Strategic Optimization of LMS in Higher Education for Working-Class Students Using SWOT Analysis

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ABSTRACT
The implementation of Learning Management Systems (LMS) in higher education presents challenges for working-class students who must balance their studies and employment. At Private University X in Karawang, the transition from conventional learning methods to LMS has caused adaptation difficulties for both students and lecturers, potentially hindering learning effectiveness. Therefore, an evaluation is necessary to identify key aspects for LMS optimization based on strategies aligned with the university's specific conditions and needs. This study formulates LMS optimization strategies through a survey involving lecturers and students from the Industrial Engineering Department. Data were collected between February 15 and March 8 and analyzed using the SWOT method based on the Internal Factor Analysis Summary (IFAS) and External Factor Analysis Summary (EFAS). The analysis involved developing variables through interviews validated by previous research, followed by a structured survey to determine variable weights used in quadrant analysis, which were subsequently revalidated by respondents. The findings indicate that diversification is the most effective strategy, as identified through quadrant analysis with an internal factor score of 0.76 and an external factor score of -9.7. This strategy includes personalized learning to align content with student needs, AI integration for enhanced interaction and recommendations, gamification to boost engagement, and improved technical support to address LMS related challenges. By providing a structured strategic framework, this study offers practical guidance for higher education institutions in developing LMS solutions that are more adaptive, inclusive, and aligned with lecturer and student demands.

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1. Introduction

Education is a fundamental right that must be accessible to all levels of society, serving as a bridge to knowledge, discipline, and adaptability (Ainscow, 2020; Mariyono, 2024). In the industrial sector, continuous skill enhancement is essential for maintaining competitiveness amid technological advancements and evolving work systems (Chikán et al., 2022). However, a significant gap exists between workforce competencies and industry demands, as most industrial workers in Indonesia have only completed secondary education, with limited access to higher education (Bank, 2020). Addressing this gap is crucial, as companies increasingly require higher competencies, particularly in response to automation and digitalization. Nevertheless, time constraints, financial limitations, and the unavailability of flexible learning programs pose significant barriers for workers seeking further education (Abo-Khalil, 2024).

To overcome these challenges, universities have introduced specialized learning programs for workers, typically held in the evenings or on weekends. However, conventional education models remain inadequate, especially for workers with irregular schedules and rotating shifts (Herdiana, 2020). In this context, digital learning through Learning Management Systems (LMS) offers a promising solution by providing flexible access to educational materials, such as video tutorials and interactive modules (Buana & Linarti, 2021). LMS-based learning enables workers to study at their convenience, reducing scheduling conflicts and improving accessibility. Despite its advantages, implementing LMS in higher education is not without challenges, as universities face financial constraints, infrastructure development costs, and the need for educator training to adapt to digital teaching methods (Agripina Shafa, 2024; Widya et al., 2021).

Beyond financial and technical challenges, ensuring the effectiveness of LMS for working students requires careful planning. Key factors such as internet accessibility, content quality, and student-instructor interaction significantly influence learning outcomes (Gusti et al., 2022; Indrawatiningsih, 2021). Poorly designed digital learning programs may hinder workers' competency development, making LMS adoption less effective. Additionally, resistance from educators accustomed to traditional teaching methods presents another challenge, requiring structured training and institutional support for smooth implementation. Without addressing these issues, digital learning may not fully bridge the skills gap for industrial workers

These challenges can be addressed by developing strategies analyzed based on internal and external factors that influence the optimization of higher education for working-class programs. Approaches such as SWOT analysis, incorporating Internal Factor Analysis Summary (IFAS) and External Factor Analysis Summary (EFAS), can formulate strategies through a comprehensive evaluation of institutional readiness, educational system needs, and technological advancements (Aisyi & Zulkarnain, 2020; Pereira et al., 2021).

By identifying strengths, weaknesses, opportunities, and threats, this analysis provides insights into strategic measures for enhancing LMS-based learning. Internal factors, such as university infrastructure and faculty readiness, along with external factors, including stakeholders demands and digital transformation trends, are assessed to formulate effective strategies (Adi Wibbowo, 2022).

This study is expected to assist universities in designing adaptive and sustainable digital learning strategies that align with stakeholder needs. It complements previous research that has highlighted the advantages of Learning Management Systems (LMS) in higher education. Although various studies have examined the role of LMS, comprehensive discussions on strategies to address challenges and weaknesses within the system and educational environment remain limited (Herdiana, 2020; MacNeill et al., 2024; Muzamzamah et al., 2023; Sofyana & Rozaq, 2019; Widayat, 2018).

