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Prioritizing Human Resource Competency Development and Financial Management in MSMEs Using the Analytic Hierarchy Process (AHP)

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ABSTRACT

Micro, Small, and Medium Enterprises (MSMEs) play a strategic role in supporting economic growth and employment, particularly in developing countries such as Indonesia. Despite their significant contribution to the national economy, many MSMEs still face internal challenges related to human resource competencies and financial management. These limitations often hinder business sustainability and competitiveness. Therefore, determining priority development strategies is essential to optimize the limited resources available to MSME actors.This study aims to analyze the priority factors for MSME development through human resource competency and financial management using the Analytic Hierarchy Process (AHP) method. The research was conducted in Denpasar City, Bali, involving 17 respondents consisting of MSME owners, academics, business consultants, and financial practitioners selected through purposive sampling. Data were collected using pairwise comparison questionnaires based on Saaty's scale and analyzed through AHP procedures, including hierarchy structuring, pairwise comparison matrix construction, normalization, priority weight calculation, and consistency testing.The results show that human resource competency is the most important factor in MSME development compared to financial management. Among the human resource sub-criteria, digital literacy has the highest priority, followed by training, experience, and education. Meanwhile, in financial management, financial recording is identified as the most important sub-criterion, followed by budgeting, cost control, and financial planning. These findings indicate that strengthening digital competencies and improving systematic financial recording practices are key priorities for enhancing MSME performance and sustainability.This research provides practical implications for MSME development programs by emphasizing the importance of targeted training and financial management improvements. The results can serve as a reference for policymakers, practitioners, and MSME actors in designing more effective strategies to support sustainable MSME growth.

1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) play a crucial role in strengthening economic resilience and supporting employment in many developing countries. In Indonesia, MSMEs contribute more than 60% of the national Gross Domestic Product and absorb approximately 97% of the workforce, making this sector one of the main pillars of economic stability and inclusive growth. The flexibility and adaptability of MSMEs also enable them to survive economic shocks better than large-scale enterprises, especially during periods of crisis and economic uncertainty [1-5]. In regional contexts such as Bali, MSMEs are closely linked with the tourism, trade, and creative industries, and their development significantly influences local economic sustainability and community welfare.

Despite their significant contribution, many MSMEs still face structural challenges related to internal management capacity. Several studies indicate that the main obstacles experienced by MSMEs involve limited human resource competencies and weak financial management practices. Low levels of managerial skills, limited technological literacy, and insufficient business knowledge often result in low innovation capability and reduced competitiveness in the increasingly digital business environment [5-12]. Furthermore, many MSME actors still experience difficulties in adopting digital technologies and utilizing online platforms effectively due to limited digital literacy and managerial competencies[13-20].

Financial management is another critical challenge affecting MSME sustainability. Many small business owners lack structured financial management systems, resulting in inadequate financial recording, poor budgeting practices, and the mixing of personal and business finances. Such practices create difficulties in monitoring financial performance and often lead to inefficient cash flow management and inaccurate business decision-making [21-23]. In addition, the absence of proper financial statements frequently prevents MSMEs from accessing formal financing because financial institutions require reliable financial data to evaluate creditworthiness and business performance [24-15].

Previous studies have highlighted the importance of strengthening human resource competencies and improving financial literacy in supporting MSME performance and sustainability. Research has shown that entrepreneurial competence and financial literacy significantly influence the resilience and long-term performance of MSMEs in competitive markets [26]. Other studies emphasize that structured training and continuous mentoring programs can effectively enhance managerial capabilities and operational performance among MSME actors [27]. However, most existing studies tend to examine human resource competence and financial management separately, while the integration of these two factors within a structured decision-making framework remains limited.

Given the limited resources available to MSMEs and policymakers, determining strategic priorities becomes essential in designing effective development programs. Without a clear prioritization framework, training initiatives, financial assistance, and policy interventions may not address the most critical needs of MSME actors and may lead to inefficient resource allocation [28]. Therefore, a systematic decision-support method is required to identify the most influential factors that should be prioritized in MSME development strategies.

