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The 1st International Conference on Computer, Science, Engineering and Technology

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1st International Conference on Computer, Science, Engineering and Technology (ICComSET)

PREFACE

It's our great pleasure to welcome you to the 1st International Conference on Computer, Science, Engineering and Technology (ICComSET-2018), Tasikmalaya, West Java, Indonesia from 27-28 November 2018.

The International Conference on Computer, Science, Engineering and Technology (ICComSET-2018), provides an excellent international forum for sharing knowledge and result in theory, methodology an applications of Computer, Science, Engineering and Technology in theoretical and practical aspects. The aim of the conference is to provide a platform to the researchers and practitioners from both academia as well as industry to meet and share cutting-edge development.

ICComSET-2018 secretariat has received 250 submissions from 6 countries: Malaysia, Taiwan, India, Mexico, Tunisia, and Indonesia. The new program held in the City of Tasikmalaya was organized by the Universitas Muhammadiyah Tasikmalaya (UMTAS) at Santika Hotel, Tasikmalaya from 27-28 November 2018, and supported by several universities including: STIKES Bakti Tunas Husada, Universitas Perjuangan Tasikmalaya, STIKES Muhammadiyah Ciamis, Universitas Muhammadiyah Sidoarjo, and Indonesian Collaboration Publication Community (Komunitas Kolaborasi Publikasi Indonesia/ KO2PI).

Each paper has been reviewed by the program committee. Only 166 paper were accepted for the oral session (acceptance rate: 65.3 %). The conference program consist of 3 keynote speakers (90 min), 6 Invited speakers (120 min), 5 parallel session, one poster session and a round table.

We would like to thank scientific committee, and reviewers, as well as the committee of the Universitas Muhammadiyah Tasikmalaya who have participated in the success of this event so that this event can be held as planned. We also conveyed to the Rector of Universitas Muhammadiyah Tasikmalaya who had supported this event both in terms of finance and other supporting facilities.

