is satisfactory, making the overall model suitable for testing the research hypothesis. The typical full collinearity VIF value suggests that multicollinearity arises from interactions among triple helix variables.

Analysis results using WarpPLS-SEM software as depicted in Table 7, the fit measurement model was evaluated for both validity and reliability. Validity employs cross-loading and AVE, whereas reliability utilizes composite Cronbach's Alpha and reliability. The measurement model in this research is valid and reliable as determined by the assessment of the measurement model following (23). Table 7 indicates that the cross-loading for every variable exceeds 0.7 and the AVE surpasses 0.50. The values for both composite reliability and Cronbach Alpha for every variable exceed 0.70.

**Table 7: Assessment of Model Fit Measurement**

Variable	Validity		Variable Validity		
	Cross Loading	AVE	Composite Reliability	Cronbach Alpha	
Triple Helix	Industry (X1)	0.703	0.667	0.912	0.830
	Government (X2)	0.769	0.612	0.914	0.887
	Polytechnic (Y)	0.805	0.824	0.946	0.844

**Table 8: Path Coefficients**

	X1	X2	Y
X1			0.829
X2	0.747		
Y		1.000	

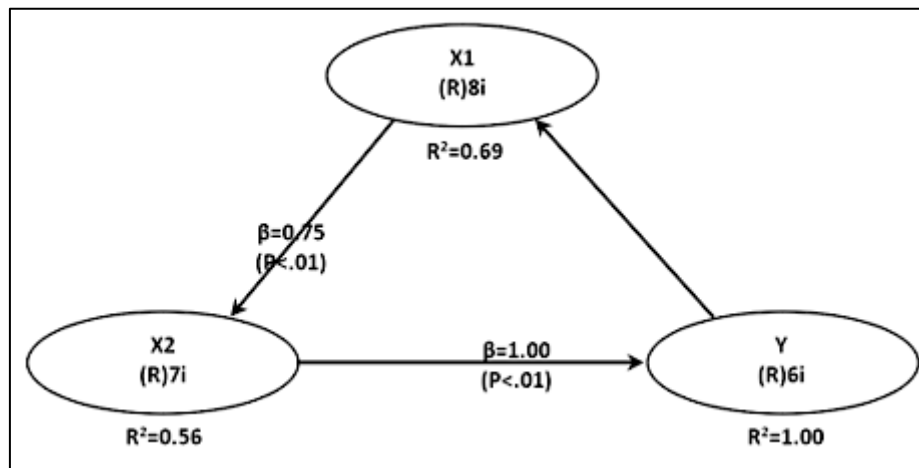
**Table 9: P-values Window**

	X1	X2	Y
X1			<0.001
X2	<0.001		
Y		<0.001	

Path coefficients are shown for X1 (industry), X2 (government), and Y (polytechnic) as can be seen in Table 8. Respective P-values are shown for X1 (industry), X2 (government), and Y (polytechnic) as can be seen in Table 9.

WarpPLS results indicate strong and positive relationships among the Triple Helix variables. All structural paths show  $p < 0.001$ , it is indicating the

relationships are statistically significant at a very high confidence level. This provides strong empirical support for the Triple Helix interaction model. The synergy between government, industry, and polytechnics is not random but systematically contributes to competence development.



**Figure 1:** Relationship Between the Triple Helix Variables

Figure 1 shows the triple helix variables, which are X1=industry, X2=government, and Y=polytechnic. According to the parameters shown in Table 6, the

model for enhancing lecturer's competence has an APC of 0.859.

