

Web-Based Student Savings Management Information System Using Laravel Framework at SD Negeri 1 Jagapura Kulon

Ahlan Ramadhani

Department of Informatics Management, STMIK IKMI Cirebon, Indonesia

ABSTRACT

The administration of student savings is an essential school activity that demands meticulous recording and high accountability. At SD Negeri 1 Jagapura Kulon, this process previously relied on manual physical logbooks and simple spreadsheets, leading to calculation vulnerabilities, risks of document damage or loss, an absence of audit trails for transaction corrections, and significant delays in periodic financial reporting. This study aimed to design and develop a web-based Student Savings Management Information System utilizing the modern Laravel 12 framework and MySQL database. The software development life cycle followed the Waterfall model, encompassing requirements analysis, system design through UML and ERD modeling, software implementation, and testing. The developed application integrates dynamic Role-Based Access Control (RBAC), class-based data scoping via the ScopedByKelas trait, real-time recording of deposits and withdrawals, an internal maker-checker workflow for transaction correction approval, and automated compilation of six comprehensive financial report types in PDF format. Functional verification was conducted using Black-Box Testing across 14 operational scenarios, all of which achieved a 100% pass rate. The results demonstrate that the system successfully satisfies all functional specifications, providing an accurate, structured, and transparent digital solution for managing student savings.

Keyword : Information System; Student Savings; Web-Based; Laravel Framework; Elementary School

 This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.

Corresponding Author:

Ahlan Ramadhani,
Department of Informatics Management
STMIK IKMI Cirebon
Jl. Perjuangan No. 10B, Karyamulya, Kesambi, Cirebon, 45131, Indonesia
Email : ahlanr91@gmail.com

Article history:

Received Aug 30, 2026
Revised Sept 10, 2026
Accepted Sept 26, 2026

1. INTRODUCTION

Cultivating financial literacy and savings habits from primary school age constitutes an integral component of student character development. School-based savings programs serve as practical pedagogical tools that introduce basic money management, encourage financial discipline, and train pupils to prioritize their expenditures (Jogiyanto, 2017). Through consistent saving habits, students not only learn how to set aside portions of their pocket money, but also develop an early understanding of financial planning for future needs. In terms of institutional school management, student savings operations involve substantial daily cash transaction volumes, including routine cash deposits, periodic withdrawals, and end-of-semester financial recapitulations submitted to parents and school authorities.

Despite its educational and administrative significance, field observation and interviews conducted at SD Negeri 1 Jagapura Kulon revealed that student savings administration still relied on traditional pen-and-paper registers and unintegrated spreadsheets. This manual workflow generated multiple operational bottlenecks: (1) High vulnerability to human error during manual arithmetic calculations and balance updates (Dennis, Wixom, & Tegarden, 2021); (2) Absence of standardized audit trails whenever input errors occurred, in which clerical mistakes were crossed out informally without hierarchical approval; (3) Protracted report generation consuming several working days for end-of-semester financial reconciliations; (4) Physical document degradation and risk of physical document damage or loss; and (5) Lack of segregated access control across administrators, treasurers, and homeroom teachers (Stauffer, 2019).

To overcome these structural limitations, modern educational institutions require a centralized, accessible, and secure digital platform. The Laravel framework was chosen for backend development due to its elegant Model-View-Controller (MVC) architectural pattern, expressive Eloquent Object-

Relational Mapping (ORM), automated database migration mechanisms, and built-in protection against common web vulnerabilities such as Cross-Site Request Forgery (CSRF) and SQL injection (Otwell, 2024; Pressman & Maxim, 2020).

