

An Analytic Network Process Method Approach to Design Models of Lecturers Performance Evaluation

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ABSTRACT

One approach to greatly enhance the quality of university education level is improving the quality and career of lecturers, including services to students. Therefore, performance and work ethic are critically evaluated to obtain re-liable information. Most performance evaluations are limited to assess students in the classroom exclusively. This research employed a Multi-Criteria Decision Making (MCDM), a model designed to evaluate the lecturer's performance and factors influencing their performance. These factors were examined from various variables, such as training and development experience, motivation, self-esteem, competency, and job satisfaction. To demonstrate the correlation and dependency among factors of lecture performance evaluation, this study employed the Analytic Network Process (ANP) method, which is part of MCDM technique. The ANP method could serve different levels of stakeholders by considering available criteria and sub-criteria. Moreover, the method could predict performance measurement of human resources by considering factors affecting lecturer's performance. This research produced a model to evaluate lecturers' performance effectively

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I. Introduction

Regulation No. 14 concerning Teachers and Lecturers, Article 1 states that lecturers should be professional educators and scientists with the prodigious duty of transforming, developing, and spreading science, technology, and art through education, teaching, and community services. The human resources of students, lecturers, and staff are highly important aspects of higher education quality [1], and [2]. This shows the important role of lecturers in the education process.

Globalization and the Asian Economic Society (AES), are highly influential when it comes to workforce intake because they increase the competition in job markets. Every citizen from any MEA member is free to work within ASEAN countries [3]. This makes the public aware of the importance of education and expects the prevalence of highly quality and competitive education in the world. The demand for intelligence teaching products in the education industry has grown rapidly by continuously improving education informatization. The development of technology and information will increase the need for the education industry to produce skilled workers [4].

The lecturer quality still becomes concern of many parties [2] and [5]. Meanwhile, discloses that universities in Indonesia generally face similar cases in the subject of qualifications, competency, and commitment to human resources [6]. The paradigm of low-quality lecturers, insufficient understanding, and lack of dedication towards the subject taught makes our education is left behind compared to other countries.

Many factors can affect lecturers' performance to complete their duties in universities, such as motivation, job environment, work satisfaction, leadership, and culture [2] and [7]. There is a correlation between competency, motivation, personality, job satisfaction, and someone's performance [5].

According to experts, Multi Criteria Decision making (MCDM) is a scientific method that is important in classifying alternatives or for ranking many alternatives into a priority order effectively and efficiently [8]. MCDM technique is a method used to help select decisions from many criteria that can be collaborated with various methods [9]. The Fuzzy-based method, such as AHP or ANP [10], [11] and [12], is a technique that allows someone to make decisions and solve problems [10]. Performance evaluation adds a technical point of view for the evaluation process using the Multi-Criteria Decision Making (MCDM) approach [13], Analytical Network Process (ANP), and Choquet Integral software (CI); they demonstrate an efficient way to handle qualitative and quantitative data simultaneously [14].

This study aimed to evaluate lecturers' performance by considering influential factors, such as motivation, self-esteem, competency, and job satisfaction. This study employed the Analytic Network Process (ANP) method, a technique of Multi-Criteria Decision Making (MCDM). This method could present levels and ranks [10], [12], of the importance of various parties by considering available criteria and sub-criteria to predict human resources based on evaluation [15], [16].

II. Literatur Overview

Actual job performance shows the performance of humans as well as the quality and quantity of work results achieved by a worker, and these results are in accordance with the assigned duties and responsibilities. Each lecturer must have a criterion as an educator to 1) Improve performance, capabilities, and outputs of education; 2) facilitate communication and exchange information about best educational practices from an educational institution; and 3) serve as a tool to understand and improve the educational performance of institutions as well as guidance in strategic planning [17].

An individual's successful performance combines assessable ability, effort, and opportunity. In addition, [18] point out that performance can function as interactions among the ability (A), motivation (M), and opportunity (O). This can be formulated as $\text{Performance} = f(A \times M \times O)$; where performance is a function of ability, motivation, and opportunity.

Lecturers' performance is a result achieved by lecturers after carrying out their tasks and functions in accordance with "University Tri Dharma" in Indonesia (three major tasks) [6]. Performance is seen from achieving tasks assigned to the lecturers and considers expertise, proficiency, experience, sincerity, and time with the resulting outputs reflected by quantity and quality.

