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Learning Management System, Employee Engagement, and Employee Performance: A Mediation Analysis in Pharmaceutical Retail

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Abstract

Background: Digital transformation encourages healthcare organizations to adopt Learning Management Systems (LMS) for flexible and measurable employee development. However, prior studies report inconsistent direct and mediated effects of LMS on performance, particularly in pharmaceutical retail.
Objective: This study examines the effects of LMS implementation on employee engagement and performance at ApotekKU Bali, including the mediating role of employee engagement.
Methods: A quantitative design and purposive sampling with a saturated (census) approach were applied. Of 413 questionnaire respondents, 409 met the analysis criteria. Data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS).
Results: LMS implementation positively affected employee engagement ($\beta = 0.714$; $p < 0.05$), while employee engagement positively affected performance ($\beta = 0.718$; $p < 0.05$). LMS had no significant direct effect on performance ($\beta = 0.090$; $p > 0.05$). Employee engagement fully mediated this relationship (indirect effect = 0.512; $p < 0.05$; VAF = 85.1%). The model explained 51.0% of employee engagement variance and 61.6% of performance variance.
Conclusion: LMS improves performance through employee engagement rather than directly. Organizations should combine technological implementation with strategies that strengthen employees' psychological engagement in digital learning.

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INTRODUCTION

Digital transformation has become a global phenomenon that changes various aspects of organizational life, including in human resource management (Gadzali et al., 2023; Vardarlier, 2020; Zhang & Chen, 2024). The rapid development of information technology encourages organizations to adopt a digital learning system to improve the competence of the workforce in an ongoing manner (Giannakos et al., 2022; Langer, 2017; Nasih & Mansur, 2024). In the health sector, these changes are taking place faster due to the demand to improve service quality, the development of health science, and the need to adapt to new technologies (Al-Assaf et al., 2024; NASEM, 2018). Healthcare organizations today are required to be able to ensure that every professional has competencies that are always updated according to regulatory developments, technology, and patient needs (Asamoah, 2025; Konttila et al., 2019). Therefore, continuous learning is one of the main strategies in maintaining the quality of health services. Learning Management System (LMS) emerged as a solution that allows the learning process to be carried out in a flexible, structured, and scalable manner so that it is increasingly applied by health organizations in various countries (Kamath et al., 2025).

The increasing need for LMS implementation is influenced by a variety of factors. First, the development of digital technology that allows organizations to conduct training online without geographical restrictions. Second, the need for cost efficiency and training time compared to conventional face-to-face methods. Third, the high demands on the competence of health workers must always be updated in line with the development of science and regulations. Fourth, the characteristics of the modern workforce generation who are more familiar with digital technology and want flexible access to learning. In addition, increasingly fierce industry competition requires organizations to have an adaptive, competent, and capable workforce that can provide high-quality services. From the perspective of human resource management, competency development through digital learning technology is seen as a strategic investment that can increase the competitive advantage of the organization (Becker, 1989; Sun et al., 2008).

These various factors have a significant impact on the organization. The implementation of digital learning can increase the accessibility of training, accelerate the knowledge transfer process, and support the equitable distribution of employee competencies in various work locations (Valk & Planojevic 2021). Previous research has shown that LMS can improve learning effectiveness, competency quality, and workforce productivity. However, various studies also reveal that the success of an LMS is not only determined by the quality of the technology used, but also by the human factors involved in the learning process. Organizations often face conditions where learning systems are well available, but not all employees show optimal levels of participation, engagement, or performance. This condition shows that the existence of learning technology does not automatically result in improved performance without psychological processes that encourage individuals to make maximum use of the system (Schaufeli, 2021).

In the context of this study, there are three main variables that are the focus of the study, namely Learning Management System, Employee Engagement, and Employee Performance. Learning Management System is a technology-based system used to manage, deliver, monitor, and evaluate the learning process digitally. An LMS allows organizations to provide training materials that can be accessed anytime and anywhere by employees. Meanwhile, Employee Engagement is a positive psychological condition characterized by vigor, dedication, and absorption that reflects the individual's level of energy, commitment, and involvement in his or her work. Employee Performance describes the ability of employees to carry out job duties and responsibilities effectively according to the organization's targets (Hasmawati, 2024). These three variables have a close relationship because digital learning is expected to be able to increase employee engagement, which ultimately contributes to improving individual and organizational performance.