Previous studies regarding school financial systems have predominantly focused on general institutional cash flow or basic ledger bookkeeping without addressing the granular data-scoping needs of homeroom teachers or dual-authorization controls for transaction corrections (Lubis et al., 2020; Rosa & Shalahuddin, 2018). Consequently, the novelty of this research lies in the integration of dynamic Role-Based Access Control (RBAC) with class-based data scoping via the custom `ScopedByKelas` trait, coupled with an internal Maker-Checker Workflow for transaction corrections. Under this mechanism, any revision to previously recorded transaction amounts must be submitted with stated justifications by the recording officer (maker) and subsequently validated by the school principal or system administrator (checker) before balances are automatically adjusted using database transactions. This study demonstrates how the web-based system substantially enhances data accuracy, transaction integrity, and administrative transparency at SD Negeri 1 Jagapura Kulon.

2. RESEARCH METHOD

The system was engineered using the Waterfall Software Development Life Cycle (SDLC) model (Pressman & Maxim, 2020). The Waterfall approach was selected because its sequential and systematic phases allow clear milestones from initial requirements gathering to final testing, ensuring rigorous software stability. The chronological phases of the research procedure are illustrated in Figure

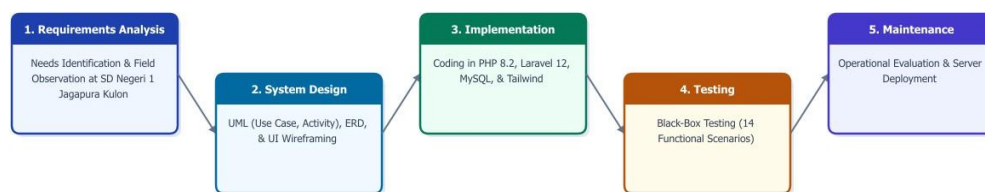


Fig 1. Research Procedure with Waterfall Software Development Life Cycle

The detailed research phases were conducted as follows:

2.1 Requirements Analysis

Data collection commenced through on-site observations at SD Negeri 1 Jagapura Kulon, semi-structured interviews with the school principal, treasurer, and homeroom teachers, as well as an examination of existing paper records. These findings were synthesized into formal functional requirements, summarized in Table 1.

Table 1. Functional Requirements of the Student Savings Information System

Code	Functional Requirement	Relevant Actor	Expected Output
F-01	Authentication & CSRF Protection	All Actors	Secure login via role-based credentials and bcrypt
F-02	Master Data (Classes & Students)	Admin, Treasurer	Complete CRUD operations for class cohorts and student identities
F-03	Bulk Student Import (Excel)	Admin, Treasurer	Rapid population of student rosters via .xlsx templates
F-04	Savings Deposit Recording	Treasurer, Homeroom Teacher	Cash deposit entry with immediate balance increment

F-05	Savings Withdrawal Recording	Treasurer, Homeroom Teacher	Balance overdraft validation and deduction
F-06	Correction Submission (Maker)	Staff / Homeroom Teacher	Formal request to modify erroneous transactions
F-07	Correction Approval (Checker)	Principal / Administrator	Review and approval; atomic balance adjustment
F-08	Class-Based Data Scoping	Homeroom Teacher	Access restricted automatically to assigned class cohort
F-09	PDF Financial Reports (6 Types)	Admin, Treasurer, Teacher	Automated compilation of official PDF passbooks and recaps

2.2 System Design

System design was formalized using Unified Modeling Language (UML) and Entity Relationship Diagrams (ERD):

1. Use Case Diagram: Defines functional boundaries and interactions between the primary actors (Administrator/Staff, School Treasurer, and Homeroom Teacher) and system modules, as depicted in

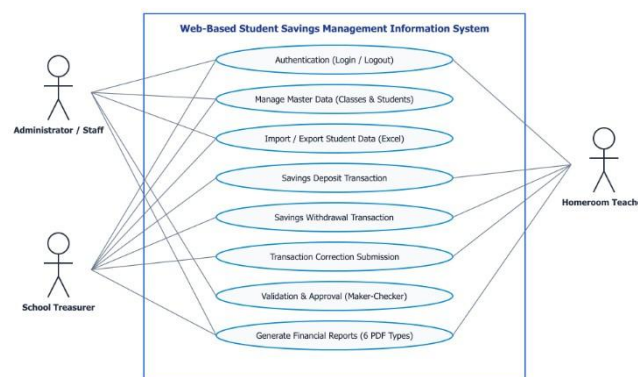


Fig 2. Use Case Diagram of Student Savings Management System

2. Activity Diagram: Formulates the internal Maker-Checker control workflow for transaction corrections. As illustrated in Figure 3, the recording officer acts as the maker, the Laravel backend serves as the validation engine, and the administrator acts as the checker.

