

The effect of ISO and leadership quality on the sustainable development of academic competence and student performance

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Abstract

This study seeks to analyze the influence of the International Organization for Standardization's (ISO) quality standards and leadership quality on the sustainable development of academic competence for lecturers and the implications for the academic performance of Islamic religious college students (PTKI). Data were collected through observation, questionnaires, and documentation and analyzed using multiple regression. The population for this study were all PTKI lecturers and students at the Maulana Malik Ibrahim State Islamic University, Malang, with a sample being selected by proportional random sampling stratification. The findings reveal that 1) ISO and leadership has a positive, significant influence on the sustainable development of PTKI lecturers' academic competence, with the combined effect being much greater than the individual effects; 2) ISO, leadership, and sustainable academic competence development has a positive and significant influence on the academic performance of students, again with the combined influence being greater than the individual influences; 3) ISO has a significant indirect effect on student academic performance through the sustainable development of lecturers' academic competence; and 4) ISO has an indirect effect on student academic performance through the sustainable development of lecturers' academic competence.

Keywords: *ISO, leadership quality, sustainable development, academic competence*

Introduction

Universities that already have good education systems are, of course, a combination of various components, such as lecturers, students, education-support staff, curricula, faculties, departments, study programs, facilities and infrastructure, finance, and so on. A university system can be divided into two subsystems, namely the hardware and the software (Bargh et al., 2000). The hardware includes various tangible components, such as facilities, infrastructure, funding, and so on, while the software includes various abstract components like curricula, lecturer competence, courses (Tachie & Kariyana, 2022).

Many companies and organizations strive to meet internationally qualified quality standards, like those set by the International Organization for Standardization (ISO). The widespread adoption of

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ISO 9000 standards by various business and non-business organizations has attracted great interest from researchers looking to learn more about the benefits of implementing them (Boiral, 2003; Briscoe et al., 2005; Gingele et al., 2002). According to Feng et al. (2006), quality management with ISO standards can be seen from three perspectives: i) planning for ISO certification, ii) making an organizational commitment to quality, and iii) implementing standard operating procedures. The success or failure of implementing a quality management system (QMS) is largely influenced by organizational culture (Kekale, 1999; Parncharoen et al., 2005; Kujala & Ullarank, 2004), because it is essentially a program for organizational change that requires transformations in organizational culture, processes, and beliefs (Parncharoen et al., 2005). The relationship between the application of an ISO-based QMS and a quality culture was indicated by Goetsch & Davis (1994).

In the case of a university, lecturers are the most critical component in the education system. Indeed, the ability to face various future challenges lies in the hands of lecturers, so the support for lecturer development becomes a determining factor in the efficiency of higher education (West & Bollington, 1990). Therefore, to achieve this capacity, it is necessary to improve the curricula and infrastructure and better manage the institution. Leadership is suspected to influence the professionalism of lecturers, which has the following characteristics: (1) a desire to pursue ever-better results, so lecturers always seek to improve their performance; (2) a seriousness and thoroughness that can only be achieved through experience and effort; (3) perseverance and persistence in chasing good results; and (4) an integrity that is not compromised by coercion or temptation.

According to Soedijarto (1993), lecturers' professionalism requires them to be able to analyze, diagnose, and program educational situations. Professional lecturers need to master (1) scientific disciplines as a source of learning materials; (2) teaching materials; (3) their knowledge of student characteristics; (4) their knowledge of philosophical and educational goals; (5) teaching methods and models; (6) the principles of educational technology; and (7) assessment and the ability to plan, lead, and facilitate the educational process.

Lecturers' main competency is teaching students, but this does not stand alone separate from other abilities, because effective teaching requires basic skills in a range of areas. According to Surya (2004), there are nine characteristics for an ideal lecturer, namely (1) having a fighting spirit accompanied by faith and piety; (2) being able to adapt to environmental demands and the progress

of science and technology; (3) being able to learn from, and cooperate with, other professions; (4) having a strong work ethic; (5) seeing clarity and certainty in the career-development path; (6) possessing a high level of professionalism; (7) having physical and spiritual well-being; (8) having insight into the future; and (9) being able to carry out functions and roles in an integrated manner. Good lecturers must meet seven criteria: (1) By nature, lecturers must be enthusiastic, stimulating, encouraging, warm, task-oriented, hardworking, tolerant and polite, wise, trustworthy, flexible, and adaptable. They must be full of hope for their students rather than looking for personal advancement, able to overcome stereotypes, and capable of conveying their feelings and listening to others. (2) They must have adequate knowledge about the subjects they teach and always follow developments in them. (3) They must be able to ensure that the material they deliver covers all the elements that are expected by students. (4) Their teaching methods must explain various concepts clearly and succinctly, serve a variety of services, and encourage all students to participate. (5) They must be able to inspire hope in students, make students accountable, and encourage parental participation in advancing their children's academic abilities. (6) They must accept various inputs, risks, and challenges and always support their students consistently. (7) Lecturers must be able to demonstrate management expertise in planning and managing classes from the first day on the job and quickly gain the ability to handle two or more classes and activities at once.