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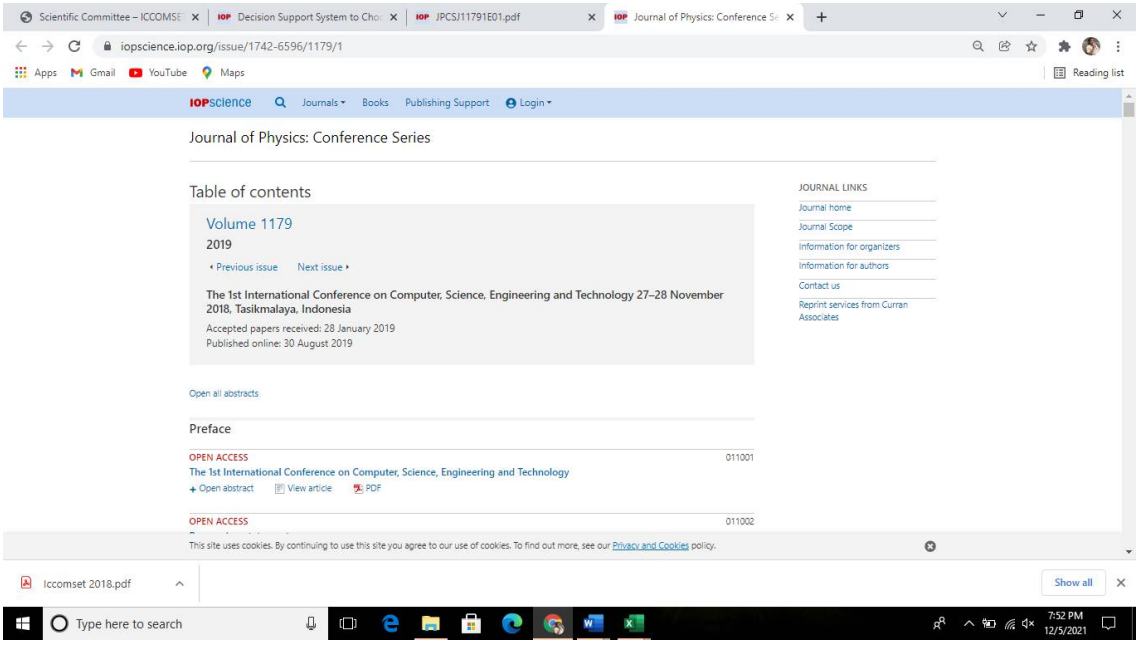
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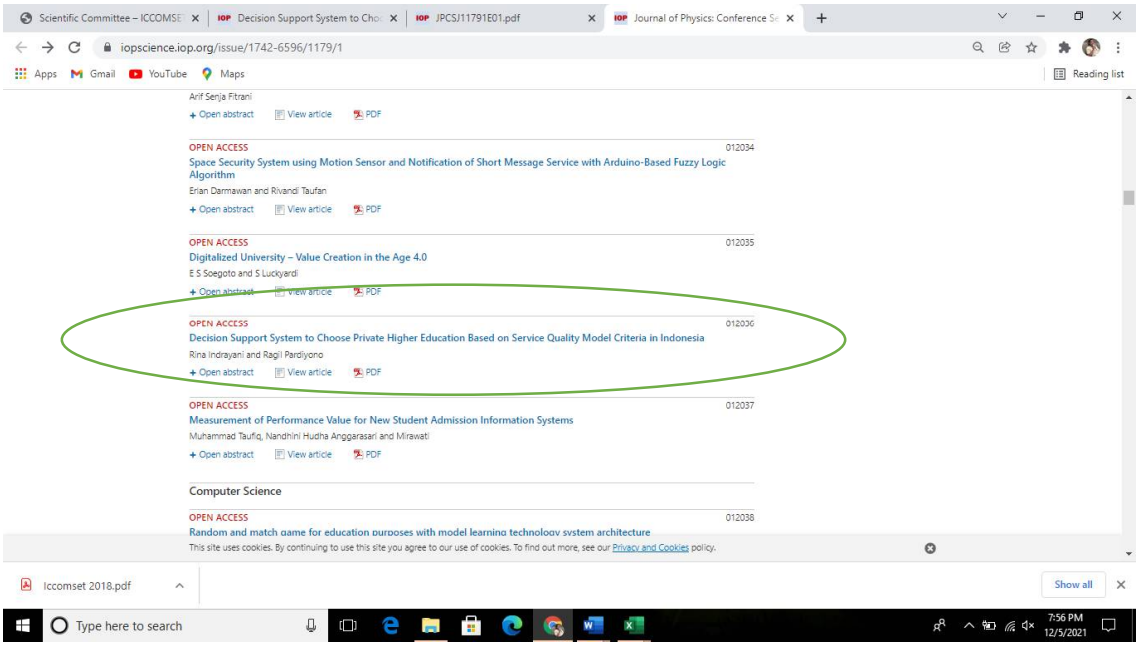
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Decision Support System to Choose Private Higher Education Based on Service Quality Model Criteria in Indonesia

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Decision Support System to Choose Private Higher Education Based on Service Quality Model Criteria in Indonesia

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Abstract. Ministry of Research and Technology of Higher Education in 2017 centralized universities in Indonesia to establish a foundation for classification and ranking of universities in Indonesia in the context of continuous improvement and health of the organization. The clustering is based on criteria 1) Quality of Human Resources, 2) Quality of Management, 3) Quality of Student Activities, and 4) Quality of Research & Publication. The following are the results of the clustering. Cluster 1 is a university whose input, process and output are in a very good category, cluster 2 is in good category, cluster 3 is categorized quite well, cluster 4 is in a poor category, and cluster 5 is very poorly categorized, Input, for example, is lecturer quality, while process is, for example, institutional accreditation and accreditation of the study program and the last output is seen from the many students who received various awards (Kemenristekdikti, 2017). The College Clustering System is very influential on prospective students in making decisions to choose universities to continue their studies. According to [1] higher education is the service industry and service quality is an important determinant of the success of higher education. According to [2] the quality of service is one of the main goals of universities to attract students. Based on that, this study will create a support system for the selection of universities from the 5 clusters based on the dimensions of Service Quality (SerQual), namely 1) Reliability, 2) Responsiveness, 3) Assurance, 4) Empathy, 5) Tangibles. According to [3] decision support systems are popular tools that help make decisions in an organization. One method in the *Multi-Criteria Decision Making* (MCDM) is AHP (Analytic Hierarchy Process). According to [4] this AHP is quite effective in simplifying and accelerating the decision-making process by solving the problem in its parts. After a *pairwise comparison*by decision makers for each criterion and alternative to obtaining the value of the level of importance of the element in the form of a qualitative opinion. Relative comparison values are then processed according to AHP steps to determine the relative rank of all alternatives. Based on the processing and analysis of data that has been done in the previous section, it can be concluded that universities in cluster 2 are selected based on the criteria of Reliability, Responsiveness, Assurance, Empathy, and Tangibles with a value of 0.261.

