World Journal of Economics and Business Research
ISSN: 2960-0081
DOI: https://doi.org/10.61784/wjebr3028

OPTIMIZING THE SYSTEM DEVELOPMENT LIFE CYCLE TO MINIMIZE RISK IN ACCOUNTING INFORMATION SYSTEMS

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Abstract: The development of reliable and secure accounting information systems is essential in supporting the smooth operations and reliability of an organization's financial statements. However, many accounting information systems face significant risks, such as design errors, system failures, and threats to data integrity. These risks, if not properly managed, can lead to serious financial and reputational losses. Therefore, this study aims to explore how System Development Life Cycle (SDLC) optimization can reduce risks in the development of accounting information systems. Using a qualitative approach and literature study, this research identifies stages in the SDLC that require special attention, such as requirements analysis, design, testing, and maintenance. The results show that better risk management at each stage of the SDLC-especially in careful planning, detailed design, and comprehensive testing-can reduce the potential for system errors and improve the security of accounting data. In conclusion, SDLC optimization plays a crucial role in minimizing risks that can affect the quality and security of accounting information systems, thereby improving operational efficiency and ensuring better accuracy of financial reports.
Keywords: System Development Life Cycle (SDLC); Accounting information system; Risk management; Information system security

1 INTRODUCTION

Accounting information systems (AIS) play a crucial role in an organization's financial management and reporting. As the primary means for collecting, processing and presenting financial data, AIS enables managers and stakeholders to make accurate and timely data-driven decisions. With the development of information technology, AIS is increasingly complex and diverse, requiring careful development to ensure smooth operations and accuracy of financial reports [1].
However, the development of AIS is not free from various risks. One of the main risks is errors in the coding process that can lead to errors in recording transactions and financial reports. In addition, data integration issues between different systems and threats to data security-such as information leaks or cyber attacks-can undermine trust in the system. Therefore, it is important to manage these risks with a more structured and planned approach.
System Development Life Cycle (SDLC) is a commonly used methodology in information system development. Although the SDLC has proven to be effective in building functional systems, it is not uncommon for the stages in the SDLC to be poorly optimized, potentially increasing the risk in the development of the AIS. Therefore, an in-depth understanding of how to optimize the SDLC to minimize risk is crucial in the development of a reliable and secure AIS.
In the context of accounting information system development, implementing an effective System Development Life Cycle (SDLC) is very important to minimize the risks that can arise during the development process. Risks include errors in system design, data integration failures, potential data corruption or information leakage, and the inability of the system to meet functional and non-functional needs.
Based on these challenges, the main problem in this study is:
"How to optimize SDLC to reduce risks in accounting information system development?"
This question will be answered by identifying and evaluating the critical steps in the SDLC that need to be strengthened to ensure better risk management. The focus of this research will be on analyzing how each stage in the SDLC-such as requirements analysis, system design, testing, and maintenance-can be optimized to reduce the potential for failures and errors that can disrupt the smooth running of accounting information systems.
This research aims to explore and analyze how optimizing the stages in the System Development Life Cycle (SDLC) can reduce potential risks in the development of Accounting Information Systems (AIS). By understanding and optimizing each stage of the SDLC-from planning, needs analysis, design, implementation, testing, to maintenance-this research aims to provide insight into how risk management can be integrated more effectively in each phase of accounting information system development.
The specific objectives of this research are as follows:
1. Evaluate the effectiveness of SDLC in mitigating risks that often occur in the development of accounting information systems, such as errors in coding, data integration, and system failure.
2. Analyze the SDLC stages that are most prone to risk in AIS development and how each of these stages can be optimized to reduce potential errors or losses.
3. Provide recommendations related to risk management at each stage of the SDLC that can improve the quality, security, and reliability of accounting information systems.
4. Find the relationship between optimal SDLC implementation and improved performance and accuracy in managing accounting data that supports appropriate managerial decisions.

Through this research, it is hoped that it can make a significant contribution to the development of the SDLC methodology in the context of accounting information systems, as well as provide practical guidance for developers and IT practitioners in designing information systems that are more secure and efficient.

