

Web-Based Financial Health Evaluation Application Development For Village Credit Institution (LPD)

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ABSTRACT

Financial health evaluation of Lembaga Perkreditan Desa (LPD, or Village Credit Institution) is currently predominantly conducted manually or via simple spreadsheets, potentially causing calculation errors and delaying risk detection. This study aims to develop a web-based LPD financial health evaluation application equipped with an early warning system. The research method applies a Research and Development (R&D) approach using a five-stage System Development Life Cycle (SDLC) model: analysis, design, coding, testing, and maintenance. Built with the PHP programming language, the application comprises eight modules and three main menus: ATMR Evaluation, CAMEL Evaluation pursuant to Bali Governor Regulation Number 44 of 2017, and Recommendations. Functional testing results across sampled LPDs in Denpasar and Badung confirm that all system calculation logics are valid. The application effectively automates accurate financial ratio analysis, determines health predicates, and provides integrated risk mitigation recommendations via an online dashboard.

Keywords: LPD; Financial Health; Information System; Web Application; Early Warning.

Pengembangan Aplikasi Evaluasi Kesehatan Keuangan Lembaga Perkreditan Desa Berbasis Web

Abstrak

Evaluasi kesehatan keuangan Lembaga Perkreditan Desa (LPD) saat ini masih dominan dilakukan secara manual atau spreadsheet sederhana, sehingga berpotensi menimbulkan kesalahan perhitungan dan memperlambat deteksi risiko. Penelitian ini bertujuan mengembangkan aplikasi evaluasi kesehatan keuangan LPD berbasis web yang dilengkapi sistem peringatan dini (early warning system). Metode penelitian menggunakan pendekatan Research and Development (R&D) berbasis model System Development Life Cycle (SDLC) lima tahapan: analysis, design, coding, testing, dan maintenance. Aplikasi ini dibangun menggunakan bahasa pemrograman PHP yang terdiri dari delapan modul serta tiga menu utama: Evaluasi ATMR, Evaluasi CAMEL sesuai Peraturan Gubernur Bali Nomor 44 Tahun 2017, dan Rekomendasi. Hasil pengujian fungsional pada sampel LPD di Denpasar dan Badung menunjukkan seluruh logika perhitungan sistem terbukti valid. Aplikasi ini terbukti efektif mengotomatisasi analisis rasio keuangan secara akurat, menentukan predikat kesehatan, serta menyajikan rekomendasi mitigasi risiko secara terintegrasi melalui dashboard daring.

Kata Kunci: LPD; Kesehatan Keuangan; Sistem Informasi; Aplikasi Web; Early Warning.

INTRODUCTION

Lembaga Perkreditan Desa (LPD, or Village Credit Institution) is a microfinance institution based in traditional villages in Bali. As of December 31, 2014, 1.423 units had been registered. (Pramanaswari, 2021). Healthy financial management is a major factor in maintaining the stability and sustainability of LPD. (Tambunan & Putri, 2024). LPDs play a strategic role in supporting the economy of traditional villages in Bali. Their sustainability and success are heavily influenced by their financial health, while transparency and responsibility positively influence their financial performance. (Mahaendrayasa & Putri, 2017). A preliminary study showed that 7 LPDs were indicated as unhealthy out of 35 in Denpasar in 2022. Meanwhile, in the same year in Badung Regency, only 10 LPDs were categorized as healthy. LPDs need to maintain their health by considering the factors that determine financial health. (Raharja & Supriana, 2019). However, the LPD financial health evaluation process is still largely manual or semi-manual, potentially leading to delays in risk detection and suboptimal support for managerial decision-making. Based on the background, this aims to identify LPD's needs for web-based financial health evaluation application, financial health evaluation application design, results of the application trial and prototype of the application.

In Bali, there are no LPDs that use applications for web-based LPD financial health evaluations, therefore it is necessary to conduct research on its development. The existence of this application is a form of digitalization of microfinance institutions, as highlighted in previous studies (Dorfleitner et al., 2022; Binaluyo et al., 2024; Aminah et al., 2025). It is very important and urgent for LPDs as a tool to help analyze their financial health and detect potential risks. This research aims to develop a web-based LPD financial health evaluation application equipped with an early warning system.

