

Accounting Process Digitalization through a Spreadsheet Based Information System : A PIECES and Internal Control Approach

Melania Lintang Kenisah¹, Yarisha Nafhan Tyara²

^{1,2}Accounting, Universitas Informatika dan Bisnis Indonesia, Indonesia
mkenisah@gmail.com

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ABSTRACT

Digitalizing accounting processes in small businesses requires not only replacing paper records with digital tools but also aligning technology with business processes, information needs, and internal control requirements. This study analyzes and redesigns the accounting information system of Kencana Anggrek Jewelry Store, Junti Branch, using an integrated systems analysis approach. A descriptive qualitative case study was conducted through observation, semi-structured interviews, and documentation. Problems in the existing system were diagnosed using the PIECES framework, followed by As-Is document flowcharting, accounting risk and internal control analysis, system requirements identification, and To-Be system modeling using a context diagram and Data Flow Diagrams. The proposed system was implemented using Microsoft Excel with Google Drive backup. Functional testing and post-implementation owner interviews were used to evaluate the system. The findings show that the manual system was characterized by repetitive calculations, dependence on physical documents, delayed reporting, incomplete segregation of duties, and risks of recording errors and data loss. The redesigned spreadsheet-based accounting information system introduced structured transaction recording, automated calculations, integrated daily-to-monthly recapitulation, standardized reporting, and digital backup. All tested functions operated as expected. The owner also reported positive evaluations regarding usability, relevance, perceived accuracy, timeliness, and operational feasibility. The study demonstrates that spreadsheet-based digitalization can provide a practical and traceable accounting system improvement for resource-constrained small businesses when system requirements are directly derived from operational problems and control risks. However, the study does not measure quantitative before-and-after effectiveness, limiting conclusions regarding performance improvement. Future studies should test measurable efficiency, error reduction, and scalability.

Keywords : Accounting Digitalization; Accounting Information System; Internal Control; PIECES; Spreadsheet-Based AIS.

INTRODUCTION

Digital transformation has changed the way organizations conduct business processes, manage information, and respond to changes in the business environment. One manifestation of digital transformation is the use of technology in financial recording, processing, and reporting activities. Digital technology not only serves to replace manual work but also enables transaction data to be collected, stored, and processed in a more structured manner to generate relevant accounting information for decision-making [1]. Previous studies have shown that the use of digital technology in micro, small, and medium-sized enterprises (MSMEs) can help organizations improve efficiency, flexibility, and information management capabilities [2], [3], [4]. However, these benefits are not necessarily realized automatically, as digital transformation among MSMEs continues to face various constraints, particularly in terms of human resources, technological capabilities, infrastructure, and organizational readiness to integrate technology into business processes [3].

The digitalization of accounting functions has become an important component of business transformation, particularly for MSMEs with limited resources that require efficient operational processes and high-quality accounting information. The use of digital accounting systems has been shown to support the processing of larger volumes of transactions, accelerate the provision of information, and improve the efficiency of accounting functions [5]. In the context of Vietnamese MSMEs, Thuan et al. demonstrated that the use of accounting information systems is influenced, among other factors, by the relative advantage of technology and owner or manager commitment, and subsequently has a positive effect on system effectiveness and business performance [6]. Meanwhile, in the Indonesian context, cloud accounting adoption is influenced by organizational readiness, information technology infrastructure, stakeholder pressure, and regulatory compliance, while its implementation contributes to improvements in the quality of MSMEs' financial reports [7]. These findings emphasize that the success of accounting digitalization is determined not only by the availability of technology but also by its alignment with business process requirements, organizational readiness, and the ability of the system to generate relevant and high-quality information.

Despite the various benefits offered by accounting technologies, some MSMEs continue to rely on manual record-keeping, resulting in various problems related to transaction management and the provision of financial information. Darmawan et al. found that sales recording using physical books in microenterprises creates risks of data loss, calculation errors, incomplete transaction records, and difficulties in preparing transaction [8]. Vidyasari and Febriyan showed that manual record-keeping and inconsistencies in recording systems across business units can hinder the preparation of financial statements and the provision of information required by management for control and decision-making [9]. Research by Rista and Azmiyanti on cash management also demonstrated that simple and non-computerized recording systems may coexist with weaknesses in segregation of duties, documentation, and transaction controls [10]. These conditions indicate that improving a recording system cannot be achieved merely

by transferring records from paper-based to digital media. Such changes should be preceded by an understanding of the existing business processes, sources of problems, information requirements, and control risks embedded in those processes.

Similar conditions were identified at Kencana Anggrek Jewelry Store, Junti Branch. This retail business engages in jewelry sales and purchases as well as jewelry repair services, while its bookkeeping and transaction recapitulation processes are still performed manually. Preliminary observations indicate that transactions are recorded in physical books. Cash calculations and daily and monthly transaction summaries are also prepared manually with the assistance of a calculator. These conditions increase the time required for transaction recapitulation, create dependence on physical documents, and result in the absence of data backups in the event that records are lost or damaged. The lack of an integrated system also limits the owner's ability to obtain financial information promptly as a basis for evaluating business activities. The field conditions further indicate risks associated with lengthy recapitulation processes, the absence of supporting hardware, the lack of a data backup mechanism, and the vulnerability of physical documents.

These system-related problems require an analysis that extends beyond merely identifying application requirements. System development should begin with an adequate understanding of how business processes operate, who the relevant stakeholders are, what information is required, what problems exist within the current system, and what risks and control weaknesses need to be addressed. Systems analysis and design approaches emphasize problem identification, user requirements, fact finding, and process modeling as essential activities before a new system is designed or developed [11]. In the context of accounting information systems, system documentation through flowcharts and data flow diagrams (DFDs) is used to represent processes, data flows, and relationships among components within the system [1].

One approach that can be used to systematically identify system weaknesses is the PIECES framework. PIECES classifies system problems into six dimensions: Performance, Information, Economics, Control, Efficiency, and Service. In accounting information systems research, this framework has been applied to evaluate system performance, information and data quality, economic aspects, control and security, efficiency, and system services [12].

Several previous studies have proposed digital solutions to similar problems, although with different areas of emphasis. Darmawan et al. designed a sales accounting information system using Microsoft Excel and VBA for a culinary enterprise by applying the SDLC approach, internal controls, and PIECES evaluation [8]. Other studies have focused more specifically on the determinants of cloud accounting adoption and its compatibility with business characteristics [7], [13]. Meanwhile, other research on accounting digitalization has emphasized the benefits and barriers associated with technology implementation within organizations [14]. Furthermore, Suyatna employed DFD modeling to design the automation of financial transaction processes through technology integration [15]. Based on these research trends, previous studies have generally treated technology

adoption, application implementation, system evaluation, and internal control as relatively separate areas of investigation. Research in the context of small businesses that integrates system problem diagnosis, risk and internal control weakness assessment, requirements formulation, system modeling, solution implementation, and user evaluation into a single traceable AIS development process remains limited.

