Development of an Integrated Information System for Lecturer Performance Management

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Abstract **– Lecturer performance evaluation continues to have issues that impede university goals. The purpose of this research is to develop an information system for evaluating lecturer performance (IS-LPA). The application was designed for three user groups: administrators, lecturers, and assessors. The application development utilizes the System Development Life Cycle (SDLC) model. The results of the feasibility test demonstrated an average score of 8.46, and the effectiveness test yielded an average achievement of 85.29%. This application has been shown to be feasible and effective for assessing lecturer performance in order to improve university management and service quality.**

Keywords **– Information system, performance, assessment.**

1. Introduction

The university is an educational institution that determines the quality of human resources based on its graduates. Indonesia has 4,424 higher education institutions, 143 state universities, and 4,281 private universities [1]. Periodic reporting of lecturer performance always has problems, especially by private universities [2], [3], [4].

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Lecturer performance is one of several factors that influence the achievement of objectives. The large role of lecturers in universities demands an appropriate management system [5], [6]. Mistakes in managing lecturer performance such as giving assignments, conducting lectures, research, community service, and publications will have an impact on other problems, especially those related to payroll and academic reporting [3], [7], [8]. Weaknesses in performance appraisal will have a negative impact on the lecturer career system, accreditation of study programs and university quality [9], [10], [11].

In point of fact, evaluating the performance of lecturers presents challenges for a significant number of educational institutions. Obstacles are inevitably encountered during the process of determining performance indicators, monitoring and evaluation systems, performance appraisal, reporting, payroll, and lecturer career systems [3], [5], [6], [12], [13]. According to the findings of some preliminary research conducted in the province of North Sumatra in Indonesia, many private universities have difficulty managing the performance of their lecturers. Because of these flaws, it is difficult for universities to collect accurate data and information regarding the performance of lecturers because: (1) lecturers have difficulty reporting work activities because the process is done manually; (2) reported teaching activities are not systematic and are unrelated to other aspects of performance; (3) the payroll system is still done manually because it is not connected to lecturer performance data; and (4) there is no representative information system available. In order to find solutions to these issues, inventive actions are required so that there is not an even greater adverse impact [3], [14], [15].

This study aims to develop an integrated information system for lecturer performance assessment (IS-LPA) starting from input, processing, and output. The IS-LPA model is based on a more specific and unique analysis of user needs that accommodates user needs and is a solution to current problems.

The system is built with the advantages of: (1) integrating elements of lecturer performance assessment in an integrated single sign-on database; (2) Preparing lecturer performance assessment applications for the fields of teaching, research, community service, publication, recognition, and intellectual property to produce outputs in the form of assessment results for lecturer performance, (3) Establishing performance indicators according to applicable regulations, (4) Setting up a decision-making system menu for lecturer performance assessment, payroll systems, and career promotion in one integrated system that can be accessed online; (5) Setting up an interface to support connection of report output with external application systems.

The results of this study will be useful for solving the problem of managing lecturer performance, which has been done conventionally so far. Integrated management of lecturer performance with online access is a solution to problems at private universities, as confirmed by previous studies [7], [16], [17]. With an integrated information system, online access will improve university services and make them more dynamic, effective, and efficient.

2. Literature Review

Information systems can be defined as the arrangements of people, data, processes, and information technology that interact to collect, process, store, and provide as output the information needed to support organizational decisions [18]. Information systems at universities serve not only to enhance administrative services but also as a foundation for making more informed decisions [15], [19]. Utilization of an integrated online access information system will increase the dynamic nature and management efficiency of higher education activities [8], [14], [20]. Universities with busy activities, a large number of employees, and numerous variables are difficult to manage in conventional and partial ways [3], [6], [21]. Therefore, the use of information systems is an unavoidable requirement.

As required, information systems are constructed. In general, academic information systems prepare application features related to academic administration, such as biodata and performance elements [8], [11], [22]. Information systems can be designed for broader purposes to facilitate academic performance evaluations of lecturers and education staff, as well as for finance, inventory, and laboratory management [4], [5]. Utilizing an integrated information system will improve academic performance so that service issues and information needs at universities can be met more rapidly and precisely [7], [18].

A model of an integrated information system is necessary to facilitate accurate, effective, and efficient university administration for lecturer performance evaluation [16], [19].

