The development of scientific identification theory to conduct
operation research in education management

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Abstract. Operations research is a general method used in the study and optimization of a system
through modeling of the system. In the field of education, especially in education management,
operations research has not been widely used. This paper gives an exposition of ideas about how
operations research can be used to conduct research and optimization in the field of education
management by developing SITOREM (Scientific Identification Theory for Operation Research in
Education Management). To clarify the intent of the idea, an example of applying SITOREM to
enhance the professional commitment of lecturers associated with achieving the vision of university
will be described.

1. Introduction
Operations research is the application of scientific methods to find optimal solutions and decision-
making of a problem by taking into account the resources and the existing restrictions. In the analysis
and solution of the problems mentioned above usually done by using modeling and optimization. In
the field of education management there are a lot of analysis and problem solving is done by using
statistical models. Statistical model is equations formed from a statistical sample to describe the
relationship between variables that is affected (the dependent variable) with the variables that
influence (independent variables). Most studies that use statistical models in the field of education
management, the discussion is stopped on the finding that there is a relationship or a positive
influence between independent variable with or towards the dependent variable. This paper provides a
description of how the research findings are followed up by finding optimal solutions so that research
results can give a more precise answer and more concrete benefits to the issues raised.

2. Scientific Identification Theory
The scientific identification theory is a theory that describes the steps in systems analysis, modeling,
and simulation. Starting from the real system which is to be studied, an observation or experimentation is conducted to obtain data from the real system. Based on the data from the real system, an analysis of the system is performed to built an abstract model. The abstract model is a description of the real system in our minds. From the abstract model, we create a mathematical model or a simulation model which is depends on the situation and steps that we choose to resolve the model. If we choose the mathematical model then we resolve the model through a mathematical deduction, while for the simulation model the solution is typically done by using a computer. The data that obtained from the mathematical deduction or from the computer simulation is then compared with the data from real system to see how far the model corresponds to the real system that will be studied (validation). The steps of the scientific identification theory can be visualized using a diagram as below:
3. The Development of Scientific Identification Theory for Operation Research in Education Management (SITOREM)

For the purpose of operations research in education management, we need to add the scientific identification theory mentioned above with statistical model and steps to obtain an optimal solution. That mean, from the abstract model can be produced mathematical model, simulation model, and/or statistical model, and based on the models we perform an optimization process using appropriate method, namely, mathematical optimization method, optimization through algorithms that implemented on a computer, or other optimization methods. The diagram below depicts the steps of scientific identification theory which has been developed for operation research in education management, which we named as SITOREM.

4. The Application of SITOREM

In this chapter, a description regarding the idea and the application of SITOREM will be presented. As an illustration, the explanation will be taken as part of the research results from Setyaningsih 2016 [4], namely the research on the influence of empowerment and academic culture towards professional commitment of lecturers.

In the study of Setyaningsih [4] was synthesized that Professional Commitment is loyalty, engagement, and integrity of a lecturer in performing the tasks on the basis of skills, expertise, and
responsibility, with indicators: Sooth, Consistency, Improvement Desire, Skills Development, and Dedication and Devotion. Empowerment is the awarding authority and responsibility of the leader to employees to carry out tasks in a creative and innovative ways, in response to various changes dynamically as the capabilities of employees, with indicators: Discretion, Authority, Creativity and Innovation, and Open Communication. While the academic culture is a basic assumption to understand the beliefs, responsibilities, norms, values, artifacts and spirit of academic, embraced by all campus residents and used as a basis in carrying out tasks and solving problems with indicators of Applied Values, Academic Spirit, Responsibility, Tradition Assessment, Support and Cooperation. The constellation of research and statistical models as shown in Figure 3.

![Figure 3. Research Constellation and Statistical Model of [4]](image)

The objective of that research was to investigate whether there exists any direct positive effect of empowerment and academic culture towards lecturer professional commitment at the University of Pakuan, Bogor, Indonesia. A total of 135 from 337 university lecturers were sampled to collect data which was then analyzed using path analysis quantitative method.

The result shows that there exists a positive direct effect of empowerment towards professional commitment and academic culture towards professional commitment with path coefficient \( \beta_1 = 0.34 \) dan \( \beta_2 = 0.17 \) respectively. This means that increasing the quality of empowerment can enhance the professional commitment and conducive academic culture can enhance the professional commitment.
The implication is that to improve the professional commitment of lecturers is necessary to increase the quality of empowerment and improvement of academic culture.

Furthermore, we perform optimization by giving weighting to each indicator as shown in Figure 5 below.

Then we do the combination between the results weighted with the calculation of the indicators obtained from the studies in the field as shown in Figure 6 below.
Figure 6. The results of the weighting and the results of the calculation of the factor obtained from the research in the field.

From the results shown in the Figure 6 then we make a priority sequence of actions to improve or repair the state of the variables. The results are as shown in Figure 7 below.

Figure 7. The end result from the optimization towards the factors of the variables.
5. Discussion
Based on the description of the steps in Chapter 4, it appears that the results of the study, during which only stops on proof of the positive influence between independent variables and the dependent variable, can be followed up by performing the optimization process.

It gives results that the factors of the studied variables can be sorted out, which is good and which is not a good situation, and what kind of priority improvements can be done so that it can give a positive impact quickly.

With the resulting optimal solution, then the questions raised at the beginning of the study can be solved effectively and efficiently.

6. Conclusions
From the description that has been given in previous chapters can then be concluded as follows:

- SITOREM scientific recognition theory has been developed and can be used to conduct operations research in education management.
- In SITOREM, to obtain the optimal solution of the issues raised, we do a follow-up to give weight to any factors / indicators of the variables. We also consider the value of each of these factors based on the results of the research in the field.
- With the optimal solutions and priorities of the improvements to be made to the factors that the situation is not good, then it can provide concrete and efficient answers to the issues raised at the beginning of the study.

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