
Design of a Collaboration Document Management Information System for Internal Parties

(Study of a Company Operating in the Field of Information and Communication Technology (ICT) Services and Telecommunication Networks in Indonesia)

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ABSTRACT

Collaboration documents are necessary for various enterprises, diverse economic sectors, and academic institutions. Cooperation documents are essential in facilitating the collaboration between a company and its partners, making effective administration of these documents crucial. Companies benefit from collaboration with other companies since it allows them to mutually assist and support one another in achieving shared objectives, enhancing work efficiency and production. Companies and partners can expand their size by leveraging industrial connections, entering new markets, establishing new facilities, or introducing supplementary products. The management of collaboration document data collecting in the Digital Business and Technology division of an Indonesian company operating in information and communication technology (ICT) services and telecommunications networks is only partially automated. Computers are restricted to archiving records, resulting in frequently disorganized, damaged, or misplaced documents. This condition hinders employees' ability to locate the necessary papers for review, leading to delays in distributing documents to relevant parties and impeding the productivity and efficiency of the collaborative document management process. Hence, it is imperative to construct a proficient system that can facilitate the collaborative document management procedure, encompassing data administration, input, and storage. This study develops an information system that allows internal stakeholders to access documents as data housed in a web-based application conveniently. The collaborative document management information system uses the System Development Life Cycle (SDLC) method, specifically employing the waterfall model as the system development approach. The author employs the Unified Modeling Language (UML) model to analyze the system by generating the necessary diagrams, a programming language that utilizes PHP and MySQL databases. The system was tested using the white box method.

Keywords: document, collaboration, waterfall, white box

INTRODUCTION

Collaboration documents are necessary for various enterprises, diverse economic sectors, and academic institutions. Cooperation documents encompass several types, such as cooperation agreements, cooperation contracts, or other documents that include clauses and unique provisions about the agreements and written agreements concerning the cooperation. Cooperation papers encompass a range of elements, including the cooperation's aims, the respective responsibilities of each partner, the duration of the collaboration, the allocation of profits, and other relevant details. Collaboration documents serve as tangible proof that may be utilized to prevent conflicts or issues arising during the collaborative process. Cooperation agreements ensure that all parties engaged in the cooperation possess a shared comprehension of the agreed-upon aims and terms. (Zhong, Wu, Ding, Luo, Luo & Pan, 2020; Kumar, Liu & Shan, 2020)

Companies must collaborate with other companies to mutually assist and support each other in achieving shared objectives and enhancing efficiency and productivity in the workplace. Companies and Partners can expand their size by leveraging industry connections, exploring new markets, establishing new facilities, or introducing supplementary products. (Карінцева, Євдокимов, Євдокимова, Харченко & Дронь, 2020; Silic & Lowry, 2020)

Data collection management for collaboration documents in the Digital Business and Technology (DBT) Division of an Indonesian company operating in the Information and Communication Technology (ICT) and Telecommunication Network Services sector is only partially automated. Computers have a restricted function of solely storing data, and due to improper storage, the papers are frequently disorganized, destroyed, or misplaced. The employee's hard disk contains a subdirectory where scan files are saved as documented data. (Fügener, Grahl, Gupta & Ketter, 2022) This task is straightforward for employees since it does not involve internet usage. However, managers may need help if employees are present, as this may result in the unavailability of the necessary cooperation document data and delayed distribution of papers to relevant parties. It is impeding the productivity and effectiveness of the collaborative document management process.

It is imperative to develop a web-based collaboration document management information system that internal division parties can access. This system will ensure that collaboration-related documents are saved digitally and can be organized effectively and orderly. This condition will enhance comprehension of the cooperation papers among the parties concerned and promote the smooth functioning of the collaboration. By organizing the file structure of collaboration documents on the collaboration document management website, internal parties may conveniently locate and access the required collaboration papers. (Wimelius, Mathiassen, Holmström & Keil, 2021; Marion & Fixson, 2021; Wang, Chen & Zghari-Sales, 2021)

The objective is to create a collaborative document management information system by employing the System Development Life Cycle (SDLC) approach, specifically utilizing the waterfall model as the system development method. The author employs the Unified Modeling Language (UML) paradigm, utilizing the PHP programming language and MySQL database for system analysis. The system was tested using the white box testing method.

Design involves the creation of novel concepts and ideas or adapting existing ones, using innovative approaches to fulfill human requirements.

