

Comparative Analysis of AHP and SMART Methods in Lecturer Performance Assessment for Providing Incentives to STIKOM Cipta Karya Informatika


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ABSTRACT

The quality of human resources is one of the supporting factors to increase the productivity of an agency's performance, highly competent human resources can support the level of performance, with a performance assessment, it will be known the achievements achieved by each employee in Higher Education Rewards or assessments in the form of incentives are a form of gratitude to lecturers for the dedication and performance that lecturers have given to universities. In this study, two methods were used in decision-making to provide incentives based on performance assessment. AHP (Analytical Hierarchy Process) method and SMART method (Simple Multi Attribute Rating Technique) with a study on Lecturers at STIKOM Cipta Karya Informatika. At the analysis stage using the two methods, the results were obtained that the performance assessment using the AHP method was only 3 lecturers out of 10 lecturers who were entitled to incentives with an assessment decision of 21.00 to 24.00 were entitled to incentives and an assessment of 0.00 to 20.00 did not get incentives. Analysis using the SMART method found that 4 lecturers out of 10 lecturers who were entitled to incentives with an assessment decision of 1.5 to 2.4 were entitled to incentives and 0.00 to 1.4 did not get incentives. From the results of data analysis in this study, it was also obtained that the assessment of incentive decisions is more appropriate using the SMART method than using the AHP method.

Kata kunci: Lecturer Performance Assessment, SMART, AHP.

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1. INTRODUCTION

Performance appraisal is an activity that should be carried out to assess the quality of human resources in a company or organization. The quality of human resources is one of the supporting factors to increase the productivity of an agency's performance, highly competent human resources can support the level of performance, with a performance assessment, the achievements achieved by each employee of Ades et al. (2015) will be known. Performance appraisal of employees is also very useful for companies or organizations to make decisions and determine policies. In Higher Education, Reward or assessment is a form of gratitude to lecturers for the dedication and performance that lecturers have given to universities. Yeni et al (2017)

In a university, lecturers are an inseparable part. Lecturers are academic societies or the academic community as explained in Law of the Republic of Indonesia No. 12 of 2012 concerning Higher Education as stated in Chapter I of General Provisions no. 13, in the next part it is explained that lecturers are professional educators and scientists with the main task of transforming, developing and disseminating Science and Technology

through Education, Research and Community Service. In the same Law, Paragraph 3 concerning the Academic Community, Article 11 point 3 Lecturers individually or in groups are required to write textbooks or text materials, published by universities and/or scientific publications as one of the learning resources and for the development of academic culture and the empowerment of literacy activities for the Academic Community.

STIKOM Cipta Karya Informatika is one of the private universities in Jakarta that always strives to improve quality in a sustainable manner, one of the efforts made is to assess the performance of lecturers which is carried out at the end of each semester with several assessment criteria, namely books

with ISBN, Processing, Journals, Research, Community Service, Resource Persons, PKM Supervisors, PA and UJMF Lecturers whose data is obtained from Research Institutions and Faculty Community Service (LPPM), especially Study Programs. This assessment is a benchmark for providing performance incentives for permanent lecturers within the STIKOM Cipta Karya Informatika. The rewards obtained by lecturers are performance incentives obtained every month for one semester. Not only that, every year a cumulative calculation of the lecturer's performance will be carried out, which will finally be selected lecturers with the best performance who will be rewarded for participating in comparative studies abroad, this is routinely done by STIKOM Cipta Karya Informatika with the hope of becoming a stimulus for other lecturers to continue to improve their scientific works and be active in academic activities outside the teaching and learning process to meet the criteria for performance assessment lecturer.

In this study, the author will compare 2 methods, namely the Analytical Hierachy Process (AHP) and the SMART method to see the best level of accuracy and the most suitable for use in the lecturer performance assessment process at STIKOM Cipta Karya Informatika based on the specified lecturer performance assessment criteria whose data sources can be taken from LPPM and the Faculty, especially the Study Program, which in the end the best pattern is expected to be used as a key performance indicator in lecturer performance assessment for the provision of incentives and rewards to lecturers that can be implemented in a Lecturer Performance Assessment Decision Support System.