Typically, the personnel information system used to manage lecturer performance is an integrated application program that combines several fundamental application programs [7], [23]. Academic information systems, personnel information systems, research and community service information systems, publications, intellectual property, and recognition are all applications related to lecturer performance. Several previous studies, including [5], [9], [10], [12], [20] served as the foundation for the development of the IS-LPA program application. The lecturer performance appraisal information system serves not only to report payroll and lecturer careers, but also to enhance the quality of the university learning process [14], [17]. [19]. Information system development will be more effective if it considers the needs of problem-solving users [16], [25]. In light of this, the development of the IS-LPA program application is predicated primarily on the initiation of the current program and the analysis of user requirements.

Due to the significance of managing lecturer performance for universities, a performance evaluation information system is essential. Developmental research continues to be conducted on occasion due to technological advancements and user requirements. Researchers conducted studies to evaluate the performance of information systems functions that highlight: (1) the ranking of IS function performance dimensions and the use of measurements; and (2) the apparent contradiction between the significant emphasis placed on the strategic impact of information systems and the absence of executive involvement [5], [15], [20], [23], [24]. Researchers conducted research on public university performance evaluation management systems [4], [6], [9], on private university performance [2], [10], [12], and universities performance in several countries [5], [17], [21].

In Indonesia, lecturer performance appraisal is very important because it determines the quality of education and university ranking. In addition, lecturer performance evaluation is also the basis for determining salaries and incentives, career promotion, and university rankings. The rapid development and stakeholder demands for lecturer performance reporting combined with the management system's inability to meet these demands, have resulted in ongoing research on the development of lecturer performance information systems.

Sofyani *et al*. [5] examined the lecturer performance evaluation system by comparing three assessment models from Indonesia, Singapore, and Turkey. Rindri and Rollastin [9] also conducted research on the development of an information system for assessing lecturer performance based on the Study Program Assessment Instrument 4.0 in order to identify the most suitable formula for ranking educational quality. Similarly, Rachmanto [12] developed a decision-support system to analyze and evaluate lecturer performance at private universities in Indonesia using the balanced scorecard method. Diovianto *et al*. [10] also conducted research on the development of a web-based information system for lecturers' performance appraisal using the scale rating method for performance reporting, quality of education delivery, and rating of educational institutions in the same year. As a continuation of previous research, it is hoped that this study will generate innovations that provide solutions to lecturer performance issues, particularly at private universities in Indonesia.

3. Research Method

The research was conducted in North Sumatra Province, Indonesia. IS-LPA information system development follows the system development life cycle (SDLC) model, which consists of four main stages: investigation, analysis, design, and implementation [18]. Some of the software used are Laragon, PHPS and Ajak, Sublime Text, MySQLi/ MySQL Improved Extension, Navicat, Laravel Framework, and Corel Draw and Photo Paint.

The following are the steps of the research process:

1) Studying the performance appraisal regulations set by the government as a reference for lecturer performance management,
2) Analyzing the needs of users involving lecturers as the main users, lecturer performance appraisal teams, and administrators,
3) Establishing lecturer performance indicators according to applicable regulations,
4) Designing systems, program algorithms, system workflows and relationships between variables,
5) Building the IS-LPA application with three accesses, namely lecturers, administrators, and assessors,
6) Compiling and testing system performance,
7) Conducting a system feasibility test based on information system feasibility standards,
8) Testing the effectiveness of the system based on user acceptability, including lecturers, administrators, and assessors.

The developed IS-LPA application program was analyzed using the life cycle procedure. Stub Testing is performed to verify the control structure of module performance mapping, along with Unit Testing, Black Box Testing, and White Box Testing to test the functionality of each module, and Integration Testing [18]. Inter-module interaction tests include interface functions, user scenarios, data flows, and flows between processes [4], [25]. The feasibility test uses the design & construction indicators, user needs, reliability, security and ease of use, while the system effectiveness test by the user employs 14 indicators which are components of lecturer performance. The feasibility test uses a scale of 0-10 while the effectiveness is stated in the percentage of achievement of the criteria.

4. Results and Discussion

This research has produced an application for an integrated information system for the management of lecturer's performance. The testing of the application developed includes: (1) program design; (2) program application; (3) program feasibility; and (4) system effectiveness. The detailed description and analysis of the testing are presented in the following section.