**Table 10:** Outcomes of the Path Coefficients

Variable	Path Coefficients	P-value	Status
H1: There is an influence on industrial collaboration are supported by government regulation (X1=industry, X2=government)	0.75	<0.01	Significant
H2: There is an influence on government regulation provide funding support for lecturer research (X2=government, Y=Polytechnic)	1	<0.01	Significant
H2: There is an influence on lecturer's research accordance to industry based (Y=Polytechnic, X1=industry)	0.83	<0.01	Significant

According to Figure 1, the evaluation of the suggested research hypothesis is evident from the size of the p-value. The path coefficient results are utilized to assess the intensity of the impact between variables. If the magnitude of the p-value is equal or less than to 0.05 (the significance level), the influence between variables is significant. Hypothesis testing is conducted to establish the connection between one variable and another variable that has already been suggested in the current hypothesis. Hypothesis testing in the WarpPLS analysis is executed through the t test rule, where this study applies the condition that if the p-value  $\leq 0.05$  with an alpha level of 5%, the hypothesis can be accepted. The results of the hypothesis testing can be found in Table 10. Based on the hypothesis testing data in Table 10, the three existing hypotheses can be explained in detail and clearly as follows:

**First Hypothesis**

H0 = Perceptions do not have a positive influence on industrial collaboration supported by government regulation.

H1 = There is a positive influence of perceptions on industrial collaboration supported by government regulation.

Based on the hypothesis testing data that have been obtained, the p-value for the first hypothesis

is <0.01 with a coefficient value of 0.75. Therefore, H0 is rejected and H1 is accepted. It can be concluded that Industry research collaboration should be supported by government regulation.

**Second Hypothesis**

H0 = Perception does not have a positive influence on government regulation that provide funding support for lecturers' research.

H2 = Perception has a positive influence on government regulation that provide funding support for lecturers' research.

Based on the analysis data that were carried out, the p-value for the second hypothesis is <0.01 with a coefficient value of 1. Therefore, H0 is rejected and H2 is accepted. It can be concluded that government regulations provide funding support for lecturer's research, it will also increase lecturers' interest in the applied research.

**Third Hypothesis**

H0 = Interest does not have a positive influence on lecturers' research accordance to industry based.

H3 = Interest has a positive influence on lecturers' research accordance to industry based.

Based on the analysis data that were carried out, the p-value for the third hypothesis is <0.01 with a coefficient value of 0.83. Therefore, it can be said that H0 is rejected and H3 is accepted. It can be concluded that lecturers research accordance to

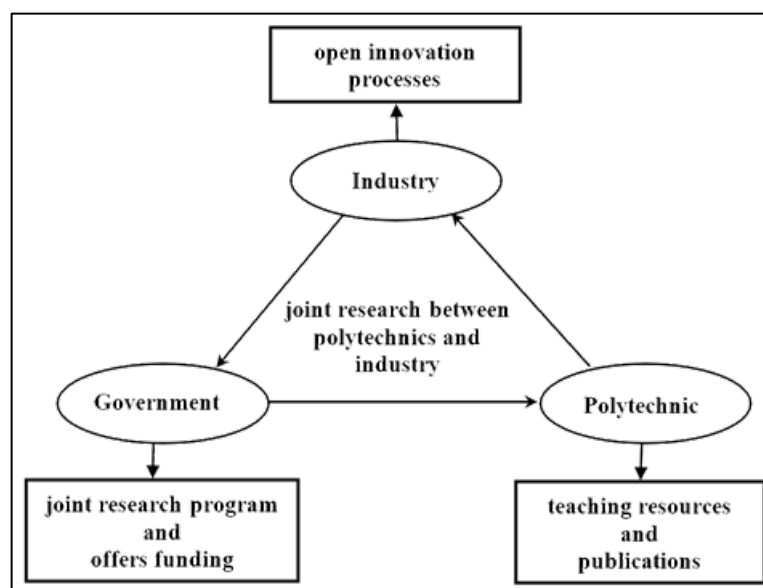
industry based, their intention to collaborate directly with businesses in research activities will increase.

## Discussion

Polytechnics are facing competition in unfamiliar and new product sectors as never before. Thus, lecturers' research of polytechnic accordance to industry based, their intention to collaborate directly with businesses in research activities will increase (24, 25). To remain competitive, polytechnics must evolve to be significantly more adaptable than they are currently and they will need to restructure to respond to a swiftly changing and unpredictable landscape (26, 27). The evolving knowledge is derived from advancements in science and technology within the industrial sector (9, 25). Cooperation between polytechnic institutions and industry is essential (4, 29).