This study offers an integrated approach that combines problem diagnosis using the PIECES framework, the assessment of risks and internal control weaknesses in the existing system, and proposed system modeling within a unified Accounting Information Systems analysis and design framework. This approach enables each proposed system requirement to be traced back to the operational problems and control risks identified in the actual business processes. Accordingly, this study aims to analyze the existing accounting information system at Kencana Anggrek Jewelry Store, Junti Branch; identify its problems, information requirements, risks, and control weaknesses; and design and implement a Microsoft Excel-based accounting information system that is aligned with the operational needs of the business. The developed system is subsequently evaluated through functional testing and qualitative user evaluation. Thus, the study demonstrates how operational problems, information requirements, and internal control weaknesses can be systematically translated into a context-specific AIS design for a small business.

METHOD

This study employed a descriptive qualitative approach with a case study design, combined with a systems analysis and design approach. The case study design was selected because the research focused on an in-depth exploration of business processes, recording practices, problems, information requirements, and system requirements within the actual operational environment. A case study approach has also been applied in previous research on accounting digitalization to identify actual organizational conditions, technologies used, implementation barriers, and benefits arising from system transformation processes [14]. Meanwhile, the qualitative approach enables researchers to obtain an in-depth understanding of processes, experiences, needs, and problems encountered by system users [13].

The research object was the transaction recording and reporting system at Kencana Anggrek Jewelry Store, Junti Branch, Bandung Regency, West Java, while the unit of analysis was the transaction recording and reporting process conducted at the branch. The scope of the study included activities related to recording cash receipts and disbursements, transaction recapitulation, cash calculation, and the provision of information to the store owner. Field data were collected through observations conducted from March 5 to May 5, 2026. The operational activities observed included jewelry sales, jewelry repurchases, and jewelry repair services. At the time of the study, administrative and financial recording processes were still performed manually; therefore, transaction processing, recapitulation, and the provision of financial information became the primary focus of the existing-system analysis.

The research framework adapted the principles of systems analysis, requirements discovery, and process modeling proposed by Whitten et al. [11]. To align the framework with the objectives of the study, the research stages were organized into System Initiation and Problem Analysis, Existing Accounting System Analysis, Accounting Risk and Internal Control Analysis, System Requirements and Proposed System, System Modeling and Spreadsheet-Based AIS Design, and System Implementation and Evaluation. The study did not conduct a quantitative assessment of implementation effectiveness or a statistical comparison of conditions before and after system implementation. The evaluation was limited to functional testing to verify system functionality and qualitative user evaluation.

Research data were obtained from individuals directly involved in the business processes and use of information within the research setting, as well as from documents related to transactions and operational procedures. Data were collected through observation, interviews, and documentation. These three techniques were employed as part of the fact-finding process to obtain an understanding of activities, involved parties, documents, information flows, problems, and system requirements. In systems analysis, fact finding may be conducted through document examination, observation, interviews, questionnaires, and other requirements elicitation techniques [11]. Interviews, observations, and documentation have also been applied in previous research on internal control in MSMEs to understand cash receipt and disbursement processes, transaction recording, segregation of duties, and control weaknesses within existing processes [10].

Observations were conducted by directly examining the stages of business activities, parties involved, documents used, transaction recording processes, and the movement of information across functions. Semi-structured interviews were conducted with three informants, consisting of the store owner and two store attendants who were directly involved in transactions, recording, recapitulation, and the use of financial information. Semi-structured interviews provided flexibility for the researcher to explore users' experiences and the reasons underlying existing practices, while the use of multiple sources of information enriched the findings and enhanced their validity [13]. Documentation was used to complement the observation and interview results through the examination of transaction evidence, financial records, forms, reports, and other operational documents related to the accounting information system at the research site.

Data obtained through these three techniques were subsequently organized according to business process activities, parties involved, documents used, information flows, identified problems, and information requirements. Information obtained from interviews was compared with directly observed conditions and available documents to ensure consistency with the actual facts of the existing system. The identified facts were then used as the basis for problem analysis, existing-system mapping, identification of risks and internal control weaknesses, and formulation of proposed system requirements.

The first stage of analysis was System Initiation and Problem Analysis. At this stage, stakeholders interacting with the system were identified, major activities were mapped, and facts concerning existing problems were collected. The identified

problems were then classified using the PIECES framework, which consists of performance, information, economics, control, efficiency, and service [12]. PIECES was used as a diagnostic framework rather than as a statistical testing instrument. Each field finding was categorized according to the relevant dimension to identify areas of the system requiring improvement. The results of this analysis provided an initial understanding of the functional requirements, information requirements, and non-functional requirements that needed to be considered in developing the proposed system.

The next stage was Existing Accounting System Analysis, which involved an analysis of the current or as-is system. The actual processes were documented using an As-Is Document Flowchart to illustrate activities, document flows, responsible parties or functions, and relationships among activities within the existing accounting information system. A document flowchart is used to trace the flow of documents and information across different areas of responsibility within an organization, thereby helping to identify how transactions are recorded, processed, and communicated to parties requiring the information [1].

Based on the mapping of the existing system, risk points and internal control weaknesses that could affect the completeness, accuracy, security, and reliability of information were identified. The control analysis considered transaction authorization, segregation of responsibilities, adequacy of documents and records, safeguarding of assets and data, and review of activities and recording outputs [1]. These aspects were used to identify potential recording errors or omissions, data loss, processing delays, weak authorization, overlapping responsibilities, inadequate documentation, and weaknesses in supervision relevant to the conditions of the research object. Previous research on MSMEs has also demonstrated that the absence of segregation of duties, weaknesses in recording processes, and risks arising from employee negligence are control issues that should be considered when developing a more structured recording system [10].

Findings from the PIECES analysis, the As-Is Document Flowchart, and the risk and internal control analysis were subsequently used in the Requirement Identification stage. System requirements were formulated by translating each identified problem and weakness in the existing system into functional and information requirements that should be fulfilled by the proposed system. The relationship between findings and system requirements was systematically documented through a problem-risk/control weakness-system requirement traceability matrix. This mechanism was used to ensure that each formulated requirement was grounded in actual business process conditions, so that the proposed system was not designed solely around technological features but was directed toward resolving identified problems and meeting user needs.

The subsequent stage was system modeling, involving the development of a proposed or to-be system model based on the identified requirements. The modeling process began with the preparation of a To-Be Document Flowchart to illustrate proposed changes in procedures, activity flows, and responsibilities within the business processes. Modeling was then continued with a Context Diagram to represent the system boundaries, external entities interacting with the system, and the data exchanged between the system and those entities. A Data Flow

Diagram (DFD) Level 0 was then used to represent the main processes, data flows, and data stores within the system, while DFD Level 1 was used to decompose selected processes into greater detail. A DFD graphically represents data sources and destinations, data flows, transformation processes, and data stores, thereby enabling information processing within the system to be understood in a structured manner [1].

The final stage of the study comprised system implementation and evaluation. The Microsoft Excel-based system developed in this study was implemented at the research site and tested through scenario-based functional testing to ensure that its main functions—including transaction recording, automated calculations, classification of receipts and disbursements, daily and monthly recapitulation, file storage, and data backup—operated in accordance with the requirements previously formulated. User evaluation was conducted through a post-implementation interview with the store owner to assess the system's usability, relevance, perceived accuracy, timeliness, and operational feasibility. The study did not conduct a quantitative evaluation of implementation effectiveness or a statistical comparison between conditions before and after system implementation.