This study uses a research and development approach aimed at producing a product in the form of a web-based LPD financial health evaluation application that can assist the financial health analysis process more systematically, quickly, and accurately. The financial health analysis uses the web-based CAMEL method. The problem-solving strategy is carried out through gradual application development, starting from user needs analysis, system design, prototype development, and system testing, so that the resulting application truly meets the operational needs of LPD.

The problem-solving approach proposed in this study has several advantages compared to the current approach to evaluating the financial health of Village Credit Institutions (LPDs). Currently, LPD financial health evaluations are generally conducted through manual financial report analysis or using simple spreadsheets. Consequently, calculating financial ratios, interpreting analysis results, and preparing financial health reports is relatively time-consuming and potentially leads to calculation errors, as demonstrated in (Utari & Adi Erawati, 2024) which uses the CAMEL method, (Indira, 2022) which uses the CAMEL Plus method, and (Susila, 2017), (Dewi & Yadnyana, 2020) which uses the Balanced Scorecard. The novelty of this research is the development of a web-based LPD financial health evaluation application that is capable of carrying out the financial health analysis process automatically, systematically, and can be done more quickly, accurately, and efficiently.

Research into web-based LPD financial health evaluation applications will make it easier for LPDs to mitigate financial declines. Numerous studies have been conducted on developing web-based applications to maintain LPD financial performance, such as (Wijana et al., 2019)

RESEARCH METHODS

The development of a web-based LPD financial health evaluation application applies a method that is part of the SDLC (System Development Life Circle) as in (Pressman,

2009) which consists of sfive steps, namely: (1) analysis, (2) design, (3) coding, (4) testing, and (5) maintenance. The development stages above can be seen in the flowchart in the figure 1.

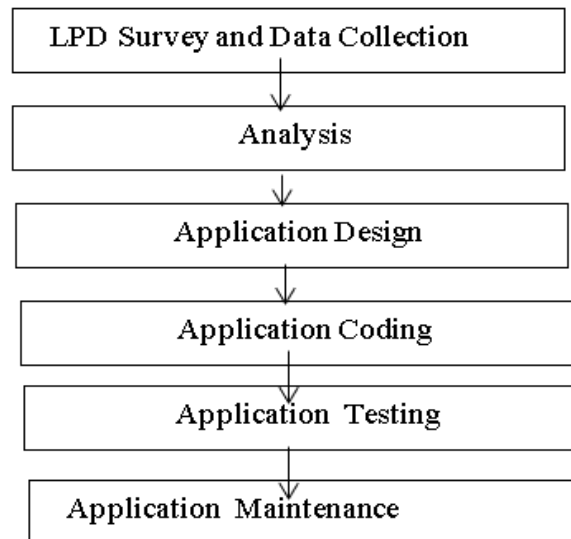


Figure 1. Flowchart

The flowchart Figure 1 describes all the steps of the application development, namely in the analysis step, application requirements can be collected as well as the required information domain and system interface (Ndubuisi et al., 2017) and (Khaledi et al., 2020). The design and coding steps are expected to provide detailed procedures and interface characteristics and translation into a form that can be read by a computer. Finally, in the testing step as mentioned by (Doğan et al., 2014), (Anwar & Kar, 2019) and (Subhiyakto & Utomo, 2016) . Meanwhile maintenance is expected to receive assurance that all software (software) statements and logic have been tested as well as assurance that the specified input will provide actual results as required and the software must be adjusted to accommodate changes in the LPD environment.