.

1. Introduction

The Ministry of Technology and Higher Education Research (Kemenristekdikti) in 2017 centralized Higher Education in Indonesia to establish a foundation for classification and ranking of Universities in Indonesia in the context of continuous improvement and organizational health.

The data used in the ranking is data that can be derived from PD Dikti Data which is the result of an assessment from the Kemenristekdikti work unit (example: research performance, student performance) and data from external Kemenristekdikti that are well established and can describe the quality of Higher Education (eg accreditation data, publication data is indexed by Scopus).

Clustering of Universities based on criteria 1) Quality of Human Resources, 2) Quality of Management, 3) Quality of Student Activities, and 4) Quality of Research & Publication. The following are the results of the clustering;

Table 1. Clustering of Universities in Indonesia

NO	CLUSTER	AMOUNTPT
1	Cluster 1	28
2	Cluster 2	97
3	Cluster 3	744
4	Cluster 4	2,043
5	Cluster 5	342
Total		3,254

According to Ministry of Research and Technology of Higher Education, cluster 1 is a university whose input, process and output are very well, cluster 2 is in good category, cluster 3 is categorized quite well, cluster 4 is in poor category, and cluster 5 is very poorly categorized, Input, for example, is lecturer quality, process is, for example, institutional accreditation and accreditation of the study program and the last output is seen by many students who received various awards.

The College Clustering System is very influential on prospective students in making decisions to choose universities to continue their studies. In addition, heterogeneity of PTS is also increasingly complex so it is very difficult to choose PTS to get the best education.

According to [5] students are 'customers' so the handling must be with a customer-oriented model approach. According to [1] higher education is the service industry and service quality is an important determinant of the success of higher education. According to [2] the quality of service is one of the main goals of universities to attract students. Based on the description, this study will create a support system for the selection of universities from the 5 clusters based on the Service Quality (SerQual) criteria.

According to [3] Decision Support Systems are popular tools that help make decisions in an organization. The process of selecting a college is a problem that involves many components or criteria being assessed (multicriteria) so that in its completion a decision support system is needed with multi-criteria.

One method in the *Multi-Criteria Decision Making* (MCDM) is AHP (Analytic Hierarchy Process). According to [4] this AHP is quite effective in simplifying and accelerating the decision-making process by solving the problem in its parts. *Multi-Criteria Decision Making* (MCDM) and Analytic Hierarchy Process can be applied in various fields.

This study will use criteria from the SerQual dimension. According to Parasuraman in [6], SERVQUAL is based on a multi-item scale designed to measure customer expectations and perceptions, and the gap between the two in the five main dimensions of service quality, namely 1) Reliability, 2) Responsiveness, 3) Assurance, 4) Empathy, 5) Tangibles,

Therefore, this study will create a system model supporting the selection of higher education institutions in Indonesia using the method *Multi-Criteria Decision Making* (MCDM) and *Analytic Hierarchy Process* based on college clustering and using criteria Service Quality dimension.

2. Method and Material

2.1 Decision support systems

According to [7] Decision support systems are a set of model-based procedures for processing and assessment data to help managers make decisions. According to [8] a decision support system is an approach to support decision making. Decision support systems use data, provide an easy user interface, and can combine decision-making thinking.

2. 2. Analytic Hierarchy Process (AHP)

AHP is a method that can help decision-makers to find the best one that is suitable with their goals and understanding of the chosen problem faced (Rina).