A. The Dimension of Lecturers' Performance Evaluation

According to [17] defines motivation as a process that starts with a physiological or psychological deficiency or need, activates a behavior or a drive, and aims to gain a goal or incentive. Thus, the key to understanding the process of motivation lies in the meaning and relationship of needs, drives, and incentives. A lecturer's motivation refers to the desire that forces him to do his work. Meanwhile, work motivation is a strong drive that stimulates the lecturers to do their job and achieve work satisfaction.

Training and development are pivotal for higher education, and they improve the performance of education staff and educators. Lecturers have a central and strategic role in determining the quality of the university [2]. The teaching staff should fulfill administrative requirements to complete their duties and work. However, 21st century education demands lecturers to apply or balance the educational development that always changes and follows the globalization demands. Meanwhile, [18] elucidate training as a well-planned formal training that has a structured format. Therefore, training and coaching for lecturers, such as in-service and off-campus training, are necessarily developed to achieve the professionalism of educators.

Job satisfaction is a pleasant or unpleasant psychological state felt by employees in the work environment [5] [7]. A representation of a worker's feelings, emotions, or affective response to a work situation and condition. This representation can realize the needs and expectations of workers and obtain results. Job satisfaction is measured from various aspects, for example the expected income, type of work and conditions and co-workers where job satisfaction arises when what is expected is achieved. A person can be relatively satisfied with his job but can be dissatisfied in other aspects. In other words, job satisfaction describes a pleasant psychological state or vice versa. Luthans (2002) divides job satisfaction into three different aspects [5]; 1) Job satisfaction refers to employees' responses and includes the condition of the working environment 2) Job satisfaction is often assessed and based on work outputs of performance, and 3) Job satisfaction is related to the attitude and performance of every employee.

Self-esteem [19] is an evaluation by which an individual makes and customarily maintains himself. Moreover, self-esteem expresses an attitude of approval or disapproval and indicates the extent to which an individual believes himself to be capable, significant, successful, and worthy. In short, self-esteem is a personal judgment of worthiness expressed in an individual's attitudes toward himself." In this context, self-esteem was related to the self-reliance of a lecturer and based on four aspects of Coopershimith's concepts: significance, power, virtue, and competency.

According to [20], competency is an underlying characteristic of an individual that is causally related to the criteria on referenced, effective, and/or superior performance in job situations." The Government Regulation Number 19-2005 Concerning National Standard of Education Chapter 28, it is emphasized that an educator is a learning agent who should have four competencies: pedagogical, personal, professional, and social competency. This is in line with competency dimensions explained by Spencer, as follows; 1) Pedagogic competency agrees with achievement and action, 2) Professional competency agrees with cognition, 3) Personal competency agrees with the impact, influence, and personal effectiveness, and 4) Social competency is assistance, and human service and managerial skills.

B. The Analytic Network Process (ANP)

The ANP Concept

The ANP method is the expansion of the Analytic Hierarchy Process (AHP), and it is more complex. Moreover, the ANP method can represent different levels of interest of many parties by considering the dependent connection between criteria or alternatives in decision making and various interconnection or dependencies [10], [16], [12], and [21].

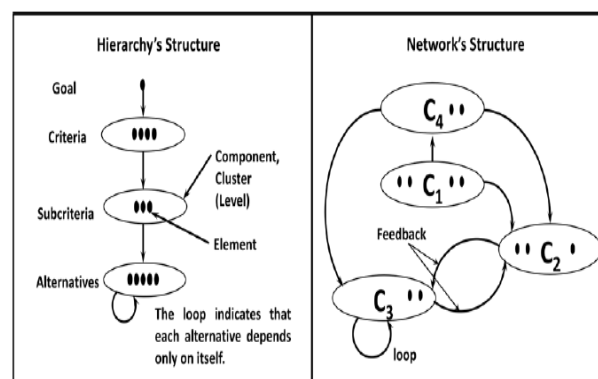


Fig. 1. Types of AHP & ANP Components [16]

Saaty states that the implementation of the ANP problem-solving depends on available alternatives and criteria [22], and [14]. The ANP analysis utilizes pairwise comparisons on alternatives and criteria. Furthermore, [16] explains the AHP network has destination levels and criteria. The AHP level is called cluster in the ANP network and has the criteria and alternatives,

called node. The ANP is formed in the network structure and has feedback that can improve produced priority of evaluation and can make a more accurate prediction.