4.1. Program Design

Information system of lecturer performance assessment (IS-LPA), is an information system that integrates several existing application programs such as academic information systems, personnel information systems and research and community service information systems as well as publications, intellectual property and recognition. The program flow chart is shown in Figure 1.

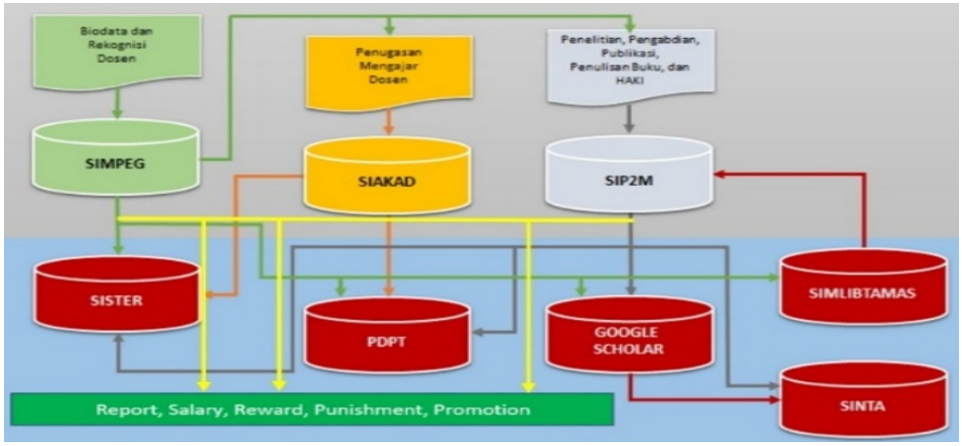

Figure 1. Design of IS-LPA

The IS-LPA is designed to interface with three primary applications: the personnel information system (SIMPEG), the academic information system (SIAKAD), and the research and community service information system (SIMPPM). Data from the three applications is integrated into a single IS-LPA database, processed based on user requirements, and then used to generate output for use in decision-making or reports for external applications such as Sister, PDPT, Google-Scholar, Sinta, and Bima application.

4.2. Program Application

The IS-LPA application is developed using the SDLC model. The investigation system phase succeed in identifying problems, system procedures, alternative solutions, system development classification, technical feasibility, and economic feasibility. System analysis is successful in classifying data, defining system requirements, and designing more effective and efficient, user-friendly, and logical new systems. System design includes conversion procedures for more detailed system services, compiling data structures, displaying information, and system configuration. The implementation phase of a system consists of enhancing the system's design, testing and installing new program applications, and conducting system trials.

The IS-LPA application is designed with three access accounts: administrator, lecturer, and assessor, as well as facility access as required. Input data includes aspects of lecturer biodata, lecturer activities and achievements according to the criteria established by the ministry. Data processing is a system work order in accordance with an algorithm designed to generate lecturer performance-related output in the form of graphs, tables, and recapitulations. The following figures are examples of the display of the IS-LPA application program menu.

