

# Modeling and Optimization Scientific Products Quality Using POP-SDM Method

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**Abstract**—The scientific work of lecturer is an important element related to the lecturers' career development and ranking universities at the national and international levels. Lecturers' scientific work can be in the form of scientific publication or intellectual property rights of research results conducted by lecturer. The paper provides a description of how the variable constellation model that has positive and dominant influence on improvement the product of the lecturer scientific work is developed and then used to optimize in finding the best ways and strategies to improve the products of lecturer scientific work. The study was conducted at Pakuan University lecturers with a population of 415 lecturers and a research sample of 204 lecturers. The research method used is the POP-SDM, a method for modelling and optimization of strengthening management resources. There are five important steps in this method, namely 1) Extracting data in the field of competent informants about other variables that have a positive and dominant influence on the products of lecturer scientific work. 2) Determination of the constellation of influence between variables based on data analysis obtained from informants. 3) Preparation of research hypotheses based on the constellation of influence between established variables. 4) Testing the research hypothesis using path analysis. 5) Analysis of indicators using the Sitorem method. The results of this research are in the form of a constellation model of influence between variables and ways and strategies to improve the products of lecturer scientific work through strengthening other variables studied.

**Keywords**—*productivity, lecture, POP-SDM*

## I. INTRODUCTION

The higher education structure has changed because of the impact of the development of science and technology. The task of lecturers in the era of educational technology 4.0 increasingly has more difficult challenges. Therefore, lecturers are required to change their mindset to increase their competence. Lecturers have a duty not only to teach but must already have a mindset on ongoing research and be part of their life. Lecturers are supposed to make research and service a part of communicating their knowledge. As stated in the Law on Teachers and Lecturers No. 14 of 2005, it is reflected that lecturers carry out tasks in the fields of education and teaching, research, and community service. The results of research which

are made in the form of productivity of published scientific works can be read and beneficial to society.

The findings indicate that the productivity of scientific research results still needs to be improved. The preliminary research results explain that: (1) There are still lecturers who have not made research results in the form of articles, indicated by 19.4%. (2) There are still lecturers who have not submitted their research results in the form of articles to national journals, indicated by 35.5%. (3) There are still lecturers who have not submitted their research results in the form of articles in the proceedings, it is shown by 54.9%. (4) There are still lecturers who have not submitted research articles to international journals, which is indicated by the presence of 71%. (5) There are still lecturers who have not revised the research articles given by reviewers, it is shown by 32.4%.

This problem can be caused by the existence of lecturers who do not understand the importance of the productivity of scientific work resulting from research and service. OECD data according to Koswara and Tadjudin [1] describes the lack of success of the research being carried out. This is because the mindset of lecturers in research is interpreted as an obligation in a promotion, teaching assignments are the focus, the high cost of research, limitations in developing research methodologies, rampant cases of plagiarism, and other problems related to human resource management or lecturers.

Referring to the data findings from the preliminary research above, it is necessary to carry out an in-depth study of the product of scientific work. This is to reveal and analyse what factors influence the scientific work of lecturers, so that improvements and improvements can be made. The research objective is to find ways and strategies to improve lecturers' scientific work products by examining other variables that have a positive and dominant effect on lecturers' scientific work products and analysing data and compiling other variables that have been found on the productivity of lecturers' scientific works as the dependent variable.

## II. THEORY

In his writing, the OECD Institute [2] defines that productivity is usually defined as the ratio between the volume

of output and the volume of input, in other words, it measures how efficiently production inputs, such as labour and capital, are used in the economy to produce a certain level of output. Furthermore, Byars et al. [3] define productivity may be defined as units of output per employee hour. Productivity is to produce more with the same amount of human effort. This statement can be interpreted as the output produced by employee working hours. Productivity is also interpreted as an increase in production with the available workforce. This theory states that productivity in the input dimension consists of (a) working time and (b) human resources and the output dimension in the factor of production.

