

Integrating Analysis of Quality Management of Higher Education- Analytical Hierarchy Process and Multiple Linear Regression

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Article

Integrating Analysis of Quality Management of Higher Education: Analytical Hierarchy Process and Multiple Linear Regression

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A B S T R A C T

The research focuses on identifying quality management factors in higher education and analyzing the impact of important quality management factors. Quality management factors in this study include human resources, facilities and infrastructure, leadership and organization. Sample study using students from several private universities in Lampung Province. Analysis method using integrating analysis by Analytical Hierarchy Method (AHP) and Multiple Regression Linear (MLR). Correlation test using the product moment stated quality management of higher education have a strong relationship to human resources, has a moderate relationship with infrastructures, and a weak relationship to the leadership and organizing. The result by multiple regression linear method reveal that significant effect on human resources, facilities and infrastructure, leadership and organizational on Quality Management in higher education. While, AHP method suggestion the result that the most important in Quality Management of Higher Education is a human resources owned by a higher education. This evidence contribute to the decision makers in universities which is priority and have to improve the quality of higher education management

I. INTRODUCTION

Higher education is an educational institution whose vision and mission is to implement a learning process to provide human, intellectual, critical and caring, and noble. Therefore, higher education is the moral force for a more democratic and competitive

civil society in the age of globalization. Higher education also has credibility in national construction. [1] stated that higher education should be organized using management principles are flexible and dynamic, in order to allow each university developing in accordance with the potential

of each and external demands that it faces. Therefore, higher education needs to redesign organizations to ultimately develop possible competitive advantages[2]. Likewise, higher education must be able to meet society's requirements for product quality[2]. Achieving quality means creating high-quality graduates. The conventional view is that education is the process of changing human behavior in accordance with established goals. The product of higher education is graduates. The measure of quality offered by most universities is the number of graduates, cumulative grade point average (CGPA). However, many employers complain of insufficient ability to understand and perform work under the CGPA [3]. Underperforming workers cause employers to spend unnecessarily on additional education and training. In response to these situations, the public should also bear the cost of education and carry out "re-education".

There are some fundamental weaknesses in the administration of education in Indonesia, and the fundamental weakness the others, the fields of management which includes the dimensions of process and substance. [4]. At the process level of planning, implementation and evaluation, strict working procedures are not implemented. At substantive levels such as human resources, finance, facilities and infrastructure, learning tools, service aids, library services, etc., not only are the content incomplete, but the success criteria for each are not consistent[5]. Related with previous study, education issue in Indonesia has not fully contribute to society through value and benefit of education itself. The quality of graduates is currently still very low. This is one proof that this immersion education in Indonesia has not been maintained and developed. Relevance of education in terms of substance to the needs of the community is still considered low. The number of education issues that come to the surface is a picture of the quality of education that must be addressed [6]

The product of higher education is graduates. Most college providers used for quality measures are graduate numbers and cumulative grade point average (CGPA)[7]. However, many employers complain of insufficient ability to understand and perform work under the CGPA[8]. Underperforming workers cause employers to spend unnecessarily on additional education and training. In response to these situations, the public should also bear the cost of education and carry out "re-education". From preliminary observations and prior studies especially in Lampung province, some of private University there are some problems on Quality Management issue of private Higher education in Lampung Province, demanding weeks to promote the quality of higher education. First, the curriculum lacks relevance to the needs of stakeholders, second, there are relatively few books available for students as auxiliary materials, third, the administrative process remains unstructured, and the fourth level of creativity is innovation held separately, according to the era of relatively low renewals. Some of the above issues point to the need to identify factors that measure the quality of higher education management.

One of the businesses of higher education or University which is expected to improve the quality of its management to achieve the goal is by implementing Total Quality Management (TQM). TQM will be associated with the quality system that consists of planning of quality systems, quality control systems, and improvement of quality systems. Total Quality Management (TQM) in the field of education has the ultimate aim of improving the quality, competitiveness for output (graduates) with an indicator of the competence of both intellectual and social skills and competence of students / graduates are high. In achieving these results, the implementation of TQM in the organization of education needs to be done to take advantage of all entities in the organization of quality then our education will not work in a place such as this. The important factors of quality management in

this study using four factors refer to previous studies [9]. The factors of quality management in this study include 1) human resources, 2) facilities and infrastructure, 3) leadership, and 4) organization. According to empirical evidence from some previous studies, the above four factors are still relatively used as measures to support quality management in higher education [10] i.e. human resources, facilities and infrastructure, leadership and organizational impact assessment results are significant participation Higher Education Quality Management. Supporting with [1] found and documented criteria and weighted for each factors within developing of software to achieve managerial qualities in "Quality Criteria Determining and Weighing Techniques" (QCDWT). QCDWTs are purpose used with management to measure quality of Management.