Most prior research has focused on describing the initial implementation of LMS and its benefits without exploring adaptive strategies that consider strengths, weaknesses, opportunities, and threats in higher education. However, integrating internal and external analyses is crucial to ensuring the effectiveness and sustainability of digital learning systems strategies.

In this study, LMS development strategies are formulated based on a SWOT analysis combined with strategic quadrant mapping to identify the most suitable approach for universities. This approach not only considers internal and external factors but also enhances decision-making through quantitative analysis. As a result, the proposed strategies are more targeted and relevant to real-world challenges in LMS implementation.

Although SWOT analysis has been widely applied in various fields, its use in LMS strategy development in higher education remains limited. Most studies have focused on LMS effectiveness without in-depth exploration of adaptive strategies that account for institutional dynamics. Therefore, the novelty of this study lies in its methodological and applied approach to LMS strategy formulation. As stated by (Cahyo, 2021), applying an established method to an unexplored context can be classified as an innovation in strategy development based on

analytical approaches. Consequently, this study contributes to a more systematic, effective, and sustainable LMS implementation strategy in higher education.

2. Research Method

This study integrates qualitative and quantitative approaches for a comprehensive LMS implementation analysis. Qualitative analysis identifies SWOT variables through interviews with lecturers and fourth-semester Industrial Engineering students at University X, validated through a literature review to ensure alignment with prior research (Templier & Paré, 2015).

Quantitative analysis applies IFAS and EFAS for objective strategy development, with validation by Industrial Engineering lecturers at a private university in Karawang, West Java (Suni et al., 2025). This integration balances expert perspectives with empirical data, enhancing LMS adoption for working students. The methodological approach aligns with previous studies emphasizing mixed methods in strategic decision-making and policy development. The research framework is shown in figure 1.

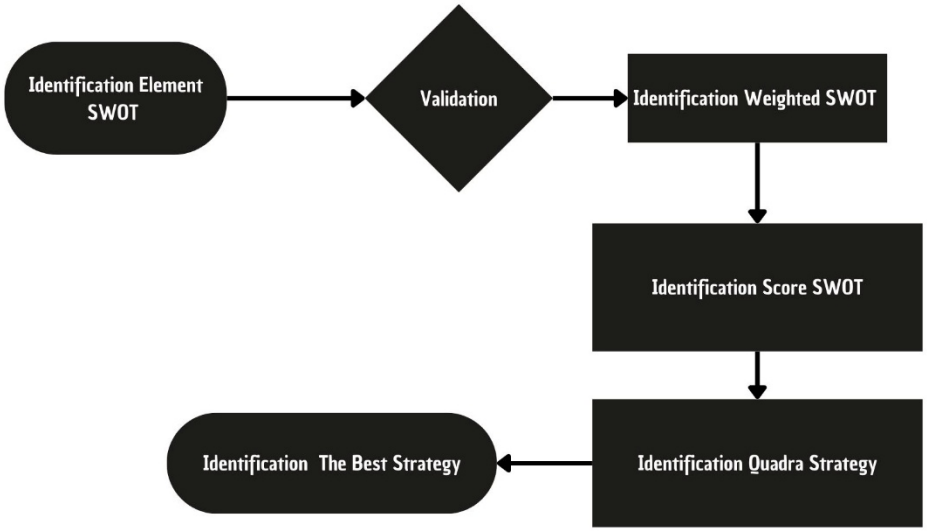

Figure 1. Framework Research

Based on figure 1, the framework of this research is presented. This study employs a mixed-method approach, integrating qualitative and quantitative analyses to develop an effective LMS implementation strategy for workers class in University. The data collection and analysis process follows these structured steps:

Identification Variables on SWOT Elements

The qualitative phase of this study includes a literature review and expert interviews to gather insights on LMS implementation using the SWOT framework. Respondents were selected based on their role and relevance in the learning process. Lecturers, as educators,

directly interact with changes in the learning system, while students experience the direct impact of transitioning to LMS. To ensure comprehensive insights, interviews were conducted with five first-cohort students from the Bachelor of Industrial Engineering program and three lecturers from the same program at University X in Karawang, West Java.