According to [9] the first AHP model developed by Thomas L. Saaty is an AHP with weighting *additive*. It is called an *additive* because arithmetic operations to get the total weight are summation. In the AHP method, there are three main principles that must be considered, namely:

1. The principle of hierarchical preparation
2. The principal determines priorities
3. The principle of theological consistency

Multi-Criteria Decision Making (MCDM) relates to the selection of optimal choices between alternatives based on attributes or decision criteria. The multicriteria problem is simplified in the form of a hierarchy consisting of 3 main components. That is the goal or goal of decision making, assessment criteria, and alternative choices.

AHP steps

1. Define the problem and determine the desired solution.
   This stage determines the problems that we will solve clearly, determine solutions that might be suitable to solve the problem. Solutions may amount to more than one which we will develop further in the next stage.
2. Create a hierarchical structure that starts with the main goal.
   The main objective is the top level in the hierarchy then followed by the level of the hierarchy that is below it, which are all suitable criteria to make an assessment of the alternatives.
3. Make a paired comparison matrix that describes the relative contribution or influence of each element to the objectives or criteria that are above it.
4. Defines pairwise comparisons so that the total number of judgments is t = nx [(n-1) / 2], where n is the number of elements compared.
5. Repeat steps 3 and 4 for all levels of the hierarchy.
6. Calculates the eigenvectors of each paired comparison matrix.
   The eigenvector is the weight of each element used to prioritize the elements at the lowest hierarchy level to reach the goal that is at the highest level (one element)
7. Checking consistency
   Expected consistency is near perfect in order to produce a near valid decision. Although it is difficult to achieve perfect, the consistency ratio is expected to be less than or equal to 0.1.
   How to calculate consistency
   7.1 Calculate the Consistency Index (CI) with the formula:
   $$CI = \frac{\lambda \max - n}{n-1}$$
   7.2 Calculate the Consistency Ratio (CR) with the formula:
   CR = CI / RI

2.3 Determination of Criteria

Identify criteria in the selection of this private tertiary institution, based on the SERVQUAL dimension. According to Parasuraman in [6], SERVQUAL is based on a multi-item scale designed to measure customer expectations and perceptions, as well as a gap between the two in the five main dimensions of service quality, namely

1) Reliability, the ability to provide services that are appropriate to the promises offered to customers and accurate,
2) Responsiveness, namely the willingness and ability of employees to help customers and provide fast and responsive service,
3) Assurance, namely the desire of staff and employees to help customers and provide responsive service,
4) Empathy, namely individual attention given by the company to customers
5) Tangibles, the quality of services provided through the form basilicas and instruments/equipment used.

the hierarchical structure of this study as in Figure 1.

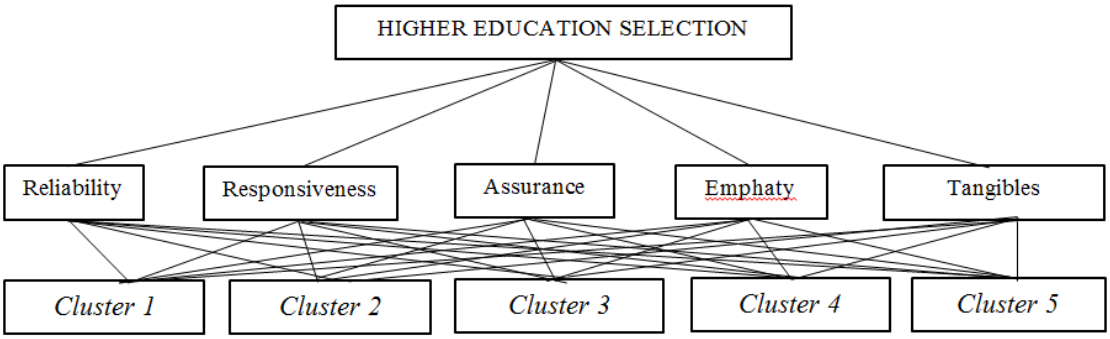

Figure 1. Structure of the research hierarchy

3. Result and Discussion

Forum pairwise comparisons *(pairwise comparison)* for each criterion and alternatives, namely comparing each element with other elements to obtain the value of the level of importance of the element in the form of a qualitative opinion. Pairwise comparisons are made by decision makers.