The validity of the analysis was strengthened through methodological triangulation by comparing information obtained from observations, interviews, and documentation. Inconsistencies across data collection techniques were re-examined against field conditions or clarified through relevant information sources before being used as the basis for analysis. In addition, development traceability was maintained by linking each system requirement to the problems and risks or control weaknesses identified in the existing system. Accordingly, the research process established a traceable relationship of problem → risk/control weakness → system requirement → proposed system model → implementation → system evaluation. The final outputs of the study comprised the PIECES analysis, As-Is Document Flowchart, risk and control weakness matrix, system requirements matrix, To-Be Document Flowchart, Context Diagram, DFD Level 0, DFD Level 1, implementation of the spreadsheet-based AIS, functional testing results, and post-implementation user evaluation.

RESULTS AND DISCUSSION

System Initiation and Problem Analysis

The System Initiation and Problem Analysis stage was conducted to identify the parties with an interest in the system and to determine the major problems associated with the existing financial recording and reporting processes.

Stakeholder Identification

The organizational structure of Kencana Anggrek Jewelry Store, Junti Branch, is relatively simple and consists only of the store owner and two store attendants. Based on the organizational structure, observations, and interview findings, three main stakeholder groups were identified as relevant to the accounting information system under analysis.

Table 1. Stakeholders in the Existing Accounting Information System

Stakeholder	Classification	Role in the Existing System	Interest in the System
Store Owner	System Owner and information user	Establishes policies, supervises operational activities, authorizes and verifies daily and monthly reports, and reconciles accounting records with physical cash balances	Requires accurate, timely, and easily verifiable information on transactions, cash flows, and financial summaries
Store Attendants 1 and 2	Primary System Users	Handle sales and buyback transactions, verify jewelry weight, prepare transaction receipts, record transactions in physical books, manage operational activities, and submit reports to the owner	Require recording procedures that are simple, fast, consistent, and capable of reducing repetitive calculations and record-keeping activities
Customers	External Stakeholders	Conduct jewelry purchases and buyback transactions, use jewelry repair or maintenance services, and receive receipts as transaction evidence	Require accurate information regarding products, jewelry weight, prices, and transaction evidence

PIECES Analysis

The PIECES framework classifies system problems into six dimensions: Performance, Information, Economics, Control, Efficiency, and Service. In the framework proposed by Whitten et al., these six categories are used to identify areas requiring improvement in system performance, information quality, economic aspects, control, efficiency, and service [11].

Table 2. PIECES Analysis of the Existing System

PIECES	Existing System Condition	Major Problem	Impact
Performance	Daily and monthly transaction summaries are prepared by adding individual receipts one by one using a calculator.	The process requires repeated manual calculations and relatively long processing time. Based on the user's estimate, monthly recapitulation typically requires approximately two hours under the manual system.	Completion of daily and monthly bookkeeping is delayed, increasing the likelihood of delays in report preparation.
Information	Data originate from handwritten receipts and are subsequently transferred into manual accounting records, involving at least one manual data-transfer stage from source documents to accounting records.	Writing or calculation errors may result in inaccurate information and discrepancies between recorded balances and physical cash.	Financial information becomes less timely and less reliable as a basis for the owner's evaluation.
Economics	Digitalization is not yet supported by a store-owned computer or laptop; at the	Hardware investment is required, while substantial working	Human resources are not utilized optimally, including

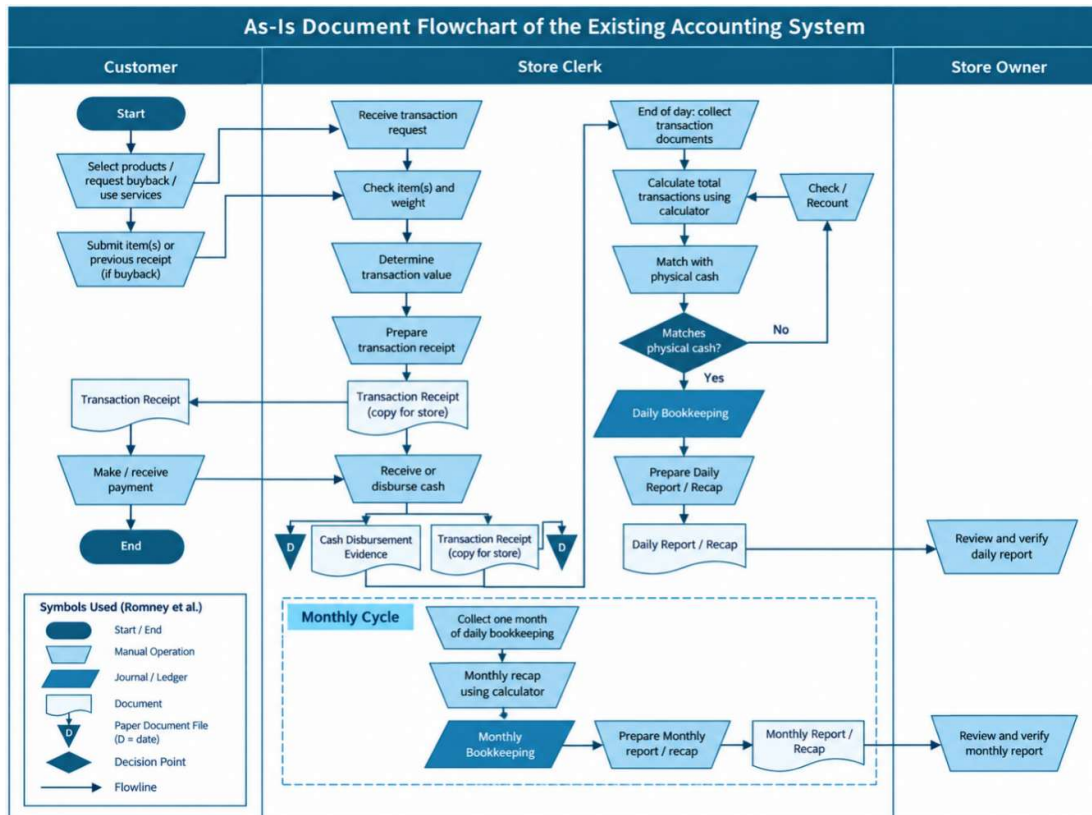
	time of analysis, the store had no dedicated computer or laptop (0 units) for accounting administration. Administrative activities also require repeated calculations and record keeping.	time is currently consumed by manual administrative activities.	approximately two hours of working time for monthly recapitulation alone.
Control	Source documents and accounting records are maintained in physical form and manually verified by the owner.	There is no digital backup (0 digital backup copies) of the accounting records; books and receipts are vulnerable to loss, damage, tearing, or illegibility.	Transaction histories may be lost, making data verification and reconstruction difficult.
Efficiency	Transaction data pass through four sequential manual stages: receipt → calculation → daily bookkeeping → monthly recapitulation.	Repetitive work is required, including calculator-based processing and repeated recapitulation across the four stages.	The repeated processing increases the time and effort required for bookkeeping. Based on the user's estimate, monthly recapitulation alone requires approximately two hours under the manual process.
Service	Reports for the owner are available only after the manual recapitulation process has been completed.	The system is unable to provide financial information promptly to internal users; for monthly information, the recapitulation process itself requires approximately two hours.	The owner cannot obtain updated bookkeeping information immediately for business monitoring and evaluation.