[11] Briefly documented that Analytic Hierarchy Process (AHP) is a method of addressing situations where an unstructured complex is divided into components in a hierarchical order, giving subjective values of the relative importance of each variable and indicating which variable has the highest The impact priority of is the result of the situation. Most of applications of the AHP method that have been proven by previous studies [12] are based on subjective and objective approaches. Subjective approach in this case is in reciprocity and comparison of alternatives. In contrast, an objective approach is a proposed procedure to find the most suitable design alternatives from pairwise comparisons of alternative design. So in the application of the AHP method [11] selection criteria in the given solution that is closest to accurate

The decision-making process basically consists of choosing the best alternative. B. Structural issues, identification of alternatives, determination of value likelihood of non-expressive variables, value allocation, time preference requirements, and risk norms. If an alternative can be defined or evaluated in as much detail as possible, the constraints surrounding it still form the

basis for comparison and form a single criterion. Using hierarchies, complex and unstructured problems are broken down into groups and organized in a hierarchy. [13] pointed out that the advantages of AHP over other methods are: 1) Hierarchy, because of selection criteria, boils down to the deepest sub-criteria, 2) Considers validity up to the tolerance limit of different inconsistency criteria and 3) Alternatives, chosen by the decision maker 4) Consider the persistence or elasticity of the output sensitivity analysis of the decision. Proved also integrating analysis method which work by Multiple Regression Linear (MLR), this conducted to determine the best linear combination of multi criteria [10]

This study design solutions are mutually compared by using the selected performance criteria to investigation and determinants: 1) factors of Quality of management in higher education. 2) evaluates a systematic selection method for determining and weighing with a multi-criteria decision making with AHP method. 3) the relationship several factors with quality management by multi regression linera method. Therefore, this findings would give contributes as an input to determine future policy, especially in planning the implementation of TQM in private unversity, especially in Lampung Province in order to achieve the quality of Higher Education reliable and superior and highly competitive.

II. LITERATURES REVIEW

Quality and TQM (Total Quality Management) Quality is a term that is always associated with a product or service, so the quality is not something foreign to everyday life. The notion of quality has a variety of senses, each of which depends on the perspective of people perceive it. [13] Defining quality broadly, quality is the dynamic state associated with products, services, people, processes, and environments that meet or exceed expectations. [3] stated that the quality of products and services can only be produced consistently by a qualified organization [8] TQM is a management system that undertakes the planning and decision-making, organization, leadership, direction, processing and utilization of all capital goods and materials, technology, information systems, energy and human resources in order to create high-quality products or services that meet requirements. With the participation of all human resources, efficiently, effectively and responsibly continue to meet the needs of the consumer market and meet the survival of the company. TQM approach is an approach that has characteristics such as focusing on customers, both internal and external, have an obsession that is high on quality, using a scientific approach to decision-making and problem-solving, has a long-term, requiring team cooperation (teamwork) Touch ups processes also continuous, organized education and training, provide freedom, has ones objectives and required the involvement and empowerment of employees [14]. The purpose of TQM is to provide quality products and services that meet the needs and satisfaction of the consumer market (sustainable satisfaction) so as to increase the productivity of manufacturers achieve economic profit with the consequent reduction in production costs [15]

1. The Relationship Between Human Resources, Facilities, and Infrastructure, Leadership, Organizing With The Quality Of University Management.
2. In the development of education in Indonesia, often appears the dilemma between educational quality and equity of education of the quality of education. The selection will be life especially in our nation's human resources, including the quality of human resources in college. The quality of human resources will greatly affect the quality of higher education. To improve the quality of human resources in universities in need of empowerment (empowerment) so that human resources education colleges have the ability and opportunity to work quality, create, innovate and develop themselves [16]. Quality of human resources will also affect the structure and infrastructure of higher education both tangible and intangible. According previous evidence the proposed a hypothesis:

H1: There is a significant relationship between human resources (X1) with the quality management in higher education (Y)

Because of the importance of infrastructure to the quality of higher education then Tampubolon (2001) states that form (tangibility) is neatness, cleanliness, beauty and harmony of physical universities, particularly managers (leaders, faculty administrative officers) that makes the situation more attractive services. Thus, these is following hypothesis:

H2: There is a significant relationship between the variables of facilities and infrastructure (X2) with the quality of university management (Y)

Quality of organization needs leadership quality as well as without quality leadership, the principles of quality improvement will not materialize. Effective leadership in higher education is visionary, unifying, empowering, controlling emotions. Muharlisiani et al (2020). The several previous finding gives evidence that the transformational leadership has a positive and significant correlation with the higher education performance (Senthamil Raja & Palanichamy, 2011; Ali et al. 2016, Handayani, 2019; Muharlisiani, et al, 2020). The ratio of high integrity will be able to manage the organization (organization) from the upper level to the extent that the organization leader leads. Organizing is right and good will manifest a quality organization. In an organization always needs someone who can manage the organization by influencing others with attitude, style, and ability to achieve the objectives of the organization, someone is called a leader. [9]give evidence that leadership and organizing significant positive with quality of management in university. Therefore, based on discussion above the hypothesis are:

H3: There is a significant relationship between leadership variable (X3) with the quality of university management (Y)

H4: There is a significant relationship between organizational variables (X2) with the quality of university management (Y).

III. METHODS

3.1 Data and Respondents

The data was obtained by several groups of data collectors. Processed data obtained from questionnaires using the analytical approach method Hierarchy Process (AHP) to then be recorded and tested using a computer program which was made specifically for the purposes of this research.

Respondents in this study were students of private university in the province of Lampung which is degree and diploma

Regular students who are members of the Student Association. Sampling is student in board of student association consists of the chairman, secretary, treasurer and members. Respondents were obtained from 10 private universities in Lampung province.

Table 1 Respondent Data

No	College	Number of Samples
1	Universitas Bandar Lampung	4
2	IIB Darmajaya	6
3	STMIK Pringsewu	5
4	UMTRA	2
5	Universitas Tekhnokrat Indonesia	5
6	Universitas Muhammadiyah Lampung	3
7	STEBI Tanggamus	4
8	STIE Lampung Timur	5
9	Universitas Malahayati	4
10	STIT Pringsewu	2
Total		40

**College Students in 2019*

3.2 Research Variables

1. Dependent Variables: Quality Management College (Y) is a condition associated with the products, services, people, processes and the environment produced by colleges that meet the expectations of students
2. Independent Variable:
 - a. Human Resources (X1) is a state located on the workers themselves as skills, attitudes, values, needs and demographic characteristics, as well as the perspective of workers to jobs that are affected by the condition of the working environment of an organization
 - b. Facilities and Infrastructure (X2) is something which is supporting the implementation of the organization's activities in the form of college objects visible (tangible) and something that does not look (intangible)
 - c. Leadership (X3) is the ability of someone to affect the spirit or the ability of other individuals that are willing and have the responsibility to attempt to achieve or exceed organizational goals. The capabilities

- demonstrated by the attitude, commitment, vision and misis a leader
- d. Organizing (X4) is a unit consisting of the parts in the group to achieve the goals and objectives set, which can be seen on the effectiveness of internal and external communication, the effectiveness of the cooperation and effectiveness of target setting organizations

- *Organizing (X4) indicators:*
 - 1) Means of Communication
 - 2) The level of cooperation,
 - 3) Organization Target Accuracy (Hani, 1998)

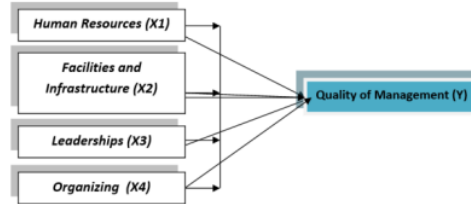


Figure 1. Framework

3.3 Operational Definitions

- *The quality of management indicators:*

1) Relevance, namely the level of conformity with the requirement, which consists of: the National Curriculum, Conformity curriculum content, Conformity Syllabus, Conformity test materials, and suitability of library books, 2) Efficiency, which consists of: Implementation Lecture, 3) *Effectiveness*, which consists of: How the presentation of lectures and administrative procedures, 4) Accountability, which consists of: confidence and Ease of Service, 5) situation Work, which consists of: Familiarity Relations 6) responsiveness, consisting of: Level response Leaders (jatiningrum, 2011 & Abadi 2019)

- *Human Resources (X1) indicators:* 1) Culture Employees, 2) Response to Change, 3) confidence to the improvement of Quality (Tampubolon, 2015)

