



## Determinant factors affecting the research performance of lecturers receiving external funds

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### ABSTRACT

Quality research can positively impact the development of science and technology and improve the reputation of universities. This study investigates the determinant factors that affect the research performance of lecturers who obtain external funding. The sample was 41 lecturers who obtained external research funds from various institutions (e.g., Directorate of Research, Technology and Community Service, Ministry of Education, Culture, Research and Technology of the Republic of Indonesia; National Research and Innovation Agency of the Republic of Indonesia; and similar institutions) for the last three years (2021 - 2023). Cluster analysis using secondary data (Science and Technology Index or SINTA data) was conducted to determine research performance clusters (high and low). Discriminant analysis was conducted to determine the determinant factors affecting research performance achievement based on the cluster analysis results. The results revealed that internal factors, including mastery of English and interest in the research topics offered, are determinant factors that affect the research performance of lecturers receiving external funding. In external factors, eight determinant factors affect research performance, namely: support for dissemination of research results in journals, support from research assistant staff, satisfaction with awards from the university, satisfaction with awards from outside the university, support for research matching funds from the university, training in writing research proposals, ease of obtaining research permits from agencies outside the university, and adequacy of facilities at the university. Universities need to consider these factors to encourage the improvement of the research performance of lecturers receiving external funding.

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## INTRODUCTION

Ideally, lecturers in higher education have high research productivity and quality. They deeply understand the importance of research as one of their core tasks and appreciate the value of research in developing science and advancing society (Gadzali & Yunizar, 2023; Mirnayanti, 2022). Lecturers also have adequate access to external research funds, facilities, and amenities that support their research. Higher education institutions and the government provide adequate financial support to support lecturers' research (Abdillah et al., 2021; Waskito, 2020). In an increasingly competitive research era, lecturers who can produce quality research with external funding support significantly positively impact their academic development, institutional reputation, society, and economy (Ulfathmi et al., 2021). In addition, lecturers' workloads balance teaching, research, and community service, so they have sufficient time to conduct research without being overburdened with other tasks (Asriadi AM et al., 2022; Lesmana et al., 2023). A research culture that encourages collaboration is also part of this ideal, with cross-disciplinary and inter-institutional cooperation

encouraged. Lecturers have easy access to relevant literature and resources to support their research. Recognition, rewards, and professional development are part of the system that supports lecturers' research (Rivai et al., 2019). Research results that impact science, technology, society, and industry are also key objectives, and lecturers are expected to conduct research with high ethics and integrity (Wahyudi, 2022). These elements aim to create an environment that supports and encourages lecturers' research so that they can make meaningful contributions to science, the development of society, and a good reputation for their universities.

Conditions related to lecturers' research performance in higher education can be very diverse. Lecturers' research productivity levels often vary across individuals and institutions (Yato & Lo, 2023). Some lecturers may be highly committed to research, publish high-quality work, and actively participate in high-impact research projects (Istambul, 2019; Wahyudi et al., 2021). However, some lecturers may also face resource limitations affecting their ability to conduct significant research (Retnowati et al., 2021). Limited resources, including research funds, laboratory facilities, and access to research literature, can be a real obstacle to conducting quality research (Bangun et al., 2021). In addition, high workloads that include teaching, student advising, and administrative tasks can often reduce the time available to focus on research (Hasyim et al., 2018; Hue et al., 2022). Intense competition for external research funding is also a challenge many lecturers face, affecting their motivation and ability to conduct innovative research (Sanmorino, 2021). Therefore, the actual conditions on the ground reflect the various dynamics that affect lecturers' research performance in different higher education institutions. However, while this importance is widely recognized, there is a gap in the theoretical and empirical understanding of the factors influencing lecturers' externally funded research performance.