These findings indicate that the problems associated with manual record keeping in small businesses extend beyond the use of paper-based media and affect processing speed, information quality, control capability, and process efficiency. The user-reported estimate of approximately two hours for monthly transaction recapitulation further illustrates the performance and efficiency limitations of the manual system, particularly because individual transaction records must be recalculated and summarized manually. This findings are consistent with Darmawan et al., who showed that manual record keeping in microenterprises increases the risks of errors, data loss, and difficulties in transaction recapitulation [8], as well as with Vidyasari and Febriyan, who found that non-computerized recording systems constrain the provision of information to management [9].

Existing Accounting System Analysis

The analysis of the existing accounting system was conducted to understand how transactions were processed, documented, summarized, and reported prior to the development of the new system design. This analysis is important because

transaction documents, accounting records, operational procedures, and interactions among users can reveal the business functions currently being performed and the types of data that should be retained in the proposed system [11]. In this study, the existing system was mapped using an As-Is Document Flowchart to illustrate the flow of documents among customers, store attendants, and the store owner.



Picture 1. As-Is Document Flowchart of the Existing Accounting System

Accounting Risk and Internal Control Analysis

Accounting risk and internal control analysis was conducted based on the activities and document flows previously mapped in the As-Is Document Flowchart.

Table 3. Accounting Risk and Internal Control Analysis

No.	Process / Risk Area	Existing Condition	Accounting Risk / Exposure	Existing Control	Internal Control Weakness	Risk Level*
R1	Transaction recording and calculation	Receipts are prepared manually, and transaction totals are calculated using a calculator	Writing errors, calculation errors, or inaccuracies in transaction amounts	Physical receipts are used as source documents, and final results are reconciled	No automated calculation, input validation, or systematic checking of entered data is available	High

R2	Cash receipts and disbursements	Store attendants are involved in transactions, receive and disburse cash, and perform transaction recording	Cash discrepancies, recording errors, or potential cash misuse may be difficult to detect promptly	Physical cash is reconciled with the daily summary at the end of each day, and the owner reviews the report	Segregation between custody of cash and the recording function has not been formally defined	High
R3	Completeness of transaction records	Recording depends on physical receipts that are subsequently summarized manually	Transactions may be omitted, incompletely recorded, or excluded from the accounting records	Receipts are used as the basis for bookkeeping	Completeness of recording depends heavily on user accuracy; no automated check is available to identify unrecorded transactions	Medium-High
R4	Physical document storage	Receipts and accounting books serve as the primary storage media	Transaction histories may be lost due to documents being misplaced, torn, water-damaged, or becoming illegible over time	Physical documents are retained as archives	No digital backup or alternative storage medium is available	High
R5	Daily-to-monthly bookkeeping	Monthly bookkeeping is prepared by compiling and recalculating daily records	Transfer errors, duplication, or inconsistencies between daily and monthly records	Monthly summaries are compared with daily bookkeeping records	Daily and monthly data are not integrated, resulting in repeated calculations and record keeping	High
R6	Cash disbursement	Operating expenses and petty cash disbursements are recorded together during the recapitulation process	Expenditures may be incompletely documented or incurred without adequate supporting evidence	Cash disbursement evidence is collected and included in the daily summary	No prior authorization mechanism, expenditure limit, or specific approval procedure for cash outflows has	Medium-High

					been established	
R7	Management reporting	Reports are generated only after all manual processes have been completed	Information may reach the owner late, delaying monitoring and decision-making	The owner receives and verifies daily and monthly reports	Controls are predominantly detective, occurring after transactions have taken place, and are not supported by immediately available information	Medium
R8	Independent verification	The owner reviews reports against cash balances and accounting records	Errors that are not apparent in source documents may be carried forward into reports	Owner review and cash reconciliation function as independent checks	The effectiveness of verification remains dependent on documents and summaries manually prepared by store attendants	Medium

*The risk level represents an analytical judgment based on the likelihood of error and its potential impact on the reliability of accounting records; this study did not quantitatively measure risk probabilities.

The findings indicate that the weaknesses of the existing system arise not only from manual record keeping but also from the concentration of transaction processing, cash handling, recording, and reporting functions among store attendants. Although the owner's review serves as a compensating control, the existing controls remain predominantly detective in nature. This condition is consistent with Rista and Azmiyanti, who highlighted limited segregation of duties and weaknesses in transaction recording as internal control deficiencies in MSMEs [10]. Therefore, the proposed improvements focus on standardizing recording procedures, introducing automation, implementing digital data storage, and strengthening owner review.

System Requirements and Proposed System

Based on the analysis of the existing system, identified accounting risks, and system requirements, the proposed system was designed to transform the bookkeeping process from a manual, paper-based procedure into a simple Microsoft Excel-based accounting information system. The following system requirements table demonstrates that the proposed design was not determined

solely by technological features, but was directly derived from the problems and risks identified in the existing system.

Table 4. System Requirements and Proposed System

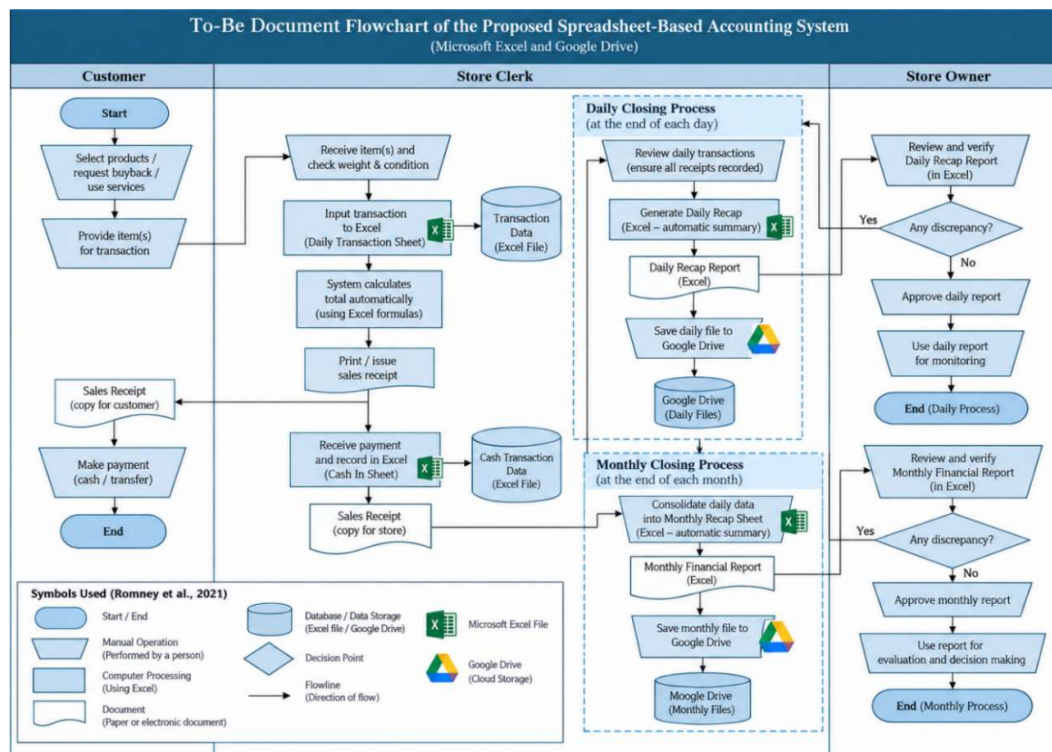
ID	Source of Requirement	Requirement Type	System Requirement	Proposed System Response	Priority
SR-01	R1 – Manual calculation error; PIECES: Performance, Information	Functional	The system shall be able to record daily transactions in a structured spreadsheet format.	Daily Transaction Input Sheet in Microsoft Excel	High
SR-02	R1 – Manual calculation error	Functional	The system shall automatically calculate transaction totals, jewelry weight, receipts, and disbursements.	Automated Microsoft Excel formulas	High
SR-03	R3 – Incomplete transaction records	Functional	The system shall provide a consistent input format for each transaction.	Structured input fields for date, transaction type, jewelry weight, transaction value, and description	High
SR-04	R2 – Cash receipt and disbursement risk; R6 – Cash disbursement	Functional	The system shall distinguish between cash receipt and cash disbursement transactions.	Separate recording of cash inflows and cash outflows	High
SR-05	R6 – Cash disbursement documentation	Functional	The system shall classify expenditures according to the type or category of operating expense.	Expense categories within the spreadsheet	Medium-High
SR-06	R2 – Cash handling risk	Functional	The system shall provide transaction balance information that can be compared with physical cash at the end of each day.	Daily transaction summary as the basis for cash reconciliation	High
SR-07	R5 – Repeated daily-to-monthly bookkeeping	Functional	The system shall generate monthly summaries from daily transaction data without requiring re-entry of data.	Monthly Bookkeeping Recapitulation Sheet with automated formulas	High