- *Facilities and Infrastructure (X2) indicators:* 1) Appearance, the item: a. Neatness, cleanliness, beauty of the lecturer hall, b. cleanliness, beauty equipment lecture, c.the appearance of supporting employees and lecturers, 2) Equipment Condition (Abadi, 2019)

- *Leadership (X3) indicators:* 1) Change Organization, 2) The ability of decision making, 3) The attitude of the leader to an improved quality. (Mulyadi, 2000)

3.4 Analysis Methods

The study using hybrid method for analysis. AHP and MLR to examine and solving the problem. In particular, the study attempts to qualitatively determine critical factors of quality management from students'perspective being primary customer as determining of quality management in higher education

Criteria and alternatives are carried out by pairwise comparisons. According to Saaty (1988), for various problems, a scale of 1 to 9 is a scale best to express opinion. The value of the level of importance is shown in the following table Intensity Description

7	Both elements are equally important
3	One element is less important than the other
5	One element is more important than the other elements
7	One element is clearly more absolutely important than theother
9	One element is absolutely important than the other elements
2, 4, 6, 8	The values between two adjacent considerations

Calculate Consistency Index (CI) with the formula

$$CI = (\lambda_{max} - n) / n$$

Calculate the Consistency Ratio with the formula

$$CR = CI / IR$$

The Stages integrating analysis whichElwakil (2017) also similar design the

study which for comprehensive analysis assessment through identifying quality management of higher education

Stage 1: Identification of critical factors or determinants of quality management

Stage 2: Survey (Quisioner phase I and phase II-using AHP Method)

Stage 3: Realibility and Validity Test

Stage 4: Weighted indicator for each Factors

Stage 5: Person Correlation Test

Stage 6 : Multiple Regression Linear (MLR)

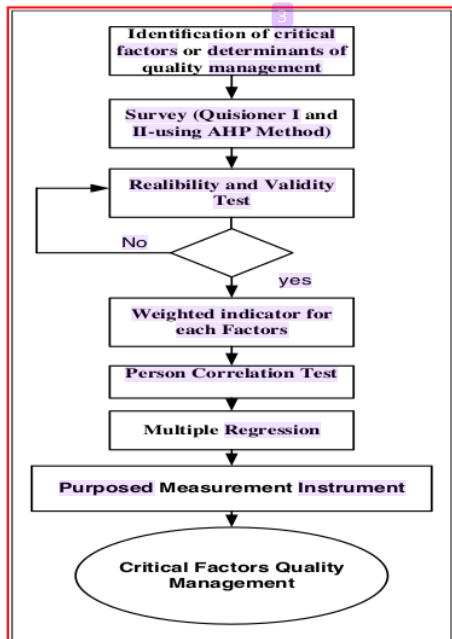


Figure 2. Stages of Analysis Method

Analytic Hierarchy Process The data processing method carried out in this data processing stage consists of two stages, namely: 1) Combine respondents' assessment of the relative importance of each criterion and sub-criteria. 2) Calculate the priority weight and inconsistency rate of each criterion and sub-criteria. Rating groups in AHP can be combined into one rating by taking the geometric mean of respondents' ratings. This rating becomes the input for experts to choose data processing. The pairwise comparisons in the pairwise comparison matrix are the result of

computing the geometric mean of the results of all respondents. Respondents' assessments are based on geometric mean:

$$R = \frac{(1 + R_1) (1 + R_2) (1 + R_3) \dots (1 + R_n)}{n - 1} \quad (1)$$

Description: $R_1 \dots R_n =$ Results of respondents 1 to the respondent

3.2 Research Instruments

In this study, the researchers used the tools of the first and second stage questionnaires, this method of selection criteria and sub-criteria weighting in two stages, the element: (Abadi et al, 2019)

1) Selection criteria and sub-criteria organized mainly in a hierarchical model when using the Phase 1 questionnaire to determine management quality (Phase 1 Questionnaire). Design of multi-attribute decision-making system based on AHP At this stage, researchers have begun to evaluate the existing higher education management quality decision indicators, and established the standard of grading scale.

Phase II: Weighting and priority of criteria and subcriteria. 1. At this stage, based on the results of the first questionnaire, the second stage of the questionnaire was developed. In the second stage of the questionnaire, respondents were asked to complete the questionnaire in pairs by weighting the criteria and sub-criteria by comparing their relative importance.