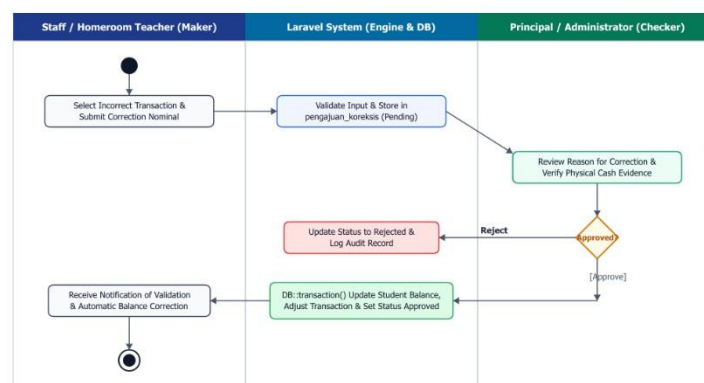


Fig 3. Activity Diagram for Transaction Correction Submission and Approval Workflow

3. Entity Relationship Diagram (ERD): Outlines relational database schemas, foreign key relationships, and cardinality constraints to guarantee structural data integrity, shown in Figure 4.

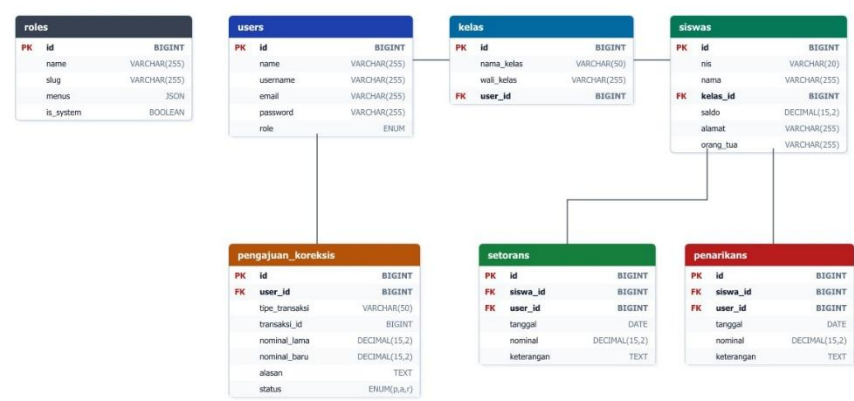


Fig 4. Entity Relationship Diagram (ERD) of Database Schema

2.3 Implementation and System Testing

Software coding was carried out with the following technology stack: PHP 8.2 backend, Laravel 12.0 framework, MySQL 8.0 relational database with the InnoDB engine (ensuring ACID transaction properties), and Tailwind CSS for responsive frontend rendering. Auxiliary libraries included Barryvdh/Laravel-DomPDF for automated document compilation and Maatwebsite/Excel for spreadsheet handling. System verification utilized Black-Box Testing, focusing on Boundary Value Analysis and functional workflow validation without examining internal code logic (Mustaqbal et al., 2015).

3. RESULTS AND DISCUSSION

The research resulted in a web-based student savings management information system deployed and evaluated in the operational environment of SD Negeri 1 Jagapura Kulon. The comprehensive discussion is structured into the following subsections:

A. Database Design and Implementation

The database schema was normalized to the Third Normal Form (3NF) to eliminate data redundancy and preserve referential integrity across financial entries. The physical data dictionary for the primary entities is presented in Table 2.

