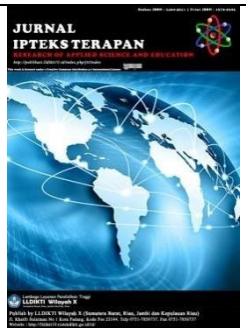

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APPLICATION OF THE PROMETHEE II METHOD ON LECTURER RECIPIENTS OF UPI YPTK PADANG GRANTS

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Abstract

This research aims to apply the PROMETHEE II method in evaluating grant recipient lecturers at UPI YPTK Padang with the aim of providing final grade recommendations according to the passing grade. The PROMETHEE II method is used to overcome the complexity of decision making which involves many criteria, so that it can provide a more objective and accurate evaluation of the performance of grant recipient lecturers. Lecturer performance data consisting of templates, proposal content, output or publications, benefits of research grants, is collected for analysis using the PROMETHEE II method. Assessments based on each criterion are integrated and analyzed to produce a final score for each grant recipient lecturer. The research results show that the PROMETHEE II method provides final grade recommendations in accordance with the passing grade for each grant recipient lecturer. This assessment is based on the performance and contribution of each lecturer in various aspects of academic and research activities. The final grade recommendation can be used as a basis for making decisions regarding the graduation of grant recipient lecturers.

Keywords: PROMETHEE II Method, Grant Recipient Lecturers, Performance Evaluation, Passing Grade, Decision Making.

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INTRODUCTION

Evaluation of the performance of grant recipient lecturers is important in improving the quality of higher education. At UPI YPTK Padang, grant recipient lecturers are assessed comprehensively and objectively based on various criteria, such as writing according to a template, proposal content, scientific output or publication, as well as the research benefits of the grant. This assessment aims to ensure that grant recipient lecturers have made maximum contributions to the institution and achieved the specified graduation standards . A lecturer is required to implement the Tri Dharma of Higher Education, namely education or teaching, research and community service, which is a unified whole. These three dharmas are interrelated with each other. In its implementation, dharma activities must be carried out in synergy so that a university sees that the activities can be realized in real terms by all lecturers. Therefore, the development of higher education must be directed at developing these three fields in synergy. LPPM Putra Indonesia University YPTK Padang is an institution that handles research and community service activities which is a forum for UPI YPTK University lecturers to develop their knowledge according to their respective scientific disciplines through the fields of research and community service. LPPM is a form of lecturer activity in contributing to all lecturers in developing their abilities directly to the community and to the latest and relevant research.

Research and Community Service Grants are one of the programs from LPPM and Institutions to improve the ability of all lecturers in writing and engaging directly with the community, where this activity is funded by the University to be carried out by lecturers, however, data from the Research and Community Service Management Information System to the Community (Simlitabmas) of the Directorate General of Higher Education, Ministry of Education and Culture shows that until now less than 5% of the lecturer population and less than 1% of Professors are actively implementing it. The LPPM Grant Research and Service Program is intended as a service activity in order to develop and direct lecturers to improve their abilities in carrying out service in higher education. This community service is intended for lecturers with the title of Expert Assistant to Doctorate with funds from the university's Internal Grant. The amount of funds allocated for community service is Rp. 4,000,000,000,000,- and each research has a different level, for the research level of novice lecturers the funds given are Rp. 5,000,000,- to 10,000,000,- for the applied research level, the funds provided are Rp. 15,000,000,- to 30,000,000,- and for the research and development level the funds provided are Rp. 25,000,000,- to 40,000,000,- for each research title per semester with a period of one year 1 research title. It is hoped that the research results of the lecturers can be used as material for self-development for the lecturers in learning activities. In this way, lecturers can carry

out the tridharma of higher education optimally, because they have synergized learning activities, research with community service. In its implementation, Grants often experience problems. This could be caused by several factors. One of them is that proposal assessment is still manual without a system to help reviewers . For this reason, the author compares the results of the reviewer's assessment with analysis using the PROMETHEE II algorithm. The comparative analysis carried out only maintains the quality of research and service within Putra Indonesia University. Many branches of computer science can solve complex problems. This is proven from previous research by researchers in solving problems [2] [3] in the field of data mining, [4] [5] [6] in the field of artificial neural networks, [7] [8] in the field of decision support systems. Based on this explanation, researchers used a decision support system to solve the problem above. In this case the researcher took one method, namely the PROMETHEE II method [9], [10].