Figure 2. The user accounts as lecturers

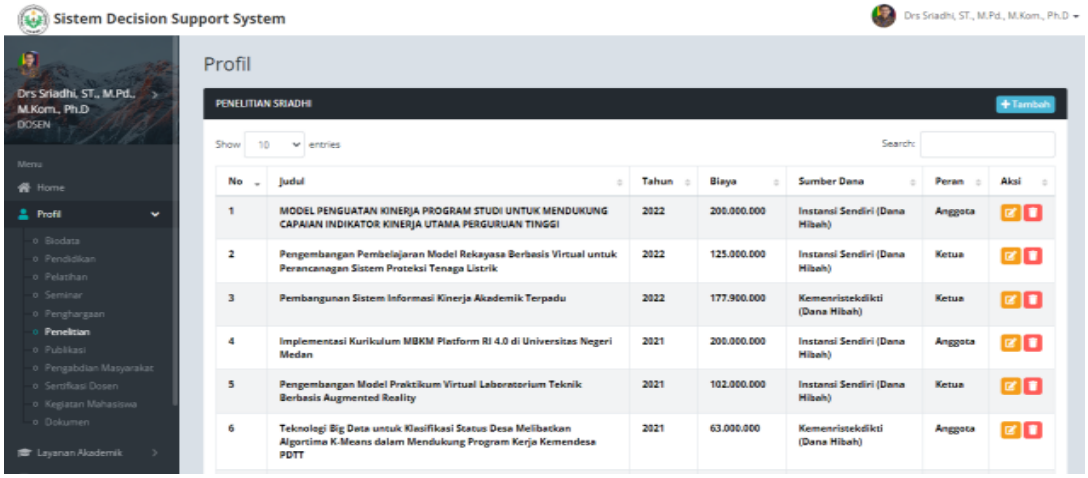

Figure 3. The display of lecturer research data

Figure 2 shows a lecturer account that is authorized to manage static data and dynamic data with access to input, edit, delete, and process. Data management encompasses biodata, education, training, community service, publications, seminars, professional certifications, coaching student activities and supporting documents.

Figure 3 displays the results of research data input by lecturers according to performance indicators. The administrator manages the application system's data, which can be evaluated by assessors to generate lecturer performance reports, salary bases, rewards, lecturer career promotions, and other outputs.

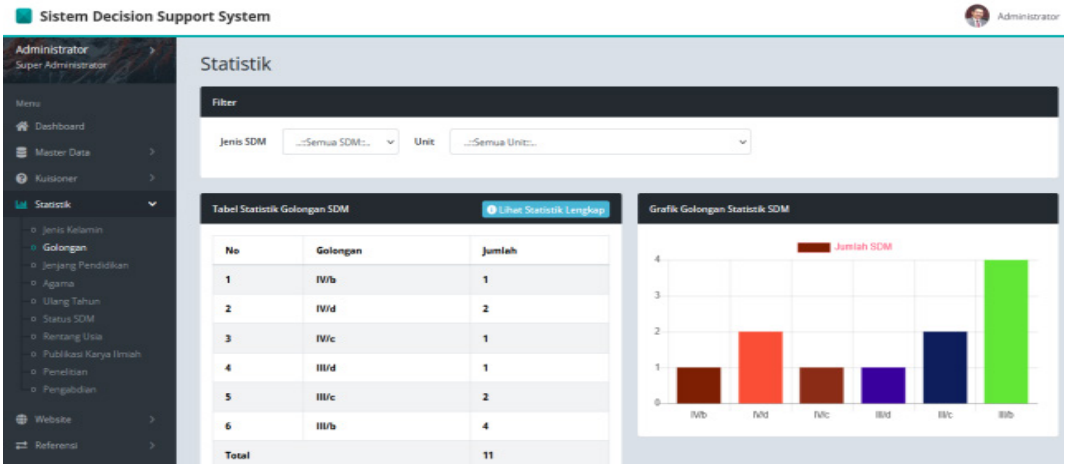

Figure 4. The lecturer position level report

Figure 4 illustrates the distribution of lecturer position levels accessible based on work units, active years, and rank history. For instance, in the field of research, the performance of lecturers in research will be displayed, including the title of the research, the type of research, the year of implementation, the amount of funds, the source of funds, and a research summary as necessary. Likewise for other performance aspects, such as teaching, publication, recognition, and other indicators, which are components of lecturer performance evaluation and the need for external university reports.

4.3. Program Feasibility

The feasibility of an application system is determined if the system displays performance according to standard criteria. The system feasibility test was carried out by two reviewers in each program unit to find out whether the resulting performance was in accordance with the standard criteria. The IS-LPA program performance feasibility test uses a scale of 0–10 with a minimum eligibility standard of 8.00. The results of the application system due diligence are shown in Figure 5.

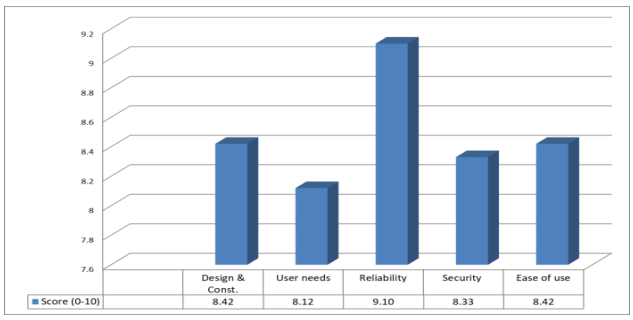

Figure 5. Feasibility of the IS-LPA application

Figure 5 shows that the five aspects required by the user have been fulfilled by obtaining a due diligence result score above 8.0. The reliability aspect gets the highest feasibility score of 9.10. Likewise with aspects of design & construction, ease and use, user needs, and security system. Furthermore, the detailed system feasibility test results are presented in Table 1.