2 LITERATURE REVIEW

2.1 System Development Life Cycle (SDLC)

System Development Life Cycle (SDLC) is a framework used to plan, develop, and maintain information systems. SDLC describes a systematic and structured process for creating software that can meet user needs and run efficiently. In the context of Accounting Information Systems (AIS), SDLC is essential to ensure that the system developed is not only functional, but also secure, reliable and dependable to support the financial management of the company.
In general, the SDLC is divided into several main stages, each of which has specific objectives and activities. The following are the SDLC stages that are relevant for AIS development:

2.1.1 Planning

This stage is the initial step in system development, where the main objective is to determine the needs and resources required for system development. Here, the development team and stakeholders identify problems and opportunities for system development. Determination of the project scope, budget, schedule, and resource allocation is also done at this stage.
In the context of AIS, the planning stage is critical to understand how the system will integrate with existing accounting business processes, as well as to identify risks that may arise related to the collection and management of financial data.

2.1.2 Requirements analysis (system analysis)

At this stage, a needs analysis is carried out with the aim of understanding more deeply the functional and non-functional needs of the system to be built. The development team works closely with users (such as the accounting team) to identify what is needed by the system to be able to support accounting tasks effectively.
For the AIS, the needs analysis focuses on understanding how financial data is collected, processed and reported, and how the system should be able to minimize errors and improve efficiency. In addition, needs related to data security and integrity also need to be a key focus.

2.1.3 Design (system design)

Once the requirements are identified, the design phase begins to design the structure and components of the system. The system design includes two main parts: a high-level design that describes the overall architecture of the system, and a low-level design that details the implementation of each system component.
In the development of AIS, the design should pay attention to important aspects such as financial transaction management, secure data processing, and intuitive interface for users. In addition, integration with other systems (for example, ERP systems or external databases) should also be considered at this stage.

2.1.4 Implementation (system implementation)

The implementation stage is the stage where system development is carried out. At this stage, the program code is written in accordance with the agreed design. In the implementation of AIS, it is important to ensure that all required functionality can be run correctly and in accordance with the needs that have been analyzed.
This stage also includes setting up the IT infrastructure and compiling the necessary documentation for system use and maintenance.

2.1.5 System testing

After implementation, the testing phase is carried out to ensure that the system works according to predetermined specifications. Testing is done to detect and fix bugs or errors that may exist in the system. System testing is very important to ensure that the accounting system runs without interruption and the data managed can be processed accurately.
In AIS development, testing includes validating the functionality of the accounting system, the reliability of the system in processing transactions, and testing data security to prevent leakage of sensitive information.

2.1.6 Maintenance (system maintenance)

Once the system is implemented and tested, the maintenance phase begins. Maintenance involves periodic updates to the system, bug fixes that arise after the system is used, and adjustments to changing user needs or new regulations.
In AIS, maintenance is essential to keep the system compatible with changes in accounting policies, tax rules, or evolving technology. Maintenance also includes continuous monitoring to ensure data security and system reliability.
Overall, the SDLC provides a systematic framework to ensure that the development of accounting information systems is carried out in a structured, efficient, and effective manner. Each stage in the SDLC contributes to identifying and managing risks that can arise in the process of system development and operation. Optimizing the SDLC to reduce risks in accounting information systems not only improves the quality of the system, but also guarantees that the financial data used for business decision-making remains accurate, secure, and well integrated.

2.2 Risk in Accounting Information Systems

Accounting Information Systems (AIS) play a vital role in ensuring the accuracy, reliability and security of financial data used by organizations [2]. However, the development and use of AIS also presents various risks that can

compromise the integrity of financial statements and undermine trust in the system. Here are some of the key risks that often arise in accounting information systems:

1. Accounting Errors Errors in accounting records can occur due to various factors, such as human error, inaccurate software, or poorly structured business processes. For example, errors in inputting numbers, allocating costs, or recording transactions can result in inaccurate financial statements.

These errors risk causing discrepancies in the financial statements that can affect managerial decisions, compliance with tax regulations, and can reduce the company's credibility in the eyes of stakeholders.