The selection of five students and three lecturers was based on the need to capture diverse experiences and perspectives while ensuring balanced representation from both key groups in the learning process. While qualitative research does not impose strict rules on sample size, previous studies indicate that interviews with at least three informants can yield meaningful findings if they are directly involved in the subject matter (Mocănașum., 2020). Additionally, research suggests that data saturation where no new themes emerge is typically achieved with a relatively small number of participants, often within the first six interviews (Henik & Kaiser, 2022). Therefore, this study deems the selected sample sufficient to obtain rich, in-depth insights into LMS implementation while maintaining methodological rigor. The determination of SWOT variables is based on a consensus of responses to key questions, such as:

a. What challenges do students and lecturers face in adapting to LMS compared to conventional learning methods? (Identifying adaptation difficulties helps highlight weaknesses and barriers in LMS adoption)
b. What are the advantages of LMS in enhancing learning flexibility and accessibility? (Understanding strengths allows for strategic improvements in LMS implementation)
c. How does LMS influence student engagement, motivation, and academic performance? (Assessing the system's effectiveness determines whether it supports or hinders learning outcomes)
d. What external factors (e.g., institutional policies, technological infrastructure, or digital literacy) impact LMS adoption? (Recognizing external influences ensures a more comprehensive implementation strategy)
e. What additional features or support mechanisms could improve LMS usability for students with work commitments? (Enhancing inclusivity ensures LMS strategies address diverse student needs)

The result of this section is the coding of keywords on the relationships between each element. To ensure methodological rigor and reliability, the identified SWOT variables must be validated against previous research findings. This validation strengthens the theoretical foundation of the analysis, ensuring that the identified factors are not only contextually relevant but also aligned with established academic insights (Templier & Pare, 2014). By systematically

addressing these questions and cross-referencing findings with the literature, this qualitative phase ensures that SWOT variables are grounded in real-world experiences, contextuais insights, and best practices in digital learning implementation. This approach enhances the credibility of the findings and supports the development of evidence-based LMS strategies that are both practical and effective (Templier & Pare, 2014).

Validation The Result of Interview for Identification Variables

Validation is conducted by reviewing findings from previous studies. This review aims to identify relevant findings within the context of prior research to ensure that the current study is well-founded and its results are comparable and justifiable. The identified variables are then assigned weights and scores to assess their significance in optimizing LMS, with evaluations conducted by the same respondents. The weighting results are then averaged and adjusted using a rounding method to minimize bias in data processing.

Identification Weighted and Score SWOT Elements and Variables

Quantitative analysis begins with **weight assessment** through Internal Factor Analysis Summary (IFAS) and External Factor Analysis Summary (EFAS). Data is collected via a structured questionnaire, where respondent assign:

a. **Weights (W)** on a **0-1 scale**, indicating the relative importance of each factor.
b. **Ratings (R)** on a **1-4 scale**, representing the level of significance or impact of each factor (David & David, 2017). The scores for each factor are calculated using the formula (Eq.1).

$$Score = W_i \; x \; R_i \tag{1}$$

Where:

a. W_i = weight of factor iii (0-1 scale)
b. R_i = rating of factor iii (1-4 scale)

Total scores for internal factors (IFAS) and external factors (EFAS) are computed as follows:

$$\sum ifas = (W_s \; x \; R_s) - (W_w \; x \; R_w) \tag{2}$$

$$\sum efas = (W_o \; x \; R_o) - (W_t \; x \; R_t) \tag{3}$$

Where:

a. W_s, W_w, W_o, W_t = weights for strengths, weaknesses, opportunities, and threats
b. R_s, R_w, R_o, R_t = respective ratings

Strategic Quadrant Identification

The total IFAS and EFAS scores determine the university's LMS positioning in the strategic quadrant matrix (Kosidin & Wibowo, 2022) :

a. (+, +) → Growth Strategy : Expansion-oriented LMS adoption
b. (+, -) → Turnaround Strategy: Optimizing internal strengths while addressing external threats
c. (-, +) → Survival Strategy: Leveraging opportunities while overcoming weaknesses
d. (-, -) → Maintenance Strategy: Addressing both internal weaknesses and external threats.

3. Result and Discussion

Identification Variables on Elements SWOT

SWOT variables were identified through structured interviews. The interviews gathered insights from students and lecturers of industrial engineering in private higher education program in Karawang West Java, while literature validation ensured the relevance of each variable in LMS-based education. Table 1 presents the modeling encoding for significant words identified during the interviews.