Table 2. Database Physical Data Dictionary and Schema Structure			
Table Name	Primary Key	Related Foreign Keys	Functional Purpose
users	id (BIGINT)	-	User accounts, encrypted credentials (bcrypt), role identification
roles	id (BIGINT)	-	Dynamic RBAC definitions storing accessible menu arrays in JSON
kelas	id (BIGINT)	user_id -> users	Class cohort information and assigned homeroom teacher
siswas	id (BIGINT)	kelas_id -> kelas	Student demographics, unique NIS, live balance (DECIMAL 15,2)
setorans	id (BIGINT)	siswa_id, user_id	Deposit transaction records, timestamps, and recording officer

penarikans	id (BIGINT)	siswa_id, user_id	Withdrawal records, timestamps, and recording officer
pengajuan_koreksis	id (BIGINT)	user_id -> users	Comprehensive audit trail of transaction modification requests

B. Implementation of Authorization Mechanism and ScopedByKelas

System security incorporates dynamic Role-Based Access Control (RBAC) managed by RoleMiddleware. To satisfy the real-world operational requirement where homeroom teachers must be restricted from viewing or altering savings data belonging to other classes, the application implements a reusable trait named `ScopedByKelas`. This trait injects scoped helper functions (`getKelasScope()` and `getSiswalsScope()`) into data controllers. Consequently, any query dispatched by a homeroom teacher is automatically filtered at the database level. The operational permissions matrix is detailed in Table 3.

Table 3. Role-Based Access Control (RBAC) and ScopedByKelas Matrix

Module / Feature	Administrator / Staff	School Treasurer	Homeroom Teacher (Scoped)
Statistical Analytics Dashboard	Entire School	Entire School	Assigned Class Only
Master Data (Students & Classes)	Full CRUD + Import	Full CRUD + Import	Read-Only (Assigned Class)
Deposit & Withdrawal Transactions	Full Access	Full Access	Assigned Class Only
Transaction Correction Submission	Authorized (Maker)	Authorized (Maker)	Authorized for Class (Maker)
Validation & Approval (Checker)	Full Authority (Checker)	Unauthorized	Unauthorized
PDF Financial Report Generation	6 Report Formats	6 Report Formats	Assigned Class Summary

C. User Interface Implementation

The interface was developed according to user-centered design principles, ensuring responsiveness, visual clarity, and ease of use for educators:

1. Interactive Analytics Dashboard: Displays real-time key performance indicators, including total school savings, daily deposit totals, daily withdrawals, and the number of active student savers, accompanied by an audit table of recent transactions (Figure 5).

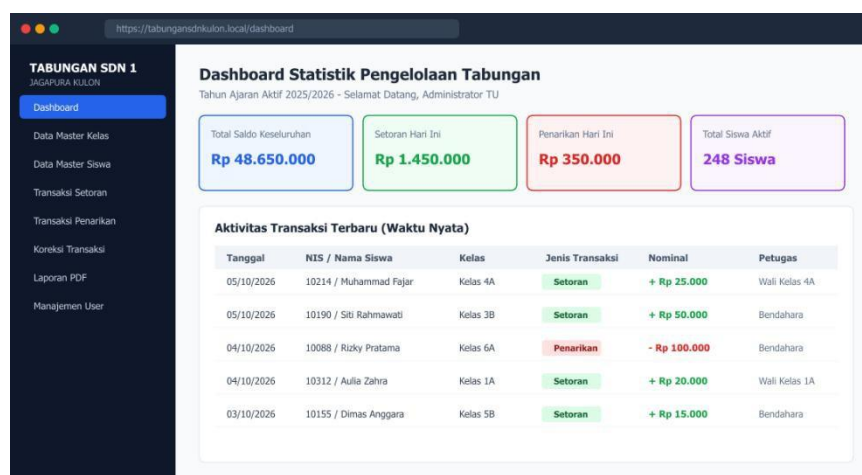


Fig 5. User Interface of the Main Analytics Dashboard

2. Savings Deposit and Withdrawal Transaction Modules: Features responsive auto-complete student searches and proactive server-side safeguards that immediately reject withdrawal requests exceeding the pupil's available balance (Figure 6).