Leadership tries to direct and influence subordinates to achieve desirable collective goals. Good leadership therefore has three important qualities: (1) it involves other people who are willing to accept direction from the leader; (2) it includes asymmetrical distribution of power between the leader and subordinates, although the latter should still be able to influence the process; and (3) it uses various mechanisms to influence the behavior of subordinates in several ways (Stoner et al., 2017).

Furthermore, Donnelly et al. (2017) stated that leadership is the ability to influence other people, so they enthusiastically work to achieve goals. Leadership involves two functions for a group to run effectively, namely problem solving and maintaining social cohesion. The first function involves providing suggestions, solutions, information, and opinions for achieving objectives, while the second concerns everything that will help the group work more effectively, such as mediating differences of opinion and so on (Hani, 1998).

In his or her efforts to influence, inspire, and direct others, a leader needs certain abilities, skills, and qualities to be successful. According to Tead (2010), a leader must possess several basic abilities and qualities, including physical and mental energy, awareness of purpose and direction, enthusiasm, friendliness and love, integrity, technical mastery, decisiveness, intelligence, teaching skills, and beliefs. Nawawi (1995) mentioned five main functions of leadership in the areas of instruction, consultation, participation, delegation, and control.

A professional person, meanwhile, is someone who is loyal and possesses the expertise or skills to complete his or her work (Sergiovanni, 1992). This loyalty to the job means that this person works for the job rather than a particular person, and even after leadership changes, such a person continues his or her duties regardless due to the loyalty attributed to the work.

Research Questions

Based on the background to the problem, this research focuses on the influence of ISO, as in the ISO 21001:2018 standard, leadership quality on the sustainable development of lecturers' academic competence and the implications this has for the academic performance of PTKI students. The researchers therefore formulated the following research questions:

- 1) How does ISO influence the sustainable development of PTKI lecturers' academic competence?
- 2) How does leadership influence the sustainable development of PTKI lecturers' academic competence?
- 3) How does the sustainable development of lecturers' academic competence influence students' academic performance?
- 4) How do ISO, leadership, and the sustainable development of lecturers' academic competence together influence students' academic performance?
- 5) How does leadership influence student academic performance through the sustainable development of PTKI lecturers' academic competence?

Literature Review

ISO and the Sustainable Development of Competency

The ISO 21001:2018 standard is a quality management system for educational organizations, having been adapted from ISO 9001:2015. Thus, it was developed specifically for the education sector and its goal of providing high-quality education. The ISO 21001 standard embodies

principles that encourage educational institutions to become more socially responsible and provide accessible and equitable educational services for students. It also helps educational institutions to increase the satisfaction of students, educators, education-support staff, and other stakeholders.

According to Brown, et. al., (1998), Mears & Voehl (1995), Meyer & Allen (1997), and Zink (1994) in Feng et al. (2006), an ISO QMS can be view from three perspectives, namely (1) planning for ISO certification, (2) making an organizational commitment to quality, and (3) applying established standards procedures. The requirements of the ISO 21001:2018 standard are general enough to be applicable to all curriculum-based institutions, both formal and informal, from kindergarten to university, from courses with face-to-face teaching to distance learning (e-learning).

The application of ISO standards can improve employee performance very significantly. Callista (2016), Umiyati (2015), Juana et al. (2016), and Irawati (2013) have suggested that it has a positive and significant influence on employee performance, and this is of course very closely related to competence. Many organizations strive to implement a QMS with international qualifications, such as ISO 9000, and the widespread adoption of ISO by various businesses and non-profit organizations has led to researchers trying to find out more about the benefits of implementing an ISO-based QMS (Boiral, 2003; Briscoe et al., 2005; Gingele et al., 2002).

The success or failure of implementing an ISO-based QMS is largely influenced by factors in the organizational culture (Kekale, 1999; Parncharoen et al., 2005; Kujala & Ullarank, 2004), because ISO is essentially a program for organizational change that necessitates transformations in organizational culture, processes, and beliefs (Parncharoen et al., 2005). The relevance of an ISO-based QMS to a culture of quality was pointed out by Goetsch & Davis (1994). This inevitably interacts with the academic competence of PTKI lecturers.

Leadership Quality's Effect on the Sustainable Development of Competence

The quality and commitment of educational staff is key to the success of any educational institution (Burki, 1999). Miller, et. a., (2001) stated that there are initially only two types of competencies that develop rapidly. These include 1) technical or functional competence, which could also be referred to as hard skills, representing the basic abilities a person needs to do his or her job well. In addition, there is 2) behavioral competence, which could also be called soft skills, and this represents behavioral aspects that help someone perform their role more effectively.

Lecturers of course need to be fully competent to perform well in their work, and this is also the basis for recruitment, performance evaluation, human resource development, career planning, and succession (McLagan, 1989).

Several studies have found that competence is significantly related to job performance. Studies including those of Liang et al. (2013); Cruz, et. al., (2007); Mathieu & Schulze (2006); and Moreland & Myaskovsky (2000) have found that lecturer competence is a positive and significant predictor of lecturer performance, because it represents their ability to carry out their duties and responsibilities. This was supported by the research of Rusydi (2017), which found that leadership has a positive and significant effect on lecturer competence.