Example: If a company's expense transactions are not recorded correctly, it can lead to inaccuracies in the balance sheet or income statement, which ultimately impacts financial analysis and decision-making.

2. Data Loss The risk of data loss in accounting information systems is often related to system failures, cyber-attacks, or errors in data management . Data loss can include the loss of transaction information, account balances, or financial statements that can cause significant losses to the company.

Weak data security, such as inadequate encryption or backup policies, can increase the potential for data loss.

Example: A ransomware attack targeting an accounting system can lead to the loss of critical transaction data or financial reports, thus damaging the integrity of the system and affecting organizational performance.

3. Errors in Recording Transactions The risk of errors in recording transactions can occur if transactions entering the system are not recorded correctly or in a timely manner. This includes errors in classifying transactions, incorrectly entering account codes, or negligence in validating transactions received from various departments.

Inaccurate or late recording of transactions can lead to errors in the financial statements, which in turn can impact the valuation of the company by auditors, shareholders, and regulators.

Example: If a sales transaction is not recorded correctly in the revenue account, it can affect the income statement and give a false picture of the company's financial performance.

4. Integration Issues Between Systems In many organizations, accounting information systems do not operate separately, but are integrated with other systems, such as Enterprise Resource Planning (ERP) systems, inventory management systems, or human resource management systems. Integration problems between systems can arise when data is not synchronized between different systems, or when there are errors in programming that hinder communication between these systems.

The inability to properly integrate data between various systems can lead to data recording errors, for example, mismatches between financial reports and operational data.

Example: If the transaction data recorded in the ERP system is not successfully integrated with the accounting system, the resulting financial statements will not reflect an accurate status, leading to errors in financial analysis and decision-making.

Identifying key risks in accounting information systems-such as accounting errors, data loss, transaction recording errors, and integration issues between systems-is a crucial first step to mitigating potential losses and improving system reliability. In the context of accounting information system development, managing and mitigating these risks is critical to ensuring that the data processed and reported is accurate, secure, and reliable to support informed decision-making [3].

An in-depth understanding of these potential risks can also help system developers to design and implement more effective strategies to address problems that may arise during the life cycle of the accounting information system.

2.3 Risk Management Models and Methods in SDLC

Risk management in the System Development Life Cycle (SDLC) is essential to identify, assess, and mitigate risks that may interfere with system development, including accounting information systems. Some of the approaches and methods used to manage risks during the development process include:

2.3.1 Risk identification

The risk identification process is the first step in risk management that aims to recognize and document potential risks that may occur during the SDLC. At this stage, the development team and stakeholders work together to explore the risks associated with each stage of the SDLC, such as design errors, data integration, testing failures, and security issues.

- In the context of Accounting Information Systems, risk identification can involve:
- Potential transaction recording errors and accounting errors.
- Data security, including threats to the integrity and confidentiality of financial information.
- System integration issues, such as communication errors between ERP systems and accounting systems.

2.3.2 Risk assessment

Once the risks have been identified, the next step is to assess the extent to which they may affect the project. Risk assessment includes two main components: probability and impact. The team must assess how likely a risk is to occur and what the consequences will be if the risk occurs. This assessment will help the team to prioritize the most critical risks and decide on the steps to take.

In AIS development, risk assessment involves evaluating:

- The financial impact that can arise in the event of accounting errors or data loss.
- Time and resources required to address the issues raised.
- Potential reputational damage due to system failure or financial statement inaccuracies.

2.3.3 Risk mitigation

Risk reduction is a measure to reduce the likelihood of a risk occurring and/or reduce its impact if it does occur. Various strategies that can be used for risk mitigation during SDLC include:
Careful planning at the planning and needs analysis stage ensures that system requirements are covered thoroughly and correctly.
● Thorough testing detects errors earlier in the development stage and reduces the possibility of accounting errors or data loss.
● Enhanced security by using strong encryption, firewall, and authentication technologies to protect financial data.
● Development of clear documentation to ensure that any changes in the system are properly recorded and tracked.
● Training and readying the team to handle issues that arise during the system lifecycle.