Modul Setoran Tabungan

Pencatatan kas masuk tabungan siswa secara real-time

Pilih Siswa (NIS / Nama)
10214 - Muhammad Fajar (Saldo: Rp 350.000)

Tanggal Transaksi
05 Oktober 2026

Nominal Transaksi (Rp)
Rp 50.000

Keterangan Transaksi
Setoran tabungan mingguan

✓ Saldo otomatis bertambah menjadi Rp 400.000 setelah disimpan.

Simpan Transaksi Setoran

Modul Penarikan Tabungan

Pencatatan penarikan saldo dengan validasi keamanan

Pilih Siswa (NIS / Nama)
10214 - Muhammad Fajar (Saldo: Rp 350.000)

Tanggal Transaksi
05 Oktober 2026

Nominal Transaksi (Rp)
Rp 100.000

Keterangan Transaksi
Penarikan untuk keperluan buku ujian

I Proteksi Validasi: Penarikan divalidasi tidak boleh melebihi saldo aktif.

Simpan Transaksi Penarikan

Fig 6. User Interface of Savings Deposit and Withdrawal Transactions

3. Transaction Correction and Maker-Checker Management: Erroneously recorded entries can be submitted for revision by recording officers, entering a pending validation queue. Administrators evaluate the attached justification and either approve or reject the request (Figure 7).

Manajemen Pengajuan dan Validasi Koreksi Transaksi

Fitur Kontrol Internal (Maker-Checker): Koreksi hanya berlaku setelah disetujui Administrator

Semua (12)Menunggu Validasi (2)Disetujui (8)Ditolak (2)

ID / Tgl	Pengaju (Maker)	Tipe / Siswa	Nominal Lama	Nominal Baru	Alasan Koreksi	Status / Aksi
#K-08 (05/10)	Wali Kelas 4A	Setoran / M. Fajar	Rp 250.000	Rp 25.000	Salah ketik kelebihan nol satu	ApproveReject
#K-07 (04/10)	Bendahara	Penarikan / SBI R.	Rp 20.000	Rp 50.000	Koreksi penyusutan buku kas	ApproveReject
#K-06 (02/10)	Wali Kelas 2B	Setoran / Rizky P.	Rp 10.000	Rp 20.000	Kerjasama terbelang lembar 2	Disetujui
#K-05 (01/10)	Wali Kelas 3A	Setoran / Aulia Z.	Rp 50.000	Rp 100.000	Bukti fisik tidak sesuai saldo fisik	Ditolak

Fig 7. User Interface of Transaction Correction & Approval Management

4. Automated Financial Reporting and PDF Compilation: Automates the generation of six distinct financial report formats in ready-to-print PDF layout, featuring institutional letterheads, tabulated mutation recaps, and validation signature sections (Figure 8).

PEMERINTAH KABUPATEN CIREBON

DINAS PENDIDIKAN DAN KEBUDAYAAN

SD NEGERI 1 JAGAPURA KULON

Jl. Ki Bagoes Ranjin No. 10, Jagapura Kulon, Kec. Gegerib, Cirebon, Jawa Barat

LAPORAN REKAPITULASI TABUNGAN KELAS

Tingkat Kelas: 4A | Periode Semester Ganjil T.A. 2025/2026

No	NIS	Nama Siswa	Total Setoran	Total Penarikan	Saldo Akhir
1	10214	Muhammad Fajar	Rp 450.000	Rp 50.000	Rp 400.000
2	10215	Nadha Putri	Rp 380.000	Rp 0	Rp 380.000
3	10216	Rian Hidayat	Rp 520.000	Rp 100.000	Rp 420.000
4	10217	Salma Sahabilla	Rp 290.000	Rp 40.000	Rp 250.000
5	10218	Zaki Al Farizi	Rp 610.000	Rp 150.000	Rp 460.000
TOTAL KELAS 4A			Rp 2.250.000	Rp 340.000	Rp 1.910.000