RESULTS AND DISCUSSION

The development of a web-based

financial health evaluation application for Village Credit Institutions (LPD) was carried out through a series of systematic stages. The initial stage focused on the analysis of the web-based application system, which included survey data collection, identification of information requirements, and a comprehensive system analysis. Entering the second phase, the application's interface design for the LPD community was developed, followed by the coding process. Subsequent stages involved field functionality testing of the application, concluding with regular system maintenance to ensure optimal performance (Wilson et al., 2024). The results of the research are presented as follows: The respondents who were sampled came from of four LPD representatives, namely LPD Darmasaba, LPD Tegal in Badung Regency and LPD Tonja, LPD Pohgading in Denpasar City. LPD financial health assessments in Badung Regency and Denpasar City have been conducted periodically by both internal and external parties. Most LPDs still use

specific accounting information systems to evaluate their financial health. Seventy-five percent of those evaluating LPD financial health use the CAMEL method, while the remainder use other methods, such as CAMEL Plus, and refer to Bali Governor Regulation Number 44 of 2017 (Bali Governor Regulation Number 44 of 2017, 2017).

The analysis revealed that all LPDs require an IT-based or web-based application for their financial evaluation activities. The application must be able to provide recommendations to LPDs regarding their financial health. Based on this, the application was designed with menus including: 1. Risk-Weighted Assets (ATMR) Evaluation, 2. CAMEL Evaluation, and 3. Recommendations. The ATMR Evaluation Menu covers the calculation of fixed assets according to risk (ATMR) referring to the Bali Governor Regulation Number 44 of 2027 Article 8. ATMR itself consists of asset elements listed in the balance sheet and liabilities that are still administrative in nature as reflected in liabilities that are still contingent and/or commitments provided by the bank to third parties (Fauzi et al., 2020). The CAMEL Evaluation menu covers the calculation of the value of each component in CAMEL, namely Capital (C), Asset (A), Management (M), Earning (E) and Liquidity (L) while determining the predicate of each, the overall CAMEL average, and the overall predicate. Meanwhile, the Recommendation Menu covers the provision of recommendations for LPD managers based on the evaluation results and predicates per

component and as a whole. The ATMR evaluation has several forms of input variables: Cash (K), interbank assets (ABA), interbank assets in non-performing conditions (ABAM), loans granted (P), fixed assets and inventory (ATI), and other assets/miscellaneous assets (ALR). Based on risk, the ATMR formula is $ATMR = 0\%K + 20\%ABA + 100\%ABAM + 100\%P + 100\%ATI + 100\%ALR$ (Peraturan Gubernur Bali Nomor 44 Tahun 2017, 2017). The ATMR value is used as the basis for finding the capital component indicator formula, namely the capital to asset ratio (CAR) = $ATMR / Equity (MS) \times 100$ in the CAMEL Evaluation Menu as the first component. The second component namely Asset Quality is measured by the indicator formula non-performing loan (NPL) = $Non-Performing Loan (KB) / Total Credit (TK) \times 100$, the third component namely Management, with the indicator formula Operating Costs to Operating Income (BOPO) = $Operating Costs (BO) / Operating Income (PO) \times 100$, the fourth component namely Earning, with the indicator formula Return On Assets (ROA) = $Profit (L) / Total Assets (TA) \times 100$, and the last component namely Liquidity (L) with the indicator formula Loan To Deposit Ratio (LDR) = $Total Credit (TK) / Public Funds (DM) \times 100$. LDR helps assess how liquid a bank is. The higher the LDR ratio, the lower the bank's liquidity (Ardiyanti & Pradita, 2025).

The Table 1 describes the calculation of the total score from the CAMEL formula.

Table 1. Camel Formula

Component	Ratio (Ri)	Weight (Wi)	Score (Si)
C	$CAR = MS / ATMR \times 100$	25	S1
A	$NPL = KB / TK \times 100$	35	S2
M	$BOPO = BO / PO \times 100$	10	S3
E	$ROA = L / TA \times 100$	20	S3
L	$LDR = PJ / DM \times 100$	10	S5
TotalCAMEL	$\sum Wi Si / 100$	-	-

Source: Processed data (2026)

In the application in the field and also referring to several sources such as (Eka Nopiyani & Putu Laba Ari Saka Yana, 2023) and (Trisnadewi et al., 2019), and (Wibawa

& Putra Astika, 2020) The conversion from Ratio (Ri) to Score (Si) or predicate for each CAMEL component is described in Table 2.