SR-08	R7 – Delayed management reporting	Functional	The system shall generate daily and monthly bookkeeping information that can be used by the owner for monitoring purposes.	Daily Recap and Monthly Bookkeeping	High
SR-09	R8 – Dependence on manual verification	Functional	The system shall provide structured outputs to facilitate owner review and verification.	Reports and summaries using a consistent format	Medium-High
SR-10	R4 – Physical document storage risk	Functional	The system shall store transaction and bookkeeping records in digital form.	Microsoft Excel file storage	High
SR-11	R4 – Risk of data loss	Functional	The system shall provide a data backup mechanism.	File backup through Google Drive	High
SR-12	PIECES: Efficiency	Nonfunctional	The system shall be easy to use for staff with basic computer skills.	A simple spreadsheet interface resembling the existing bookkeeping format	High
SR-13	PIECES: Performance, Efficiency	Nonfunctional	The system shall generate calculation results immediately after transaction data are entered.	Spreadsheet formulas that automatically process transaction data	High
SR-14	PIECES: Information	Nonfunctional	The system shall use a consistent recording format to facilitate information tracing and verification.	Standardized daily and monthly worksheet formats	Medium-High
SR-15	R4 – Data availability risk	Nonfunctional	Bookkeeping files shall be capable of being stored, reopened, and restored if the primary copy becomes unavailable or corrupted.	Local storage and Google Drive backup	High
SR-16	PIECES: Economics; implementation constraint	Nonfunctional	The system shall be operable using relatively simple hardware and software without	Microsoft Excel on an available computer or laptop	Medium-High

requiring
specialized
accounting
applications.

In addition to the requirements implemented in the system, the analysis also identified further control requirements, including formula or worksheet protection and file access restrictions. These controls were not implemented in the current version and were therefore positioned as recommendations for future system development.

Based on the system requirements presented above, the proposed process flow was subsequently visualized in the To-Be Document Flowchart, which illustrates changes in document flows, processing activities, and responsibilities among customers, store attendants, and the store owner following the implementation of the spreadsheet-based system.

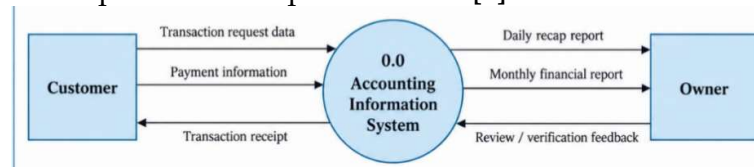


Picture 2. To-Be Document Flowchart of the Proposed Spreadsheet-Based Accounting System

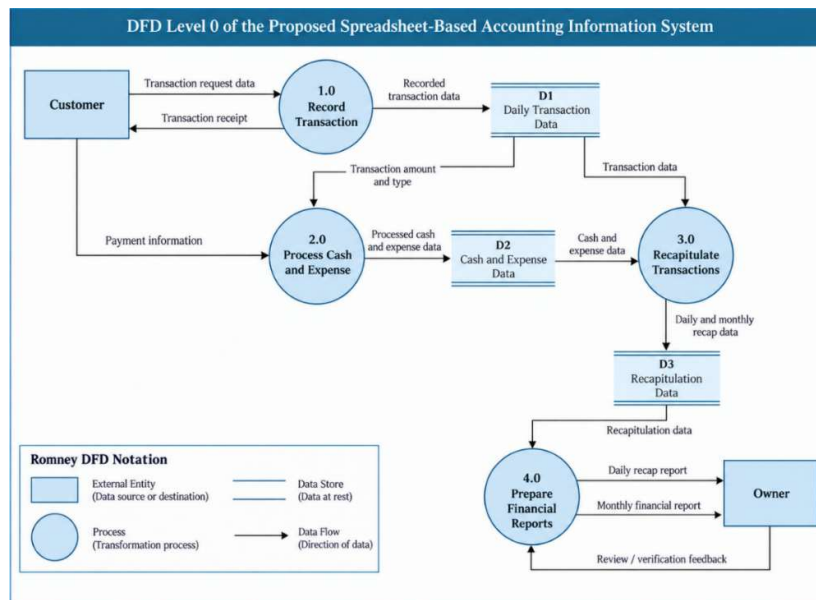
System requirements were formulated by translating identified problems and risks into traceable functional and non-functional requirements. This approach is consistent with Sastararuji et al., Putri et al., and Telukdarie et al., who emphasize the importance of aligning technology with organizational needs and readiness [4], [7], [13]. Microsoft Excel was selected because it is capable of meeting the primary requirements for structured record keeping, automated calculations, integrated recapitulation, and digital data storage, while maintaining a level of complexity appropriate for a small business.