This research has a novelty that distinguishes it from previous research. Most previous studies have focused on the direct influence of LMS on improving employee competency or performance, as well as placing employee engagement as a dependent variable. Research on the role of employee engagement as a mediating variable that explains the mechanism of the relationship between LMS implementation and employee performance is still relatively limited, especially in the pharmaceutical retail sector. In addition, most previous research was conducted in the context of educational institutions or hospitals, while studies on retail pharmacy organizations that have the characteristics of fast, dynamic, and service-oriented operations to customers are still rare. Thus, this study offers a new perspective on how employee engagement functions as a psychological mechanism that bridges the influence of LMS on employee performance improvement in the context of the retail pharmaceutical industry.

The urgency of this research is getting stronger as organizations increase their need to ensure that learning technology investments have a real impact on human resource performance. ApotekKU Bali as one of the growing pharmacy networks has implemented LMS comprehensively as part of its human resource digital transformation strategy. However, internal data shows that training completion rates still vary and performance improvements have not occurred evenly across employees. On the other hand, employee engagement rates show a relatively good and increasing trend. This condition indicates that employee engagement is an important factor that explains the relationship between LMS implementation and employee performance. If the relationship can be understood empirically, organizations will gain a stronger basis in designing technology-based human resource development strategies that are not only oriented to the technical aspects of the system, but also to the psychological aspects of employees (ApotekKU).

Based on this phenomenon, this study aims to analyze the influence of the implementation of the Learning Management System on employee engagement, analyze the influence of employee engagement on employee performance, test the direct influence of the Learning Management System on employee performance, and analyze the role of employee engagement as a mediating variable in the relationship between the Learning Management System and employee performance in employees of ApotekKU Bali. With the achievement of these goals, the research is expected to be able to provide a more comprehensive understanding of the mechanisms underlying the successful implementation of digital learning in improving employee performance.

METHOD

This study was designed to gain an empirical understanding of the relationship between the implementation of the Learning Management System (LMS), employee engagement, and employee performance among employees of ApotekKU Bali. The main focus of the research was to explain how the implementation of digital learning systems affected employee engagement at work and its impact on individual performance. Therefore, this study used a quantitative approach that allowed the relationships between variables to be measured objectively through numerical data obtained from respondents. This approach was chosen because it provided a measurable picture of the strength of the relationships between variables and enabled the testing of a conceptual model based on the Information System Success Model (ISSM) and Job Demands-Resources Theory (JD-R Theory) (Hair Jr et al., 2021; Saunders et al., 2009).

The research was conducted using an explanatory research approach that aimed to explain the causal relationships between independent, mediating, and dependent variables. In this study, the Learning Management System was positioned as the independent variable, employee engagement as the mediating variable, and employee performance as the dependent variable. This approach was used to explain not only whether relationships existed, but also how those relationships were formed through employee engagement as a psychological factor that linked the implementation of learning technologies with improved performance (Bakker & Demerouti, 2017).

The research was conducted at ApotekKU Bali, one of the modern pharmacy networks that had implemented an integrated Learning Management System across all its operational branches. The research location was selected purposively because ApotekKU was undergoing digital transformation in human resource management through the implementation of an LMS as the primary learning medium for employees. This condition made ApotekKU a relevant research setting for examining the relationship between digital learning, employee engagement, and employee performance in the context of the retail pharmaceutical industry (ApotekKU, 2025).

The research data were collected during the LMS implementation period, which lasted from 2025 to early 2026. This period was selected because all branches had actively used the LMS, ensuring that respondents had sufficient experience in utilizing digital learning systems. In addition, during this period, the organization had employee engagement and employee performance data that could be used to understand the research phenomenon more comprehensively (ApotekKU, 2025).

The research population consisted of all active employees of ApotekKU Bali who had used the Learning Management System for learning activities and competency development. The population was selected because all employees had equal opportunities to access the LMS and participate in various training programs organized by the company. Thus, all members of the population were considered to have relevant experience to provide information regarding LMS implementation, employee engagement, and performance within the organizational environment (Hair et al., 2019).

The sampling technique used a census (saturated sampling) approach, meaning that all members of the population who met the inclusion criteria were included as respondents. This differed from purposive sampling, which selected specific individuals based on the researcher's judgment; in this study, the entire eligible population was surveyed. This approach was used because the researcher sought to obtain a comprehensive picture of the phenomenon among all employees who met the research criteria. A total of 413 responses were collected, and after the data screening process, 409 respondents were deemed suitable for further analysis. This number was considered adequate to meet the requirements of the Structural Equation Modeling-Partial

Least Squares (SEM-PLS) analysis, which requires a sufficient sample size to produce stable and reliable parameter estimates (Hair et al., 2019).

This research involved three main constructs that were interrelated within the research model. The first variable was the Learning Management System (LMS), which described employees' perceptions of the quality of the digital learning system used by the company. This construct included aspects such as system ease of use, information quality, service quality, suitability of learning materials, and perceived user benefits. The concept was developed based on the Information System Success Model, which placed system quality as an important factor in generating organizational benefits.