Table 1. The Result Identification Variables on SWOT Element

Internal	External
Strength	**Opportunities**
1. Flexibility	1. Growing Trend of Digital Learning
2. Availability of Technology	2. Government Support for Digital Transformation
3. Personalized Learning	3. Integration with AI and Gamification Technologies
4. Evaluation Automation	4. Increasing Awareness of Digital Skills
5. Progress Monitoring and Tracking	
6. Cost Efficiency	
Weakness	**Treat**
1. Low Engagement	1. Dropout Rate in Online Learning
2. Slow Adaptation	2. Digital Fatigue
3. Limited Infrastructure	3. Data Security and Privacy
4. Lack of Self-Learning Motivation	4. Lack of Social Interaction
	5. Weak Digital Literacy
	6. Technological Access Gap

The structured interviews reveal key factors influencing LMS implementation in the Industrial Engineering program at a private university in Karawang. Strengths include flexibility, technology availability, personalized learning, evaluation automation, and cost efficiency, while weaknesses involve low engagement, slow adaptation, and limited infrastructure. Opportunities arise from digital learning trends, government support, AI

integration, and increasing digital skills awareness. However, threats such as high dropout rates, digital fatigue, data security risks, weak digital literacy, and access gaps pose challenges to effective adoption.

Validation Result From Identification Variables

SWOT variables were identified through structured interviews and a literature review. The interviews gathered insights from students and lecturers in a private higher education program in Karawang West Java, while literature validation ensured the relevance of each variable in LMS-based education. Table 2 shows in this result identification variable.

Table 2. Result in Identification Variables SWOT

Behavior	Element	Variable	References
Internal	Strength	1. Flexibility 2. Availability of Technology 3. Personalized Learning 4. Evaluation Automation 5. Progress Monitoring and Tracking 6. Cost Efficiency	(Shafa, 2024; Al-Emran et al., 2018; Buana & Linarti, 2021; Gusti et al., 2022; Mugo et al., 2017; Widya et al., 2021)
Internal	Weakness	1. Low Engagement 2. Slow Adaptation 3. Limited Infrastructure 4. Lack of Self-Learning Motivation	(Al-Adwan et al., 2023; Alexander Bueno-Vesga et al., 2017; Indrawatiningsih, 2021)
External	Opportunities	1. Growing Trend of Digital Learning 2. Government Support for Digital Transformation 3. Integration with AI and Gamification Technologies 4. Increasing Awareness of Digital Skills	(Azmi et al., 2023; Qaddumi & Smith, 2024)
External	Threat	1. Dropout Rate in Online Learning	(Yadav, 2024; MacNeill et al., 2024b;

Behavior	Element	Variable	References
		2. Digital Fatigue 3. Data Security and Privacy 4. Lack of Social Interaction 5. Weak Digital Literacy 6. Technological Access Gap	Rahmani et al., 2024)

Based on Table 1, the identified variables and elements highlight the dynamic interaction between strengths, weaknesses, opportunities, and threats in LMS implementation for workers. Flexibility and cost efficiency, supported by technology availability, personalized learning, evaluation automation, and progress monitoring, provide significant advantages in workforce education (Shafa, 2024; Al-Emran et al., 2018). However, these strengths may be undermined by low engagement, slow adaptation, infrastructure limitations, and lack of self-learning motivation, which can hinder the effectiveness of LMS implementation (Al-Adwan et al., 2023; Indrawatiningsih, 2021).

Meanwhile, the growing trend of digital learning, government support, and the integration of AI and gamification technologies present opportunities for LMS optimization. However, its sustainability is challenged by high dropout rates, digital fatigue, data security risks, and technological access gaps (Azmi et al., 2023; Qaddumi & Smith, 2024). Additionally, lack of social interaction and low digital literacy may further impede learning effectiveness, particularly for workers unfamiliar with independent digital education (Yadav, 2024; MacNeill et al., 2024b). Without adaptive strategies to mitigate these threats and weaknesses, LMS adoption risks failing to achieve the desired impact, highlighting the need for a more responsive learning framework tailored to workers' needs.