It has led to discrepancies in the research performance of lecturers in higher education. Lecturers are ideally expected to have a deep understanding of the importance of research, adequate access to resources, sufficient time, and strong financial support (Izuagbe, 2021). They can be recognized and rewarded, have opportunities for collaboration, and produce impactful research (Fajrizal et al., 2022). However, the actual conditions on the ground often involve challenges such as limited resources, high workloads, and intense competition (Noor et al., 2020; Restu & Sriadhi, 2022). Some lecturers may successfully overcome these obstacles, but these empirical gaps suggest further research to understand the complex dynamics that influence lecturers' research performance across different universities (Sukirno, 2020; Sukirno & Siengthai, 2011). Therefore, a study is needed to investigate factors affecting lecturers' research performance (Jusmin et al., 2016). With a better understanding of the factors that influence lecturers' research performance, higher education institutions can design more effective strategies to support quality and impactful research.

This study is expected to significantly contribute to understanding lecturers' research performance with external funding. The findings will enrich existing knowledge by combining theoretical literature and recent empirical findings. In addition, this study is expected to provide valuable information for higher education policymakers and research institutions. Thus, this study can serve as a foundation to increase support for lecturers who conduct externally funded research and increase their positive contribution to the development of science and technology. Therefore, this study aims to analyze and identify the determinant factors that affect the research performance of lecturers who receive external funding.

## METHOD

### Research Procedure

This study aims to reveal the determinant factors that affect the research performance of lecturers who receive external funding. A quantitative approach was chosen to achieve the research objectives. The research begins with preparing instruments related to factors that affect research performance (see Figure 1). Furthermore, this instrument is validated to ensure the suitability of

the instrument substance with the research objectives. This research focuses on (1) clustering lecturers' research performance and (2) determining the determinant factors that influence lecturers' research performance. Cluster analysis (see Ismail et al., 2022; Križanić, 2020) was chosen to determine performance clusters, and the desired achievement was the availability of information related to the clustering of lecturers' research performance. The results of this clustering were also determined as the dependent variable in this study. Furthermore, discriminant analysis revealed factors that significantly affect lecturers' research performance. The factors or variables to be tested were obtained based on theoretical studies, and all these variables were determined as independent variables. The expected outcome of this discriminant analysis is the availability of information related to determinant factors that contribute significantly to the research performance of lecturers receiving external funding.

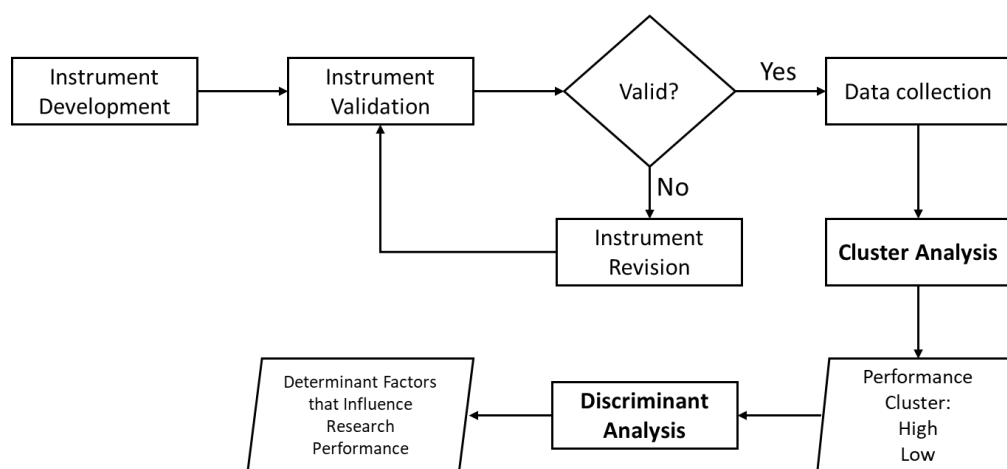


Figure 1. Flowchart of Research Procedure.

## Research Participants

This research involved lecturers of Universitas Negeri Yogyakarta who received external research funds from institutions (e.g., Directorate of Research, Technology and Community Service, Ministry of Education, Culture, Research and Technology of the Republic of Indonesia; National Research and Innovation Agency of the Republic of Indonesia; and similar institutions) for the last three years (2021 – 2023). A total of 41 lecturers participated as samples in this study. The lecturers were spread across eight faculties, namely the Faculty of Mathematics and Natural Sciences, Faculty of Education and Psychology, Faculty of Engineering, Faculty of Economics and Business, Faculty of Social, Legal, and Political Sciences, Faculty of Language, Arts, and Culture, Faculty of Sport and Health Sciences, and Faculty of Vocational Studies.