The ANP calculation process is based on a priority of every cluster which is described in matrix $n \times n$ with a ratio-scaled pair comparison. A system with an N cluster has elements that interact with several or all available clusters. These clusters are annotated as Ch ($h = 1, 2, 3, \dots, N$) with elements nh ($e_{h1}, e_{h2}, e_{h3}, \dots, e_{hn}$). The value of the supermatrix is gained as the results of the evaluation of a priority scale derived from the pairwise comparison.

ANP Stages

Decision-making with the ANP consists of four stages [16].

Stage 1: Arranging the problem structures and developing the decision model to identify **ANP Stages** alternatives that will be the most significant decision-making.

Stage 2: Comparing a Pairwise matrix with an interconnected variable to calculate the matrix's impact on alternatives, which are compared with the measurement scales from 1 to 9.

Table 1. Scales of Absolute Numbers

Intensity of Importance	Definition
1	Equally important
3	Moderately important
5	Strongly important
7	Very strongly important
9	Extremely important
2, 4, 6, 8	Intermediate values

Stage 3: Calculating supermatrix (weight elements) using the inverse comparison values. For example, $a_{ij} = 1/a_{ji}$ shows the level of importance of element $-i$ or $-j$. The consistency ratio must be less than or equal to 10%. If the value is more than 10%, the evaluation of decision data is necessarily fixed.

$$A * w = \lambda_{max} * w \tag{1}$$

Stage 4: Defining the weight of interests using limited super matrix results from the models

$$CI = \frac{\lambda_{max} - n}{n - 1} \tag{2}$$

- CI = Indexes of consistency
- λ_{max} = The biggest eigen value
- n = Number of elements to compare

III. Methode Construction of the Model

A. Problem Definition

Besides evaluation, understanding factors affecting the performance is also crucial to improve lecturers' performance. This research designed the evaluation model of lecturers' performance by considering influential factors, previous research, observations, and interviews.

Most previous research employed models for performance evaluation, assessment, and social research and used a statistical method by adding or removing variables; thus, very rarely did they use an analytical method. This research aimed to create a flexible model of the lecturer performance using the MCDM approach and the ANP method. The model was designed to rank indicators that affected the performance of lecturers.

The next step after defining and developing the criteria, sub-criteria, and an alternative was constructing a model to connect elements as an interdependent network. The elements' criteria interacted with each other as determined earlier (Figure 3).

The network model of the ANP method was characterized by two inter-dependencies: inter-levels, inter-criteria, between criteria and sub-criteria, and inter-sub-criteria within criteria. They were represented by two arrows. In the analysis, the sub-criteria were represented by the inner dependency.

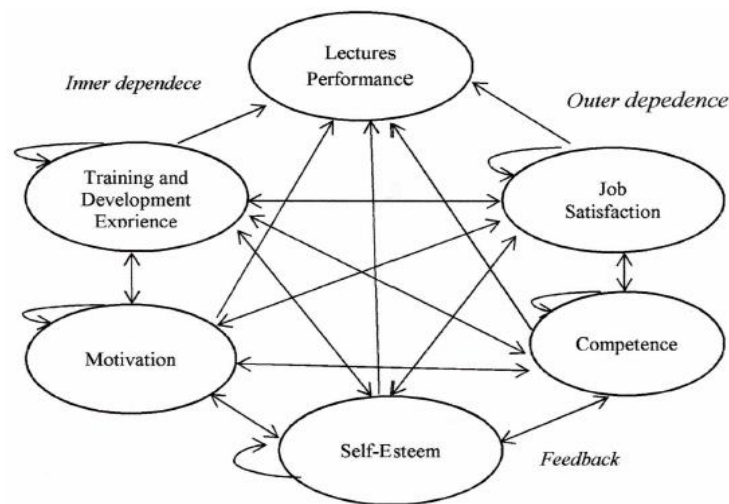


Fig. 2. The Construction of the Evaluation Models of Lecturers' performance

This research applied the ANP questioner method to determine values of weighted criteria or measured indicators. The questioner was in the form of pairwise comparison among group criteria/sub-criteria, performance, and evaluations of indicators. Questioners refer to a media used by researchers, experts, and academicians to evaluate the value of each criterion/sub-criteria in the model.