Table 1. Feasibility of performance system

No	Indicators Aspect	Feasibility Scores		Average
		Rev.1	Rev.2	
1	Design & Construction			
	• system layout	8.10	8.40	8.25
	• program facilities	8.70	8.80	8.75
	• navigation	9.30	9.10	9.20
	• hyperlink-relation	8.70	8.90	8.80
	• interface	8.40	8.20	8.30
	• interactivity	8.30	8.00	8.15
	• visualization	7.80	7.60	7.70
	• color resolution	8.40	8.50	8.45
	• operational system	8.30	8.10	8.20
2	User needs			
	• needs representative	8.30	8.00	8.15
	• level of usage	8.60	8.40	8.50
	• help desk system	7.60	7.80	7.70
3	Reliability			
	• stability	9.40	9.20	9.30
	• consistency	9.20	9.40	9.30
	• compatibility	8.60	.80	8.70
4	Security			
	• login system	9.20	9.10	9.15
	• security system	7.40	7.50	7.45
	• multiple layers	8.30	8.50	8.40
5	Ease of use			
	• usability	8.60	8.40	8.50
	• friendly	8.50	8.60	8.55
	• support system	8.10	8.30	8.20
	Total			8.46

The results of the feasibility testing of the IS-LPA application show that the system meets the eligibility criteria; even the navigation, stability, consistency, and login system aspects score at a very high feasibility level. Overall, the performance test results get an average score of 8.46, which is meaningful in the high category.

If declared feasible, the IS-LPA application can then be used to manage lecturer performance, starting with the input of activity data and the process of evaluating and reporting lecturer performance. It is hoped that the use of this application can improve the quality of lecturer performance management, as proven through previous research [5], [6], [9], [12], [14], [19]. The use of information systems will produce output data on the results of assessments with high accuracy and improve management efficiency.

4.4. System Effectiveness

Testing the effectiveness of the system is carried out by three groups of application users, namely administrators, lecturers, and assessors. Each user group assigned three people to test the effectiveness of the system based on lecturer performance assessment indicators. The test uses a 0-100 score scale, namely system performance results compared to set standard performance, with a score notated in percent. The system effectiveness test includes 14 aspects which are the main components of lecturer performance assessment. A summary of the results of testing the effectiveness of the IS-LPA application system is shown in Table 2.

Table 2. The summary of IS-LPA acceptance test

No	Performance of System Aspects	Acceptance (%)			Average (%)
		Adm	User	Assessor	
1	Profile	86.53	81.45	85.16	84.38
2	Education	88.64	86.92	82.46	86.01
3	Training	90.12	92.54	86.58	89.75
4	Seminar	92.46	85.82	85.25	87.84
5	Community service	92.68	87.46	84.86	88.33
6	Journal publication	86.42	83.72	85.62	85.25
7	Proceeding	84.53	82.84	84.94	84.10
8	Book	84.25	81.58	79.43	81.75
9	Module	83.65	84.05	80.42	82.71
10	IPR	82.65	82.16	79.85	81.55
11	Skill certification	96.26	88.41	81.45	88.71
12	Student Guidance	91.62	86.75	84.58	87.65
13	Recognition	85.38	82.45	82.59	83.47
14	Performance Status	83.74	83.48	80.25	82.49
	Total Average	87.78	84.97	83.10	85.29

Table 2 shows that of the 14 performance component indicators, all of them can meet the established effectiveness criteria (≥80%). System effectiveness can meet user needs in the range of 81.55% – 89.75%, above the eligibility standard. Even the indicators for training, seminars, community service, skill certification and student guidance have achieved more than 87%, while for all 14 indicators of system effectiveness it has achieved 85.29%.

Administrator, lecturer, and assessor user groups have met the effective standard for user needs fulfillment; however, the system effectiveness scores of the three user groups are not identical. The administrator group received a score of 87.78% for system effectiveness, the lecturer group received a score of 84.97%, and the assessor group received a score of 83.10%. Using the ANOVA test, it must be established that there is a significant difference in the mean score of system effectiveness. Following the data normality test and the test for variance homogeneity, which yielded a significant P-value of 0.935, the one-way ANOVA can be used to conduct a comparison test. Table 3 displays the outcomes of the comparative test.