Effect of ISO on Student Performance

As explained earlier, ISO 21001:2018 is a QMS that was specifically designed for educational organizations. With a good implementation in a school, it has a positive impact on the quality of student outcomes, so when a school can properly satisfy the various ISO demands, it will almost certainly enhance student performance.

The ISO standard, when applied to educational institutions, can yield great benefits for students and schools (Brown, et. al., 1998; Mears & Voehl, 1995). With ISO standards, student performance in all aspects will increase, because the ISO standards require students, teachers, and principals to take various actions according to the quality standards that have been set (Meyer & Allen, 1997). Thus, with a thorough implementation of quality standards, the hope is that student performance will improve. When schools avoid applying quality standards, in contrast, this will of course have a negative impact on student performance (Feng et al., 2006). Thus, it can be concluded that applying the various ISO standards will have a positive impact on student performance.

The Influence of Leadership on Student Performance

Leadership has a significant direct effect on student performance, so the better the quality of leadership shown by principals and teachers, the better that student performance will be (Burki, 1999). When university leaders are able to demonstrate good leadership to students, student performance will of course improve (Miller, et. al., 2001). Indeed, leadership plays a very big role in determining student competence and performance (McLagan, 1989), and universities that provide good examples to students have a positive impact on student performance (Liang et al.,

2013). A university must offer various forms of good leadership, so students can benefit from all of them and improve their performance (Perez, & Ramos, 2007).

Mathieu and Schulze (2006) showed that the better that the leadership model practiced on campus is, the more positive the impact it will have on student performance (Moreland & Myaskovsky, 2000). This means that students experience decreased competence when higher education leadership is unable to set a good example for their students. Students need leaders who make good choices, and when a better leadership model is presented to students, they perform better both academically and non-academically (Rusydi, 2017).

The Effect of Sustainable Competence Development on Student Performance

The process of developing students' academic competencies must be a continuous process in order to improve student performance. Likewise, the more sustainable that academic competency is developed, the better that overall student performance will be. Conversely, when lecturers' academic development is unsustainable, it will cause student performance to also decrease. Thus, when lecturers have the necessary competence to teach according to the planned curriculum, their students will perform better (Bargh et al., 2000). In other words, student performance improves when their teachers' academic competence is sustainably developed (Boiral, 2003).

Striving for sustainable development of academic competencies requires non-trivial efforts, because it involves all institutional aspects, such as the learning process, resources, teaching methods, learning planning, assessment, extracurricular activities, and various student competitions (Briscoe et al., 2005). These aspects comprise the atmosphere of an educational institution and affect student performance (Gingele et al., 2002).

The above leads us to speculate that the more sustainable the development of lecturers' academic competence is, the better their students will perform. Conversely, if the development of academic competence is sporadic or non-existent, students will perform worse academically. Thus, to improve student academic performance, one step that could be taken is to enhance the sustainable development of academic competence.

The Influence of ISO and Leadership Quality on the Sustainable Development of Academic Competence

Universities that already have a good education system are, of course, an amalgamation of various interrelated components, such as lecturers, students, education-support staff, curricula, faculties, departments, study programs, facilities and infrastructure, finance, and so on. As mentioned earlier, this system can be conceptually divided into two sub-systems, namely the hardware and software (Bargh et al., 2000). Many organizations strive to implement internationally qualified quality standards like ISO 9000, and the widespread acceptance of ISO 9000 has attracted great interest from researchers (Boiral, 2003; Briscoe et al., 2005; Gingele et al., 2002).

In the case of universities, lecturers are the most critical components in the education system. Indeed, the ability of universities to face future challenges lies in the hands of their lecturers, so the pattern of support for developing these lecturers professionally becomes a determining factor in an institution's efficiency (West & Bollington, 1990). Therefore, to improve the overall quality of higher education, developing lecturers must be high on the agenda. Of course, this should not be seen as denigrating efforts to improve the curricula, infrastructure, and management practices of higher education institutions, but without qualified, professional, and motivated lecturers, everything else becomes meaningless.

According to Soedijarto (1993), professional lecturers need to be able to analyze, diagnose, and program educational situations. They need to master (1) scientific disciplines as a source of learning materials; (2) the teaching materials being taught; (3) their knowledge of student characteristics; (4) their philosophical and educational goals; (5) teaching methods and models; (6) the principles of educational technology; and (7) assessment and the ability to plan, lead, and facilitate the educational process.

The main competency that must be mastered by lecturers is teaching, but this does not stand alone in isolation from other abilities, because classroom teaching requires some essential skills. According to Surya (2004), an ideal lecturer has nine characteristics, namely (1) a fighting spirit accompanied by faith and piety; (2) the ability to adapt to environmental demands and progress in science and technology; (3) the ability to learn from, and cooperate with, other professionals; (4) a strong work ethic; (5) clarity and certainty in the development of a career path; (6) a professional attitude; (7) physical and spiritual wellbeing; (8) insight into the future; and (9) the ability to carry out his or her functions and roles in an integrated manner. The research conducted by Callista

(2016), Umiyati (2015), Juana et al. (2016), and Irawati (2013) suggests that competence has a positive and significant influence on employee performance.