An approach for public research institutions is to participate in open innovation processes, which view innovation as distributed inter-organizational collaborations that can include various stakeholders (13, 30). The results of this research demonstrate that the Triple Helix relationship in technology transfer involving industry, government, and polytechnics significantly contributes to enhancing the competence of lecturers in polytechnics.

The government supports and offers online funding programs for joint research between polytechnics and businesses. This finding has several implications for different stakeholders. Industry research collaboration should be supported by government regulation. Hence, to overcome the limitation of the prior studies, Industry research collaboration should be supported by government regulation (31, 32).



**Figure 2:** Relationship Between the Triple Helix

The industrial sector provides the polytechnic with innovation projects, and the lecturers at the polytechnic conduct applied research in collaboration with the industry, which can be utilized for educational purposes. This finding strongly recommends that polytechnic lectures create materials such as industry innovation papers for teaching resources and publications (33). This finding can be recommended for developing the competence of polytechnic lecturers and this can be illustrated in Figure 2.

## Conclusion

### Overview

This study investigated the significance of relationships within the Triple Helix framework—comprising industry, government, and polytechnic institutions—in enhancing lecturers' competence. Using WarpPLS 7.0 software for analysis, the results demonstrate that interactions among industry, government, and polytechnic research exert statistically significant effects. These findings confirm that structured collaboration is crucial for

knowledge transfer, applied research, and innovation in polytechnic institutions.

### Contributions

The study contributes to both theory and practice by providing empirical evidence that polytechnic lecturers' engagement in industry-aligned research increases when supported by collaborative frameworks under the Triple Helix model. It demonstrates that lecturers' competence is enhanced through participation in applied research projects, industry partnerships, and knowledge-sharing initiatives. Furthermore, the study highlights the importance of government support, showing that policies, financial incentives, and regulatory frameworks strengthen collaboration and motivate lecturers to engage in research that addresses real-world industrial problems.

### Consequences (Implications)

The findings show that government support is important for successful collaboration between industry and polytechnic institutions. Governments can help by providing funding, clear regulations, and structured programs. Polytechnics can use these partnerships to produce applied research, create teaching materials, and publish research findings. Industry also benefits from new research and skilled graduates, creating a partnership that support innovation and growth for all parties.

### Limits

Despite its contributions, this study has several limitations. First, the sample was limited to selected polytechnic institutions and industry partners. Second, the data relied on self-reported measures of lecturers' competence and collaboration. Third, the study primarily focused on quantitative assessments and did not explore qualitative dimensions of collaboration, such as organizational culture or stakeholder perspectives.

### Future Research Directions

Future research should expand the sample to include multiple institutions to enhance the generalizability of the findings. Longitudinal studies could examine the sustained impact of Triple Helix collaborations on lecturers' competence over time. Additionally, future studies could explore complementary factors, such as digital technology platforms and organizational culture.

### Abbreviations

AARS: Average Adjusted R-squared, APC: Average Path Coefficient, ARS: Average R-squared, AVE: Average Variance Extracted, HE: Higher Education, PBL: Problem-Based Learning, PLS-SEM: Partial Least Square-Structural Equation Modeling, VET: Vocational Education Training.

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### Author Contributions

Unang Achlison: conceptualization, drafted the manuscript, data collection, data analysis.

### Conflict of Interest

Author declares no conflict of interest.

### Data Availability

The datasets generated and analyzed during the current study are available in the Zenodo repository at <https://doi.org/10.5281/zenodo.18780895>

### Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

This manuscript was prepared solely by the authors. Generative AI or AI-assisted tools were not used in writing, editing, or data analysis.

### Ethics Approval

This study was conducted in accordance with the ethical guidelines and principles.

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