The second variable was employee engagement, which described the level of employees' psychological involvement at work. Employee engagement was measured through the dimensions of vigor, dedication, and absorption, which reflected work energy, commitment, and concentration in carrying out tasks. This construct was selected because previous studies showed that engagement was an important factor in explaining the relationship between organizational resources and various positive outcomes, including improved performance (Bakker & Demerouti, 2017).

The third variable was employee performance, which represented employees' ability to complete tasks effectively in accordance with organizational targets. Performance was measured based on work quality, quantity of work, timeliness of task completion, and the ability to meet operational standards established by the company. This variable was selected because it represented an important indicator of the organization's success in optimizing human resource investment through the use of digital learning technology (Sutanto, 2017).

The questionnaire items were adapted from validated scales used in previous research. LMS quality items were adapted from the DeLone and McLean Information System Success Model; employee engagement items were adapted from the Utrecht Work Engagement Scale (UWES) developed by (Schaufeli, 2021); and employee performance items were adapted from the Individual Work Performance Questionnaire (IWPQ) and the organizational KPI frameworks used at ApotekKU.

The questionnaire was distributed electronically via Google Forms through the company's internal communication platform in February 2026. All 413 distributed questionnaires were returned, and 409 were retained after four unengaged responses (uniform or inconsistent answer patterns) were excluded.

All respondents provided informed consent prior to participation. The consent form explained the research purpose, the voluntary nature of participation, the right to withdraw without consequence, and the confidentiality of individual responses. The data were anonymized and stored in encrypted files accessible only to the research team.

The research data were obtained through the distribution of a structured questionnaire to all respondents who met the research criteria. The questionnaire was used as the main research instrument because it enabled the efficient collection of large amounts of data and systematic measurement of respondents' perceptions of the research variables. All questionnaire items were compiled based on indicators developed in previous research and adapted to the context of LMS implementation at ApotekKU Bali.

The research instrument used a five-point Likert scale consisting of the categories strongly disagree, disagree, neutral, agree, and strongly agree. The scale was used to capture the level of respondents' agreement with each statement related to the Learning Management System, employee engagement, and employee performance. Before being used in the main study, the instrument was evaluated to ensure the validity and reliability of the indicators used to measure each research construct.

The collected data were analyzed using the Structural Equation Modeling-Partial Least Squares (SEM-PLS) approach. This technique was selected because it enabled the simultaneous analysis of complex relationships between latent variables, including direct and indirect relationships through mediating variables. In addition, SEM-PLS was considered suitable for research aimed at developing theories, testing predictive models, and evaluating relationships between constructs with multiple measurement indicators (Hair et al., 2019).

SEM-PLS was selected over covariance-based SEM (CB-SEM) for three specific reasons. First, although the sample size of 409 respondents was adequate for CB-SEM, the research model

was prediction-oriented and theory-building rather than theory-confirming, which aligned with the strengths of PLS-SEM (Hair et al., 2019). Second, PLS-SEM was more robust for examining complex mediation models involving formative and reflective indicators simultaneously. Third, PLS-SEM provided a prediction-oriented assessment, which was essential for evaluating whether LMS implementation predicted employee engagement and performance outcomes in organizational practice.

The analysis began with an evaluation of the measurement model (outer model) to ensure the validity and reliability of all research indicators. The evaluation was conducted through convergent validity, discriminant validity, Average Variance Extracted (AVE), Composite Reliability, and Cronbach's Alpha tests. After the measurement model met the established criteria, the analysis continued with an evaluation of the structural model (inner model), which aimed to test the strength of the relationships between the research variables using path coefficients, R-square, effect size (f-square), and significance testing through the bootstrapping technique.

Mediation testing was conducted to determine whether employee engagement acted as a mechanism that bridged the relationship between LMS implementation and employee performance. This analysis was an important part of the research because it aimed to explain how the benefits of digital learning technology could be translated into improved performance through employees' psychological engagement. Thus, the analysis provided not only information about the relationships between variables but also an explanation of the process underlying those relationships in the context of pharmaceutical retail organizations undergoing digital transformation in human resource management.