Table 3. ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	49.764	2	24.882	2.55	.091
Within Groups	380.118	39	9.747		
Total	429.882	41			

According to Table 3, F = 2.553 with a significance level of 0.91 indicates that there is no significant difference in the level of effectiveness of the IS-LPA among administrators, lecturers, and evaluators. Thus, it can be concluded that IS-LPA has been demonstrated to be equally effective for administrators, lecturers, and assessors, with no different levels of effectiveness. With this integrated information system,

It is hoped that it can improve the quality of lecturer performance management, which will contribute to improving university quality and grading. The IS-LPA application will help the lecturer performance appraisal process become more accurate, effective, and efficient with outputs that can be used as a basis for decision-making for payroll, rewards, career promotion, and even punishment. This is in line with previous research conducted [3], [8], [13], [22]. Even now, the Indonesian government is implementing IAPS as an instrument for assessing the accreditation of study programs and institutions that require accuracy, thoroughness, and speed in data processing [9].

As a result, the IS-LPA is well suited for use in the management and performance evaluation of lecturers in order to solve current problems as well as respond to emerging challenges.

This research produced a lecturer performance assessment model based on an integrated information system with databases of several applications related to external applications such as the Sinta, Google-Scholar, Sister, Bima, and other similar applications.

Thus, the management of lecturer performance, starting from teaching activities, research, community service, publication, recognition, assessment, and reporting, can be processed in this application, which has an impact on improving the quality of service in managing lecturer performance.

5. Conclusion

Improving university performance necessitates the implementation of management information systems. The constructed IS-LPA information system has been evaluated, demonstrating its usability. Likewise, the effectiveness test demonstrates that both administrator groups and lecturer and assessor groups use this information system effectively to manage lecturer performance.

The IS-LPA application brings novelty by integrating existing application systems within the university environment. Additionally, the IS-LPA application model can also interact with external application systems such as Google-Scholar and applications from the Indonesian Ministry of Education, namely Sister, Bima, Simpeg, and others. The management of lecturer's performance including teaching and learning, research, community service, publications, recognition, assessment and reporting processed in one integrated system using IS-LPA enhances the effectiveness and efficiency on the management of lecturer's performance.

The IS-LPA application has limitations because it was developed only based on the characteristics of lecturers in North Sumatra Province, Indonesia as a pilot project. However, it can be further developed more broadly and uniquely according to specific needs based on the characteristics of university lecturers in all provinces in Indonesia.

References:

[1]. Pddikti. (2024). *Pangkalan data pendidikan tinggi kementrian pendidikan dan kebudayaan (Higher education database, ministry of education and culture), Indonesia*. Pddikti. Retrieved from: https://pddikti.kemdikbud.go.id/. [accessed: 01 February 2024].

[2]. Sanusi, H. (2013). Lecturers' performance and technology at private higher education in South Sulawesi, Indonesia. *Procedia - Social and Behavioral Sciences, 83*, 580-584, ISSN 1877-0428. Doi: 10.1016/j.sbspro.2013.06.110.

[3]. Sukirno, S. (2020). Dataset of lecturer performance appraisal, *Data in Brief*, *32*, 106161.

[4]. Retnowati, T. H., Mardapi, D., Kartowagiran, B., & Hamdi, S. (2021). A model of lecturer performance evaluation: Sustainable lecturer performance mapping. *International Journal of Instruction, 14*(2), 83-102. Doi: 10.29333/iji.2021.1426a.

[5]. Sofyani, H., Nazaruddin, I., Puti, C.M., Fatmaningrum, E.S. (2019). Exploring performance measurement system for lecturer (PMSL): Comparison among three models in Indonesia, Singapore and Turkey. *Jurnal Reviu Akuntansi dan Keuangan, 9*(3), 269-294. Doi:10.22219/jrak.v9i2.61.

[6]. Nuru, S., István, H. (2023). Performance management system and its role for employee performance: Evidence from Ethiopian SMEs. *Heliyon, 9*(11). Doi: 10.1016/j.heliyon.2023.e21819.