The PROMETHEE II method is quite simple in concept and application compared to other methods for multi-criteria analysis. This method will later make decisions using several conflicting and alternative criteria and will produce the greatest value which will later be selected as the best alternative [10]. Based on the background above, it is hoped that the PROMETHEE II algorithm can help related parties in determining recommendations for lecturers who receive research grants in accordance with the results of the reviewers ' assessments .

RESEARCH METHODS

1. Promethee Process

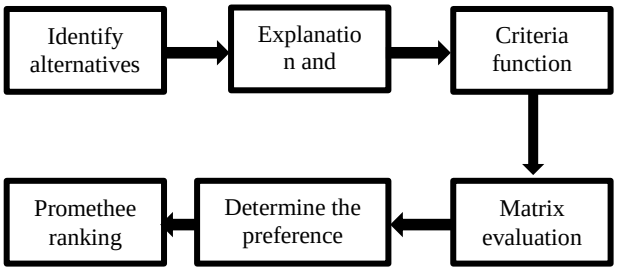

Figure 1 Promethee Process Diagram

the steps used by this method are as follows:

a. Identify alternatives
b. Explanation of the criteria, alternative (a) is evaluated from several criteria (k), which must be maximized or minimized.
c. Recommended preference functions for application needs. In Promethee six criteria functions are presented, this is of course not absolute, but this form is good enough for some cases.
d. Matrix evaluation, when the criteria and alternatives have been selected, the next step is to create a payoff matrix . This matrix table for each pair of criteria, quantitative and qualitative measures of the effect produced by the alternative associated with that criterion. A matrix can consist of cardinal size data or an ordinal scale.
e. Determine the multicriteria preference index. Preferences are expressed by

numbers between 0 and 1, and are assessed by certain procedures.

f. Promethee ranking . The direction in the graph of outranking values is determined based on Leaving flow, Entering flow , and Leaving flow is the number of curved line values that have a direction away from the node a and this is a characteristic of outranking measurements. The explanation of the outranking relationship is built on consideration of actions on the outranking value graph , in the form of a partial sequence (Promethee) and a complete sequence (Promethee) of a number of possible actions that can be proposed to decision makers to enrich the problem solving of data characteristics.

2. Promethee Ranking

Calculation of preference direction is considered based on value index:

a. Leaving Flow

Amount from Which own direction avoid from nodes a. And matter This is measurement outranking . For every nodes a in the graph mark outranking determined based on leaving flow , withequality:

$$\emptyset^{+}(a) = \frac{1}{n-1} \sum_{\varphi(a,x)} \varphi(a,x)$$

b. Entering Flow

Entering flow is the number of those approaching node a and this is the character of the outranking measurement. Entering flow is measured based on the outranked character of a.

$$\emptyset^{-}(a) = \frac{1}{n-1} \sum_{x \in A} \varphi(a,x)$$

c. Net Flow

Net flow is measured by calculating the difference between leaving flow and entering flow.

$$\emptyset(a) = \emptyset^{-}(a) - \emptyset^{-}(x)$$

Information:

φ (a,x) = indicates a preference that alternative a is better from alternative x.

φ (x,b) = shows a preference that alternative x is better from alternative a.

Ø⁺ (a) = Leaving flow, used to determine the priority order in the Promethee I process which uses partial order.

Ø¯(a) = Entering flow, used to determine the priority order in the Promethee I process which uses partial order.

Ø(a) = Net flow, used to produce the final decision to determine the sequence in solving the problem so as to produce a complete sequence.

The explanation of the outranking relationship is built on consideration for each alternative in the outranking value graph, (Promethee II) on a number of possible alternatives, which can be proposed to decision makers to enrich problem solving

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RESULTS AND DISCUSSION

1. Determining Several Alternatives To make calculations easier with promethee, each alternative uses code 1 to the number of alternatives for each type of alternative. The following is data on alternative students who will be selected, which can be seen in table 1.

No	Qualitative Data	Data Symbols
1	Researcher 1	R1
2	Researcher 2	R2
3	Researcher 3	R3
4	Researcher 4	R4
5	Researcher 5	R5
6	Researcher 6	R6
7	Researcher 7	R7
8	Researcher 8	R8
9	Researcher 9	R9

Table 1. Alternative data

2. Determining several criteria used is based on needs in the decision making process. The criteria can be seen in table 2.