Identification Weighted SWOT Variables

All variables in Table 2 serve as the basis for weighting, conducted by selected academics and industry professionals from private universities in karawang west Java. SWOT weighting is applied to internal factors (strengths and weaknesses) and external factors (opportunities and threats). Internal factors can be directly managed to enhance LMS effectiveness, while external factors require

adaptive strategies. Weights, ranging from 0 (low relevance) to 1 (high relevance), are determined by key stakeholders. Table 3 presents the weighted values for each element.

Table 3. Result Identification Weighted

Elemen SWOT	Variable	Description Variables	Weighted
Strength	Flexibility	LMS enables learning access anytime and anywhere, enhancing accessibility for students with diverse schedules.	**0.7**
	Availability of Technology	The digital infrastructure supporting LMS is continuously evolving, enabling integration with various devices and learning applications.	**0.7**
	Personalized Learning	LMS can be tailored to individual needs, allowing students to learn at their own pace and according to their preferences.	**0.8**
	Evaluation Automation	Automated evaluation systems, such as digital quizzes, assignments, and exams, reduce administrative workload for instructors and provide faster feedback for students.	**0.8**
	Progress Monitoring and Tracking	LMS provides real-time tracking of student learning progress, helping instructors identify challenges faced by students.	**0.8**
	Cost Efficiency	LMS reduces the need for printed materials, physical classrooms, and other operational costs, making it more cost-effective than conventional learning methods.	**0.9**
Weakness	Low Engagement	Students tend to be less active in discussions and interactions due to limited social engagement compared to face-to-face learning.	**0.8**
	Low Engagement	Some students and lecturers struggle to adapt to the LMS, especially those unfamiliar with digital technology.	**0.8**
	Slow Adaptation	Not all students have access to adequate devices or a stable internet connection to utilize the LMS optimally.	**0.8**
	Limited Infrastructure	LMS requires a high level of student independence, but some still rely on conventional	**0.6**

Elemen SWOT	Variable	Description Variables	Weighted
		learning methods.	
	Lack of Self-Learning Motivation	Not all institutions provide adequate technical support services, making it challenging for students and lecturers to use LMS effectively.	**0.9**
Opportunities	Growing Trend of Digital Learning	The adoption of LMS is expanding as interest in flexible and easily accessible digital learning methods continues to grow.	**0.7**
	Government Support for Digital Transformation	Government policies promoting digitalization in education support the development of infrastructure and regulations for LMS implementation.	**0.7**
	Integration with AI and Gamification Technologies	The utilization of artificial intelligence (AI) and gamification elements in LMS can enhance the learning experience, making education more interactive and engaging.	**0.7**
	Increasing Awareness of Digital Skills	The demand for digital skills in the workforce encourages students to actively use LMS to enhance their competencies.	**0.7**
Treat	Dropout Rate in Online Learning	The dropout rate or course incompletion in online learning tends to be higher than in conventional education due to various factors, such as a lack of discipline and self-motivation.	**0.7**
	Digital Fatigue	Excessive use of technology in learning can lead to fatigue, stress, and decreased effectiveness.	**0.8**
	Data Security and Privacy	The risk of personal data breaches and misuse of information in LMS systems poses a significant challenge in the digital era.	**0.8**
	Lack of Social Interaction	The online learning model can reduce face-to-face interactions between students and lecturers, potentially hindering the development of social and collaborative skills.	**0.8**

Elemen SWOT	Variable	Description Variables	Weighted
	Weak Digital Literacy	Students who lack an understanding of how to effectively utilize LMS may face difficulties in the learning process and system navigation.	**0.8**
	Technological Access Gap	Not all students have equal access to devices and stable internet connections, creating a gap in the effectiveness of online learning.	**0.8**

Identification Score Each Variable

After weighting, the next step is to determine the scores to measure the importance of each variable. SWOT scores are assigned using a rating scale of 1 to 4. where a score of 4 indicates a highly important element, while a score of 1 represents a low level of importance. The final score is obtained by multiplying the rating by the weight of each variable. The results of the SWOT score identification are presented in Table 4.