RESULTS AND DISCUSSION

Measurement Model Assessment - Supplementary Validity Indicators: To ensure comprehensive construct validity, the following additional measurement model results are reported. Outer Loading: Indicator outer loadings met the criteria recommended by Hair et al. (2019), with values ranging from 0.662 to 0.894; the single indicator below 0.70 (LMS2 = 0.662) was retained because the construct's AVE and composite reliability exceeded the recommended thresholds, confirming that each indicator adequately represents its latent variable. Average Variance Extracted (AVE): LMS Implementation AVE = 0.679; Employee Engagement AVE = 0.672; Employee Performance AVE = 0.644. All values exceed the 0.50 threshold, confirming that each construct explains more than 50% of the variance in its indicators. Discriminant Validity (HTMT): All Heterotrait-Monotrait Ratio values were below the 0.90 threshold (LMS-EE: 0.775; LMS-EP: 0.659; EE-EP: 0.870), confirming adequate discriminant validity between all construct pairs. Cross-Loading Analysis: Each indicator loaded highest on its intended construct, with cross-loadings on other constructs at least 0.10 lower, satisfying the Fornell-Larcker criterion and cross-loading requirements.

Results

Research Study Profile

This study was conducted to analyze the influence of Learning Management System (LMS) on Employee Engagement and Employee Performance and examine the mediating role of Employee Engagement in the relationship between Learning Management System and Employee Performance. The research was carried out on ApotekKU employees using a survey-based quantitative approach and analyzed using the Structural Equation Modeling–Partial Least Squares (SEM-PLS) method. The number of respondents who successfully met the research criteria was 409 employees who actively used the Learning Management System in learning activities and competency development in the organizational environment.

The selection of ApotekKU as the research location is based on the implementation of a digital learning system that has been implemented in an integrated manner to support human resource development. In the context of modern organizations, the Learning Management System is one of the important instruments in improving employee competence through the provision of learning materials, online training, learning evaluation, and continuous monitoring of competency development. The implementation of the system is expected to not only improve employee knowledge and skills, but also encourage employee engagement with the organization which ultimately impacts performance improvement.

This study uses three main variables consisting of Learning Management System as an independent variable, Employee Engagement as a mediating variable, and Employee Performance as a dependent variable. The relationship between variables was tested through a structural model to obtain an empirical picture of the mechanism of influence of LMS on employee performance improvement through employee engagement.

Overview of Research Variables

Learning Management System (LMS)

The Learning Management System is a digital learning system used by organizations to manage the training process, distribute learning materials, evaluate competencies, and monitor employee learning progress. In this study, LMS is positioned as an organizational resource that can provide easy access to learning, flexibility of learning time, training efficiency, and opportunities for sustainable competency development.

The measurement results show that all indicators in the Learning Management System construct meet the criteria of validity and reliability. The Average Variance Extracted (AVE) value for the Learning Management System construct is above the minimum threshold of 0.50, indicating that the indicator can adequately explain the latent variable. In addition, Cronbach's Alpha value of 0.931 and Composite Reliability of 0.944 indicate an excellent level of reliability.

The findings show that respondents have a relatively consistent perception of the implementation of LMS implemented by organizations. The digital learning system can provide learning facilities that support work needs and employee competency development.

Employee Engagement

Employee Engagement describes the level of involvement, commitment, dedication, and enthusiasm of employees in carrying out their work. Employees who have high engagement generally show greater motivation in work and have a desire to make the best contribution to the organization.

The results of the reliability test showed that the Employee Engagement variable had a Cronbach's Alpha value of 0.902 and a Composite Reliability of 0.925. This value indicates that all indicators in the Employee Engagement construct have good internal consistency in measuring employee engagement. These findings show that employee engagement levels in organizations are relatively good, allowing for a strong relationship between digital learning and performance improvement.

Employee Performance

Employee Performance is the result of work achieved by employees both in terms of quality, quantity, effectiveness, and achievement of work targets. This variable is used to measure the success of the organization in optimizing human resources through the implementation of the Learning Management System and increasing Employee Engagement.

The results of the reliability test showed that Employee Performance had a Cronbach's Alpha value of 0.889 and a Composite Reliability of 0.916 which indicates that all indicators have a high level of reliability. This condition shows that the research instrument can measure employee performance consistently and can be used to explain the relationship between variables in the research model.

Evaluation Results of Measurement Model (Outer Model)

Before testing the hypothesis, an evaluation of the measurement model is first carried out to ensure that all research indicators meet the requirements for validity and reliability.

Table 1

Construct Reliability Test Results

Variable	Cronbach's Alpha	Composite Reliability	Remarks
Learning Management System	0,931	0,944	Reliable
Employee Engagement	0,902	0,925	Reliable
Employee Performance	0,889	0,916	Reliable

Source: Data Processing Results, 2026

Based on Table 1, all variables have Cronbach's Alpha and Composite Reliability values above 0.70. Therefore, all constructs are reliable and suitable for the next stage of analysis. The high reliability values indicate that the indicators consistently measure the same construct.

In addition to reliability, the results of the convergent validity evaluation showed that the entire construct had an AVE value above 0.50. This condition indicates that the research indicators can explain latent variables that are well measured so that they meet the requirements for convergent validity.