[7]. Shaojun, Q., Nan Jia., Xueming, L., Chengcheng, L., & Ziyao, H. (2023) Perceived fairness of human managers compared with artificial intelligence in employee performance evaluation. *Journal of Management Information Systems, 40*(4), 1039-1070, Doi: 10.1080/07421222.2023.2267316

[8]. Mishra, L., Kendhe, R. & Bhalerao, J. (2015). Review on management information systems (MIS) and its role in decision making. *International Journal of Scientific and Research Publications, 5*(10), 1–5.

[9]. Rindri, Y.A., and Rollastin, B. (2021). Lecturer performance information systems based on IAPS 4.0, *Manutech: Jurnal Teknologi Manufaktur, 13*(2), 81-89.

[10]. Diovianto, P., Rakhmadani and Adhinata, F.D. (2021). A Web-based information system for lecturer's performance appraisal using rating scale methods. *Jurnal Riset Informatika, 3*(2).

[11]. Mahmoud, M. M. H., & Othman, R. (2023). Performance management system in developing countries: A case study in Jordan. *Journal of Public Affairs*, *23*(4), e2864.

[12]. Rachmanto, A. (2021). Decision support system analysis performance evaluation lecturer using balanced scorecard method in a private university. *International Conference on Business, Economic, Social Sciences and Humanities (ICOBEST 2018), Advances in Social Science, Education and Humanities Research,*, *225*, 108-113.

[13]. Emmanuel, A., Esmond, N. K., Aramata, A. (2024). Performance management and contextual performance in technical universities. *Social Sciences & Humanities Open, 9*, 100788. Doi: 10.1016/j.ssaho.2023.100788

[14]. Monica, M., & Priyaadharshini, M. (2022). Recommender system for low achievers in higher education. *International Journal of Information and Education Technology 12*(12), 1390-1398.

[15]. Kang, D., & Park, M. J. (2024). Performance management and policy evaluation of information and communication technology graduate program for developing countries. *Evaluation and Program Planning*, *103*, 102401. Doi: 10.1016/j.evalprogplan.2024.102401.

[16]. Tarik, A. R., Hawraz, A. A. (2016). Lecturer performance system using neural network with particle swarm optimization. *Computer Applications in Engineering Education, 24*(4), 629-638. Doi:10.1002/cae.21737

[17]. Xi Yang., Wipada, P. (2024). Research on the modernization of private higher education management systems in China. *Migration Letters, 21*, 460-474.

[18]. Laudon, K. C., & Laudon, J. P. (2020). *Management Information Systems: Managing the Digital Firm (16th ed).* Person.

[19]. Barrachina-Palanca, M., Gonzalez-Sanchez, M. B., & Gutiérrez-López, C. (2023). Effects of performance management systems–strategy alignment on lecturers' engagement with knowledge transfer: A perspective from Spain. *Higher Education Quarterly, 77,* 874–889. Doi:10.1111/hequ.12437

[20]. Andy, N., Tuure, T., Lesley, G., & Don, S. (2021). Design principles for learning analytics information systems in higher education, *European Journal of Information Systems, 30*(5), 541-568, Doi:10.1080/0960085X.2020.1816144

[21]. Oladejo, S. Y. (2022). Appraisal of teaching and supervision load of academic staff in selected universities in Nigeria. *European Review of Applied Sociology, 15*(25), 1-12. Doi:10.2478/eras-2022-0006

[22]. Carlos, D., Daniel, P.M., Miguel-Ángel, G. M., & Carlos, L. A. (2017). Information systems strategy and its relationship with innovation differentiation and organizational performance. *Information Systems Management, 34*(3), 250-264. Doi: 10.1080/10580530.2017.1330002

[23]. Coenen, T., Coertjens, L., Vlerick, P., Lesterhuis, M., Mortier, A. V., Donche, V., ... & De Maeyer, S. (2018). An information system design theory for the comparative judgement of competences. *European Journal of Information Systems*, *27*(2), 248-261.

[24]. Olga, G. K., Yuliya, R., Rudneva., & Elvira, A. K. (2022). Reputation capital of a university lecturer: Identification and assessment. In Bogoviz, A.V., Popkova, E.G. (eds), *Digital technologies and institutions for sustainable development*. Springer, Cham. Doi:10.1007/978-3-031-04289-8_12

[25]. Meneses, B., Varajão, J. (2022). A framework of information systems, development concepts. *Business Systems Research, 13*(1), 84-103. Doi:10.2478/bsrj-2022-0006