System design is the systematic process of developing and constructing a new system to study, assess, enhance, and integrate a system. *Design* may be defined as creating novel or

altered concepts and ideas by employing innovative techniques to fulfill human necessities and satisfy users' functional demands.

A system is a set of components collaborating to accomplish a specific objective. A system is a complex arrangement of interrelated procedures organized to execute a specific action or achieve a particular objective. Information refers to a compilation of processed data and facts presented in a manner that is comprehensible and advantageous to the receiver. (Lehtinen & Aaltonen, 2020; Alkadi, Moustafa, Turnbull & Choo, 2020)

An information system comprises two crucial components: systems and information. An information system comprises several components: humans, computers, information technology, and work procedures. These components process data to transform it into meaningful information in order to accomplish specific objectives. Documents are written or printed records that serve as evidential proof. Thus, papers encompass many forms, such as letters, contracts, recordings, film images, and certain types that might serve as proof. (Dong, Karhade, Rai & Xu, 2021; Asatiani, Malo, Nagbøl, Penttinen, Rinta-Kahila & Salovaara, 2021)

Cooperation is a social process characterized by engaging in activities that contribute to attaining shared objectives through mutual assistance and comprehension of each other's actions. Cooperation is the collective activities of many partners to accomplish shared objectives.

Collaboration document management refers to the systematic management of documents associated with multiple parties' collaborative efforts. Efficiently managing the document management of cooperation is crucial to providing proper storage, convenient accessibility, and orderly arrangement of cooperation-related documents.

METHOD

This study aims to develop a highly functional and streamlined Document Collaboration Management Information System for the internal stakeholders of a telecommunications and information technology services firm based in Indonesia. The research methodology utilized is the System Development Life Cycle (SDLC) with the waterfall model, which provides a systematic and sequential approach from the initial feasibility study to the system's ongoing maintenance.

The Software Development Life Cycle (SDLC) begins with a feasibility study that assesses the technical, economic, and operational elements. The system analysis phase encompasses the gathering and examination of user requirements, as well as the identification of business processes. System design involves organizing the system's architecture, user interface, and database. The process of system development entails the implementation of the design, which includes the integration and testing of modules. System testing encompasses functional, integration, and system tests. Implementation involves initiating the system and training users, which is then followed by ongoing maintenance and evaluation.

System analysis uses the Unified Modeling Language (UML), including use case, activity, class, and sequence diagrams. UML offers a concise graphical depiction of the interactions between users and systems, the flow of activities, and the data structure.

PHP is selected as the primary programming language during the implementation phase, with MySQL being used as the database. PHP is utilized to construct online applications, while MySQL is responsible for storing and managing data related to document collaboration. The technology selection is determined by their capacity to deliver efficient and dependable solutions.

The white-box method is utilized in system testing, which includes unit testing, integration testing, system testing, and acceptance testing. This testing guarantees that each code segment operates effectively and interacts efficiently inside the system's context, conforming to user specifications and expectations.

This research offers a pragmatic and ideal method for managing document cooperation within the firm. The system, created using SDLC, UML, and PHP-MySQL technology, is expected to fulfill the requirements of internal stakeholders. It aims to improve efficiency and effectiveness in managing document cooperation within Indonesia's telecommunications and information technology services sector.

RESULTS AND DISCUSSION

System Analysis and Design

a. Current System Analysis

This result is an investigation of the collaborative document management system now in use at a company working in the information and communication technology (ICT) and telecoms network services industry in Indonesia:

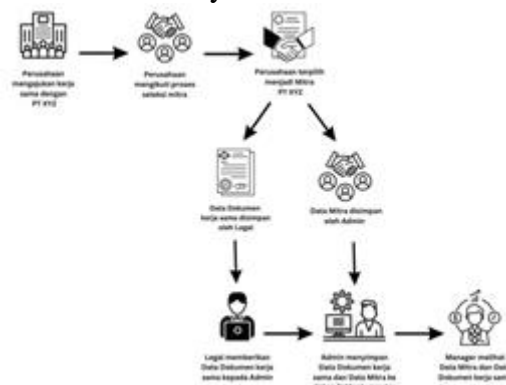


Figure 1. Current System Analysis

b. SWOT Analysis

This result is an investigation of the collaborative document management system now in use at a company working in Indonesia's information and communication technology (ICT) and telecoms network services industry.