## Data Collection Techniques and Research Instruments

Data collection in this study will use documentation and questionnaire techniques. The documentation technique obtains lecturer research performance data from the Science and Technology Index or SINTA (<https://sinta.kemdikbud.go.id>) from 2021 to 2023. Eight performance parameters are taken from SINTA (see Table 1 in the Finding section). This data will be used to determine the research performance cluster of each respondent. The research instrument is a questionnaire containing internal and external factors affecting lecturers' research performance. Each factor is translated into indicators representing the study's independent variables. The questionnaire used in this study uses a Likert scale with five answer options. There are 20 items on the questionnaire

consisting of 9 items for internal factors (see [Table 2](#) in the Finding section) and 11 items for external factors (see [Table 3](#) in the Finding section).

### Data Analysis Technique

In this study, data analysis was conducted in two stages. The first stage focused on cluster analysis aimed at obtaining clusterization of the level of research performance of lecturers receiving external funding. In this study, the desired number of clusters was set at the beginning, consisting of two performance clusters: high and low. Based on the cluster analysis results, lecturers' research performance will be grouped into these two categories. The second stage focused on discriminant analysis to uncover factors significantly influencing research performance. All independent variables suspected of significantly contributing to research performance will be tested for significance in the model. The variables contributing significantly to research performance are the determinants of the research performance of lecturers receiving external funding. All analyses, both cluster analysis and discriminant analysis, were conducted using several packages such as 'factoextra' (Kassambara & Mundt, 2020), 'cluster' (Maechler et al., 2022), 'MASS' (Venables & Ripley, 2002), and 'klaR' (Weihs et al., 2005) executed using RStudio (Posit team, 2023).

## FINDINGS AND DISCUSSION

### Findings

This study used two stages of analysis, namely cluster analysis to determine the research performance of each research sample and discriminant analysis to determine the determinant factors that affect the research performance of lecturers receiving external funding. In the results section, we first present the clusters of lecturers' research performance based on the cluster analysis results. Next, we present the discriminant analysis results to determine the determinant factors that significantly affect the research performance of lecturers receiving external funding.

#### *Lecturer Research Performance Cluster*

Lecturer performance clusters were estimated using eight parameters. The cluster analysis results indicate that the optimal number of clusters based on the eight parameters is two clusters (see [Figure 2](#)). Of the 41 samples, 27 (65.85%) belonged to Cluster 1, while 14 (34.15%) belonged to Cluster 2 (see [Figure 3](#)). A comparison of research performance between clusters 1 and 2 based on the eight parameters is presented in [Table 1](#).

**Table 1.** Mean Research Performance Parameters for Cluster 1 and Cluster 2 Lecturers

Research Performance Parameters	Cluster 1 ( <i>n</i> = 27)	Cluster 2 ( <i>n</i> = 14)
Number of articles indexed by Scopus	16.93	48.21
Number of articles indexed by Google Scholar	79.18	150.00
Number of citations to Scopus-indexed articles	40.56	259.00
Number of citations to articles indexed by Google Scholar	541.52	1706.21
H-Index Scopus	3.48	9.79
H-Index Google Scholar	11.30	22.14
i10-Index Scopus	1.15	7.50
i10-Index Google Scholar	11.93	31.64

Cluster 1 has lower mean values than Cluster 2 for all observed variables, indicating lower performance in the number of indexed articles, citations, H-Index, and i10-Index. In contrast, Cluster 2 has higher mean values, indicating better performance in these aspects. This analysis provides insight into the performance differences between these two clusters in the context of

scientific research and citation impact, which can serve as a basis for further understanding and relevant decision-making. The distribution of data by cluster group can be seen in Figure 3.