The Analytic Hierarchy Process (AHP) is widely recognized as an effective multi-criteria decision-making method capable of structuring complex problems into hierarchical models and generating priority weights through pairwise comparisons. The method allows qualitative judgments from experts and practitioners to be transformed into quantitative priorities that can guide strategic decision-making [29-35]. AHP has been applied in various fields, including strategic management, project evaluation, and risk analysis, due to its ability to integrate subjective assessments with mathematical analysis [36-40].

This study proposes the use of the Analytic Hierarchy Process (AHP) to determine the priority factors in MSME development by integrating human resource competencies and financial management aspects into a single analytical framework. The research focuses on MSMEs operating in Denpasar City, Bali, which represents a dynamic urban economic environment with strong competition and diverse business activities. By analyzing expert and practitioner judgments through pairwise comparisons, this study identifies the relative importance of human resource competencies and financial management factors in supporting MSME development.

The novelty of this research lies in integrating human resource competency development and financial management within a unified priority decision model using the Analytic Hierarchy Process (AHP) specifically in the context of MSMEs in Denpasar. While previous studies have examined these factors individually, limited research has explored their combined prioritization using a structured decision-making approach. Therefore, this study aims to provide a systematic prioritization model that can assist policymakers, practitioners, and MSME actors in designing more effective strategies for improving MSME competitiveness and sustainability.

2. Method

This study employed a quantitative approach using the Analytic Hierarchy Process (AHP) method to determine priority factors in the development of Micro, Small, and Medium Enterprises (MSMEs). The AHP method was selected because it is capable of transforming qualitative judgments from experts into quantitative priority values through pairwise comparisons. This method is widely used in multi-criteria decision-making problems where several factors influence strategic decisions [41-50].

The research was conducted in Denpasar City, Bali, which represents one of the economic centers with rapid MSME growth, particularly in the tourism, trade, and creative industries. The focus of this research is to determine priority factors for MSME development through the integration of human resource competency and financial management.

The research framework begins with identifying the research problem related to MSME development constraints. Afterward, the hierarchy structure of the decision problem was developed consisting of three levels: the goal, criteria, and sub-criteria. The main goal is to determine the priority strategy for MSME development. The second level consists of two main criteria: human resource competency and financial management. The third level consists of sub-criteria supporting each main criterion.

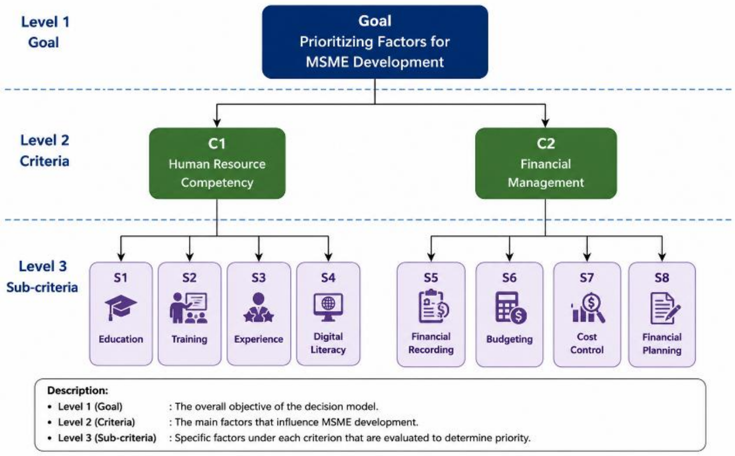

Figure 1. AHP Hierachy Model for Prioritizing MSME Development Factors

The human resource competency criterion consists of four sub-criteria: education, training, experience, and digital literacy. Meanwhile, the financial management criterion includes financial recording, budgeting, cost control, and financial planning.

Data collection was carried out using pairwise comparison questionnaires based on the Saaty scale (1–9). The respondents were selected using purposive sampling, considering individuals who possess knowledge and experience related to MSME management. The respondents consisted of MSME owners, academics, business consultants, and financial practitioners. A total of 17 respondents participated in this study.

Table 1. Characteristics of Respondents
[Source: Research Data Processed]

No	Category of Respondents	Number
1	MSME Owners	10
2	Academics	3
3	Business Consultants	2
4	Financial Practitioners	2
	Total	**17**

The questionnaire required respondents to compare the relative importance between criteria and sub-criteria using the Saaty scale ranging from 1 (equal importance) to 9 (extreme importance).