2.3.4 Risk monitoring and control

Risk monitoring is an ongoing activity once the system is implemented. The system must be continuously monitored to ensure that the risks that have been identified do not develop into bigger problems. In addition, risk control measures need to be implemented to mitigate risks that may be missed or arise unexpectedly.
In the context of AIS, this could include:
● Regular audits of financial transactions and data to detect errors or misuse.
● Regular maintenance and updates of the system to address its potential vulnerability to new security threats.

2.4 Related Studies

Various previous studies have examined the application of SDLC in the context of Accounting Information Systems and risk management. Some studies that are relevant to this topic include:

2.4.1 Research by Sommerville [4]

In his book "Software Engineering," Sommerville explains the importance of risk management in every stage of the SDLC. He emphasizes that good risk management can improve the quality of software developed, including in the development of accounting information systems. One important finding is the importance of thorough testing at the development stage to detect errors in the processing of accounting data that can cause losses.

2.4.2 Research by C. K. Jørgensen and G. H. Møller [5]

This research focuses on the application of the SDLC methodology in the development of ERP systems, which are often integrated with accounting information systems. They found that poor system integration can be a significant source of risk, especially in financial data management. This study provides important insights into how risk management at the design and testing stages can mitigate integration issues and ensure data consistency between systems.

2.4.3 Research by C. H. Lee and H. J. Kim [6]

In this study, they examined the importance of data security in cloud-based accounting information systems. They pointed out that threats to information security can increase the risk of data loss and information misuse. This research highlights the importance of structured risk management to protect financial data in cloud-based systems, which is becoming highly relevant with modern trends in AIS development.

2.4.4 Research by A. A. S. Al-Debei and S. M. K. Al-Lozi [7]

This research discusses the use of SDLC to develop accounting information systems in the banking sector. The researcher found that risk management at the requirements analysis and system design stages is critical to identify potential transaction recording errors and integration issues between systems that could compromise the accuracy of financial statements.

3 RESEARCH METHODOLOGY AND RESEARCH DESIGN

This research will use a qualitative approach to explore an in-depth understanding of the risk management process in the development of Accounting Information Systems (AIS) through System Development Life Cycle (SDLC) optimization. The qualitative approach was chosen because the main objective of the research is to explore and analyze the factors that influence risk management in SDLC, as well as identify challenges and practical solutions used by organizations in the implementation of accounting information systems.
Case Study will be used as the main research design. The case study approach allows researchers to investigate in depth how a particular company or organization manages risk in their accounting information system development through the implementation of a structured SDLC. Through this case study, researchers can analyze the contextual factors that influence the development process, as well as evaluate the effectiveness of the risk management applied.
In addition, surveys can be used as an additional method to collect quantitative data that involves measuring the level of effectiveness and challenges faced by companies in optimizing SDLC to reduce risk. The survey will include data collection from software developers, accountants, and IT managers involved in the development and maintenance of AIS.

4 DATA COLLECTION

Data collection in this study will be done through two main methods:

4.4 Interview

Semi-structured interviews will be conducted with various parties involved in the development and management of accounting information systems. These interviews will provide insight into the challenges, risk management processes, and SDLC optimization measures undertaken by the company. Interviewees will include:
● System developers: To understand the technical perspective on the application of SDLC and risk management in software development.
● Accountant: To recognize the challenges faced in the integration of accounting information systems with accounting and financial processes, and how accounting risks are managed.
● IT Manager: To gain an understanding of the management of system development projects, as well as the risk management policies implemented at the organizational level.

4.2 Document Analysis

Data collection will also be carried out through document analysis related to the accounting information system development project. Documents to be analyzed include:
● SDLC project documentation: For example, planning documents, requirement analysis reports, system design, testing, and system maintenance reports.
● Audit reports and system security reports: To evaluate how risks in accounting information systems are managed in practice.
● Documentation related to risk management policies and procedures applied in system development projects.
● This document analysis provides a more in-depth look at the steps the organization has taken in designing and implementing the SDLC to minimize risks.