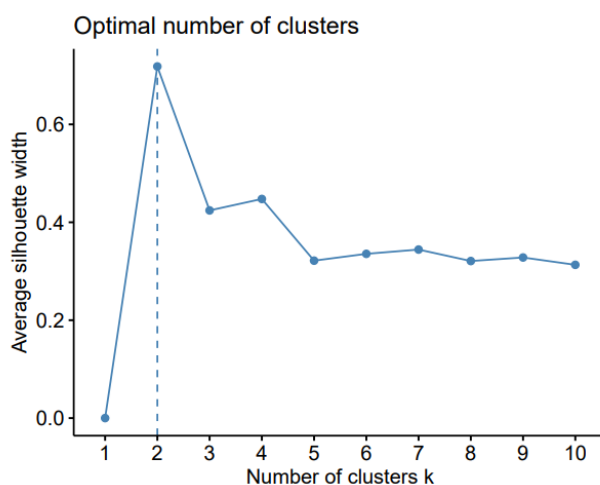
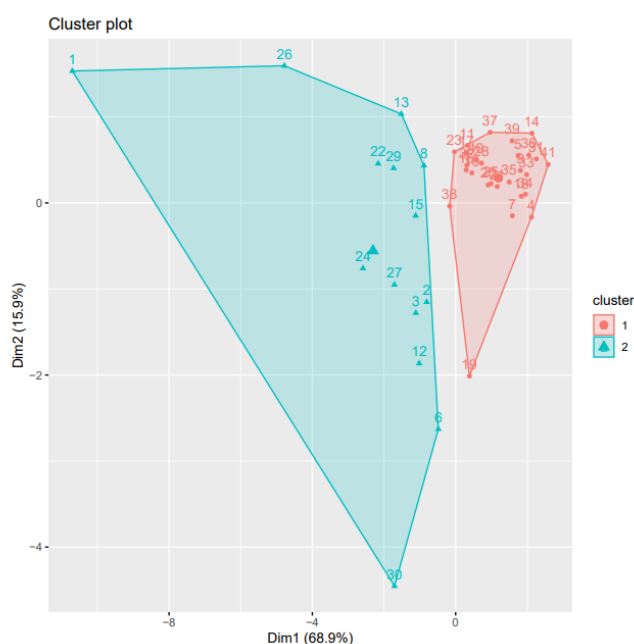


Figure 2. K-Optimum Plot

The cluster plots presented in this analysis illustrate the results of forming two distinct clusters. The presence of these two clusters is predetermined, and in this plot, they are represented with different colors, i.e., Cluster 1 in red and Cluster 2 in blue. It should be noted that Cluster 1 has a smaller coverage area than Cluster 2, which indicates that the observations or data in Cluster 1 have a higher degree of similarity in some of the features or characteristics used in this cluster analysis. In dimensional interpretation, Dimension 1 (68.9%) contributes more significantly to the variation in the data than Dimension 2 (15.9%). Therefore, this cluster plot provides a helpful visual understanding of how the data is grouped into two clusters based on specific variables, which can be used for further decision-making or in-depth analysis of characteristics and patterns in the data.





### ***Description of Predictor Variables of Research Performance***

In this study, we have classified the predictor variables into internal and external factors. Table 2 and Table 3 present the descriptive statistics of the sample responses to the questionnaire for internal and external factors, respectively. The overall data reflects responses from Cluster 1 (low performance) and Cluster 2 (high performance). In this analysis, Cluster 1 has relatively high mean on most predictor variables, such as motivation, interest in the research topic, and ability to collaborate. Meanwhile, Cluster 2 tended to have slightly lower mean on these variables. However, it is essential to note that the mean difference between these two groups is not always significant. Moreover, overall, the combined mean for each variable indicates relatively high levels of motivation, interest, and support from the entire population of respondents. These data, therefore, provide a valuable understanding of the factors that influence motivation and support in scientific research, noting the differences between the groups.