Mengakhiri,
Kepala SDN 1 Jagapura Kulon

Cirebon, 05 Oktober 2026
Bendahara Sekolah / Wali Kelas

NIP. 19780322 200801 1 008

NIP. 19780322 200801 2 015

Fig 8. Generated Student Savings Financial Report (PDF Document Preview)

D. System Testing

Functional verification was executed across 14 comprehensive operational scenarios covering authentication, class-based isolation, transaction constraints, correction approvals, and document exports. The test results are documented in Table 4.

Table 4. Functional Black-Box Testing Results

No	Test Scenario	Input / Test Action	Expected Result	Status
1	Valid User Authentication	Correct username and password	Successful login; redirected to role dashboard	Valid
2	Invalid Password Defense	Correct username, invalid password	Access denied; credential error message displayed	Valid
3	RBAC Route Protection	Homeroom Teacher navigates to /users	Route blocked; HTTP 403 Forbidden returned	Valid
4	Class-Based Data Scoping	Teacher of Class 4A views student roster	Displays solely pupils enrolled in Class 4A	Valid
5	Single Student Registration	Valid form submission with unique NIS	Saved to database with initial balance Rp0	Valid
6	Batch Student Import (Excel)	Upload 30-student .xlsx template	Batch parsed and imported without data loss	Valid
7	Cash Deposit Transaction	Deposit Rp50,000 to student account	Transaction logged; balance increases by Rp50,000	Valid
8	Legitimate Cash Withdrawal	Withdraw Rp20,000 (Current balance: Rp150,000)	Transaction logged; balance reduced by Rp20,000	Valid
9	Overdraft Prevention	Withdraw Rp150,000 (Current balance: Rp50,000)	Blocked with alert: "Insufficient account balance"	Valid
10	Correction Request Submission	Submit revision from Rp250,000 to Rp25,000	Record queued with "Pending" review status	Valid
11	Maker-Checker Approval	Admin approves pending correction	Status set to "Approved"; balance atomically adjusted	Valid
12	Maker-Checker Rejection	Admin rejects pending correction	Status set to "Rejected"; original transaction preserved	Valid
13	PDF Report Export	Select Class 4A filter and export	Formatted PDF downloaded with headers and recaps	Valid
14	Academic Term Rollover	Execute end-of-year data reset	Graduating cohort archived; new term initialized	Valid

4. CONCLUSION (10 PT)

This research successfully designed, developed, and evaluated a Web-Based Student Savings Management Information System at SD Negeri 1 Jagapura Kulon using the Laravel 12 framework and MySQL database following the Waterfall SDLC model. The system successfully modernizes paper-based logbooks into a centralized digital repository, eliminates arithmetic errors in balance calculations, and accelerates semester financial reporting from days to seconds.

The incorporation of dynamic Role-Based Access Control (RBAC) with the ScopedByKelas trait ensures data governance across homeroom teachers, while the Maker-Checker workflow strengthens internal financial controls and auditability. Future research recommendations include: (1) Integrating WhatsApp Gateway APIs for automatic, instant transaction receipts sent directly to parents' mobile devices; and (2) Developing a dedicated Progressive Web App (PWA) portal allowing parents to monitor their children's savings history independently.

ACKNOWLEDGEMENTS

The author expresses sincere gratitude to STMIK IKMI Cirebon, particularly the Department of Informatics Management, for the academic support and computational resources provided throughout this study. Sincere appreciation is also extended to the Principal, faculty, and administrative staff of SD

Negeri 1 Jagapura Kulon for their valuable cooperation, field data access, and constructive feedback during system deployment.