IV. RESULT

4.1 Validity and Realibility Test The Factors of Quality Management

The validity of the test results show that the correlation coefficient compared with r table product moment (at 0.05 with 2-side test). If the correlation coefficient > of r table the item statement is Valid. It can be seen from the result that all assertions of quality of management, human resources, infrastructure, leadership and organizing variable is Valid.

In this research test of reliability using Cronbach Alpha reliability test techniques. Cronbach Alpha coefficients will give the

price of the smaller or larger than the critical number (critical value) the number of the item in question (from the table).Based on the result of realibility test shows that the value of *Cronbach Alpha* in quality management, human resouces, variable is greater than 0.60. That case this means that the entire item statement is realibel. And for the value of Corrected Item Total Correlation compared with r table (0,312 to N = 40), it can be seen the value of coefficient is positive and greater than r table. So it is stated that the item is reliable and can be used in research

4.2 The Weight of Main Factors and Sub Criteria The Quality Management

a. Main Factors



Figure 3. The Weight Value of Main Factors The Quality Management

Human resources are the biggest factor compared to other criteria. The weights are not significantly different compared to other value criteria. The other factors have weight values close to each factor. This shows that the most important thing in the quality management of higher education is the human resources that the university has, because good quality and ability of print graduates depends on the learning process of teachers and human resources who are competent in their field, and another important factor determines the university management quality.

b. Human Resources

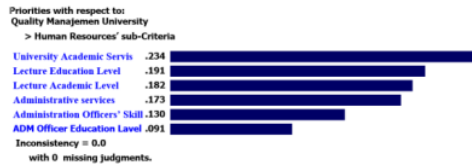


Figure 4. The Weight Value of Human Resources

For the human resources factor, the sub-criteria for academic services higher education was the largest of each factor compared to the other criteria. The weights are not significantly different compared to other value criteria. The other factors have weight values close to each factor. This shows that the Faculty of Human Resources Academic Services is the most important, it is for students, because the learning process determines the degree of specialization of students in universities, especially private universities.

c. Facilities and Infrastructure

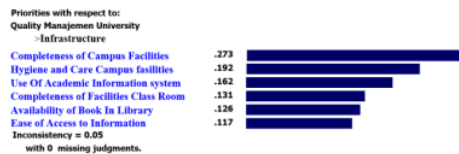


Figure 5. The Weight Value of Facilities and Infrastructure

Compared to other standards, the campus facility sub-integrity standard is the biggest factor. The weights are not significantly different compared to other value criteria. The other factors have weight values close to each factor. This shows that the most important thing is the integrity of the campus infrastructure, as the learning process of the university needs to be supported by the infrastructure that supports students, especially in private universities.

d. Leaderships

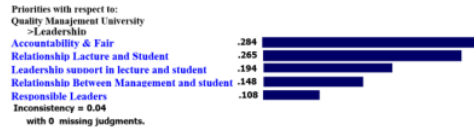


Figure 6. The Weight Value of Leadership

The Accountability and Fair Governance sub-criteria were the largest of each factor compared to the other criteria. The weights are not significantly different compared to other value criteria. The other factors have weight values close to each factor. This shows that the most important thing in university governance is the accountability and fairness of governance. This is because the management and administration of private colleges is carried out entirely by the college owners and chairmen.

e. Organizing

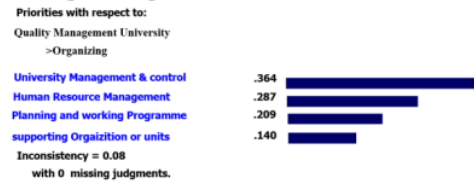


Figure 7. The Weight Value of Organizing

The sub-standard of higher education management and control is the biggest factor compared to other standards. There is no significant difference in weight values compared to other criteria. Other factors have weight values close to each other. This suggests that the most important aspect of higher education quality management is the control of universities and colleges, as organizations pursuing continuous improvement ensure the sustainability of higher education, especially private universities.