Method

Research Design

This research adopted a quantitative approach with a correlational design (Creswell, 2014). A correlational research design investigates relationships between variables without the researcher controlling or manipulating any of them. A correlation reflects the strength and/or direction of the relationship between two (or more) variables. The direction of a correlation can be either positive or negative approach, which was chosen because the researcher wanted to establish the effect of exogenous variables on endogenous variables, either directly or indirectly through intervening variables (Creswell, 2009). Four variables were correlated in this study, namely: ISO (X_1) and Leadership Quality (X_2) as independent variables, sustainable academic competence of lecturers (Y_1) and student performance (Y_2) as the dependent variables. In relation to the research hypothesis testing, this study is a form of verification research, because it intends to verify the results of data analysis from the field with results from relevant previous studies through hypothesis testing (Creswell, 2009; 2014).

Sample

The population for this study were the lecturers and students at PTKI colleges in Indonesia, more specifically at the Maulana Malik Ibrahim State Islamic University in Malang. The total population was therefore 303 lecturers, with a sample of 150 lecturers being selected using proportional random sampling stratification (see Table 1). The total student population comprised 9,217 students, with stratified random sampling again being used to obtain a sample of 150 students (see Table 2).

Table 1*Population and sample of lecturers*

Position	Population	Sample
Professor	19	9
Associate Professor	64	30
Lecturer	163	81
Expert Assistant	67	30
Total	303	150

The student sample was classified into four-year groups (see Table 2).

Table 2*Student population and sample*

Student Level (year)	Population	Sample
I	22,505	41
II	2,470	40
III	2.126	35
IV	2.116	34
Amount	9,217	150

Instrument

The instrument of this study is a questionnaire consisting of 24 items. As seen in table 3, the questionnaire consisted of (1) ISO 4 items, (2) leadership quality 8 items, (3) sustainable competence development 6 items, and (4) student performance 6 items. The questionnaire was devised by the researcher himself. Prior to the application to collect data, validity and reliability test were applied the results of which were described in table 3 and table 4.

Table 3*Validity test results for ISO (X₁), leadership quality (X₂), the sustainable development of competence (Y), and student performance (Z)*

Variable	Rcount	Rtable	Sig	Description
ISO (X ₁)	0.818	0.1339	0.000	Valid
	0.815	0.1339	0.000	
	0.786	0.1339	0.000	
	0.463	0.1339	0.000	
Leadership Quality (X ₂)	0.624	0.1339	0.000	Valid
	0.755	0.1339	0.000	
	0.467	0.1339	0.000	
	0.672	0.1339	0.000	
	0.593	0.1339	0.000	
	0.545	0.1339	0.000	
	0.707	0.1339	0.000	

	0.39	0.1339	0.000	
Sustainable Competence Development (Y ₁)	0.288	0.1339	0.000	Valid
	0.603	0.1339	0.000	
	0.631	0.1339	0.000	
	0.452	0.1339	0.000	
	0.5	0.1339	0.000	
	0.485	0.1339	0.000	
Student performance (Y ₂)	0.254	0.1339	0.000	Valid
	0.653	0.1339	0.000	
	0.623	0.1339	0.000	
	0.454	0.1339	0.000	
	0.523	0.1339	0.000	
	0.443	0.1339	0.000	

From Table 3 above, it can be seen that each statement item has an $r_{count} > r_{table}$ and is positive with a value of $sig < 0.05$, so all statement items can be declared valid.

Table 4

Reliability test results for ISO (X₁), leadership quality (X₂), sustainable competence development (Y), and student performance (Y₂)

Variable	Cronbach's Alpha	Critical Value	Description
ISO (X ₁)	0.677	0.6	Reliable
Leadership Quality (X ₂)	0.731	0.6	Reliable
Sustainable Competency Development (Y ₁)	0.699	0.6	Reliable
Student performance (Y ₂)	0.759	0.6	Reliable

From Table 3 and table 4 above, the results of the analysis above reveal that the Cronbach's alpha value for the X₁ variable is 0.677, while it is 0.731 for X₂ and 0.699 for Y. It can therefore be concluded that the items of the research instrument are reliable, because these values are all greater than 0.6.

Data Collection

The data for this study comprised primary and secondary data. Primary data were obtained directly from the distribution of questionnaires to the respondents, so the data-collection methods used in this study include questionnaire distribution and documentation. Table 5 indicates how indicators were embedded in the questionnaire.

Table 5*Questionnaire grid*

Variable	Dimension	Indicator	Scale
ISO (X ₁)	Accountability	1. Organizing education, producing graduate products	Interval
	Alignment curriculum	2. Ensuring that the materials taught are in accordance with the standards and assessments expected by the state or society	
	Evaluation	3. Identifying individual and collective needs and outcomes	
	Student satisfaction	4. Making available faculty study/remediation and special services	
Leadership Quality (X ₂)	Innovator	1. Innovation ability	Interval
	Communicator	2. Conceptual ability	
		3. Ability to convey the meaning and purpose of communication	
		4. The ability to understand and grasp the essence of a conversation	
	Motivator	5. The ability to encourage employees to work more effectively	
		6. The ability to contribute to the successful achievement of organizational goals	
Sustainable Competency Development (Y ₁)	Knowledge	7. The ability to effectively supervise	Interval
	Understanding	8. The ability to use resources effectively	
	Ability/skills (skills)	1. Awareness in the cognitive field	
		2. The cognitive and affective depth of the individual	
	Value (value)	3. The ability of employees to choose work methods that are more effective and efficient	
	Attitude	4. Standards of behavior for employees when carrying out their duties	
Interest	5. Reactions to economic crises, feelings toward salary increases, and so on		
Student performance (Y ₂)	Daily value	6. Interest in tasks and activities	Interval
	Mid-semester grades	Improved daily value increase	
	Individual assignment score	Improved mid-semester exam scores	
	Group assignment scores	Enhanced value in individual assignments	
	Semester final exam score	Enhanced value in group assignments	
	Extracurricular value	Improved final semester exam scores Enhanced extracurricular value	