Results of Structural Model Evaluation (Inner Model)

After the measurement model is declared valid and reliable, the next stage is to evaluate the structural model to determine the model's ability to explain the relationship between research variables. Evaluation was carried out through testing R-Square, Effect Size (f-square), Path Coefficient, and Bootstrapping values.

R-Square Value

The R-Square value is used to measure the ability of independent variables to explain the variation of dependent variables.

Table 2

R-Square Test Results

Variable	R-Square	Adjusted R-Square	Categories
Employee Engagement	0,510	0,509	Moderate
Employee Performance	0,616	0,614	Moderate

Source: Data Processing Results, 2026

An R-Square value of 0.510 indicates that the Learning Management System can explain 51.0% of the variation in Employee Engagement. Meanwhile, the R-Square Employee Performance value of 0.616 showed that the Learning Management System and Employee Engagement together were able to explain 61.6% of the variation in Employee Performance, while the remaining 38.4% was influenced by other factors outside the research model. These findings indicate that the research model has a fairly good predictive ability in explaining the phenomenon being studied.

Effect Size (f-square)

The f-square test was performed to determine the contribution of each exogenous variable to the endogenous variable.

Table 3

Effect Size Test Results (f-square)

Variable Relationships	F-Square	Interpretation
LMS → Employee Engagement	1,041	Large
Employee Engagement → Employee Performance	0,657	Large
LMS → Employee Performance	0,010	Very small

Source: Data Processing Results, 2026

Based on these results, the influence of LMS on Employee Engagement is relatively large with an f-square value of 1.041. The effect of Employee Engagement on Employee Performance is also large with a value of 0.657. In contrast, the direct influence of the LMS on Employee Performance is very small, at only 0.010.

Path Coefficient

Path coefficient analysis was used to determine the direction and strength of the relationship between variables in the research model.

Table 4
Path Coefficient Results

Variable Relationships	Path Coefficients	Directions	Strength
LMS → Employee Engagement	0,714	Positive	Strong
Employee Engagement → Employee Performance	0,718	Positive	Strong
LMS → Employee Performance	0,090	Positive	Very weak

Source: Data Processing Results, 2026

These results show that the strongest relationship in the research model is found in the Employee Engagement to Employee Performance pathway with a coefficient of 0.718. Meanwhile, the relationship between LMS and Employee Engagement also showed a strong influence with a coefficient of 0.714. In contrast, the LMS's direct relationship to Employee Performance has a very low coefficient of 0.090.

Hypothesis Testing

H1: The Influence of Learning Management System on Employee Engagement

The test results showed that the Learning Management System (LMS) had a positive and significant effect on Employee Engagement with a path coefficient value of 0.714 and a p-value of 0.000. These findings indicate that the better the implementation of the LMS in the organization, the higher the level of employee engagement in the work and organization. The LMS allows employees to gain flexible access to learning, improve competencies, and provide a more independent and sustainable learning experience. These results are in line with research that states that an effective digital learning system can increase learning motivation, sense of belonging to the organization, and employees' emotional attachment to the work carried out. The findings of this study also support the perspective of Job Demands-Resources Theory which explains that organizational resources, including learning technology, can increase positive psychological conditions in the form of employee engagement.

H2: The Effect of Employee Engagement on Employee Performance

The results of the analysis showed that Employee Engagement had a positive and significant effect on Employee Performance with a path coefficient value of 0.718 and a p-value of 0.000. These findings show that employees who have a high level of involvement tend to show greater work morale, dedication, and commitment in completing tasks so that they can produce more optimal performance. Engaged employees generally have stronger intrinsic motivation so that they can work beyond the targets set by the organization. The results of this study are in line with research conducted by Saks (2022) which found that employee engagement is one of the main predictors of improving individual performance because it can increase productivity, work quality, and employee loyalty to the organization.

H3: The Effect of Learning Management System on Employee Performance

The test results showed that the Learning Management System did not have a significant direct effect on Employee Performance with a path coefficient value of 0.090, t-statistic of 1.526, and p-value of 0.127. These results indicate that the existence of an LMS is not automatically able to improve employee performance if it is not accompanied by active employee involvement in the learning process. These findings show that learning technology only functions as a facilitator, while performance improvement is strongly influenced by behavioral and psychological factors of users. These results are consistent with research that states that the implementation of learning technology does not necessarily result in improved performance if it is not able to create optimal user participation and engagement.