The ANP method used primary data collected from interviewing experts and regulators about the research subjects. Moreover, the data were collected by distributing questionnaires to the respondents. Measurement was done using numeric scales or considering the respondents' views about the importance of intensity in the form of evaluation variables.

B. Criteria of Problems

The evaluation criteria of lecturers' performance in this research consisted of lecturers' performance, work motivation, self-esteem, competency, and job satisfaction. Each criterion has several sub-criteria, as follows:

Table 2. Criteria for the Evaluation Model of Performance

Factor/Criteria	Sub-Criteria /Indicator
Lecturers' performance (LP)	Presentation
	Interest/motivate
	Organization
	Use of information technology
	Accessibility
Training and development experience (TDE)	Feedback
	Reaction
	Learning

	Behavior Results
Motivation (M)	Need for achievement Need for power Need for affiliation
Self-esteem (SE)	Respectful power Significance Virtue Competence
Competency	Pedagogy Professional
Job satisfaction	Interest in the work Work satisfaction Appreciation of work results

C. Proposed Models

The framework of the network model was designed by considering the ANP method (see Figure 4). All criteria and sub-criteria were connected with each factor of lecturer performance evaluation. The modeling was designed by determining clusters, nodes, and relationships that occurred among the elements (inner dependence and outer dependence). Then, they were identified based on empirical theories. The next stage was describing the network models. The model was created by connecting elements into interdependent and interacting networks among the predetermined criteria elements. The evaluation model of lecturers' performance was developed using the Super Decision software.

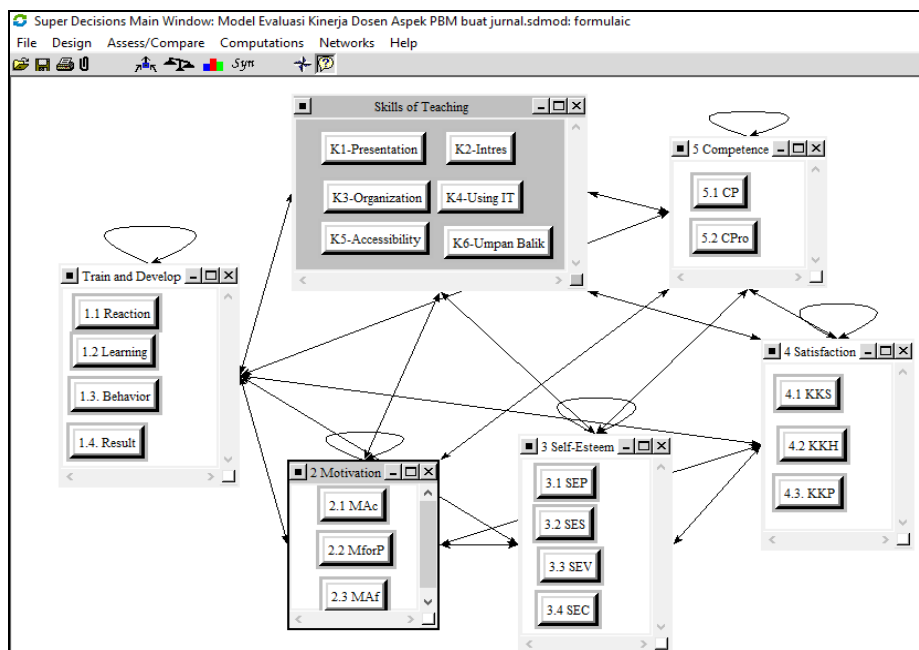


Fig. 3. Performance Evaluation Models with the ANP

IV. Conclusion

Performance evaluation is a process of determining an individual's performance levels. Conducting an evaluation in accordance with the work and functions of an educator is crucial to receive the information achieved by his performance. The evaluation model of lecturers' performance using the ANP forms network could represent some problems without focusing on the initial and final continuation. The developed model was based on ANP and believed to effectively measure direct and indirect influences and correlations among factors of lecturers'

performance, motivation, self-esteem, job satisfaction, and competence. This model was designed to rank factors influencing the performance of lecturers.

This research is still limited to the design of the evaluation model of lecturers' performance. Therefore, it is necessary to conduct an expert survey to examine the comparison values of the criteria. Moreover, further research can calculate the unweighted supermatrix, weighted supermatrix, limiting supermatrix, and priorities and test the designed model of lecturers' performance.

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