Data Analysis

Statistical software called SPSS version 25.0 was used to look at the data. In this study, Cressweell's (2014) strategies for testing regression are used to look at the data. There are two types of data analysis: testing the classic assumptions with the normality test and the linearity test, and testing the regression to see how the variables are related. Validity and reliability tests were

also used to look at the data from the instrument tests. After making sure that all of the instrument items and variables were valid and accurate, the researchers went out into the field.

In order to determine whether or not it was possible to use the data obtained from the distributed questionnaire for hypothesis testing, which took the form of simple regression and multiple regression, the data were first put through the traditional assumption test, which established whether or not it was possible to use the data. The ability to determine whether or not a sample was taken from a non-normal distribution is referred to as "power," and it is the most common way to measure the value of a test for normality. Because the assumption of normal data is implicit in parametric testing, many statistical tests require that it first be determined whether or not the data in question are normally distributed. Normality tests are utilized in the field of statistics for the purpose of determining whether or not a data set can be adequately modeled by a normal distribution and computing the likelihood that a random variable underlying the data set will be normally distributed.

Linearity is the ability of a test to give results that are directly related to the amount of the measurand (the thing being measured) in the test sample. Testing for linearity is important because many statistical methods depend on the assumption that data are linear (i.e. the data was sampled from a population that relates the variables of interest in a linear fashion). The linearity test has a significance value less than 0.05, which means that there is a straight line between how old you are and how much you smoke. The test for deviation from linearity also has a small significance value, which means that there is a nonlinear component to the relationship in addition to the linear one. As it does not compare two groups the homogeneity test is not required. This study is based on 5 main hypotheses, which were broken down into 10 sub-hypotheses. SPSS package software was used to look at all of the data.

Results

Classic Assumption Test

The results of the normality test (Table 6) using *Kolmogorov-Smirnov test* and the linearity test are presented in the classical assumption test (Table 7). One of the most common ways to evaluate the usefulness of a test for normality is by looking at its power, which is defined as the ability to determine whether or not a sample was taken from a non-normal distribution. Because table 6 reveals that every variable possesses significant values that are greater than 0.05, indicating that

the data from this investigation is normally distributed, the subsequent statistical process can be carried out successfully.

Table 6

Kolmogorov-Smirnov test — one-sample normality test results

Variable	Significance	Description
Variables X1	0.078	Normal
Variable X2	0.085	Normal
Variable Y	0.455	Normal
Variable Z	0.435	Normal

In the normality assumption test table above, it can be seen that all the significance values for the normality model are greater than 0.05, so it can be concluded that the normality assumption is met. In addition, table 7 that shows the linearity test.

Table 7

Linearity test results

Variable	F	Significance	Description
x1 against y1	12,231	0.002	Linear
x2 against y1	43,541	0.001	Linear
x1 against y2	32,345	0.000	Linear
x2 against y2	12,342	0.003	Linear
Y against Z	56,349	0.000	Linear

From Table 7, we can be seen that all the significance values for the linear model are less than 0.05, so it can be said that the assumption of linearity for the structural model has been fulfilled.

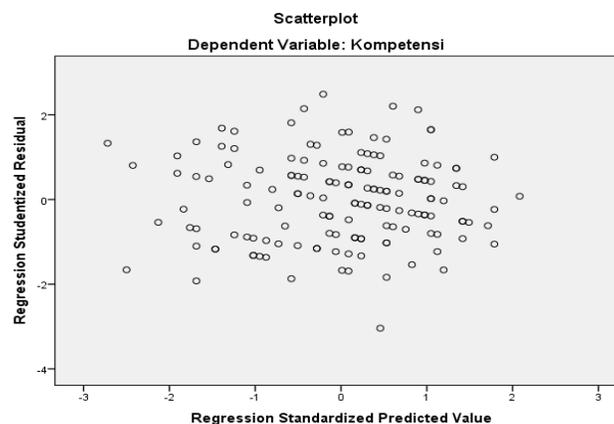


Figure 1. Heteroscedasticity test results

In the graph in Figure 1 above, the dots are spread randomly, do not form a clear pattern, and are spread both above and below 0 (zero) on the Y axis, so there is no heteroscedasticity.

Hypothesis Testing

This study's five primary hypotheses are further developed into a total of ten hypotheses in this section. The results of the testing for the first to the fifth hypotheses are shown in Table 8 below.