System Modelling and Spreadsheet-Based AIS Design

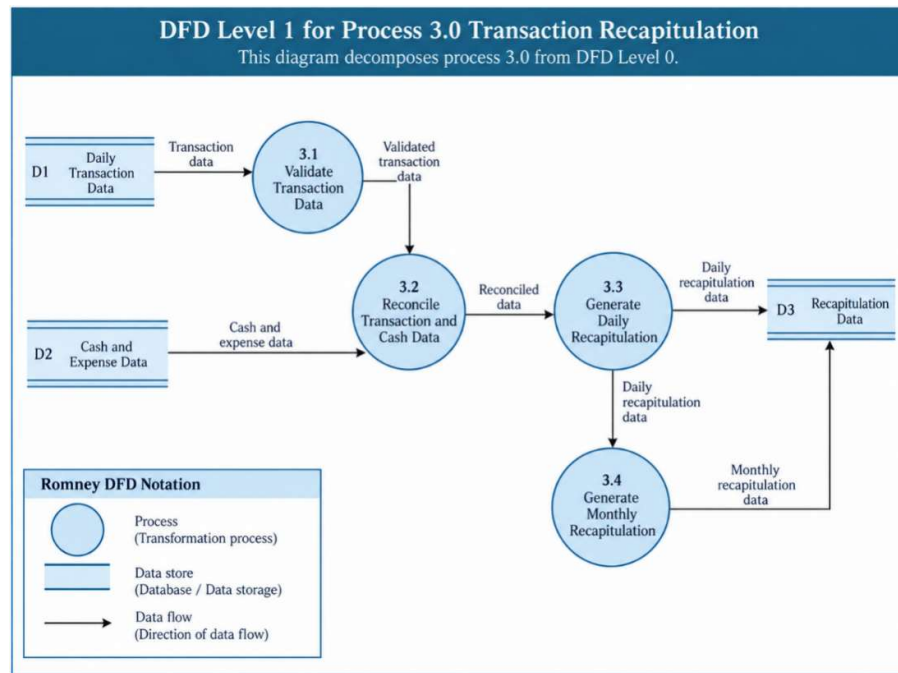
Once the system requirements and proposed process flows had been established, the next stage involved modeling how data enter the system, are processed and stored, and are transformed into information for users. The modeling process employed a Context Diagram, Data Flow Diagram (DFD) Level 0, and DFD Level 1. The Context Diagram and DFDs demonstrate that the spreadsheet was designed as an information system with structured data flows rather than merely as a collection of worksheets. The separation of transaction recording, cash and expense processing, recapitulation, and reporting processes clarifies how transaction data are transformed into information for the owner. This modeling approach is consistent with Romney et al. and serves as a link between system requirements and spreadsheet implementation [1].



Picture 3. Context Diagram of the Proposed Spreadsheet-Based Accounting Information System



Picture 4. DFD Level 0 of the Proposed Spreadsheet-Based Accounting Information System



Picture 5. DFD Level 1 for Process 3.0. Transaction Recapitulation

System Implementation and Evaluation

The implementation stage was carried out after the proposed process design and system models described in the previous section had been completed. The developed system used Microsoft Excel as the primary platform for transaction recording and processing, while Google Drive was used as the data backup medium.

The system implementation consisted of three main components that collectively supported the recording and reporting processes, namely:

1. Daily Transaction Input

The Daily Transaction Input served as the initial point for recording transaction data. This worksheet replaced the use of a manual daily ledger by providing a more structured format for entering transactions arising from the store's operational activities. The formulas embedded in the spreadsheet automatically processed the entered data, thereby eliminating the need for users to perform all calculations manually using a calculator. The Daily Transaction Input Sheet can be seen in figure 6.

2. Monthly Bookkeeping Recapitulation

The transaction data previously recorded were subsequently used to generate the monthly bookkeeping recapitulation. Under the manual system, this process was performed by compiling daily records for an entire month and recalculating all transactions using a calculator. The spreadsheet-based system reduces these manual activities through automated formulas that aggregate transaction data and generate the monthly recapitulation. Monthly Bookkeeping Recapitulation Sheet can be seen in figure 7.

31 MARET 2026		
NAMA BARANG	GRAM	HARGA
ANTING PLENI'S MATA AIR	1.5	Rp 38.000
CINCIN SILS MATA	2	Rp 50.000
GELANG RANTAI JEPIT CHANEL	11.0	Rp 275.000
ANTING PLENI'S BUNGA MATA	1.5	Rp 38.000
GELANG RANTAI PLAT KOTAK	19	Rp 475.000
LIONTIN BULAN SABIT	3.5	Rp 88.000
GELANG KAKI RUMBAI MUSIK	4	Rp 100.000
KALUNG ITALY	7	Rp 175.000
ANTING JEPIT MATA 4 RUMBAI	2	Rp 50.000
ANTING JEPIT RUMBAI 4 MATA	2	Rp 50.000
ANTING DESI	1.5	Rp 35.000
CINCIN SILS MATA	2	Rp 50.000
JUMLAH	58.5	Rp 1,459,000
KAS AWAL		Rp 14,634,000
JUMLAH		Rp 16,093,000
BELANJA		Rp 50,000
B. BARANG A	108.5	Rp 2,170,000
KENCLENG		Rp 1,000
JUMLAH		Rp 13,872,000

Picture 6. Daily Transaction Input Sheet

REKAPAN PEMBUKUAN BULAN MARET 2026											
TANGGAL	PEMERIKHAAN	BELANJA	TF	B. BARANG ALGOREK	DEPOSIT	BELANJA TOKOK	KENCLENG	PENGELUARAN	SAMPAH	BELANJA TIBI (SIRUP)	
1 MARET 2026	32.5	Rp 895.000	Rp 100.000	Rp 38.000	19	Rp 380.000		Rp 3.000			
2 MARET 2026	36.5	Rp 98.000	Rp 100.000	11	Rp 2.500			Rp 2.000			
3 MARET 2026	54	Rp 1,328.000	Rp 100.000	3	Rp 180.000			Rp 2.000			
4 MARET 2026	36.5	Rp 390.000	Rp 100.000	49	Rp 375.000			Rp 2.000			
5 MARET 2026	18.5	Rp 488.000	Rp 100.000	20.5	Rp 43.000			Rp 35.000			
6 MARET 2026	49.5	Rp 1,238.000	Rp 100.000	69	Rp 1,380.000			Rp 5.000			
7 MARET 2026	48	Rp 1,201.000	Rp 100.000	28.5	Rp 570.000			Rp 3.000			
8 MARET 2026	81.5	Rp 2,245.000	Rp 100.000	91	Rp 250.000			Rp 3.000			
9 MARET 2026	50	Rp 1,280.000	Rp 100.000	100.000	32	Rp 290.000		Rp 190.000			
10 MARET 2026	59	Rp 1,477.000	Rp 100.000	65.5	Rp 270.000			Rp 2.000			
11 MARET 2026	53.5	Rp 1,337.000	Rp 100.000	375.000	51.5	Rp 1,020.000		Rp 6.000			
12 MARET 2026	68	Rp 1,679.000	Rp 100.000	13.5	Rp 270.000			Rp 2.000			
13 MARET 2026	58.5	Rp 1,442.000	Rp 100.000	50.000	20.5	Rp 405.000		Rp 4.000			
14 MARET 2026	69	Rp 3,320.000	Rp 100.000	175.000	25	Rp 575.000	Rp 5,000.000	Rp 2.000			
15 MARET 2026	185	Rp 2,881.000	Rp 100.000	48	Rp 1,020.000					Rp 100.000	Rp 250.000
16 MARET 2026	75	Rp 1,877.000	Rp 100.000	24.5	Rp 700.000			Rp 2.000			
17 MARET 2026	524	Rp 3,152.000	Rp 195.000	693.000	6	Rp 300.000		Rp 4.000			
18 MARET 2026	264	Rp 6,608.000	Rp 195.000	400.000	134.5	Rp 2,667.000		Rp 2.000			
19 MARET 2026	147.5	Rp 3,616.000	Rp 120.000	338.000	68.5	Rp 1,287.000		Rp 2.000			
20 MARET 2026	39	Rp 475.000	Rp 50.000		23.5	Rp 470.000					
21 MARET 2026	39	Rp 308.000	Rp 100.000		41	Rp 620.000					
22 MARET 2026	103.5	Rp 1,248.000	Rp 50.000		28	Rp 585.000					
23 MARET 2026	39	Rp 373.000	Rp 50.000		33.5	Rp 370.000					
24 MARET 2026	25	Rp 640.000	Rp 50.000		44	Rp 880.000					
25 MARET 2026	65	Rp 1,382.000	Rp 50.000		88	Rp 1,700.000					
26 MARET 2026	59.5	Rp 1,453.000	Rp 50.000		100.5	Rp 2,170.000					
JUMLAH	1820.5	Rp 45,515.000	Rp 2,460.000	Rp 2,687.000	1044.0	Rp 20,093.000	Rp 5,000.000	Rp 50.000	Rp 35.000	Rp 5.000	Rp 100.000