The Analytical Hierarchy Process (AHP) is a multi-criteria decision-making method developed by Saaty to solve complex decision problems by structuring them into hierarchical levels. The process involves pairwise comparisons between criteria to determine their relative importance.

The analysis steps in this research include:

1. Defining the research objective and constructing the decision hierarchy.
2. Developing a pairwise comparison matrix for criteria and sub-criteria.
3. Normalizing the comparison matrix.
4. Calculating the priority weights (eigenvector).
5. Testing the consistency of judgments using the Consistency Ratio (CR).
6. Determining the final priority ranking of factors.

The pairwise comparison matrix is represented as shown in Equation (1).

Data collection in this study was conducted using two primary methods: pairwise comparison questionnaires and brief interviews. The pairwise comparison questionnaire served as the main instrument to obtain respondents' assessments regarding the relative importance of criteria and sub-criteria in MSME development. In this questionnaire, respondents were asked to compare two elements at a time using an importance scale to determine the dominance of one element over another [10]. The data obtained were then processed into a pairwise comparison matrix to calculate the priority weights of each criterion using the Analytical Hierarchy Process (AHP) method. Additionally, brief interviews were conducted as needed to gather supplementary information, clarify respondents' answers, and deepen the understanding of the actual conditions of human resource competency and financial management within MSMEs in Denpasar. The combination of these two techniques is expected to enhance data validity and provide a more comprehensive overview in analyzing MSME development strategy priorities.

The research instrument is an Analytic Hierarchy Process (AHP) questionnaire based on Saaty's 1–9 fundamental scale, a cornerstone for pairwise comparisons in multi-criteria decision analysis. This scale enables respondents to evaluate the relative importance of criteria, spanning from 1 (equal importance) to 9 (extreme or absolute dominance) [51-60].

Table 2. Saaty's 1–9 Scale for Pairwise Comparison
[Source: Adapted from Saaty (2008)].

Scale Value	Level of Importance	Description
1	Equal importance	Both elements have the same level of importance in the decision-making process.
2	Between equal and slightly more important	A compromise value when the level of importance lies between 1 and 3.
3	Slightly more important	One element is slightly more important than the other based on experience or judgment.
4	Between slightly more and more important	A compromise value between scale 3 and 5.
5	More important	One element is clearly more important than the other.
6	Between more and strongly more important	A compromise value between scale 5 and 7.
7	Strongly more important	One element is strongly dominant over the other.
8	Between strongly and extremely more important	A compromise value between scale 7 and 9.
9	Extremely more important	One element has an extremely strong or absolute importance over the other.

The Analytic Hierarchy Process (AHP) employs a fundamental scale of relative importance ranging from 1 to 9, as proposed by Saaty. This scale allows decision-makers to express the intensity of preference between elements through pairwise comparisons, transforming subjective judgments into quantitative values. The Analytic Hierarchy Process (AHP) employs a fundamental scale of relative importance ranging from 1 to 9, commonly known as Saaty's scale [61-70]. This scale is used to evaluate the relative importance of criteria through pairwise comparisons. A value of 1 indicates equal importance between two elements, while 3, 5, 7, and 9 represent increasing levels of importance, ranging from slightly more important to extremely more important. Intermediate values (2, 4, 6, and 8) are used to express judgments that fall between two adjacent levels. This scale enables subjective assessments to be transformed into quantitative values, forming the basis for constructing pairwise comparison matrices. These matrices are then processed to derive eigenvector values, which represent the priority weights of each criterion within the decision hierarchy [12],[71-82].

3. Result and Discussions

The initial step in the analysis using the Analytic Hierarchy Process (AHP) is to construct a pairwise comparison matrix. This matrix is used to compare the relative importance of each criterion within the research hierarchy. The assessment is based on questionnaire results obtained from respondents using Saaty's scale (1–9), where the values reflect the dominance level of one criterion over another in achieving the research objective.

In this study, two main criteria are compared, namely human resource (HR) competence and financial management. These criteria are analyzed to determine their relative importance in formulating priority strategies for MSME development in Denpasar City.