Research on productivity testing was carried out by Nafukho et al [4] in their journal article that the purpose of this study is to test the productivity of faculty research at two leading Kenyan public universities. Meanwhile, Sanmugam and Rajanathan [5] explained that productivity in research and publication are two main requirements for academic positions in higher education institutions. Milburn and Brown [6] This study investigates the research productivity of landscape architecture faculty at North American universities and compares it with research results from 1998. The results show that productivity has increased in all categories. The average number of reference journal articles nearly doubled from 0.48 to 0.93 per faculty member. Publication of conference papers nearly tripled compared to the 1998 study, from 0.87 to 2.25 per faculty member per year. Godin [7] argues that productivity is now a keyword in science studies. Whether you consult the literature on research management, the economic literature on technology and innovation, the literature on bibliometrics or the official literature on science policy and its conceptual frameworks.

Productivity of scientific works can be defined as publishing or publishing them for the public's knowledge. Peat [8] states that:

A scientific article that is published in a well-respected, peer-reviewed journal is an important goal for any researcher and remains one of the ultimate markers of research success. For this reason, it is important to write your paper well so that it has clear messages, is readily accepted for publication, and is something that you can always be proud of.

It can be synthesized that the productivity of scientific work is the result achieved by a person in carrying out scientific activities in accordance with his duties and obligations in the organization where he works, with indicators 1) Scientific Publications, 2) Scientific Books, 3) Copyright, 4) Patents, and 5) Scientific Award.

**III. METHODS**

This study applies the Modelling and Optimization Method for Strengthening Management Resources (POP-SDM) as an alternative sequential exploration method developed by Setyaningsih and Hardhienata [9]. In this method, the research begins with a simple qualitative research to explore factors that are thought to have a positive and dominant effect on the

resources to be strengthened. Based on the factors or variables found, a constellation of the influence of these variables on the resources to be strengthened is arranged, resulting in a research hypothesis. Furthermore, at the quantitative research stage, hypothesis testing is carried out using path analysis. Based on the findings of the path analysis, a Sitorem analysis was carried out to determine priorities for handling weak indicators. The result of implementing the POP-SDM method is recommendations and strategies to improve aspects of management resources that are still weak as a priority for handling that is positively beneficial to the organization [9]. The steps in the Modelling Method and Optimization for Strengthening Management Resources (POP-SDM) consist of 7 stages, namely: 1) Research Theme, 2) Pre-Modelling, 3) Modelling, 4) Pre-Model Test, 5) Model Test, 6) Optimization Model, and 7) Optimal Recommendation.

**IV. RESULTS AND DISCUSSION**

The productivity of scientific papers has an important influence in improving the quality of higher education, therefore if lecturers do not carry out research or publications. Sanctions for unproductive lecturers, among others, will be hampered by the promotion of functional positions and it is also possible to reduce their teaching assignments because they are not productive, meaning they do not meet the requirements as lecturers.

This is evidenced by the analysis of the results of the interviews, which are used as the basis for constructing a constellation model of the strengthening of the productivity of lecturers' scientific work as variable Y. The results of the interviews obtained variables of empowerment, knowledge management, organizational culture, and creativity. The findings are used as the basis for the preparation of a constellation of variables or intervening variables. Thus, it can be said that the scientific work products of lecturers are influenced by empowerment, knowledge management, organizational culture, and creativity. This influence can be seen in the following constellation image: Based on the results of the interview, it can be concluded as in figure 1:

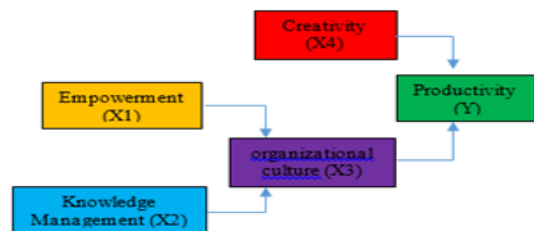


Fig. 1. Picture of the constellation of research results.

The constellation image above shows that the productivity of lecturers' scientific work is influenced by factors or variables of empowerment, knowledge management, organizational culture, and creativity. The research results prove that lecturers will be able to produce scientific work with empowerment,

knowledge management, and organizational culture. Thus, the creativity of lecturers in creating scientific works will increase. The following describes the results of the study.