Picture 7. Monthly Bookkeeping Recapitulation Sheet

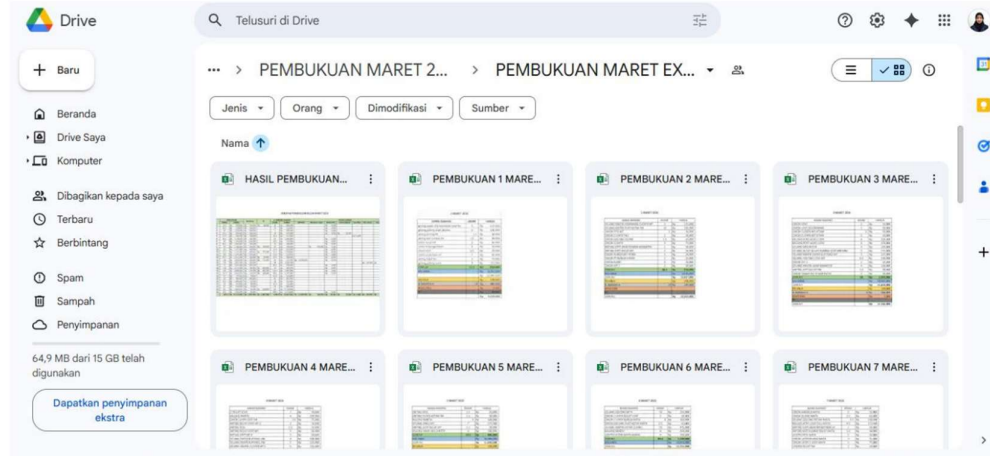
3. Monthly Bookkeeping

The Monthly Bookkeeping component presents transaction information for a given period to support the owner in monitoring the store's financial condition. In the student-developed design, this table primarily provides details of monthly expenditures, enabling the owner to access the required information without waiting for a lengthy manual recapitulation process.

Picture 8. Monthly Bookkeeping Sheet

4. Digital Backup

In addition to replacing the recording medium, the implementation also included the digital storage of backup copies through Google Drive. This function was intended to reduce dependence on physical documents as the sole source of information.



Picture 9. Digital Backup Using Google Drive

Because formula protection and access restrictions had not yet been implemented as technical controls, temporary operational procedures were applied during daily system use to reduce the risk of accidental changes to spreadsheet formulas. Users were instructed to enter transaction data only in the designated input areas and to avoid modifying cells containing formulas or system-generated calculations. In addition, backup copies were maintained through Google Drive to support data and file recovery if accidental deletion or modification occurred. These procedures served as interim operational controls; however, they remained dependent on user compliance and did not

eliminate the residual risk of formula alteration or cell deletion. Therefore, formula protection, input validation, and access restrictions remain priorities for further system development.

5. Functional Testing

Following system implementation at Kencana Anggrek Jewelry Store, Junti Branch, the evaluation was conducted using two approaches: functional testing and a post-implementation interview with the store owner. Functional testing was used to verify whether all system functions operated in accordance with the predefined requirements, while the interview was conducted to obtain user evaluations regarding ease of use, information relevance, accuracy of results, timeliness of information provision, and the operational feasibility of the system.

Table 5. Functional Testing of the Spreadsheet-Based AIS

Test ID	Function Tested	Testing Procedure	Expected Result	Result
FT-01	Daily transaction recording	Enter transaction data into the Daily Transaction Input Sheet	Transaction data are recorded in the appropriate rows and columns	Pass
FT-02	Automatic calculation	Enter jewelry weight and transaction values	Formulas automatically calculate the total transaction value	Pass
FT-03	Cash and expense recording	Enter cash receipt and disbursement transactions	Receipts and disbursements are recorded under the appropriate categories	Pass
FT-04	Payment classification	Enter cash and bank transfer transactions	Payment methods are distinguishable within the transaction records	Pass
FT-05	Daily recapitulation	Enter multiple transactions occurring within a single day	Daily transaction totals are generated without manual recalculation using a calculator	Pass
FT-06	Monthly recapitulation	Use a set of daily transactions recorded during the testing period	The spreadsheet aggregates the transactions into a monthly recapitulation	Pass
FT-07	Monthly bookkeeping output	Process transaction data for the current period	Monthly bookkeeping information can be displayed and reviewed by the owner	Pass
FT-08	File saving and retrieval	Save, close, and reopen the Excel file	Data can be retrieved without changes to the recorded values	Pass
FT-09	Digital backup	Save a copy of the file to Google Drive	The bookkeeping file is available as a backup copy	Pass

The testing results indicate that all core system functions operated in accordance with the specified requirements. Transaction data entered into the system could be processed through the calculation and recapitulation stages without requiring re-entry of the same data. The automated formulas also generated recapitulated values consistent with the transaction data entered. Thus, the system functions successfully supported the flow of data from transaction recording to the generation of bookkeeping information for the store owner.

6. User Evaluation

In addition to functional testing, the system was evaluated through a post-implementation interview with the owner of Kencana Anggrek Jewelry Store, Junti Branch, as the primary user of the information generated by the system. The evaluation focused on five aspects: usability, relevance, perceived accuracy, timeliness, and operational feasibility.