Table 3. Pairwise Comparison Matrix of Main Criteria
[Source: Research Data Processed]

Criteria	HR Competence	Financial Management
HR Competence	1	3
Financial Management	1/3	1

The values presented in the table indicate that human resource (HR) competence is considered more important than financial management in the development of MSMEs in Denpasar City. The value of 3 shows that HR competence has a slightly higher level of importance compared to financial management based on respondents' judgments. The reciprocal value of 1/3 reflects the inverse relationship within the pairwise comparison matrix, in accordance with the fundamental principles of the AHP method.

This pairwise comparison matrix is subsequently used as the basis for the normalization process and the calculation of priority weights (eigenvectors) to determine the relative importance of each criterion in formulating MSME development strategies.

Table 4. Pairwise Comparison Matrix of HR Competence Subcriteria
[Source: Research Data Processed]

HR Subcriteria	Education	Training	Experience	Digital Literacy
Education	1	1/3	1/3	1/5
Training	3	1	1	1/3
Experience	3	1	1	1/3
Digital Literacy	5	3	3	1

The pairwise comparison matrix for the human resource (HR) competence subcriteria illustrates the relative importance among factors influencing MSME development. The assessment was conducted using Saaty's scale of importance (1–9), in which each subcriterion is compared pairwise to determine the level of dominance of one factor over another.

The matrix results indicate that digital literacy has the highest level of importance compared to the other subcriteria. This is reflected in the comparison values of digital literacy against education, training, and experience, which are 5, 3, and 3, respectively. These values suggest that the ability of MSME actors to utilize digital technology is considered highly important in supporting business development, particularly in responding to the rapid growth of the digital economy.

The subcriteria of training and experience also demonstrate relatively high and balanced levels of importance. This is indicated by comparison values showing that both factors have a nearly equal influence in enhancing MSME competencies. Training contributes to improving practical skills and providing new knowledge, while business experience enables MSME actors to address various business challenges and make more effective decisions.

Table 5. Pairwise Comparison Matrix of Financial Management Subcriteria
[Source: Research Data Processed]

Financial Subcriteria	Recording	Budgeting	Cost Control	Financial Planning
Recording	1	3	3	5
Budgeting	1/3	1	1	3
Cost Control	1/3	1	1	3
Financial Planning	1/5	1/3	1/3	1

The pairwise comparison matrix for financial management subcriteria illustrates the relative importance of various financial management aspects in supporting MSME sustainability. The assessment in this matrix also utilizes Saaty's scale of importance, allowing respondents to evaluate the dominance of one factor over another.

The matrix results indicate that financial recording has the highest level of importance compared to other financial management subcriteria. This is reflected in the comparison values of financial recording against budgeting, cost control, and financial planning, which are 3, 3, and 5, respectively. These values suggest that the ability of MSME actors to systematically record financial transactions is considered the fundamental basis of effective financial management.

The subcriteria of budgeting and cost control demonstrate relatively balanced levels of importance. Both factors play a significant role in regulating the use of business funds efficiently and assisting MSME actors in controlling expenditures, thereby ensuring business stability.

Meanwhile, financial planning has a relatively lower level of importance compared to the other factors. This indicates that many MSME actors tend to focus more on day-to-day financial operations rather than long-term financial planning. Nevertheless, financial planning remains an important aspect in supporting business sustainability when combined with proper financial recording and effective cost control practices.

Table 6. Normalization of the Main Matrix
[Source: Research Data Processed]

Criteria	HR Competence	Financial Management	Row Total	Priority Weight
HR Competence	0.75	0.75	1.50	0.75
Financial Management	0.25	0.25	0.50	0.25

The normalization results of the pairwise comparison matrix between the human resource (HR) competence and financial management criteria are presented as follows. The normalization process is carried out by dividing each value in the pairwise comparison matrix by the total value of its respective column.

The results show that the value in the HR competence row is 0.75 in both columns, while the value in the financial management row is 0.25. These values represent the relative importance proportions of each criterion with respect to the research objective. The normalized results are subsequently used to calculate the priority weights (eigenvectors), which indicate the level of importance of each criterion in determining MSME development strategies in Denpasar City.

Matrix normalization is conducted by dividing each element in the pairwise comparison matrix by the sum of its respective column. This process converts the comparison values into proportional values, enabling their use in the calculation of priority weights.