Table 8

Direct partial effects

Effect of	R	R²	T	P sign.
X1-Y	0.277	0.077	10.209	0.000
X2-Y	0.192	0.037	7.223	0.000
X1-Z	0.438	0.192	5.922	0.000
X2-Z	0.261	0.068	3.292	0.001
YZ	0.645	0.417	10.280	0.000

Source: Results of primary data analysis 2021 (summarized)

H₁: ISO has a positive and significant effect on the sustainable development of academic competency for PTKI lecturers.

Based on the results of the hypothesis testing summarized in Table 8, the effect of the ISO variable on the sustainable development of lecturers' academic competence has an R of 0.277 and an R² of 0.077 with a T of 10.209 and a significance of 0.000 (<0.05), so it can be concluded that this effect is positive and significant, thus confirming H₁.

The coefficient of determination (i.e., the adjusted R square) of 0.077 means that variation in the ISO variable explains 7.7% of the variation in the sustainable development of lecturers' academic competence, with the remaining 92.3% being determined by other factors.

H₂: Leadership quality has a positive and significant effect on the sustainable development of academic competency for PTKI lecturers.

The regression results yielded an R of 0.192 and an R² of 0.037 with a T of 7.223 and a significance of 0.000 (<0.05), showing that leadership has a positive and significant effect on the sustainable development of academic competence for PTKI lecturers, thus confirming H₂.

The coefficient of determination (adjusted R square) of 0.037 means that variation in the leadership variable explains 3.7% of the variation in the sustainable development of academic competence for lecturers, with the remaining 96.3% being due to other factors.

H₃: ISO has a positive and significant effect on the academic performance of PTKI students

Based on the results of hypothesis testing shown in Table 8, the effect of the ISO variable (X_1) on student performance (Z) has an R of 0.438 and an R^2 of 0.192 with a T of 5.922 and a significance of ($0.000 < 0.05$), so it can be concluded that the effect is positive and significant and that H_3 can be accepted.

The coefficient of determination (adjusted R square) of 0.192 means that variation in the ISO variable can explain 19.2% of the variation in the academic performance of students, with the remaining 80.8% being due to other factors.

H₄: Leadership quality has a positive and significant effect on the academic performance of PTKI students.

The regression results yielded an R of 0.261 and an R^2 of 0.068 with a T of 3.292 and a significance of 0.001 (< 0.05), so leadership has a positive and significant effect on the academic performance of PTKI students and H_4 can be accepted. The coefficient of determination (adjusted R square) of 0.068 means that variation in the leadership variable can explain 6.8% of the variation in student academic performance, with the remaining 93.2% being due to other factors.

H₅: The sustainable development of lecturers' academic competence has a positive and significant effect on the academic performance of PTKI students.

The regression results yielded an R of 0.645 and an R^2 of 0.417 with a T of 10.280 and a significance of 0.000 (< 0.05), so the sustainable development of lecturers' academic competence has a positive and significant effect on the academic performance of PTKI students and H_5 can be accepted.

The coefficient of determination (adjusted R square) of 0.417 means that variation in the sustainable development of lecturers' academic competence can explain 41.7% of the academic performance of students, with the remaining 58.3% being due to other factors.

The testing results for the sixth, seventh, and eighth hypotheses can be seen in Table 9 below.

Table 9*Combined influences*

Effect of	R	R2	F	F table	T	P sig.
X1,X2-Y	0.283	0.080	6.388	3.057	6.644	0.001
X1,X2-Z	0.439	0.193	17.564	3.057	9.055	0.000
X1,X2,YZ	0.699	0.489	46.584	2.666	5.525	0.000

Source: results of primary data analysis 2021 (summarized)

H₆: ISO and leadership quality have a positive and significant combined effect on the sustainable development of PTKI lecturers' academic competence.

Based on the regression results, the combined effect of ISO and leadership on academic competence has an R of 0.283 and an R² of 0.080 with an Fcount of 6.388, which is greater than the Ftable of 3.057, with a significance value of 0.001 (< 0.05), so it is positive and significant and H₆ can be accepted.

The coefficient of determination (adjusted R square) of 0.080 means that variation in ISO and leadership together can explain 8.0% of the variation in the sustainable development of lecturers' academic competence, with the remaining 92.0% being due to other factors not included in this research model.

H₇: ISO and leadership quality have a positive and significant combined effect on the academic performance of PTKI students.

Based on the regression results, the combined effect of ISO and leadership on student academic performance has an R of 0.438 and an R² of 0.193 with an Fcount of 17.564, which is greater than the Ftable of 3.057, with a significance value of 0.001 (< 0.05), so the effect is positive and significant and H₇ can be accepted.

The coefficient of determination (adjusted R square) of 0.193 means that variation in ISO and leadership together explain 19.3% of the variation in academic performance, with the remaining 80.7% being due to other factors.

H₈. ISO, leadership quality, and the sustainable development of lecturers' academic competence have a positive and significant combined effect on the academic performance of PTKI students.

Based on the regression results, it was found that the combined effect of ISO, leadership, and the sustainable development of lecturers' academic competence on student academic performance has an R of 0.699 with an R² of 0.489 with an Fcount of 46.584, which is greater than the Ftable of

2.666, with a significance value of 0.000 (<0.05), so the effect is positive and significant and H_8 can be accepted.