Table 2. Conversion From Ratio To Predicate

Component	Score		
	100	80	60
C	$Ri \geq 12$	$9 \leq Ri < 12$	$8 \leq Ri < 9$
A	$Ri \leq 2$	$2 < Ri \leq 5$	$5 < Ri \leq 8$
M	$Ri \leq 70$	$70 < Ri \leq 80$	$80 < Ri \leq 90$
E	$Ri \geq 2$	$1.5 \leq Ri < 2$	$1.25 \leq Ri < 1.5$
L	$80 \leq Ri \leq 110$	$70 \leq Ri < 80$	$110 < Ri \leq 120$
Predicate	Very Healthy (VH)	Healthy (H)	Fairly Healthy (FH)

Component	Score	
	40	20
C	$6 \leq Ri < 8$	$Ri < 6$
A	$8 < Ri \leq 12$	$Ri \geq 12$
M	$90 < Ri \leq 100$	$Ri \geq 100$
E	$0.5 \leq Ri < 1.25$	$Ri < 0.5$
L	$60 \leq Ri < 70$	$Ri < 60$ atau $Ri \geq 120$
Predicate	Less Healthy (LH)	Unhealthy (UH)

Source: Processed data (2026)

Meanwhile, the overall predicate based on the total CAMEL score (TNC) is "Healthy" if $TC \geq 81$, "Fairly Healthy" if $66 \leq TC < 81$, "Less Healthy" if $51 \leq TC < 66$, and "Unhealthy" if $TC < 51$.

Based on the overall CAMEL predicate and each CAMEL component, the Recommendations Menu will display the following recommendations to LPD managers as illustrated in Table 3.

Table 3. Overall CAMEL Recommendation

Predicate	Recommendation
1	Focus on credit expansion and digital innovation
2	Maintain performance and improve operational cost efficiencies
3	Carry out intensive collection on non-performing loans and limit non-priority costs
4	Immediately report to the Traditional Village for capital injections and halt the issuance of new loans

Where 1. Healthy, 2. Fairly healthy, 3. Less healthy, and 4. Unhealthy.

The recommendations for each CAMEL component, especially the Capital

component are described in Table 4.

Tabel 4. Capital Component Recommendations

Predicate	Recommendation
VH	Expansion and Modernization
H	Consolidation and Efficiency
FH	Capital Reserve Building
LH	Collection and Restructuring
UH	Rescue and Capital Injection

Where VH=Very healthy, H=Healthy, FH=Fairly healthy, LH= Less healthy, and UH=Unhealthy.

Meanwhile, recommendations for other components are as follows:

1. Asset component recommendations are defined as Maintain excellent credit quality for VH, Maintain consistent credit monitoring for H, Be alert to signs of increasing non-performing loans for FH, Take immediate corrective action for LH, and Temporarily suspend new credit disbursements for UH.
2. Management component recommendations are defined as Maintain a consistently low BOPO ratio for VH, Maintain existing budget management for H, Evaluate less productive general and administrative expense items for FH, Reduce operational costs for LH, and Stop non-essential expenses for UH.
3. Earning component recommendations are defined as Maintain a consistently low BOPO ratio for VH, Maintain existing budget management for H, Evaluate less productive general and administrative expense items for FH, Reduce operational costs for LH, and Stop non-essential

expenses for UH

4. Liquidity component recommendations are defined as Maintain a secure cash structure to maintain public confidence for VH, Maintain minimum liquidity reserve management for H, Check for potential idle funds for FH, Immediately curb new credit disbursement and boost fundraising if the LDR is too high for LH, and Stop the disbursement of new credit and immediately coordinate with the Village Head for UH.