Analytical Hierarchy Process (AHP) is a methodology that can basically solve a complex problem and is not structured into its components, AHP has the ability to combine qualitative factors and quantitative factors in making a decision for individuals and groups. Rizka and Dino (2017)

Simple Multi Attribute Rating Technique (SMART) is a multi-criteria decision-making method developed by Edward in 1977. This multi-criteria decision-making technique is based on the theory that each alternative consists of a number of criteria that have values and each criterion has a weight that describes importance when compared to other criteria. Ali and Lia (2018)

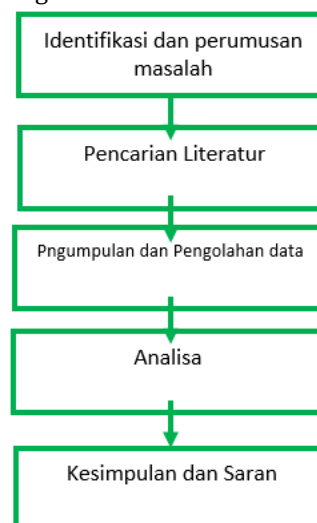
SMART means having specific and measurable goals (Specific and Measurable), achievable/realistic (Attainable), relevant and timely (Relevant and Timely). Goals formulated in the SMART method as measurable goals will automatically be more motivating than vague targets. Deddy and Rr (2017).

2. RESEARCH METHOD

A. Research Methodology

This study compares two methods in processing decision support systems, namely the AHP method and the SMART method, starting with the stage of problem identification and formulation, search. literature, then continued with the preparation stage and then the most suitable method to be used in the decision support system to calculate the lecturer's Performance Appraisal at STIKOM. The flow chart of the steps of this research can be seen in the figure below:

Figure 1. Research Methods



B. Research Flow

In the research flow section, the research flow is described to compare 2 methods, namely the AHP method and the SMART method in finding lecturer performance appraisal for providing incentives to lecturers. The research flow can be seen in the image below:

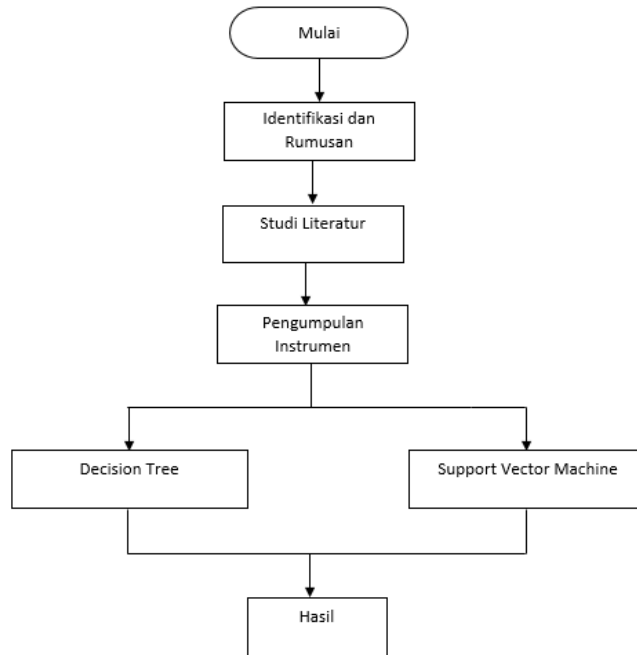


Figure 2. Flowchart of the research steps

3. RESULTS AND DISCUSSION

In this system, there are two main processes, namely determining who is entitled to receive performance incentives using the SMART method and the AHP method which will compare the performance results of the method to see the most suitable method used to process data at STIKOM Cipta Karya Informatika in providing incentives. to lecturers. The sequence of troubleshooting steps to determine who is entitled to incentives using the AHP algorithm is as follows:

- a. In this study, the criteria used were ISBN Book, Processing, Journal, Research, Community Service, National Seminar/INT Resource Person, PKM Supervisor, PA Lecturer, UJMF

Table 1. Paired Matrix for criteria for providing performance incentives to lecturers

Kriteria	Dosen PA	UJMF	Jurnal	Penelitian	Pengabdian	Procesing	Narasumber	Buku ISBN	Pemb PKM
Dosen PA	1	2	3	4	5	6	7	8	9
UJMF		1	2	3	4	5	6	7	8
Jurnal			1	2	3	4	5	6	7
Penelitian				1	2	3	4	5	6
Pengabdian					1	2	3	4	5
Procesing						1	2	3	4
Narasumber							1	2	3
Buku ISBN								1	2
Pemb PKM									1

The way to fill in the matrix elements in the table above is as follows:

- Element $a[i,j]$, where $i = 1,2,3.....n$ and $j = 1,2,3.....n$, for this study $n=9$
- b. Matrix element of the upper triangle as input
- c. The matrix element of the lower triangle has the formula:

$$a[j,i]= \text{for } i \neq j \frac{1}{a[i,j]}$$

Information:

$a [i,j]$ = matrix element of the upper triangle

$a [j,i]$ = element of the matrix of the lower triangle

i = rows, j = columns

b. Determining Alternatives in Determining Performance Incentive Recipients

Of the total 312 permanent lecturers who can get incentives, the meals that will be used as samples use the slovin formula $n = \frac{N}{1+Ne}$ namely:

- n = Number of samples
- N = Number of population
- e = Margin of error

so:

$$n = \frac{312}{1 + 312(10\%)}$$

$$n = \frac{312}{1 + 312(10\%)}$$

$$n = \frac{312}{32,2}$$

n=9.68 rounded to 10

then the Paired *Alternative* matrix Recipients of performance incentives:

Table 2. Alternative Paired Matrix Performance incentive recipients

K R	Syarif	Hariano	Sasmi	Aulia	Junawan	Hafni	Suherman	Rahmaniar	Novalinda	Warisman
Syarif										
Hariano										
Sasmi										
Aulia										
Junawan										
Hafni										
Suherman										
Rahmaniar										
Novalinda										
Warisman										
Σ										

The matrix value for each alternative in the table above is obtained from the value of each criterion in providing lecturer performance incentives

Dosen PA	Pengabdian
Ya = 0,9	Ya = 0,9
Tidak = 0,1	Tidak = 0,1
Pemb PKM	
Ya = 0,9	
Tidak = 0,1	
UJMF	Procesing
Ya = 0,9	Ya = 0,9
Tidak = 0,1	Tidak = 0,1
Jurnal	Narasumber
Ya = 0,9	Ya = 0,9
Tidak = 0,1	Tidak = 0,1
Penelitian	Buku ISBN
Ya = 0,9	Ya = 0,9
Tidak = 0,1	Tidak = 0,1

c. Testing the consistency of the paired matrix with the formula:

$$|CI = \frac{\lambda_{max} - n}{n - 1}$$

Information:

CI = Consistency *Index*

λmax = Largest Eligen Value of the n-order matrix

n = Ordo matrix

- d. calculate the Consistency Ratio with the formula

$$CR = \frac{CI}{RI}$$

Information:

CR = Consistency Ratio

RI = Indeks Random

CI = Consistency Index

- e. Calculating the Global Matrix for the final ranking

- Calculating the Global Matrix for the final ranking
-

Table 3. Criterion Comparison Value

Kriteria	Dosen PA	UJMF	Jurnal	Penelitian	Pengabdian	Procesing	Narasumber	Buku ISBN	Pemb PKM
Dosen PA	1	2	3	4	5	6	7	8	9
UJMF	1/2	1	2	3	4	5	6	7	8
Jurnal	1/3	1/2	1	2	3	4	5	6	7
Penelitian	1/4	1/3	1/2	1	2	3	4	5	6
Pengabdian	1/5	1/4	1/3	1/2	1	2	3	4	5
Procesing	1/6	1/5	1/4	1/3	1/2	1	2	3	4
Narasumber	1/7	1/6	1/5	1/4	1/3	1/2	1	2	3
Buku ISBN	1/8	1/7	1/6	1/5	1/4	1/3	1/2	1	2
Pemb PKM	1/9	1/8	1/7	1/6	1/5	1/4	1/3	1/2	1

- Calculate the hierarchical weighting factor matrix for all simplified criteria

Table 4. Matrix Weighting Factor Hierarchy for all criteria simplified

Kriteria	Dosen PA	UJMF	Jurnal	Penelitian	Pengabdian	Procesing	Narasumber	Buku ISBN	Pemb PKM
Dosen PA	1	2	3	4	5	6	7	8	9
UJMF	0,5	1	2	3	4	5	6	7	8
Jurnal	0,33	0,5	1	2	3	4	5	6	7
Penelitian	0,25	0,33	0,5	1	2	3	4	5	6
Pengabdian	0,2	0,25	0,33	0,5	1	2	3	4	5
Procesing	0,16	0,2	0,25	0,33	0,5	1	2	3	4
Narasumber	0,14	0,16	0,2	0,25	0,33	0,5	1	2	3
Buku ISBN	0,12	0,14	0,16	0,2	0,25	0,33	0,5	1	2
Pemb PKM	0,11	0,12	0,14	0,16	0,2	0,25	0,33	0,5	1
Σ	2,81	4,7	7,58	11,44	16,28	22,08	28,83	36,5	45