Table 7. Normalization of HR Subcriteria
[Source: Research Data Processed]

Subcriteria	Education	Training	Experience	Digital Literacy
Education	0.08	0.06	0.06	0.11
Training	0.25	0.19	0.19	0.18
Experience	0.25	0.19	0.19	0.18
Digital Literacy	0.42	0.56	0.56	0.53

The normalization results indicate that the highest values in most columns are found in the digital literacy subcriterion, suggesting that this factor has a relatively higher level of importance compared to other subcriteria in human resource (HR) competence.

The normalization of the financial management subcriteria is performed using the same approach, by dividing each element in the pairwise comparison matrix by the sum of its respective column.

Table 8. Normalization of Financial Management Subcriteria
[Source: Research Data Processed]

Subcriteria	Recording	Budgeting	Cost Control	Financial Planning
Recording	0.53	0.56	0.56	0.42
Budgeting	0.18	0.19	0.19	0.25
Cost Control	0.18	0.19	0.19	0.25
Financial Planning	0.11	0.06	0.06	0.08

The normalization results reveal that financial recording attains the highest proportional value, indicating its dominance within the financial management dimension of MSMEs. Furthermore, a consistency test is performed to ensure that the judgments in the pairwise comparison matrix meet an acceptable level of consistency.

The Consistency Index (CI) is calculated using the following formula:

$$CI = (\lambda max - n) / (n - 1) \tag{1}$$

The Consistency Ratio (CR) is calculated using the following formula:

$$CR = CI / RI \tag{2}$$

Description of Equations::

CI = Consistency Index

CR = Consistency Ratio

λmax = Maximum eigenvalue of the pairwise comparison matrix

n = Number of criteria (matrix size)

RI = Random Index, which is the average consistency index of a randomly generated matrix of the same order

If the CR value is ≤ 0.1, the matrix is considered to be consistent.

Table 9. Main Criteria Priority

Criteria	Weight
HR Competence	0.75
Financial Management	0.25

HR competence is the most dominant factor in MSME development.

The eigenvector, representing the priority weights, constitutes a fundamental step in the AHP method to determine the relative importance of each criterion and subcriterion within the decision hierarchy. The weights are derived from the average of each row in the normalized matrix. These values indicate the relative contribution of each factor to the research objective and enable the ranking of factors to identify the most dominant elements in MSME development strategies.

Priority weights are derived by calculating the average value of each row in the normalized matrix. These values reflect the relative importance of each subcriterion in contributing to human resource (HR) competence within MSMEs.

Table 10. HR Competence Subcriteria Priority
[Source: Research Data Processed]

Subcriteria	Weight
Education	0.08
Training	0.20
Experience	0.20
Digital Literacy	0.52

The results reveal that digital literacy attains the highest priority weight, indicating its dominant role in the development of human resource (HR) competence in MSMEs.

Table 11. Financial Management Subcriteria Priority
[Source: Research Data Processed]

Subcriteria	Weight
Financial Recording	0.52
Budgeting	0.20
Cost Control	0.20
Financial Planning	0.08

Financial recording is the most dominant factor.

Table 12. Global Priority of MSME Development Factors
[Source: Research Data Processed]

No	Criteria	Subcriteria	Global Weight
1	HR Competence	Digital Literacy	0.39
2	HR Competence	Training	0.15
3	HR Competence	Experience	0.15
4	Financial Management	Financial Recording	0.13
5	Financial Management	Budgeting	0.05
6	Financial Management	Cost Control	0.05
7	HR Competence	Education	0.06
8	Financial Management	Financial Planning	0.02

The global priority analysis reveals that digital literacy is the most dominant factor in MSME development in Denpasar City, highlighting the critical role of digital capability in enhancing competitiveness in the digital economy. Furthermore, training and experience significantly contribute to strengthening MSME competencies. From a financial management perspective, financial recording is identified as the most essential factor, as it underpins effective financial decision-making.

4. Consistency Test

To ensure that the judgments in the pairwise comparison matrix are consistent, a consistency test is conducted by calculating the Consistency Index (CI).