H4: The Role of Employee Engagement Mediation

The results of the indirect effect test showed a coefficient value of 0.512 with a t-statistic of 11.450 and a p-value of 0.000. The Variance Accounted For (VAF) value of 85.1% confirms that Employee Engagement plays a role as a full mediator in the relationship between the Learning Management System and Employee Performance. These findings show that LMS improves employee performance not directly, but rather through increased employee engagement first. In

other words, the success of an LMS implementation depends heavily on its ability to create learning experiences that can increase engagement. These findings support the Job Demands-Resources Theory which explains that organizational resources affect work outcomes through a motivational process in the form of work engagement. The results of this study are also in line with the research of Bakker & Demerouti (2017) who stated that engagement is the main mechanism that bridges the relationship between various organizational resources and improving employee performance.

Discussion

The Influence of Learning Management Systems on Employee Engagement

This research was carried out to answer the main problems faced by ApotekKU Bali in optimizing the use of the Learning Management System (LMS) as a means of developing employee competencies. Although organizations have invested in digital learning systems, employee performance improvements don't always happen automatically. This raises fundamental questions about how the LMS mechanism can produce a real impact on human resources. The results of the study showed that the Learning Management System had a positive and significant effect on Employee Engagement with a path coefficient of 0.714 and a p-value of 0.000. These findings show that the better the quality of the LMS implementation, the higher the level of employee engagement in the organization.

The findings indicate that LMS not only serves as a medium for delivering training materials, but also as an organizational resource that is able to increase employee intrinsic motivation. The availability of easily accessible learning materials, the flexibility of learning time, and the opportunity to improve competence independently provide a positive experience for employees. When employees feel that the organization provides adequate means of self-development, there is a perception that the organization pays attention to their career progression. The perception then develops into a stronger emotional attachment to work and organization.

In the perspective of Job Demands-Resources Theory, LMS can be categorized as a job resource that functions to help individuals achieve work goals while developing personal capacity. Adequate job resources will result in a motivational process that encourages engagement. Therefore, the findings of this study strengthen the argument that the success of digital transformation of human resources does not only depend on technological aspects, but also on the ability of technology to create a positive work experience for employees. These findings are in line with the research of Bakker & Demerouti (2017) who explain that adequate organizational resources will increase vigor, dedication, and absorption as the main components of employee engagement.

When compared to the conditions before the implementation of LMS, organizations often face limitations in the implementation of conventional training such as time constraints, costs, and difficulty reaching all employees at the same time. The LMS can overcome these barriers through a flexible and standardized learning system. Thus, the cause of increased engagement is not solely due to technology, but because this technology has succeeded in meeting the needs of competency development that have been the needs of employees.

The results of this study also reinforce the findings of previous research that states that digital learning systems have contributed to increasing employee engagement. However, the novelty of this research lies in the context of the retail pharmaceutical industry, which was previously rarely studied. Most of the previous research was conducted on educational institutions or knowledge-based organizations, while this study proves that LMS is also effective in increasing engagement in the pharmacy operational environment which has the characteristics of fast, dynamic, and customer service-oriented work. Thus, this study expands the scope of the application of engagement theory in the context of the health and pharmaceutical industries.

The Effect of Employee Engagement on Employee Performance

The second urgency that this study wants to answer is why some employees can show high performance despite being in the same work environment. The results of the study showed that Employee Engagement had a positive and significant effect on Employee Performance with a path coefficient of 0.718 and a p-value of 0.000. These findings suggest that employee engagement

is a key factor driving improvements in individual performance in organizations.

Employees who have high engagement tend to show greater work morale, have a commitment to organizational goals, and are more focused on completing their work. They not only work to fulfill formal obligations, but also have the desire to make the best contribution to the organization. This condition is reflected in the improvement of service quality, work productivity, accuracy of task completion, and the ability to meet organizational targets.

From the perspective of organizational psychology, engagement is a form of positive energy that connects individuals to their work. When a person feels that their work is meaningful and receives support from the organization, the individual will be more motivated to perform at their best. In contrast, employees who have low engagement tend to work minimally, lack initiative, and have no emotional attachment to the organization.

The findings of this study are important because they explain that performance improvement cannot be achieved through technical competency development alone. Organizations must also pay attention to the psychological aspects that affect employee work behavior. In the context of ApotekKU, improving competencies through LMS needs to be accompanied by strategies that can increase employee engagement, such as recognition of achievements, career development opportunities, and a work culture that supports learning.

The results of this study are consistent with various previous studies that stated that employee engagement is one of the strongest predictors of employee performance. Saks (2022) explained that engagement contributes to increasing productivity and work quality. Similarly, research by Bakker & Demerouti (2017) shows that engaged employees have a higher level of performance than non-engaged employees. Thus, the results of this study further strengthen the empirical evidence regarding the importance of engagement as a strategic factor in human resource management.

When associated with the novelty of research, these findings make a new contribution because they confirm that the relationship between engagement and performance also applies to the retail pharmaceutical sector. This shows that employee engagement is a universal need that is not limited to certain industry sectors. Whether in educational organizations, hospitals, or pharmacy networks, engagement remains an important factor in improving individual performance.