Table 4. Result Score Identification

Elemen SWOT	Variable	Weighted	Rating	Score
Strength	Flexibility	**0.7**	**4**	2.8
	Availability of Technology	**0.7**	**4**	2.8
	Personalized Learning	**0.8**	**3**	2.4
	Evaluation Automation	**0.8**	**4**	3.2
	Progress Monitoring and Tracking	**0.8**	**3**	2.4
	Cost Efficiency	**0.9**	**3**	2.7
	Total 16.3			
Weakness	Low Engagement	**0.8**	**4**	3.2
	Slow Adaptation	**0.8**	**4**	3.2
	Limited Infrastructure	**0.6**	**4**	2.4
	Lack of Self-Learning Motivation	**0.9**	**4**	3.6
	Total 15.6			
Opportunities	Growing Trend of Digital Learning	**0.7**	**3**	2.1
	Government Support for Digital Transformation	**0.7**	**3**	2.1
	Integration with AI and Gamification Technologies	**0.7**	**3**	2.1
	Increasing Awareness of Digital Skills	**0.7**	**4**	2.8
	Total 9.1			

Elemen SWOT	Variable	Weighted	Rating	Score
Treat	Dropout Rate in Online Learning	**0.7**	**4**	2.8
	Digital Fatigue	**0.8**	**4**	3.2
	Data Security and Privacy	**0.8**	**4**	3.2
	Lack of Social Interaction	**0.8**	**4**	3.2
	Weak Digital Literacy	**0.8**	**4**	3.2
	Technological Access Gap	**0.8**	**4**	3.2
	Total 18.8			

The SWOT analysis of LMS implementation for workers reveals a complex interaction between internal and external factors. The strengths of LMS, including flexibility, technology availability, personalized learning, evaluation automation, progress tracking, and cost efficiency, achieve a total score of 16.3, demonstrating its potential to enhance workforce training. Among these, evaluation automation (3.2) and cost efficiency (2.7) contribute significantly to effectiveness, ensuring streamlined assessments and affordability. However, these advantages are counterbalanced by weaknesses, which score 15.6, highlighting challenges such as low engagement (3.2), slow adaptation (3.2), limited infrastructure (2.4), and lack of self-learning motivation (3.6). The highest-scoring weakness, lack of self-learning motivation (3.6), poses a major barrier to LMS effectiveness, requiring targeted interventions (Gusti et al., 2022; Maharani & Khalid, 2024).

Externally, opportunities such as the growing digital learning trend, government support, AI integration, and increasing digital skills awareness accumulate a total score of 9.1, indicating potential for LMS expansion. However, this score is lower than threats, which total 18.8, signaling substantial risks. Major threats include high dropout rates (2.8), digital fatigue (3.2), data security risks (3.2), lack of social interaction (3.2), weak digital literacy (3.2), and technological access gaps (3.2). The consistently high threat scores underscore significant barriers to LMS sustainability, particularly in maintaining engagement and ensuring equitable access. Without strategic interventions to address these vulnerabilities, the full potential of LMS in student work class may remain unrealized (Sofyana & Rozaq, 2019).

Identification Strategy

a. Selected Quadran Strategy

Based on Table 3, SWOT scoring assesses each element's importance, guiding strategy formulation by analyzing (S-W) and (O-T) differences. A Cartesian diagram visualizes the strategic position, determining whether to strengthen advantages, address weaknesses, seize opportunities, or mitigate threats. Strategy selection relies on the organization's position within

the diagram and the relevance of identified factors, shaping an effective LMS strategy for sustainable digital learning.

1. Growth Strategy (Quadrant I): Strengths and opportunities dominate, requiring expansion and innovation. LMS strategies include enhancing personalized learning, strengthening infrastructure, and integrating AI or gamification for engagement.
2. Turnaround Strategy (Quadrant II): High opportunities but internal weaknesses demand capability enhancement. LMS strategies focus on improving digital literacy, optimizing support, and strengthening infrastructure for a smoother digital transition.
3. Survival Strategy (Quadrant III): Weaknesses and threats prevail, necessitating a defensive approach. LMS strategies involve boosting self-learning motivation, providing faculty-student training, and mitigating dropout risks.
4. Maintenance Strategy (Quadrant IV): Strong internal capabilities counter external threats. LMS strategies include strengthening data security, fostering digital interactions, and adapting learning methods to prevent digital fatigue.

   Coordinat (x) = Strength(16.3) – Weakness(15.6) = 0.76

   Coordinat (y) = Opportunity (9.1) – Treat (18.8) = -9.7

Decision The Best Strategy

The optimal strategy is determined by the tangent line between the x (0.7) and y (-9.7) coordinates in the Cartesian diagram. This intersection identifies the strategic quadrant, guiding whether to strengthen advantages, address weaknesses, seize opportunities, or mitigate threats. Figure 2 visualizes this positioning and its strategic interpretation for enhancing LMS effectiveness.