- The dominant factors which directly influence productivity are a) empowerment; b) knowledge management, this factor is related to the workload and demands of a lecturer which are solid. Starting from teaching, community service and conducting research turned out to be obstacles for them. Most of them have difficulty managing their time, so many understand that the productivity of lecturers in writing scientific papers is also limited. In this case, knowledge management is a form of self-knowledge management of lecturers in carrying out the task of the Tri Dharma of Higher Education. Productivity can also be increased through training or training on how to do good research, and how to be able to publish research results in the form of good scientific works, so that they can be accepted in the appropriate media; c) organizational culture, because a conducive organizational culture will have an influence on the productivity of lecturers' scientific work; d) creativity; With the empowerment carried out by universities, knowledge management and a conducive organizational culture, it will create lecturers who have high creativity in creating scientific works that are published in the form of articles (papers), copyrights (IPR), and patents.
- The factors mentioned above have a dominant relationship with productivity, empowerment, knowledge management, organizational culture, and the creativity of lecturers in realizing higher or quality higher education rankings. Empowerment of lecturers can create lecturers who have good knowledge management based on a conducive organizational culture, so that lecturers are able to create research creativity in the form of publications.

Based on the results of the interview, it can be concluded that the factors related to the productivity of lecturers' scientific work are empowerment, knowledge management, organizational culture, and creativity, with the following relationship patterns.

The conclusion from the interviews and observations found that the factors related to the productivity of scientific work are empowerment, knowledge management, organizational culture, and creativity. It is hoped that the publication obligations that have been regulated for lecturers and researchers can increase the number and quality of scientific publications at the national and international levels so that Indonesia can compete with other nations.

The productivity of lecturers' scientific work tends to be low, which is due to the low creativity of the lecturers in research and dedication, the high teaching load makes the lecturers less time to do research. Thus, lecturers tend to allocate a long time only to prepare teaching material in class.

The ability of lecturers to research is also a challenge in building a research culture in the campus environment.

Therefore, understanding the driving factors for lecturer productivity in research is important to know. This happens because tertiary institutions as one of the elements in the National Education System have a big responsibility. Higher education is an institution dedicated not only to disseminating knowledge, but also to creating new knowledge through research.

The results of this study turned out to be different from several problems presented by Cargill and O'Connor [10] which stated several reasons why researchers experienced difficulties in scientific publications, namely: (1) Not all research is new or of sufficient scientific interest. (2) Experiments do not always work positive result are easier to publish. (3) Scientific journals have specific requirements which can be difficult to meet publishing is a buyer's market. In other words, not all research results are new or up to date research categories. Some experimental research results do not always produce the expected conclusions, positive results are easier to publish. In addition, some journals have conditions that are difficult for researchers to fulfil. These differences can occur because of the point of view used. Darmadi also shared a different point of view, who argues that writing is the most difficult skill compared to listening, speaking, or reading. The ability to write is a problem faced by everyone. Then, in more detail, Kamaroesid [11] states that the biggest obstacle in the productivity of scientific work comes from within oneself, especially the existence of a self-view that making scientific writing is a difficult job. This view is often the obstacle to writing scientific papers. Apart from the problems that have been previously mentioned, other problems faced by lecturers are in journal publications, IPR management, and patents. The productivity of lecturers' scientific work can be seen from the number of publications during a certain period, the number of participations in various team activities at the study program, faculty, or college level.

Lecturers are an important parameter in the process of controlling higher education institutions. Lecturer rank and education are used as basic guidelines, in addition to the graduation ratio, in the accreditation mechanism. Thus, thinking about efforts to empower the quality of lecturers should be the goal of every higher education manager. The measure of the quality of the teaching staff in higher education can be seen from the productivity of the implementation of the tridharma, namely: education and teaching, research and scientific work, and community service.

## V. CONCLUSION

Scientific work products of lecturers are influenced by empowerment, knowledge management, organizational culture, and creativity. The research shows that the productivity of lecturers' scientific work tends to be low, which is due to the low creativity of the lecturers in research and dedication, the high teaching load makes the lecturers less time to do research.

Thus, lecturers tend to allocate a long time only to prepare teaching material in class. The ability of lecturers to research is also a challenge in building a research culture in the campus environment.

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