4.3 Result of R Square Test

Tabel 2. Result of R Squere Test Human Resources, Facilities And Infrastructure, Leadership And Organization.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.745 ^a	.655	.504	.255

a. Predictors: (Constant), ORG, KPMAN, SDM, SAR_PRSRN

Based on the table above, result of R square test of Quality Management to Human Resources showed that Human Resources, Facilities and Infrastructure, Leadership and Organisation are able to explain the relationship of 0.655 or 65%, and amounted to 0.345 or 34% explained by other factors. This means that there are still other factors that mempengaruhi quality college management.

a. The Results of Correlation test between Quality Management with Human Resources

After testing by using a technique *Product Moment* which is correlation values obtained correlation coefficient $r = 0.717$, the values when consulted by the critical value in the table product moment for $N = 40$, the error rate (α) of 0.05, a score of 0.312. So that means that $t_{count} > t_{tabel}$ thus this findings a relationship between the quality of the Human Resource Management in Higher Education. The relationship between quality management and Human Resources showed a strong relationship. This means that employees of cultural indicators, feedback changes, and self-confidence to change is very strongly related to the quality of management in Private university.

b. The Results of Correlation test between Quality Management with Facilities and Infrastructure

After testing by using a technique *Product Moment* Correlation values obtained correlation coefficient $r = 0.592$, the values

when consulted by the critical value in the table product moment for $N = 40$, the error rate (α) of 0.05, a score of 0.312. So that means that $t_{count} > t_{tabel}$ thus discovered the relationship between Infrastructures and Quality Management. The relationship between quality management and Infrastructures indicate the relationship is weak. This means that the indicators Appearance (Cleanliness, neatness, and lecture halls, and the appearance of lecturers), Condition Perlengkapat relationships were with the quality

c. The Results of Correlation test between Quality Management with Leadership

After testing by using a technique Product Moment Correlation values obtained correlation coefficient $r = 0.343$, the values when consulted by the critical value in the table product moment for $N = 40$, the error rate (α) of 0.05, a score of 0.312. So that means that $t_{count} > t_{tabel}$ thus discovered the relationship between Quality Management in Higher Education with Leadership. The relationship between quality management and leadership meant a weak link. That case this means that the indicators of Organizational Change, Decision-making Ability, Attitude leader to an improved quality relationships lemahdengan quality Management.

d. The Results of Correlation test between Quality Management with Organizing

After testing by using a technique Product Moment Correlation values obtained correlation coefficient $r = 0.343$, the values when consulted by the critical value in the table product moment for $N = 40$, the error rate (α) of 0.05, a score of 0.312. So that means that $t_{count} > t_{tabel}$ thus discovered the relationship between Quality Management in Higher Education Leadership. The relationship between quality management and leadership meant a weak link. That case this means that the indicators of Organizational Change, Decision-making

Ability, Attitude leader to an improved quality relationships lemahdengan quality Darmajaya IBI Management.

4.4 Result of Partial Regression

Table 3. Result of Effect Human Resorces, Infrastructure, Leadership, Organizing with Quality Management in Higher Education

Model	Coefficients ^a				
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.362	.497		2.739	.010
HR	.490	.087	.650	5.654	.000
INFSTRC	-.227	.130	-.317	-1.742	.040
LDRS	.301	.131	.413	2.288	.028
ORG	-.067	.091	-.088	-.733	.036

Based on table above present that all factors support the hypothesis alterantif. After testing using regression analysis found there is significant with an error rate (α) of 0.05, the test results stating that there is influence between the quality of university management on Human Resorces, Infrastructure, Leadership and Organization. So based on the above table shows the significant value of 0.000 or less than 0.05. Human Resoucers (0,000), Infrastructure (0,040), Leadership (0,028) and Organizing (0,036)

The test results indicate that the effect of the influence of variables human resources, facilities and infrastructure, Leadership, and Organization of the Quality Management in private universities. This result consisten with Jatiningrm (2011) and Abadi (2016). Therefore, the implementation of TQM is indispensable in improving the quality of management. TQM is a management system that utilizes all capital equipment and materials, technology, system information, energy and human resources for planning and decision-making, quantity organization, management, guidance, and processing to create high-quality products or services that meet demand. And to continuously satisfy the satisfaction of the consumer market for

the survival of the company in an efficient, effective and responsible way, involving all human resources. The purpose of TQM is to provide quality products and services that meet consumer market needs and satisfaction (sustainable satisfaction) to increase productivity.

V. CONCLUSION

This study aims to demonstrate empirically the picture quality of university management and examine the influence of factors of human resources, facilities and infrastructure, leadership, organization of the

quality of university management in private universities. Based on the research results can be concluded: The results using the product moment correlation test show that higher education quality management has a strong relationship with human resources, a moderate relationship with infrastructure, and a weaker relationship with leadership and organization. The results of the effect test using multiple linear regression in this study show that human resources, facilities and infrastructure, leadership and organization influence higher education quality management.

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