**Table 2.** Descriptive Statistics of Internal Factors Based on Research Performance ( $n = 41$ )

Code	Item	Mean ( <i>SD</i> )		
		Low	High	Overall
I-MOT	Motivation for conducting research	4.692 (0.480)	4.536 (0.576)	4.585 (0.547)
I-MNT	Interest in the research topics offered	4.462 (0.776)	4.429 (0.504)	4.439 (0.594)
I-MTD	Mastery of research methodology	4.231 (0.599)	4.214 (0.499)	4.220 (0.525)
I-KOLIN	Ability to collaborate with other lecturers from within the university	4.462 (0.660)	4.357 (0.678)	4.390 (0.666)
I-KOLEX	Ability to collaborate with other researchers or partners from outside the university	4.077 (0.641)	3.964 (0.838)	4.000 (0.775)
I-INSTF	Satisfaction with research incentives obtained	4.231 (0.599)	4.071 (0.716)	4.122 (0.678)
I-BING	Mastery of English	4.000 (0.707)	3.750 (0.585)	3.829 (0.629)
I-MNJM	Research time management skills	4.000 (0.707)	3.929 (0.663)	3.951 (0.669)
I-WRTPRO	Ability to write research proposals	4.154 (0.555)	4.143 (0.448)	4.146 (0.478)

**Table 3.** Descriptive Statistics of External Factors Based on Research Performance ( $n = 41$ )

Code	Item	Mean ( <i>SD</i> )		
		Low	High	Overall
E-FSLTS	Adequate facilities at the university to support research	4.308 (0.630)	4.107 (0.786)	4.171 (0.738)
E-DNPDP	Matching financial support provided by the university to carry out research	3.615 (0.870)	3.750 (0.752)	3.707 (0.782)
E-FSLEX	Ease of access to facilities outside the university (materials, laboratories, samples)	3.846 (0.555)	3.786 (0.630)	3.805 (0.601)
E-IZNEX	Ease of obtaining research permits from agencies outside the university	4.154 (0.555)	3.893 (0.629)	3.976 (0.612)
E-PLTPRO	Ease of accessing research proposal preparation training from universities	4.769 (0.439)	4.321 (0.670)	4.463 (0.636)
E-PLTMET	Ease of accessing research methodology training from universities	4.538 (0.519)	4.179 (0.723)	4.293 (0.680)
E-AWDIN	Satisfaction with awards from the university	4.538 (0.519)	4.143 (0.651)	4.268 (0.633)
E-AWDEX	Satisfaction with awards from outside the university	3.923 (0.494)	3.679 (0.670)	3.756 (0.624)
E-DISJUR	Support for dissemination of research results through national/international journals	4.462 (0.660)	4.071 (0.663)	4.195 (0.679)
E-DISSEM	Support for dissemination of research results through national/international seminars	4.462 (0.519)	4.321 (0.548)	4.366 (0.536)
E-STF	Research support staff (students) support	4.154 (0.801)	4.429 (0.742)	4.341 (0.762)

In addition, there is variation in mean values between the measured predictor variables. The predictor variable with the highest mean is I-PLTPRO, which describes the ease of accessing research proposal writing training, with a mean value of 4.463. It indicates that, on average, respon-

dents have a positive perception of how easy it is for them to get training on research proposal writing. On the other hand, the variable with the lowest mean is E-DNPDP, which relates to the counterpart funding support provided by the university to carry out research, with a mean value of 3.707. It indicates that respondents tend to give lower ratings to the co-funding support they receive from the university for research activities. The difference in mean scores can provide essential insights into understanding respondents' perceptions and satisfaction with scientific research factors.

### ***Internal Determinants of Research Performance***

Nine internal factors are predicted to influence the performance of externally funded research. Of these nine factors, this study found that only two factors significantly affected externally funded research performance (see Table 4). The two factors are mastery of English (I.BING) and interest in the research topic offered (I.MNT).

**Table 4.** Stepwise Discriminant Analysis of Internal Factors

Predictor Variables	Wilks Lambda	F-Overall	p-Overall
I.BING	<b>0.87</b>	<b>5.82</b>	<b>0.02</b>
I.MNT	<b>0.85</b>	<b>3.37</b>	<b>0.04</b>
I.KOLEX	0.83	2.57	0.07
I.MNJM	0.82	2.02	0.11
I.KOLIN	0.81	1.60	0.18
I.MTD	0.81	1.31	0.28
I.MOT	0.81	1.10	0.39
I.WRTPRO	0.81	0.93	0.50
I.INSTF	0.81	0.80	0.62

The best model involves two significant factors, namely, I.BING and I.MNT produced linear discriminant (LD) coefficients, as shown in Table 5. The LD coefficients in Table 5 indicate that I.BING has the most significant contribution in predicting external fund research performance. Table 5 also informs us that high-performing respondents view English proficiency and interest in the research topic as more critical than low-performing respondents.