Table 13. Consistency Test Calculation (AHP)
[Source: Research Data Processed]

Step	Description	Calculation	Result
1	Matrix multiplication (HR Competence)	(1 × 0.75) + (3 × 0.25)	1.50
2	Matrix multiplication (Financial Management)	(1/3 × 0.75) + (1 × 0.25)	0.50
3	λ (HR Competence)	1.50 / 0.75	2
4	λ (Financial Management)	0.50 / 0.25	2
5	λmax	(2 + 2) / 2	2
6	Consistency Index (CI)	(λmax − n) / (n − 1) = (2 − 2) / (2 − 1)	0
7	Consistency Ratio (CR)	CR = CI / RI = 0 / 0	0

A Consistency Ratio (CR) value of ≤ 0.1 indicates that the pairwise comparison matrix has an acceptable level of consistency. The calculation results show that CR = 0, which means that the respondents' judgments in the pairwise comparison matrix are consistent and can be used in the AHP analysis. The results indicate that HR competence is the main priority in MSME development, with a weight of 0.75. This suggests that improving human resource capabilities plays a crucial role in enhancing business performance.

Digital literacy emerges as the most dominant factor, highlighting the importance of technology adoption in the digital economy era. Training and experience also contribute significantly to improving MSME competitiveness. On the financial side, financial recording is the most critical factor, as it forms the basis for decision-making and financial control.

Overall, the findings emphasize that strengthening digital skills and financial management practices is essential to support sustainable MSME development in Denpasar City.

Based on the calculated priority weights of both subcriteria groups, the ranking of the most dominant factors in supporting MSME development strategies can be identified.

Table 14. Ranking of Dominant Factors
[Source: Research Data Processed]

Rank	Factor	Weight
1	Digital Literacy	0.52
2	Financial Recording	0.52
3	Training	0.20
4	Experience	0.20
5	Budgeting	0.20
6	Cost Control	0.20
7	Education	0.08
8	Financial Planning	0.08

The results reveal that digital literacy and financial recording are the most dominant factors in MSME development, as reflected by their highest priority weights. These findings highlight that strengthening digital capabilities and improving financial recording practices represent the core strategic directions for enhancing MSME competitiveness in Denpasar City.

The results of the study indicate that human resource (HR) competence is the most dominant factor in MSME development strategies in Denpasar City. The ability of business actors to manage their enterprises plays a crucial role in improving both performance and business sustainability. A high level of competence enables MSME actors to be more adaptive to market changes and to effectively capitalize on available business opportunities.

The advancement of digital technology also requires business actors to possess the capability to utilize technology in their operations. The ability to use digital media, marketplaces, and online marketing platforms can assist MSMEs in expanding market reach and increasing product sales. Strong HR competence encourages business actors to be more innovative in developing strategies that align with evolving market conditions.

The findings of this study are consistent with previous research indicating that human resource competence has a significant influence on MSME development. A study conducted by Astarinaya et al. (2024) found that HR competence and financial management have a positive effect on MSME performance.

Other studies also highlight that enhancing human resource capacity through training and mentoring can improve managerial capabilities and business competitiveness. Digital literacy has also been identified as a key factor in enabling MSMEs to effectively utilize digital technology for marketing and operational efficiency. Therefore, this study reinforces previous findings emphasizing the importance of HR competence development in improving MSME success.

5. Conclusion

This study aims to analyze the priority of MSME development strategies in Denpasar City using the Analytic Hierarchy Process (AHP) approach by considering two main criteria, namely human resource (HR) competence and financial management. The results show that HR competence has a priority weight of 0.75, while financial management has a weight of 0.25. These findings indicate that HR competence is the most dominant factor in supporting MSME development in Denpasar City.

Human resource competence reflects the ability of business actors to manage and develop their enterprises, including aspects such as education, training, experience, and digital literacy. A high level of competence enables MSME actors to improve product quality, expand marketing networks, and adapt to technological advancements and market changes. The findings suggest that enhancing HR competence plays a crucial role in strengthening MSME competitiveness in an increasingly dynamic business environment.

Financial management also plays an important role in supporting business sustainability, although its priority level is lower than that of HR competence. Effective financial management includes the ability to conduct financial recording, manage cash flow, prepare budgets, and perform systematic financial planning. Good financial management practices help MSME actors monitor their financial condition and make more accurate business decisions.

Overall, the results indicate that MSME development strategies in Denpasar City should focus on improving human resource competence, supported by effective financial management practices. The synergy between these two factors is expected to enhance MSME performance, competitiveness, and sustainability in facing the dynamic challenges of economic and business development.

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