The application design outline above is presented through coding into three modules: the ATMR module, the CAMEL module, and the Recommendation module, along with five submodules corresponding to the five CAMEL components. All modules form an application prototype that can be accessed online at <https://www.prkeulpdbadung.com/program/EvaKesKeuLPD.php> and a preview of the application display can be seen in Figure 2.

Sistem Evaluasi Kesehatan Keuangan LPD

Panel Utama Navigasi Aplikasi

Menu Utama Evaluasi

Selamat datang di Sistem Evaluasi Kesehatan Keuangan Lembaga Perkreditan Desa (LPD).
Silakan pilih salah satu modul di bawah ini untuk memulai proses analisis keuangan.

1. Evaluasi ATMR

Simulasi perhitungan Aset Tetap Menurut Risiko berdasarkan Pergub Bali No. 44 Tahun 2017

2. Evaluasi CAMEL

Analisis rasio komponen Capital, Asset, Management, Earning, dan Liquidity

3. Rekomendasi Pengelola

Form Simulasi Perhitungan ATMR

Komponen Aktiva Menurut Risiko (ATMR)

Kas (K)

Bobot Risiko: 0%

250

Antar Bank Aktiva (ABA)

Bobot Risiko: 20%

325

Antar Bank Aktiva Macet (ABAM)

Bobot Risiko: 100%

220

Pinjaman yang Diberikan (P)

Bobot Risiko: 100%

1000

Analisis CAMEL Lengkap

1. CAPITAL (CAR)

Modal Sendiri

Total ATMR

1665

Update Capital

2. ASSET QUALITY (NPL)

Total Kredit

1000

Kredit Bermasalah

KKL + Diragukan + Macet

Update Asset

4. EARNINGS (ROA)

Laba Sebelum Pajak

Total Aset

Update Earnings

5. LIQUIDITY (LDR)

Pinjaman Diberikan

Dana Diterima (Tab+Dep)

Update Liquidity

Figure 2. Preview Of The Application Display

Next, the application was tested by comparing the application output with a previously prepared EXCEL formula. For the

Capital component, five trials with input of various possible numbers resulted in the following results as described in Table 5.

**Table 5. Capital Component Trial
(In Billions of Rupiah)**

No	ATMR	Equity (MS)	CAR	Predicate	Validity
1	1.665	0.210	12.61	VH	V
2	10.8	10.0	10.8	H	V
3	52.8	4.488	8.5	FH	V
4	15.77	1.099	7.0	LH	V
5	5.77	0.2308	4.00	UH	V

Where VH=Very healthy, H=Healthy, FH= Fairly healthy=LH. Less

Meanwhile, the test results for the other components are as follows:

1. Asset component trial results are defined as: a) The first trial with input total credit = 10.0 and non-performing credit = 0.15 yields an NPL value of 1.5, predicate VH, and valid. b) The second trial with input total credit = 10.8 and non-performing credit = 10.0 yields an NPL value of 10.8, predicate H, and valid. c) The third, fourth, and fifth trials also yield valid results.
2. Management component trial results are defined as: a) The first trial with input operational revenue = 2.0 and operational costs = 1.2 yields a BOPO value of 60, predicate VH, and valid. b) The second trial with input operational revenue = 10.8 and operational costs = 10.0 yields a BOPO value of 10.8, predicate H, and valid. c) The third, fourth, and fifth trials also yield valid results.
3. Earning component trial results are defined as: a) The first trial with input risk-weighted assets (ATMR) = 1.665 and equity = 0.210 yields a CAR value of 12.61, predicate VH, and valid. b) The second trial with input risk-weighted assets (ATMR) = 10.8 and equity = 10.0 yields a CAR value of 10.8, predicate H, and valid. c) The third, fourth, and fifth trials also yield valid results.

healthy, and UH=Not healthy. V=valid.

4. Liquidity component trial results are defined as: a) The first trial with input risk-weighted assets (ATMR) = 1.665 and equity = 0.210 yields a CAR value of 12.61, predicate VH, and valid. b) The second trial with input risk-weighted assets (ATMR) = 10.8 and equity = 10.0 yields a CAR value of 10.8, predicate H, and valid. c) The third, fourth, and fifth trials also yield valid results.