Criteria	The Value of Research Grants								
	R1	R2	R3	R4	R5	R6	R7	R8	R9
K1	5	3	4	4	5	3	2	5	3
K2	2	5	5	4	5	5	3	4	3
K3	3	2	1	4	4	3	2	4	1
K4	3	4	4	3	4	4	1	3	1
K5	2	1	5	3	4	3	2	4	2
K6	5	3	2	3	4	4	2	3	3

Table 2. Criteria

KI (Writing Template)	Strongly follows the grant template (weight 5) Follows grant template (weight 4) Just follow the template (weight 3) Not following the template (weight 2) Doesn't follow the template (weight 1)
K2 (Benefits of Research Results)	Very useful (weight 5) Useful (weight 4) Quite useful (weight 3) Not useful (weight 2) Not good (weight 1)
K3 (Output Criteria/mandatory output)	Scopus (weight 5) International proceedings (weight 4) Sinta 1 & 2 (weight 3) Sinta 3 & 4 (weight 2) Sinta 5 (weight 1)
K4 (Output Criteria/mandatory output II)	International proceedings (weight 5) Books (weight 4) Sinta 3 & 4 (weight 3) Sinta 5 (weight 2) Local (weight 1)
K5 (Additional Output Criteria)	International journal (weight 5) National Journal (weight 4) Patent IPR (weight 3) Copyright IPR (weight 2) Product Prototype (weight 1)
K6 (Contents of the Proposal)	The contents of the proposal are very clear & detailed (weight 5) The contents of the proposal are clear & detailed (weight 4) The contents of the proposal are quite detailed (weight 3) The contents of the proposal are unclear (weight 2) The contents of the proposal are unclear (weight 1)

Table 3. Data Assessment By Reviewer

3. Determine the alternative table that has been given a value by the Reviewer based on the weight of the criteria that have been determined
4. Calculate the preference function table for all alternative pairs

	K1	K2	K3	K4	K5	K6
R1,R2	2	-3	1	-1	1	2
R1,R3	1	-3	2	-1	-3	3
R1,R4	1	-2	-1	0	-1	2
R1,R5	0	-3	-1	-1	-2	1
R1,R6	2	-3	0	-1	-1	1
R1,R7	3	-1	1	2	0	3
R1,R8	0	-2	-1	0	-2	2
R1,R9	2	-1	2	2	0	2
R2,R1	-2	3	-1	1	-1	-2
R2,R3	-1	0	1	0	-4	1
R2,R4	-1	1	-2	1	-2	0

R2,R5	-2	0	-2	0	-3	-1
R2,R6	0	0	-1	0	-2	-1
R2,R7	1	2	0	3	-1	1
R2,R8	-2	1	-2	1	-3	0
R2,R9	0	2	1	3	-1	0
R3,R1	-1	3	-2	1	3	-3
R3,R2	1	0	-1	0	4	-1
R3,R4	0	1	-3	1	2	-1
R3,R5	-1	0	-3	0	-1	-2
R3,R6	1	0	-2	0	2	-2
R3,R7	2	2	-1	3	3	0
R3,R8	-1	1	-3	1	1	-1
R3,R9	1	2	0	3	3	-1
R4,R1	-1	2	1	0	1	-2
R4,R2	1	-1	2	-1	2	0
R4,R3	0	-1	3	-1	-2	1
R4,R5	-1	-1	0	-1	-1	-1
R4,R6	1	-1	1	-1	0	-1
R4,R7	2	1	2	2	1	1
R4,R8	-1	0	0	0	-1	0
R4,R9	1	1	3	2	1	0
R5,R1	0	3	1	1	2	-1
R5,R2	2	0	2	0	3	1
R5,R3	1	0	3	0	-1	2
R5,R4	1	1	0	1	1	1
R5,R6	2	0	1	0	1	0
R5,R7	3	2	2	3	2	2
R5,R8	0	1	0	1	0	1
R5,R9	2	2	3	3	2	1
R6,R1	-2	3	0	1	1	-1
R6,R2	0	0	1	0	2	1
R6,R3	-1	0	2	0	-2	2
R6,R4	-1	1	-1	1	0	1
R6,R5	-2	0	-1	0	-1	0
R6,R7	1	2	1	3	1	2
R6,R8	-2	1	-1	1	-1	1
R6,R9	0	2	2	3	1	1
R7,R1	-3	1	-1	-2	0	-3
R7,R2	-1	-2	0	-3	1	-1
R7,R3	-2	-2	1	-3	-3	0
R7,R4	-2	-1	-2	-2	-1	-1
R7,R5	-3	-2	-2	-3	-1	-2
R7,R6	-1	-2	-1	-3	-1	-2
R7,R8	-3	-1	-2	-2	-2	-1
R7,R9	-1	0	1	0	0	-1
R8,R1	0	2	1	0	2	-2
R8,R2	2	-1	2	-1	3	0
R8,R3	1	-1	3	-1	-1	1
R8,R4	1	0	0	0	1	0
R8,R5	0	-1	0	-1	0	-1
R8,R6	2	-1	1	-1	1	-1
R8,R7	3	1	2	2	2	1
R8,R9	2	1	3	2	2	0
R9,R1	-2	1	-2	-2	0	-2
R9,R2	0	-2	-1	-3	1	0
R9,R3	-1	-2	0	-3	-3	1
R9,R4	-1	-1	-3	-2	-1	0
R9,R5	-2	-2	-3	-3	-2	-1
R9,R6	0	-2	-2	-3	-1	-1
R9,R7	1	0	-1	0	0	1
R9,R8	-2	-1	-3	-2	-2	0