**Table 5.** Group Means and Linear Discriminant Coefficients of Internal Factors

Predictor Variable	Mean Low Performance	Mean High Performance	LD Coefficient
I.BING	0.03	0.29	3.08
I.MNT	0.44	0.57	0.78

### ***External Determinants of Research Performance***

In the external factors, 11 predictor variables are predicted to affect the research performance of lecturers' external funds. Eight of the 11 factors were found to jointly influence the performance of externally funded research (see Table 6). The eight factors include support for dissemination of research results in journals (E.DISJUR), support from research assistants (E.STF), satisfaction with awards from the university (E.AWDIN), satisfaction with awards from outside the university (E.AWDEX), support for matching funds (E.DNPDP), training in writing research proposals (E.PLTPRO), ease of obtaining research permits from agencies outside the university (E.FSLEX), and adequacy of facilities at the university (E.FSLTS).

The best model involving eight significant factors resulted in the LD coefficients in Table 7. Satisfaction with university awards (E.AWDIN) contributed the most to predicting external faculty research performance. The second highest contribution in predicting externally funded research performance is contributed by proposal writing training (E.PLTPRO). However, several other fac-

tors have a negative LD, indicating that low-performing respondents view these factors as more important than high-performing respondents.

**Table 6.** Stepwise Discriminant Analysis of External Factors

Predictor Variables	Wilks Lambda	F-Overall	p-Overall
E.DISJUR	0.92	3.40	0.07
E.STF	0.84	3.55	0.04
E.AWDIN	0.78	3.44	0.03
E.AWDEX	0.75	2.95	0.03
E.DNPDP	0.72	2.72	0.04
E.PLTPRO	0.67	2.84	0.02
E.FSLEX	0.64	2.64	0.03
E.FSLTS	0.63	2.36	0.04
E.IZNEX	0.62	2.08	0.06
E.DISSEM	0.62	1.82	0.10
E.PLTMET	0.62	1.61	0.15

**Table 7.** Group Means and Linear Discriminant Coefficients of External Factors

Predictor Variables	Mean Low Performance	Mean High Performance	LD Coefficient
E.DISJUR	0.22	0.50	0.06
E.STF	0.56	0.36	-1.15
E.AWDIN	0.30	0.50	2.23
E.AWDEX	0.11	0.07	-1.40
E.DNPDP	0.11	0.00	-2.92
E.PLTPRO	0.44	0.71	1.66
E.FSLEX	0.11	0.07	-1.14
E.FSLTS	0.37	0.36	-0.62

## Discussion

This study seeks to uncover the determinant factors that affect the research performance of lecturers receiving external funding. The determinants were categorized into internal and external factors. In terms of internal factors, this study revealed that English language skills and interest in the research topics offered were the determinant factors affecting lecturers' research performance. In terms of external factors, the study revealed that there are eight determinant factors affecting lecturers' research performance, namely: support for dissemination of research results in international and national journals, support from research staff, satisfaction with awards from the university (internal), satisfaction with awards from external institutions, satisfaction with matching funds from the university, training in writing research proposals, ease of obtaining research permits from agencies outside the university, and adequacy of facilities at the university. In general, these findings are not surprising and are consistent with the findings of [Heng et al. \(2020\)](#).

[Heng et al. \(2020\)](#) categorized the factors affecting research performance into three levels: individual, institutional, and national. English proficiency and interest in research topics can be classified as individual-level factors. Other factors such as support for disseminating research results in journals, research staff support, satisfaction with internal rewards, satisfaction with matching fund support, adequate facilities at the university, and training in writing research proposals are classified as factors at the institutional level. Meanwhile, factors such as satisfaction with awards from external institutions and ease of obtaining research permits from agencies outside the university can be classified as factors at the national level.