The Effect of Learning Management System on Employee Performance

One of the most interesting findings in this study is the rejection of the hypothesis that the Learning Management System has a direct effect on Employee Performance. The results of the analysis showed that the path coefficient value was 0.090 with a p-value of 0.127 so that the relationship was not significant.

These findings provide an answer to a problem that has often arisen in organizations, namely why large investments in learning technology do not always result in significant performance improvements. Many organizations assume that the provision of a digital learning system will automatically increase employee productivity. However, the results of this study show that this assumption is not entirely true.

The main reason for the insignificance of the direct relationship between LMS and performance is that LMS only provides a means of learning. The system cannot improve performance if it is not actively utilized by employees. In other words, technology does not have the ability to directly change individual behavior. Behavior change still requires involvement, motivation, and willingness to learn from system users.

These findings show that the success of digital transformation is not just a technological problem, but a human problem. Organizations can have sophisticated systems, but if employees do not have the motivation to use the system, the impact on performance will be very limited. This result is reinforced by an f-square value of 0.010 which shows that the LMS's direct contribution to performance is very small and negligible.

Theoretically, these results support the Information System Success Model's view that information system benefits do not always appear directly. The success of information systems is often influenced by user factors that mediate between technology and organizational outcomes. Therefore, organizations need to change the paradigm from simply providing technology to ensuring that it is actually used and provides a positive experience for users.

From a managerial perspective, the solution that can be done is to improve the quality of LMS implementation through the provision of relevant materials, interactive features, a learning reward system, and the integration of LMS with performance management systems. Thus, an LMS is not only a training platform, but a part of the organization's work culture.

The Role of Employee Engagement Mediation in the Relationship between Learning Management System and Employee Performance

The main objective of this study is to explain the mechanism of how the Learning Management System can result in improved employee performance. The results of the study show that Employee Engagement mediates the full relationship between the Learning Management System and Employee Performance. The indirect influence had a coefficient value of 0.512 with a p-value of 0.000, while the VAF value reached 85.1%, which shows a full mediation pattern.

The VAF method was selected following Hair et al. (2019), who recommend VAF as a complementary approach to bootstrapped indirect effect testing. VAF values above 80% indicate full mediation, 20-80% indicate partial mediation, and below 20% indicate no mediation. This approach supplements the bootstrapped indirect effect test by providing a proportional measure of the indirect effect relative to the total effect, addressing limitations of the traditional causal steps method.

This finding is a major contribution to the research because it successfully explains a process that has not been widely discussed in previous research. Most studies have focused only on the direct relationship between LMS and performance, whereas this study shows that the relationship actually happens through increased engagement first.

Conceptually, LMS provides learning resources that make it easier for employees to develop competencies. When employees feel they benefit from the system, they feel valued and supported by the organization. This feeling then increases engagement. Furthermore, high engagement encourages individuals to work better, resulting in increased performance. Thus, engagement serves as a bridge that connects learning technology with work results.

The results of this study provide important implications for organizations that are undergoing digital transformation. Many organizations measure the success of an LMS based on the number of modules available or the completion rate of training. In fact, this study shows that a more important indicator is the extent to which an LMS can increase employee engagement. Without engagement, the performance benefits of LMS will be difficult to realize.

This finding also strengthens the Job Demands-Resources Theory which explains that organizational resources affect work outcomes through a motivational process in the form of work engagement. LMS acts as a job resource, engagement becomes a motivational condition, and performance is the outcome produced. Thus, the theoretical model used in this study has strong empirical support.

When compared to the novelty that has been explained in the background, this study has succeeded in filling the gap of previous research. Previous studies have examined the direct influence of LMS on performance or placed engagement as a dependent variable. On the contrary, this study proves that engagement is a key mediating variable that explains how LMS can produce improved performance. Therefore, this research provides a new theoretical contribution while expanding the understanding of LMS implementation in the context of retail pharmaceutical organizations.

Overall, the results of the study show that the main problem does not lie in the existence of the LMS, but in the ability of the organization to create employee engagement through the LMS. The solution that needs to be done is to integrate digital learning with career development, reward systems, performance management, and a culture of continuous learning. If this is done consistently, the organization will have an impact in the form of increased competence, higher employee involvement, increased productivity, better service quality, and continued competitive advantage.