The overall application test results are as follows.:

1. First Trial
 - a. In the ATMR menu, input K=200, ABA=1000, ABAM=1800, P=4000, ATI=1700, ALR=2300 results in ATMR=10,000.
 - b. In the CAMEL Evaluation menu, the components Capital MS=1500, ATMR=10,000; Asset KB=40, TK=4000; Management BO=500, PO=800; Earning L=150, TA=8,000; Liquidity P=4,000, DM=5,200, resulting in a Total CAMEL score of 94, with a Healthy rating.
 - c. In the Recommendations menu, the output is "Focus on credit expansion and digital innovation."
2. Second Trial
 - a. In the ATMR menu, input K=400,

- ABA=1200, ABAM=2000, P=5000, ATI=1760, ALR=3000 yields ATMR=12,000.
- b. In the CAMEL Evaluation menu, the components Capital MS=900, ATMR=12,000; Asset KB=250, TK=5,000; Management BO=720, PO=1,200; Earning L=200, TA=8,500; Liquidity P=5,000, DM=6,000, resulting in a Total CAMEL score of 78, with a Fairly Healthy rating.
 - c. In the Recommendations menu, the output is "Maintain performance, implement operational cost efficiencies."
3. Third Trial
- a. In the ATMR menu, input K=350, ABA=900, ABAM=1100, P=6000, ATI=2110, ALR=2100 results in ATMR=11,500.
 - b. In the CAMEL Evaluation menu, the components Capital MS=1500, ATMR=11,500; Asset KB=400, TK=6000; Management BO=900, PO=1100; Earning L=100, TA=9350; Liquidity P=6000, DM=6500, resulting in a Total CAMEL score of 55, with a rating of Less Healthy.
 - c. In the Recommendation menu, the output is "Carry out intensive collection on non-performing loans and limit non-priority costs."

Based on the results described above, the development of a web-based financial health evaluation application for Village Credit Institutions (LPDs) has gone through analysis, design, and PHP (Hypertext Preprocessor)-based coding, resulting in an application with security authorization. Web security is necessary considering that the website itself can be accessed via a public network (Riska & Alamsyah, 2021). The trial phase has demonstrated valid results for each CAMEL component and the overall CAMEL score. The application has also generated

useful recommendations for LPD administrators as early warnings. These recommendations serve as a mitigation tool. Once the CAMEL score is calculated, the system not only displays a predicate (such as "Healthy" or "Fairly Healthy") but also immediately provides specific recommendations based on the weakened ratio components. The early warning system in this application is very useful for LPDs as financial institutions. This is in line with the findings that the existence of an early warning system has a significant impact on the company's financial health. (Setianingsih et al., 2024).

CONCLUSION

Based on the previous discussion, it can be concluded as follows:

- a) All LPDs in Denpasar City and Badung Regency, Bali, require an IT-based or web-based application for their financial evaluation activities.
- b) The application design consists of menus including: 1. ATMR Evaluation, 2. CAMEL Evaluation, and 3. Recommendations.
- c) Trial results indicate that all individual components and the overall CAMEL are valid.
- d) The application prototype consists of eight modules written in PHP. The dashboard module can be accessed online at <https://www.prkeulpdbadung.com/program/EvaKesKeuLPD.php>

Based on the research findings, several recommendations are proposed to enhance the implementation of the web-based LPD financial health evaluation application. First, LPD managers in Denpasar and Badung are encouraged to adopt this web-based system to minimize human error and utilize the early warning system recommendations for proactive risk mitigation. Second, technical supervisors such as LPLPD and BKS LPD should conduct periodic training for LPD administrators and consider integrating this

application to standardize financial reporting under Bali Governor Regulation No. 44 of 2017. Finally, future researchers are advised to further develop the platform by integrating API connections directly with LPD Core Banking Systems and adding multi-period trend analysis dashboards for long-term performance tracking.

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