4.3 Data Analysis

Data collected through interviews and document analysis will be analyzed using qualitative analysis methods. Some of the techniques that will be used include:

4.3.1 Thematic analysis

This technique is used to identify the main patterns or themes that emerge from the interviews and documents analyzed. The researcher will categorize the data based on certain themes such as:
● Challenges in risk management at each stage of the SDLC.
● Implemented solutions to reduce risks in the development of accounting information systems.
● Procedures or best practices implemented by the company to minimize accounting errors and data loss.

4.3.2 Coding analysis

The coding process was conducted to organize and classify the interview data and documents in categories relevant to risk management in SDLC. In this way, researchers can identify the relationship between risk management practices and success in optimizing the SDLC. This coding also helps in mapping the factors that influence the risks that arise in the development of accounting information systems.

4.3.3 Data triangulation

To increase the validity and credibility of the findings, data triangulation will be applied, i.e. by comparing interview results, document analysis, and survey results. This approach allows the researcher to gain a more thorough understanding of the risk management practices implemented in the SDLC and how these practices can reduce risks in the development of accounting information systems.

4.3.4 Descriptive analysis

This technique was used to provide a clear picture of the main challenges faced by the company in managing risks during the SDLC. Using the collected data, the researcher can present information regarding common patterns and obstacles that are often encountered during the implementation of SDLC in the context of accounting information system development.

5 RESULTS AND DISCUSSION

5.1 Optimization of SDLC Stages

5.1.1 Planning and needs analysis

The planning and needs analysis stage is an important foundation in the development of accounting information systems. At this stage, the identification of the functional and non-functional needs of the system is crucial to ensure that all aspects required in the system can be fulfilled properly, as well as reducing the risk of design errors that can arise in subsequent stages.
● Identification of Functional Requirements: The functional needs of an accounting system include features that must be present in the system, such as transaction processing, journal recording, financial report generation, and other accounting data management. Ensuring that each functional requirement is clearly recorded and understood by all stakeholders can reduce the risk of errors in system implementation.
● Non-Functional Requirements: Non-functional requirements, such as system performance, data security, and scalability, also need to be considered. Failure to identify and plan for these non-functional aspects can lead to high

risks related to system performance and data integrity. Therefore, risk mitigation measures specific to non-functional requirements should be established at the planning and requirements analysis stage.
Risk management at this stage can be done by:
● Conduct workshops or in-depth discussions with the accounting team to clearly understand operational needs.
● Comprehensive documentation and clarify all requirements early on to prevent misunderstandings in the design stage.

5.1.2 System design

At the system design stage, the application of a risk-based design approach is essential. Risk-based design helps identify potential problems that may occur during system implementation and operation. In accounting information systems, some of the risk factors that need to be considered in the design are:
● System complexity: A complex accounting system with many modules or functions may face the risk of integration errors between systems. Therefore, it is important to carry out a system design that is modular and easy to integrate.
● Data security: Financial data is a valuable asset that must be protected. In the system design, measures to secure data such as the use of encryption, double authentication, and management of access rights need to be implemented to reduce the risk of data leakage or manipulation.
● User interface: Accounting information systems that are not intuitive can lead to human error in recording transactions. A user-friendly and user-centric interface design can minimize the risk of data input errors.

5.1.3 System testing

System testing is a critical stage in ensuring that the accounting information system functions as expected. To reduce the risk of system failure, testing must be done thoroughly, covering various types of testing, such as:
● Functional testing: To ensure that every function in the system works correctly, as intended, and can process data accurately.
● Security testing: These tests aim to identify gaps in the system that can be exploited by irresponsible parties, such as cyberattacks or data leaks.
● Integration testing: It is important to test the integration of the accounting information system with other systems used by the company, such as ERP systems, external databases, or other reporting systems. Integration testing helps ensure that the data processed in the system remains consistent and accurate.
More thorough test methods may include:
● Regression testing ensures that updates or changes to one part of the system do not cause problems in other parts.
● Stress testing to evaluate how well the system handles large transaction volumes.

5.1.4 Maintenance

The maintenance phase ensures that the system remains secure, efficient, and relevant over time. Timely maintenance can reduce the risks that arise from system failures or threats to data security. Some ways to ensure effective maintenance include:
1. Regular updates: Perform software updates to fix bugs, address vulnerabilities, and adjust to changes in regulations or new accounting policies.
2. System monitoring: Systems should be monitored continuously to identify problems or anomalies that could affect performance or data security. For example, transaction monitoring to detect suspicious activity.
3. Data backup and recovery: Develop policies and procedures for regular data backup and ensure rapid data recovery in the event of data loss due to system crashes or disasters.