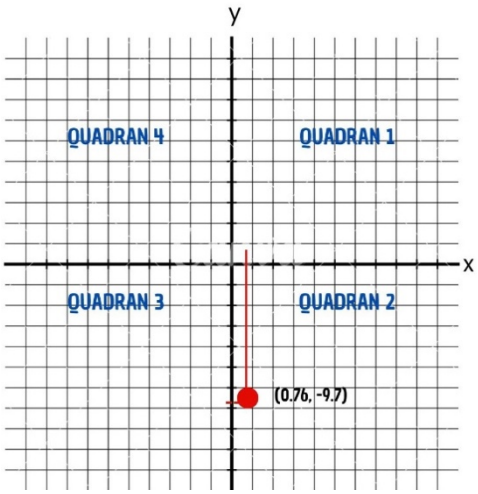

Figure 2. Visualization Result

Based on figure 2, the strategic focus that should be adapted falls within Quadrant 2,

which corresponds to a diversification strategy. This position indicates that the most effective approach is to address internal weaknesses while leveraging external opportunities in LMS implementation for digital learning. The diversification strategy in the LMS context includes:

1. **Enhancing Learning Flexibility and Personalization**
   a. Developing curriculum customization features based on individual needs to overcome the lack of personalized learning.
   b. Optimizing AI usage to tailor materials according to students' comprehension levels.
2. **Integration with AI and Gamification Technologies**
   a. Utilizing AI-based automated assessments to address slow adaptation in digital learning processes.
   b. Incorporating gamification elements to enhance engagement and reduce the lack of self-learning motivation.
3. **Strengthening Technical Support for Students and Faculty**
   a. Establishing a more responsive technology support center to address the lack of technical assistance for students and faculty.
   b. Providing regular training and tutorials to improve digital literacy in LMS usage.
4. **Bridging the Technology Access Gap**
   a. Collaborating with internet providers or universities to offer free LMS access for students with limited technological resources.
   b. Developing an offline mode in the LMS to ensure learning continuity without a stable internet connection.
5. **Improving Monitoring and Progress Tracking**
   a. Implementing data-driven progress monitoring systems to reduce dropout rates in online learning.
   b. Using notifications and automated reminders to help students stay consistent in their learning process.
6. **Leveraging Government Support for Digital Transformation**
   a. Securing government grants or subsidies to enhance LMS infrastructure in response to technological constraints.
   b. Aligning LMS implementation with national education policies to support the digitalization of education programs.
   c. Encouraging government-led training initiatives for faculty and students to improve LMS adoption, including digital pedagogy workshops and adaptive learning

strategies.

d. Facilitating partnerships between universities and policymakers to develop standardized LMS guidelines and best practices for effective digital learning integration.

To ensure the robustness of this strategic approach, validation was conducted by consulting faculty members from industrial engineering as part of a review process for academic training and development. Sensitivity analysis was also performed by adjusting the weighting and scoring perspectives, demonstrating that slight variations in input do not significantly alter the final strategy recommendation. This confirms that the model remains stable and reliable for guiding LMS digital transformation efforts, ensuring that proposed strategies are consistently applicable across different scenarios.

4. Conclusion and Sugestion

This study concludes that the implementation strategy for a digital learning system based on LMS for working-class students can be effectively formulated using SWOT analysis, along with IFAS and EFAS assessments. The findings indicate that a diversification strategy is the most suitable approach, emphasizing increased flexibility, personalized learning, AI and gamification integration, strengthened technical support, and expanded access to bridge the digital divide.

The results highlight key benefits, such as cost efficiency, adaptive learning, and automated progress tracking, while also addressing challenges like low engagement, slow adaptation, and digital access disparities. These findings reinforce the need for targeted training programs, digital literacy initiatives, and institutional support to optimize LMS adoption for industrial workers.

However, this study has limitations, as the SWOT-based strategy relies on predefined weighting and expert validation, which may not fully capture sectoral variations. Additionally, external factors like evolving policies and technological advancements could influence long-term effectiveness. Future research should explore dynamic modeling or longitudinal studies to enhance LMS adaptability over time.

5. Conflict of Interest

The author declares no conflict of interest.

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