The coefficient of determination (adjusted R square) of 0.489 means that variation in ISO, leadership, and the sustainable development of lecturers' academic competence together can explain 48.9% of the variation in the academic performance, with the remaining 51.1% being due to other factors that are not included in this research model.

The testing results for the ninth and tenth hypotheses tests are shown in Table 10 below.

Table 10

Indirect influence

Effect of	R calculate	R2	R table
X1-YZ	0.178	0.031	0.1603
X2-YZ	0.123	0.015	0.1603

Source: results of primary data analysis 2021 (summarized)

H₉. ISO has a significant indirect effect on student academic performance through the sustainable development of lecturers' academic competence.

The testing results yielded an R of 0.178, which is greater than the R table of 0.1603, so ISO has a significant indirect effect on student academic performance through the sustainable development of lecturers' academic competence. The coefficient of determination (adjusted R square) is 0.031 meaning that the ISO variable explains the academic performance of students through the sustainable development of lecturers' academic competence by 3.1%, with the remaining 96.9% being due to other factors.

H₁₀. Leadership has a significant indirect effect on students' academic performance through the sustainable development of lecturers' academic competence.

The testing results yielded an R of 0.123, which is greater than the R table of 0.1603, so leadership has a significant indirect effect on student academic performance through the sustainable development of lecturers' academic competence. The coefficient of determination (adjusted R square) of 0.015 means that variation in the leadership variable indirectly explains 1.5% of the variance in academic performance through the sustainable development of lecturers' academic competence, with the remaining 98.5% being due to other factors.

The above analysis results, when the research model is compiled, are summarized in Figure 2.

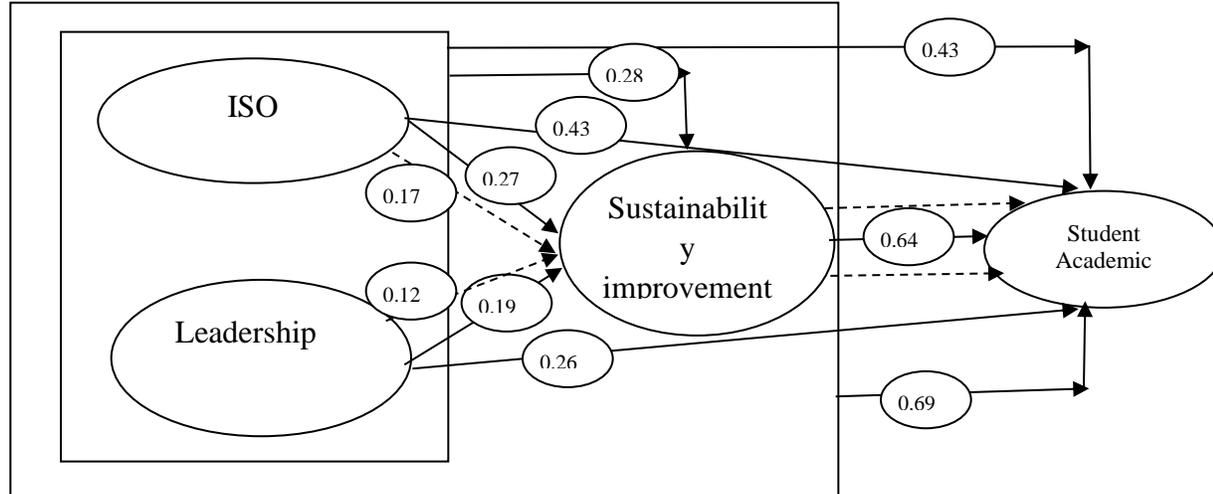


Figure 2. Path analysis

Description:

- : Immediate influence
 - - - - -> : Indirect influence

Discussion

The Effect of ISO on the Sustainable Development of Lecturers' Academic Competence

This study proves that ISO has a positive and significant effect on academic competence, as can be seen from the results of the t-test, with a Tcount of 3.553 being greater than the Ttable of 1.65508 at a significance level of 0.047, which is less than 0.05. The coefficient value of 0.280 means that ISO explains the academic competence of lecturers by 2.8%.

This finding agrees with research conducted by Callista (2016), Umiyati (2015), Juana et al. (2016), and Irawati (2013), who all suggested a positive and significant influence on employee performance, which is of course very closely related to competence. In addition, many organizations strive to implement internationally qualified quality standards, such as the ISO standards, and this has attracted great interest from researchers (Boiral, 2003; Briscoe et al., 2005; Gingele et al., 2002).

The success or failure of implementing ISO is largely down to factors in the organizational culture (Kekale, 1999; Parncharoen et al., 2005; Kujala & Ullarank, 2004), because ISO is essentially a program for organizational change (Parncharoen et al., 2005). The relevance of the ISO standard

QMS to a culture of quality was indicated by Goetsch and Davis (1994), and this is of course highly relevant to the academic competence possessed by PTKI lecturers.

Influence of Leadership on the Sustainable Development of Lecturers' Academic Competence

Leadership also has a positive and significant effect on academic competence, as can be seen from the t-test results obtained, with the Tcount of 3.551 being greater than the Ttable of 1.65508 with a significance level of 0.048, which is less than 0.05. Furthermore, the leadership coefficient value of 0.280 means that the influence of leadership on academic competence is 2.8%. In other words, the better the leadership given to lecturers, the better their development of academic competence will be.