The fact that individual, institutional, and national factors influence research performance has led to several recommendations to improve the research performance of lecturers receiving external funding. We suggest lecturers continue improving their English language skills at the individual level. With good English skills, lecturers can more easily collaborate with foreign researchers.



This collaboration can expand their network in the international scientific community and thus increase their chances of obtaining research funding from external institutions. With good English skills, lecturers will also find it very easy to review the latest research trends through international journals or seminars. It will help them to increase their interest in new research topics offered by external institutions.

At the institutional level, in this case, the university, several important policies need to be taken to improve the research performance of lecturers receiving external funding. The existence of awards from the university and training in proposal writing are two key factors that encourage the improvement of lecturers' research performance. Thus, universities are expected to continue to improve the form of awards given to lecturers' research performance. In addition, training and workshops on writing research proposals for obtaining external research funds must improve quality and quantity. Policies taken at the individual and institutional levels need to be supported by policies at the national level. Based on the research findings, we recommend improving awards given by authorized institutions at the national level.

In addition, the findings in this study are closely related to several theories related to research management and the factors that influence lecturers' research performance. Cluster analysis confirms clustering theory by showing that lecturers can be divided into two groups based on their research performance. Cluster 1, which has relatively lower performance, and Cluster 2, with a higher performance, reflect variations in researcher characteristics and behavior following the concept of clustering theory. In terms of determinant factors, these findings support the theory that some factors significantly impact research performance. As internal factors, English language proficiency and interest in research topics were identified as critical determinants of lecturers' research performance. It aligns with theories emphasizing the importance of individual internal characteristics in research success (Sukirno, 2020). Although not directly measured, the motivation aspect supports the theory of motivation and lecturer performance by showing that motivation can contribute to higher research performance (Colquitt et al., 2019). Furthermore, the finding that satisfaction with university and external rewards can positively influence research performance aligns with reward and recognition theory (Brown & Reilly, 2013; Kokubun, 2019). In research management, the findings highlighting the ability to collaborate and research auxiliary staff support research management theories that emphasize the importance of collaboration and team support to improve research productivity. In conclusion, these findings can guide universities and policy-makers in improving support structures and strategies to enhance overall research performance among lecturers.

This study identifies two distinct groups of lecturers' research performance and the internal and external factors influencing such performance. English language proficiency and interest in research topics significantly impacted research performance. These results provide a basis for developing more focused training and support programs, including English language training and research skills enhancement. To improve research performance, universities can use these findings to design incentives, proposal writing training, and inter-faculty collaboration support. The findings, therefore, have substantial practical implications for improving lecturers' research productivity through targeted and practical approaches.

### ***Limitations and Future Directions***

The main limitation of this study is the relatively small sample size. Although the findings of our study contribute significantly to the literature, they cannot be generalized to the broader population. Our findings, although significant, still need to be verified through other studies involving larger samples. We recommend that future studies replicate this study by involving samples that represent a broader population. It is hoped that future studies will also investigate the determinant factors that influence the research performance of lecturers receiving external research funds in various aspects, such as gender, university status, region, lecturer academic position, number of

students, and other aspects. In the future, it is also important to reveal in depth the causes of differences in lecturers' research performance in terms of various factors through case studies or phenomenology.

## CONCLUSION

This study concludes that internal and external factors influence external fund research performance. Internal factors, including mastery of English and interest in the research topic offered, affect the performance of externally funded research. On external factors, eight determinant factors affect the performance of externally funded research, namely: support for dissemination of research results in journals, support from research assistant staff, satisfaction with awards from the university, satisfaction with awards from outside the university, support for research matching funds from the university, training in writing research proposals, ease of obtaining research permits from agencies outside the university, and the adequacy of facilities at the university. Universities need to consider these factors in encouraging the improvement of lecturers' research performance, especially for research that uses external funding. Strengthening lecturers' mastery of English and appreciation from universities for lecturers' research performance need to be continuously improved, considering that these two factors contribute the most to research performance. In addition, universities need to consider increasing training on research proposal writing for lecturers, considering that this factor also has a reasonably high contribution to lecturer performance compared to other factors.

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