Table 4 preferences for all alternative pairs R1 until R9

For the probability value if the value is above 0 give a value of 1 if the value is 0 below the value remains 0

5. Normalizing the alternative matrix against the criteria.

	R1	R2	R3	R4	R5	R6	R7	A8	A9
R1	-	0,67	0,5	0,33	0,33	0,33	0,67	0,17	0,67
R2	0,33	-	0,5	0,33	0,00	0,00	0,67	0,33	0,50
R3	0,50	0,33	-	0,50	0,17	0,33	0,67	0,50	0,67
R4	0,50	0,33	0,33	-	0,00	0,33	1,00	0,00	0,83
R5	0,67	0,67	0,50	0.83	-	0,50	1,00	0,50	1,00
R6	0,50	0,50	0,33	0,50	0,00	-	1,00	0,50	0,83
R7	0,17	0,17	0,17	0,00	0.00	0.00	-	0.00	0.17
R8	0.50	0.50	0.50	0.33	0.17	0.50	1.00	-	0.83
R9	0.17	0.17	0.17	0.00	0.00	0.00	0.33	0.00	-

Table 10 Normalization Matrix Results

6. Determine Leaving flow and Entering flow

Alternative	Leaving flow	Entering flow
R1	0,46	0,42
R2	0,33	0,42
R3	0,46	0,38
R4	0,42	0,35
R5	0,71	0,08
R6	0,52	0,25
R7	0,08	0,08
R8	0,54	0,25
R9	0,10	0,69

Table 11. Output results of leaving flow and entering flow

7. Count net flow

Alternative	net flow
R1	0.446
R2	-0.08
R3	0.08
R4	0.06
R5	0.63
R6	0.27
R7	0.00
R8	0.29
R9	-0.58

Table 12 next to Net Flof

8. Determine the ranking of all alternatives being considered. Grant selection results **>=0 Accepted, <0= Rejected**
The results are shown in table 12

Alternative	net flow	Rank	Selection results
R5	0.63	1	Accepted
R8	0.29	2	Accepted
R6	0.27	3	Accepted
R3	0.08	4	Accepted
R4	0.06	5	Accepted
R1	0.04	6	Accepted
R7	0.00	7	Rejected
R2	-0.08	8	Rejected
R9 _	-0,58	9	Rejected

Table 12. Results from the net outranking of each alternative

CONCLUSION

Based on the results of the discussion, it can be concluded that the use of a decision support system with the PROMETHEE II algorithm can be a solution to solve this problem the problem of determining grant recipient lecturers. From the calculation results of the 9 alternative researchers , it can be concluded that the 6 alternatives accepted to obtain the Research Grant are R5, R8, R6, R3, R4, R1 with preference values that are identical to the reviewer's assessment. This shows that the PROMETHEE II method is successfully applied and has the potential to address complex decision-making problems in collection center prioritization. This system can also be used as a comparison tool between reviewer assessments and the PROMETHEE II system, thereby maintaining objectivity in determining RESEARCH grant recipients.

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