- Creating a normalization table, namely dividing the value of each cell in the Hierarchy weighting factor matrix table for all criteria is simplified by the sum of each column with the following calculations:

$$HN = \frac{\text{Nilai Elemen Kolom Kriteria}}{J Km}$$

Information:

HN = Normalized Results

Nek = Criterion Column Value

Jkm = Number of matrix columns

>< = Comparison

1. Normalization of criterion weights

Furthermore, normalization of the weight of the criteria is carried out. The weight of each criterion that has been obtained will be normalized which is done by dividing the weight of a criterion obtained by the total weight of all criteria. The normalization process of each criterion in providing lecturer performance incentives is as follows:

$$\text{a. Dosen PA} = \frac{\text{bobot nilai}}{\text{Total Bobot}}$$

$$\text{Dosen PA} = \frac{10}{100} = 0,1$$

$$\text{b. UJMF} = \frac{10}{100} = 0,1$$

$$\text{c. Jurnal} = \frac{10}{100} = 0,1$$

$$\text{d. Penelitian} = \frac{10}{100} = 0,1$$

$$\text{e. Pengabdian} = \frac{10}{100} = 0,1$$

$$\text{f. Proceeding} = \frac{10}{100} = 0,1$$

$$\text{g. Narasumber} = \frac{20}{100} = 0,2$$

$$\text{h. Buku ISBN} = \frac{10}{100} = 0,1$$

$$\text{i. Pem PKM} = \frac{10}{100} = 0,1$$

The results of the calculation of the normalization of the criteria weight can be seen in the table below:

Table 5. Normalization Results

Inventory Indicators	Normalized Weight (W _j)
PA Lecturer	0,1
UJMF	0,1
Journal	0,1
Research	0,1
Devotion	0,1
Proceeding	0,1
Sources	0,2
Buku ISBN	0,1
PKM Supervisor	0,1
Sum	1

The final calculation can be done using the formula below:

Final Score = (PA lecturer value weight * PA lecturer utility value weight) + (UJMF value weight * UJMF utility value weight) + (journal value weight * journal utility value weight) + ((Research weight * Research utility value weight) + ((Service weight * Service utility value weight) + ((Proceeding weight * Procurement utility value weight) + ((Resource Person weight * Utility value weight Resource person) + ((ISBN Book weight * ISBN Book utility value weight) + (PKM Supervisor weight * PKM Supervisor utility value weight)

a. Syarif

$$(0,1 \times 0) + (0,1 \times 1) + (0,1 \times 1) + (1,0 \times 0) + (1,0 \times 0) + (1,0 \times 1) + (0,2 \times 1) + (0,1 \times 1) + (0,1 \times 1) = 1,6$$

For the final tally all criteria can be seen in the table below:

Table 6. Final count of all criteria

Nama Dosen	Nilai
Syarif	1,6
Hariato	2,4
Sanusi	0,3
Aulia	0,5
Junawan	2,4
Hafni	1,1
Suherman	1,5
Rahmaniar	0,6
Novalinda	0,2
Warisman	0,5

After obtaining the final score of the calculation of performance values using the SMART method obtained from the keiteria for each lecturer, a decision table is made to determine the final score that is stated to be able to receive performance incentives as follows:

Table 7. Decision

It	Value	Information
1	1.5 to 2.4	Get Incentives
2	0 to 1,4	Not Getting Incentives

From the table of decisions above, the population sampled, who is entitled to incentives or not, can be seen in the table below:

Table 8. Decision

Lecturer Name	Value	Results
Hariato	2,4	Get Incentives
Junawan	2,4	Get Incentives
Syarif	1,6	Get Incentives
Suherman	1,5	Get Incentives
Hafni	1,1	Not Getting Incentives
Rahmaniar	0,6	Not Getting Incentives
Aulia	0,5	Not Getting Incentives
Warisman	0,5	Not Getting Incentives
S	0,3	Not Getting Incentives
Novalinda	0,2	Not Getting Incentives

4. CONCLUSION

From the results of experiments carried out using the SMART and AHP methods for lecturer performance assessment, it was obtained:

- a. The criteria used only use two assessment weights, namely yes and no
- b. The criteria used are not suitable for analysis using the AHP method because the derivatives of the hierarchy are very simple
- c. The SMART method is more suitable for processing data in the assessment of lecturer performance at STIKOM Cipta Karya Informatika
- d. For the performance assessment of lecturers, it can distinguish grades that have one or more studies because there are no grades and sub-criteria from the set criteria.

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