Relative comparison values are then processed according to AHP steps to determine the relative rank of all alternatives. Based on the results of the calculation it is obtained to produce rank and priority as in the following tables;

Table 2. Comparison of Pairings between Criteria

Criteria	*Reliability*	*Responsiveness*	*Assurance*	*Empathy*	*Tangibles*
Reliability	1.00	5.00	3.00	5.00	2.00
Responsiveness	0.20	1.00	0.25	4.00	0.50
Assurance	0.33	4, 00	1.00	5.00	1.00
Empathy	0.20	0.25	0.20	1.00	0.50
Tangibles	0.50	2.00	1.00	2.00	1.00
Total	2.23	12.25	5,45	17,00	5,00

The first step is to normalize each column by dividing each value in the I column and the j row with the total value in column i.

Table 3. Normalization

Criteria	*Reliability*	*Responsiveness*	*Assurance*	*Emphaty*	*Tangibles*	*JML*	*PRIORITY VECTOR*
Reliability	0,45	0,41	0,55	0,29	0,40	2,10	0,42
Responsiveness	0,09	0,08	0,05	0,24	0,10	0,55	0,11
Assurance	0,15	0,33	0,18	0,29	0,20	1,15	0,23
emphaty	0,09	0,02	0,04	0,06	0,10	0,31	0,06
Tangibles	0,22	0,16	0,18	0,12	0,20	0,89	0,18
Total	1,00	1,00	1,00	1,00	1,00	5,00	1,00

After normalizing the next step is to determine the priority weighting to each criterion I, and Eigenvalues obtained as shown in Table 3

Table 4. Eigen Value

Criteria	Eigen Value
of Reliability	2.325
Responsiveness	0.585
Assurance	1.296
empathy	0,308
Tangibles	0,962

$$\lambda = \frac{(\Sigma \text{ EigenValue / PriorityVector})}{N}$$

$$\lambda = \frac{((2{,}325 / 0{,}42) + (0{,}585 / 0{,}11) + (1{,}296 / 0{,}23) + (0{,}308 / 0{,}06) + (0{,}962 / 0{,}18))}{5}$$

$$\lambda = \frac{26.97}{5} = 5.41$$

Next,

$$\text{CI (Consistency Index)} = \frac{\lambda - n}{n-1} = 0.099$$

$$\text{CR (Consistency Ratio)} = \frac{CI = 0.099}{RI = 1.12} = 0.088$$

Because the result of CR = 0.1 then consistent assessment and processing of data can proceed to the next calculation. Based on AHP calculations, the final ranking results are obtained as follows:

Table 5. Priority Ranking Value

	Reliability	***Responsiveness***	***Assurance***	***Empathy***	***Tangibles***	***PRIORITY RANKING***
	0.42	0.11	0.23	0.06	0.18	
CLUSTER 1	0.16	0.13	0.32	0.52	0.39	0.258
CLUSTER 2	0.28	0.12	0, 21	0.26	0.37	0.261
CLUSTER 3	0.11	0.28	0.33	0.11	0.33	0.220
CLUSTER 4	0.12	0.18	0.19	0.09	0.21	0.157
CLUSTER 5	0.09	0 , 14	0.12	0.11	0.09	0.104

Based on table 4, it can be seen that universities in cluster 2 get the highest score of 0.261, followed by universities in cluster 1 with a value of 0.258 and universities in cluster 3 with a value of 0.220, then higher education in cluster 4 with a value of 0.157 and the last college in cluster 5 with a value of 0.104. The results of the calculation of the value of each cluster seen no significant difference in value between *clusters* because the assessment given by decision makers is subjective.

4. Conclusion

Based on the processing and analysis of data that has been done in the previous section, it can be concluded that universities in cluster 2 are selected based on the criteria of Reliability, Responsiveness, Assurance, Empathy, and Tangibles with a value of 0.261.

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