Table 1. SWOT Analysis

Analisis SWOT	Deskripsi
1. <i>Strength</i> (Kekuatan)	<ul style="list-style-type: none"> Data mitra dan data dokumen kerja sama yang disimpan dalam folder komputer dapat mengurangi kebutuhan ruang penyimpanan untuk dokumen fisik. Peningkatan kontrol versi dan pelacakan dokumen dibandingkan dengan sistem berbasis kertas.
2. <i>Weakness</i> (Kelemahan)	<ul style="list-style-type: none"> Proses manajemen dokumen kerja sama belum menggunakan sistem informasi terkomputerisasi yang bisa diakses oleh pihak internal divisi, sehingga pengelolaan dokumen kerja sama kurang efektif dan efisien. Data dokumen masih tersimpan secara <i>offlow</i> di folder komputer pegawai saja. Memerlukan pelatihan dan penggunaan sistem yang tepat agar dapat digunakan secara efektif dengan membuat panduan (<i>guidance</i>) yang bisa dipelajari oleh pegawai.

3. <i>Opportunity</i> (Peluang)	<ul style="list-style-type: none"> • Dengan sistem yang dibuat ini dapat mempermudah proses manajemen data dokumen kerja sama yang dilengkapi dengan fitur – fitur yang dibutuhkan. • Perusahaan dapat menyimpan data dokumen kerja sama dengan mitra di dalam sistem ini yang bisa diakses oleh pihak internal divisi.
4. <i>Threats</i> (Ancaman)	<ul style="list-style-type: none"> • Perubahan teknologi yang cepat dan perubahan kebijakan pemerintah yang dapat mempengaruhi penggunaan sistem manajemen dokumen kerja sama. • Peryaratan kepatuhan hukum dan peraturan untuk manajemen dokumen.

c. Proposed New System

1. Use case diagrams

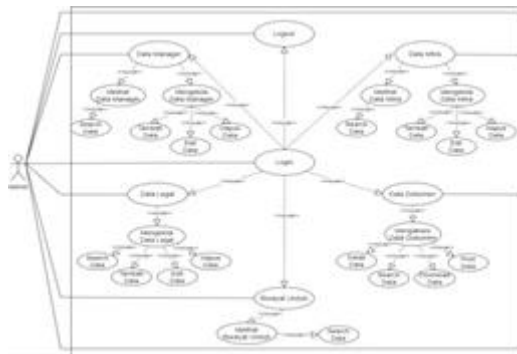


Figure 2. Admin Usecase Diagram



Figure 3. Legal and Manager Usecase

2. Usecase Actors

The following table concisely explains actors or users who have a direct connection to the system being developed. It is observable in the following manner:

Table 2. Usecase Actors

No.	Aktor	Deskripsi
1.	Admin	Admin adalah pegawai yang melaksanakan fungsi teknis sistem dan wewenang untuk : <ol style="list-style-type: none"> 1. Melakukan Login 2. Mengelola Data Mitra 3. Mengelola Data Legal 4. Mengelola Data Manager 5. Mengakses Data Dokumen 6. Melihat Riwayat Unduh 7. Melakukan Logout

2.	Legal	Legal adalah pegawai yang memiliki wewenang untuk: 1. Melakukan <i>Login</i> 2. Melihat Data Mitra 3. Melihat Data <i>Manager</i> 4. Mengakses Data Dokumen 5. Mengelola Data Dokumen 6. Melihat Riwayat Unduh 7. Melakukan <i>Logout</i>
3.	<i>Manager</i>	<i>Manager</i> adalah pihak yang memiliki kepentingan atau pemangku kepentingan pada suatu perusahaan yang memiliki wewenang untuk: 1. Melakukan <i>Login</i> 2. Melihat Data Mitra 3. Mengakses Data Dokumen

3. Scenario Table

Table 3. Login Scenario

<i>Use Case</i>	<i>Login</i>
Aktor	Admin, Legal, <i>Manager</i>
Deskripsi	Proses <i>login</i> merupakan proses verifikasi untuk melihat ke dalam suatu sistem dengan memasukkan data identifikasi dan verifikasi diri
<i>PreCondition</i>	Menampilkan <i>form login</i>
<i>PostCondition</i>	Menampilkan <i>dashboard</i>
Skenario Utama	
Aksi Aktor	Respon Sistem
1. Melihat sistem	Menampilkan <i>form login</i>
2. Memasukkan <i>username</i> dan <i>password</i>	Melakukan validasi user, a. Jika terverifikasi maka akan menampilkan menu <i>dashboard</i> b. Jika tidak terverifikasi maka akan muncul sebuah pesan peringatan atau informasi (<i>alert</i>)