Higher education leaders are central figures who determine direction and policy for an organization, so the two dimensions of leadership, namely transactional leadership and transformational leadership, must be practiced in tandem with an emphasis on transformational leadership. This finding agrees with research conducted by Rusydi (2017) and West & Bollington (1990).

The Effect of ISO on Student Academic Performance

ISO clearly has a significant effect on student academic performance, so when universities wish to improve student academic performance, they could apply the various quality standards suggested by the ISO. When standard operating procedures (SOPs) have been prepared to gain recognition from ISO, they should all be applied to students to improve student performance. On the other hand, when universities are unable to implement the SOPs required by ISO, the academic performance of students is unlikely to improve. Indeed, the level of student academic competence is highly dependent on the level of application for ISO quality standards.

The Effect of Leadership on Student Academic Performance

The results of the hypothesis testing revealed that leadership positively affects student academic performance, so the better the leadership that is served to the academic community, the greater the performance of students will be in terms of academic achievement, non-academic achievements, and other achievements that will enhance the good name of a university.

A better leadership model leads to a better academic climate, and this has a significant direct influence on student academic performance. Therefore, when universities want to improve student academic performance, steps need to be taken to improve the quality of leadership for lecturers, department heads, deans, and other leading players.

The findings of this study provide a complete picture for improving student academic performance in terms of academic achievement and non-academic achievement in various campus activities. It would be preferable of course to have a good example of an applied leadership model. When applied in higher education, democratic leadership models tend to work much better than more authoritarian leadership models, especially considering that the students are much more mature than when they were in secondary or elementary school.

The Effect of the Sustainable Development of Lecturers' Academic Competence on Student Academic Performance

The analysis results show that the sustainable development of lecturers' academic competence has a positive effect on student academic performance. This means that to improve students' academic performance, universities should take action to sustainably develop their lecturers' academic competence. On the other hand, if the lecturers' academic competence is allowed to decline, the students' academic performance will also decline. It is therefore vital for campus leaders to support the sustainable development of lecturers' academic competencies to achieve optimal student academic performance.

The Combined Effect of ISO and Leadership on the Sustainable Development of Lecturers' Academic Competence

This study proves that ISO and leadership have a combined effect on competence, with them together explaining 9.1% of the variation in the sustainable development of lecturers' academic competence. In a university, lecturers are a vital component in the education system, and the ability of universities to face future challenges lies in their hands. Thus, the pattern of support for lecturer development is a determining factor for a university's efficiency (West & Bollington, 1990; Soedijarto, 1993).

The Combined Influence of ISO and Leadership on Student Academic Performance

ISO and leadership have a combined effect on student academic performance. What is more, this combined effect of 0.283 is more powerful than the individual effects of 0.277 and 0.192, respectively. To achieve greater improvement in student academic performance, ISO and better

leadership practices should be applied in tandem, because there is strong empirical evidence to suggest this will achieve better results than applying them individually.

The Combined Influence of ISO, Leadership, and the Sustainable Development of Lecturers' Academic Competence on Student Academic Performance

The combined influence of ISO, leadership, and the sustainable development of lecturers' academic competence on student academic performance was found to be positive and significant. Therefore, to improve student academic performance, it is necessary to consider improving all these three factors together rather than in isolation. This is intuitively rational given that all three factors will make unique but complementary contributions to improving student performance. This finding should inform campus leaders, from the chancellor to the lecturers, in developing interventions to improve student academic performance, both on and off campus, by implementing ISO quality standards, providing good leadership, and supporting the continuous development of lecturers' academic competence.

Conclusion

Based on the results of the data analysis and discussions in this study, some conclusions can be reached: First, both ISO and leadership individually have a positive and significant influence on the sustainable development of lecturers' academic competence and the academic performance of PTKI students. Second, the sustainable development of lecturers' academic competence has a positive and significant influence on the academic performance of students. Third, ISO and leadership together have a significant combined influence on both the sustainable development of lecturers' academic competence and the academic performance of PTKI students. Fourth, ISO, leadership, and the sustainable development of lecturers' academic competence have a significant combined influence on the academic performance of PTKI students. In addition, there is also a significant indirect effect, with ISO influencing student academic performance through the sustainable development of lecturers' academic competence.

The implementation of the ISO quality standards has a greater effect on improving the sustainable development of lecturers' academic competence than improved leadership does. The managerial implication of this is that when higher education leaders want to improve the sustainable development of their lecturers' academic competence, they should first prioritize implementing the ISO standards consistently. That said, the combined effect of ISO and leadership is much

greater than the individual effects, so this process will achieve even better results when combined with enhanced leadership practices.

This will also have a greater effect in terms of improving student performance, which can be further enhanced by other efforts to enhance the sustainable development of lecturers' academic competence. Indeed, ISO, leadership, and the sustainable development of lecturers' academic competence work in a complementary manner to improve student performance, more so than if they were pursued separately.

Future researchers could continue this line of research in other areas, such as for factors like quality of learning, the adequacy of facilities and infrastructure, and various other aspects, either in a similar or different scope.

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