Table 6. Post-Implementation User Evaluation of the Spreadsheet-Based Accounting Information System

Evaluation Aspect	Evaluation Focus	Owner's Evaluation	Interpretation
Usability	Ease of understanding and using the spreadsheet	The owner considered the spreadsheet format simple and easy to understand because its recording structure resembled the bookkeeping format previously used	Satisfied
Relevance	Alignment of the information with the store's operational needs	Information on transactions, receipts, disbursements, and monthly recapitulation was considered relevant to the store's financial monitoring needs	Satisfied
Perceived Accuracy	Accuracy of calculation results and data consistency	The use of automated formulas was considered helpful in reducing calculation errors that could previously occur when using a calculator	Satisfied
Timeliness	Speed of obtaining information	Recapitulation could be generated immediately after transaction data were entered, eliminating the need to wait for the recalculation of all receipts	Satisfied
Operational Feasibility	Suitability of the system for the store's operating conditions and capabilities	Microsoft Excel was considered feasible because the system is simple and does not require specialized accounting software, provided that a computer or laptop is available	Satisfied

The functional testing results showed that the core system functions operated as designed, while the owner's evaluation indicated positive responses in terms of usability, relevance, perceived accuracy, timeliness, and operational feasibility. These findings are consistent with Darmawan et al. and Vidyasari and Febriyan regarding the benefits of simple computerization for MSME record-keeping [8], [9]. However, these results primarily reflect functional adequacy and user acceptance, rather than improvements in effectiveness that have been quantitatively demonstrated. The implemented system does not yet include technical controls such as formula protection or access restrictions. Although temporary operational procedures were applied during daily use to reduce the risk of accidental formula modification and backup copies were maintained to support recovery, these safeguards remain dependent on user compliance. Therefore, further system development should focus on

strengthening processing integrity and data security through formula protection, input validation, and access restrictions.

CONCLUSION

This study demonstrates that the accounting information system problems at Kencana Anggrek Jewelry Store, Junti Branch, are not limited to manual record keeping, but also involve repetitive calculations, dependence on physical documents, delays in information availability, and limitations in internal control. The PIECES analysis and As-Is Document Flowchart mapping revealed weaknesses primarily in the dimensions of performance, information, control, and efficiency, while the risk analysis identified potential recording errors, overlapping responsibilities between cash handling and record keeping, document loss, incomplete transaction recording, and repeated processing from daily to monthly bookkeeping.

Based on these findings, the study developed and implemented a Microsoft Excel-based accounting information system using a To-Be Document Flowchart, Context Diagram, and DFD Level 0 and Level 1. The system transformed the manual process into structured record keeping, automated calculations, more integrated daily and monthly recapitulation, and digital data storage and backup through Google Drive. Functional testing showed that the core system functions operated in accordance with the specified requirements, while the owner's evaluation indicated positive responses in terms of usability, relevance, perceived accuracy, timeliness, and operational feasibility. Accordingly, the contribution of this study lies in integrating problem diagnosis, risk and internal control analysis, requirements formulation, system modeling, implementation, and evaluation within a single AIS development process.

However, this study did not quantitatively measure improvements in system effectiveness and was limited to a single case study. Future research may employ a before-and-after comparison to assess processing time, error rates, reconciliation accuracy, and information quality. Further system development may also incorporate input validation, formula protection, access restrictions, broader automation, database integration or cloud-based accounting, and testing across multiple business units.

BIBLIOGRAPHY

- [1] M. B. Romney, P. J. Steinbart, S. L. Summers, and D. A. Wood, *Accounting Information Systems*, 15th ed. Pearson Education Limited, 2021.
- [2] A. Perdana, H. H. Lee, S. K. Koh, and D. Arisandi, "Data analytics in small and mid-size enterprises: Enablers and inhibitors for business value and firm performance," *International Journal of Accounting Information Systems*, vol. 44, Mar. 2022, doi: 10.1016/j.accinf.2021.100547.
- [3] M. Skare, M. de las Mercedes de Obesso, and S. Ribeiro-Navarrete, "Digital transformation and European small and medium enterprises (SMEs): A comparative study using digital economy and society index data," *Int. J. Inf. Manage.*, vol. 68, Feb. 2023, doi: 10.1016/j.ijinfomgt.2022.102594.

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- [4] A. Telukdarie, T. Dube, P. Matjuta, and S. Philbin, "The opportunities and challenges of digitalization for SME's," in *Procedia Computer Science*, Elsevier B.V., 2022, pp. 689–698. doi: 10.1016/j.procs.2022.12.265.
- [5] A. Lutfi et al., "Influence of Digital Accounting System Usage on SMEs Performance: The Moderating Effect of COVID-19," *Sustainability* (Switzerland), vol. 14, no. 22, Nov. 2022, doi: 10.3390/su142215048.
- [6] P. Q. Thuan et al., "The Determinants of the Usage of Accounting Information Systems toward Operational Efficiency in Industrial Revolution 4.0: Evidence from an Emerging Economy," *Economies*, vol. 10, no. 4, Apr. 2022, doi: 10.3390/economies10040083.
- [7] E. Putri, B. Bandi, W. Widarjo, and T. Arifin, "The value of cloud accounting for MSMEs: a Technology-Organization-Environment (TOE) framework perspective," *Cogent Business and Management*, vol. 12, no. 1, 2025, doi: 10.1080/23311975.2025.2494712.
- [8] T. G. P. Darmawan, L. F. Ginoga, A. K. Inayah, R. J. Ramadhanti, and N. Rosyanti, "Perancangan Sistem Informasi Akuntansi Penjualan Berbasis Makro VBA Microsoft Excel pada UMKM Afnan Cake & Cookies," *Account; International Journal for accountancy, Finance, and Banking*, no. 2, pp. 2681–2693, 2025.
- [9] R. Vidyasari and Febriyan, "Komputerisasi Pencatatan Akuntansi dan Pelaporan Keuangan berbasis Microsoft Excel pada UMKM Umita Food and Drink," *Account: Jurnal Akuntansi, Keuangan dan ...*, vol. 9, no. 1, 2022.
- [10] R. P. Rista and R. Azmiyanti, "Analisis Implementasi Pengendalian Internal terhadap Pengelolaan Kas Pada UMKM Teko Teh," *Jurnal Akuntansi dan Keuangan*, vol. 13, no. 1, pp. 1–16, Mar. 2025, doi: 10.29103/jak.v13i1.17816.
- [11] J. L. . Whitten and L. D. . Bentley, *Systems Analysis and Design Methods*. New York: McGraw-Hill/Irwin, 2007.
- [12] A. E. Pratiwi and S. Susanti, "Evaluasi Kinerja Sistem Informasi Akuntansi Accurate Accounting Enterprise Menggunakan Metode Pieces," *JURNAL RESPONSIF*, vol. 3, no. 1, pp. 63–74, 2021, [Online]. Available: <http://ejurnal.ars.ac.id/index.php/jti>
- [13] D. Sastararuji, D. Hoonsoon, P. Pitchayadol, and P. Chiwamit, "Cloud accounting adoption in Thai SMEs amid the COVID-19 pandemic: an explanatory case study," *J. Innov. Entrep.*, vol. 11, no. 1, Dec. 2022, doi: 10.1186/s13731-022-00234-3.
- [14] B. Kotowska and M. Sikorska, "Digital transformation of a Polish accounting firm: tools, impediments, business performance benefits and implications - case study," in *Procedia Computer Science*, Elsevier B.V., 2023, pp. 327–336. doi: 10.1016/j.procs.2023.10.017.
- [15] N. Suyatna, "Transformasi Rekonsiliasi Bank: Mengintegrasikan RFID untuk Otomasi Transaksi Kartu dalam Sistem Penerimaan Kas," *Jurnal Accounting Information System (AIMS)*, vol. 8, no. 1, pp. 30–42, 2025, doi: 10.32627.
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