REFERENCES (10 PT)

Al-Khowarizmi, A., Sitompul, O. S., Suherman, S., & Nababan, E. B. (2017). Measuring the Accuracy of Simple Evolving Connectionist System with Varying Distance Formulas. In Journal of Physics: Conference Series (Vol. 930, No. 1, p. 012004). IOP Publishing.

Dennis, A., Wixom, B. H., & Tegarden, D. (2021). Systems Analysis and Design: An Object-Oriented Approach with UML (6th ed.). Hoboken: John Wiley & Sons.

Fauzi, F., Al-Khowarizmi, A. K., & Muhathir, M. (2020). The e-Business Community Model is Used to Improve Communication Between Businesses by Utilizing Union Principles. JITE (Journal of Informatics and Telecommunication Engineering), 3(2), 252-257.

Fitriani, L., & Nurfalah, R. (2021). Rancang Bangun Sistem Informasi Pengelolaan Tabungan Siswa Berbasis Web Menggunakan Metode Waterfall. Jurnal Algoritma, 18(1), 88-96.

Jogiyanto, H. M. (2017). Analisis dan Desain Sistem Informasi: Pendekatan Terstruktur Teori dan Praktik Aplikasi Bisnis. Yogyakarta: Andi Offset.

Korb, K. B., & Nicholson, A. E. (2011). Bayesian Artificial Intelligence (2nd ed.). Boca Raton: CRC Press.

Ladjudin, A. B. (2013). Analisis dan Desain Sistem Informasi. Yogyakarta: Graha Ilmu.

Lubis, A. R., Lubis, M., & Al-Khowarizmi. (2020). Optimization of distance formula in K-Nearest Neighbor method. Bulletin of Electrical Engineering and Informatics, 9(1), 326-338.

Lubis, A. R., Lubis, M., & Listriani, D. (2019, August). Big Data Forecasting Applied Nearest Neighbor Method. In 2019 International Conference on Sustainable Engineering and Creative Computing (ICSECC) (pp. 116-120). IEEE.

Mustaqbal, M. S., Firdaus, R. F., & Rahmadi, H. (2015). Pengujian Aplikasi Menggunakan Black Box Testing Boundary Value Analysis. Jurnal Ilmiah Teknologi Informasi Terapan, 1(3), 31-36.

Otwell, T. (2024). Laravel Documentation: The PHP Framework for Web Artisans. Retrieved from <https://laravel.com/docs>

Pressman, R. S., & Maxim, B. R. (2020). Software Engineering: A Practitioner's Approach (9th ed.). New York: McGraw-Hill Education.

Pratama, I. P. A. E. (2020). Sistem Informasi dan Implementasinya. Bandung: Informatika.

Rosa, A. S., & Shalahuddin, M. (2018). Rekayasa Perangkat Lunak Terstruktur dan Berorientasi Objek. Bandung: Informatika.

Setiawan, A., & Kurniawan, D. (2022). Penerapan Role-Based Access Control (RBAC) pada Sistem Administrasi Sekolah Berbasis Web. Jurnal Teknologi Komputer dan Informatika, 8(2), 142-150.

Sommerville, I. (2019). Software Engineering (10th ed.). London: Pearson Education.

Stauffer, M. (2019). Laravel: Up & Running: A Framework for Building Modern PHP Apps (2nd ed.). Sebastopol: O'Reilly Media.

Suprianto, A., & Azis, M. (2021). Rancang Bangun Sistem Informasi Tabungan Sekolah Berbasis Framework Laravel. Jurnal Sistem Informasi Bisnis, 11(2), 115-123.

BIOGRAPHIES OF AUTHORS

	Ahlan Ramadhani was born in Cirebon, West Java, Indonesia. He is currently pursuing an Associate Degree (D3) in Informatics Management at STMIK IKMI Cirebon. His academic research interests include Web Development, Software Engineering, and Database Management Systems. In this research, he served as the principal investigator and lead software developer for the Web-Based Student Savings Management Information System at SD Negeri 1 Jagapura Kulon.
---	--