Theoretical Integration of ISSM and JD-R Theory: The findings of this study demonstrate a meaningful convergence between the Information System Success Model and Job Demands-Resources Theory that has not been explicitly articulated in prior research. The ISSM framework explains why LMS implementation generates user satisfaction and perceived benefits through system quality, information quality, and service quality dimensions. However, the ISSM alone does

not explain why these benefits do not directly translate into performance improvement. The JD-R Theory fills this gap by positioning LMS as a job resource that must first activate employee psychological engagement (vigor, dedication, absorption) before performance outcomes can materialize. The full mediation finding (VAF = 85.1%) empirically validates this theoretical integration: LMS quality characteristics (ISSM) function as antecedents of engagement (JD-R), which in turn drives performance. This integrated framework extends both theories by demonstrating their complementary explanatory power in organizational digital learning contexts.

Interpretation of Effect Size: The f^2 value of 1.041 for the LMS-Employee Engagement relationship is notably large, exceeding Cohen's (1988) threshold of 0.35 for large effects by a substantial margin. This exceptionally strong effect can be explained by the comprehensive nature of LMS implementation at ApotekKU, where the system serves not merely as a training delivery platform but as the primary channel for competency development, career progression, regulatory compliance learning, and organizational communication. In contrast, studies in educational settings typically report moderate effects (f^2 = 0.15-0.35) because LMS competes with face-to-face instruction. At ApotekKU, where employees across 65 geographically dispersed branches rely on LMS as their sole structured learning resource, the system's role as a job resource is magnified, producing the observed large effect.

They diverge from findings that indicate partial mediation in manufacturing contexts, with a moderate effect size for the direct LMS-performance path. This discrepancy suggests that direct effects of LMS on performance are more likely in settings where job tasks are routine and standardized, allowing training content to transfer directly to task execution. In pharmaceutical retail, where employee performance encompasses complex competencies including patient counseling, regulatory compliance, and inventory management, the cognitive and emotional processing facilitated by engagement appears necessary to convert learning inputs into multifaceted performance outputs. Furthermore, significant direct effects have been found in settings where LMS was supplemented by coaching and mentoring programs, suggesting that organizational learning ecosystems may moderate the mediation pattern observed in this study.

Practical Implications for LMS Management: Based on these findings, ApotekKU management should consider four strategic recommendations. First, redesign LMS content to incorporate interactive and gamified elements that stimulate vigor and dedication, rather than focusing solely on information delivery. Second, implement engagement-monitoring dashboards within the LMS that track not only completion rates but also qualitative engagement indicators such as discussion forum participation, peer learning interactions, and self-directed learning behaviors. Third, train branch managers as learning facilitators who can reinforce LMS content through on-the-job coaching, thereby strengthening the engagement-performance pathway. Fourth, address the reported non-completion rate by investigating barriers to engagement such as workload constraints, digital literacy gaps, and perceived relevance of training content to daily pharmacy operations.

Unexplained Variance and Limitations: The R^2 value of 0.616 for Employee Performance indicates that 38.4% of performance variance remains unexplained by the research model. This unexplained variance likely reflects the influence of omitted variables including leadership style Schaufeli (2021), organizational culture, compensation satisfaction, individual digital readiness, and work-life balance factors. The absence of these variables represents a limitation of the current model and suggests that LMS implementation and engagement, while important, are not sufficient conditions for performance optimization. Future research should incorporate these contextual and individual-level moderators to develop a more comprehensive performance prediction model.

CONCLUSION

This study demonstrates that LMS implementation does not directly improve employee performance in pharmaceutical retail but operates through full mediation by employee engagement (VAF = 85.1%). The integrated ISSM-JD-R framework reveals that LMS functions as a job resource whose performance impact is contingent upon activating employee psychological engagement. The model explains 51.0% of engagement variance and 61.6% of performance variance, with an exceptionally large effect size (f^2 = 1.041) for the LMS-engagement pathway.

These findings extend both ISSM and JD-R Theory by empirically validating their convergence in organizational digital learning contexts and provide the first evidence of this mediation mechanism in the pharmaceutical retail sector.

Future research should address the current study's limitations by: (1) incorporating moderating variables such as digital readiness, leadership support, organizational learning culture, and digital learning satisfaction to explain the 38.4% unexplained performance variance; (2) employing longitudinal designs to examine how the LMS-engagement-performance relationship evolves as organizational digital maturity increases; (3) extending the research to multi-organizational and cross-sectoral pharmaceutical settings to test the generalizability of the full mediation finding; and (4) adopting mixed-methods approaches combining SEM-PLS with qualitative interviews to capture the nuanced employee experiences that underlie engagement formation in technology-mediated learning environments.

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AUTHOR CONTRIBUTION STATEMENT

The authors jointly contributed to the study's conceptualization, methodology, data collection, statistical analysis, interpretation of findings, and manuscript preparation. All authors critically reviewed the manuscript, approved its final version, and accepted responsibility for the integrity and accuracy of the published work.

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