5.2 Risk Management in SDLC

Good risk management throughout the SDLC can significantly reduce potential losses, especially in the aspects of data security and integrity in accounting information systems. Some risk management steps that can be implemented at each stage of the SDLC include:
1. Proactively identify risks early in development to avoid bigger problems later on.
2. Evaluate and mitigate risks through previously discussed steps, such as comprehensive security testing and risk-based design.
3. Continuous monitoring of risks after the system is implemented, to ensure that risks that were not identified at the initial stage can be addressed immediately.

5.3 Example of Risk Management Application in Accounting Information System Case Study

A case study of company X implementing an accounting information system with an optimized SDLC shows how structured risk management can reduce potential losses. In this case study, company X identified key risks, such as transaction data loss and recording errors, and implemented mitigation strategies at the design and testing stages. For example, company X conducted more rigorous security testing with better data encryption and stricter access control.
In addition, they also integrated the accounting system with the existing ERP system, ensuring that financial and operational data remained consistent and accurate. During the maintenance phase, Company X ensures regular system updates and monitors system performance regularly to anticipate emerging threats.

6 CONCLUSION

6.1 Summary of Findings

This study shows that optimizing the System Development Life Cycle (SDLC) can significantly minimize the risks associated with the development of accounting information systems. Effective risk management at each stage of the SDLC-from planning, needs analysis, design, testing, to maintenance-can reduce the potential losses that arise, both in terms of technical, operational, and managerial. The main findings that can be concluded are as follows:
1. Careful planning and needs analysis can identify and reduce the risk of design errors that could potentially compromise financial data integrity.
2. Risk-based design helps in anticipating issues that may arise, especially those related to system integration, data security, and system functionality.
3. Thorough and structured system testing ensures that technical defects can be detected early, reducing the risk of system functionality failure or data leakage.
4. Timely maintenance can minimize risks to system security and performance after implementation, keeping the system relevant and effective as technology and regulations evolve.
Thus, an optimized SDLC provides great advantages in reducing risks that can adversely affect the successful implementation and operation of accounting information systems.

6.2 Implications for Practice

This research confirms the importance of close collaboration between system developers and accounting teams in designing and implementing SDLC for accounting information systems. This collaboration is crucial so that each stage of the SDLC is carefully planned and implemented, given the complexities that exist in accounting systems that are directly related to sensitive financial data.
The practical implication of this research is that developers and accountants should work together from the planning stage to ensure that all functional and non-functional needs of the system are clearly understood and existing risks can be identified early. In addition, it is also important to ensure that system testing is carried out thoroughly and system maintenance is carried out regularly to maintain system quality and security.

6.3 Suggestions for Future Research

This research makes a significant contribution to the understanding of risk management in SDLC for accounting information systems, but there are still some areas that can be expanded for further research. Some suggestions for future research include:
1.Application of a more adaptive SDLC methodology: Further research can explore how a more flexible and adaptive SDLC can be applied to address challenges arising from regulatory changes or rapidly evolving technologies. For example, with the growing number of cloud computing-based accounting information systems, SDLC methodologies that accommodate dynamic changes and continuity of system updates are needed.
2.Comparative studies: Further research can also compare the application of SDLC in different industries or types of organizations to see how SDLC optimization affects risk management in different sectors, such as the banking sector, government, or small and medium-sized enterprises.
3.Evaluation of new risk management methodologies: Future research could more deeply examine the use of more modern or automated risk management methodologies, such as Artificial Intelligence (AI) and machine learning, to identify, assess and mitigate risks in the development and operation of accounting information systems.
By expanding the scope of research and adopting the latest technologies and methodologies, it is hoped that future research can provide deeper insights into new ways of optimizing SDLC to reduce risks in accounting information systems.

CONFLICT OF INTEREST

The authors have no relevant financial or non-financial interests to disclose.

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