Table 4. Scenario Accessing Document Data

<i>Use Case</i>	Mengakses Data Dokumen
Aktor	Admin, Legal, <i>Manager</i>
Deskripsi	Merupakan tampilan informasi mengenai keseluruhan data dokumen kerja sama, seperti jenis dokumen, jangka waktu kerja sama, dan status kerja sama.
<i>PreCondition</i>	Menampilkan <i>dashboard</i>
<i>PostCondition</i>	Menampilkan data dokumen kerja sama
Skenario Utama	
Aksi Aktor	Respon Sistem
1. Melihat menu data	Menampilkan informasi keseluruhan data dokumen kerja sama yang sudah terinput
2. Mengklik <i>download</i>	Mengunduh data dokumen kerja sama yang dibutuhkan
3. Mengklik <i>print</i>	Mencetak data dokumen kerja sama yang dibutuhkan
4. Mengklik <i>search</i>	Mencari nama data dokumen kerja sama yang dibutuhkan

4. Activity Diagrams

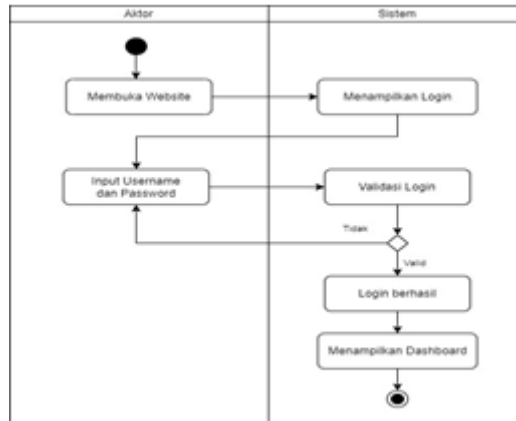


Figure 4. Login Activity Diagram

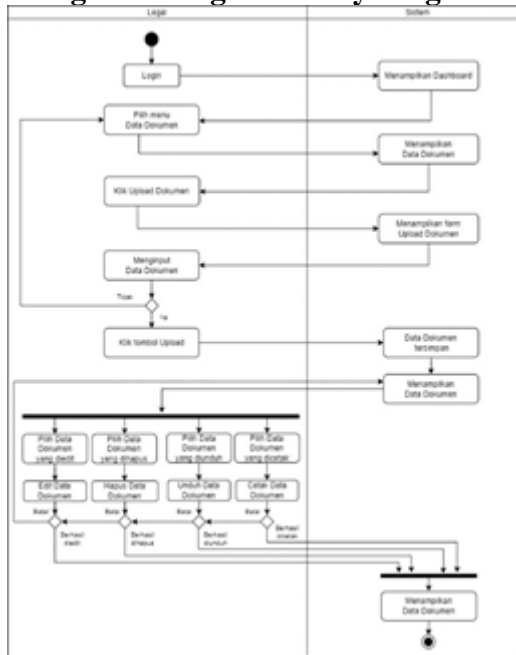


Figure 5. Activity Diagram Accessing Document Data

- d. System Design
 - 1. Database Design

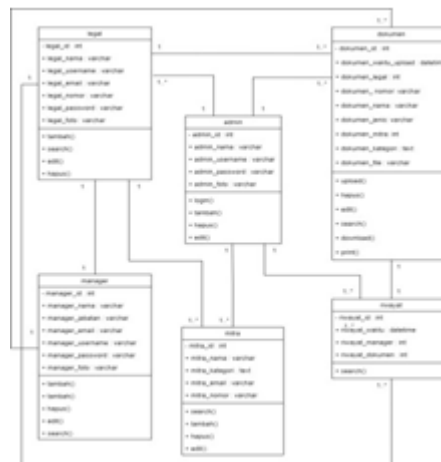


Figure 6. Class Diagram db_document

Table 5. Admin

No.	Field	Type	Primary
1	admin_id	int(6)	*
2	admin_nama	varchar(100)	
3	admin_username	varchar(30)	
4	admin_password	varchar(50)	
5	admin_foto	varchar(255)	

Table 6. Documents

No.	Field	Type	Primary
1	dokumen_id	int(6)	*
2	dokumen_waktu_upload	datetime	
3	dokumen_legal	int(11)	
4	dokumen_nomer	varchar(30)	
5	dokumen_nama	varchar(30)	
6	dokumen_jenis	varchar(30)	
7	dokumen_mitra	int(11)	
8	dokumen_kategori	text	
9	dokumen_file	varchar(255)	

2. Interface Design



Figure 7. Home Page View



Figure 8. Dashboard display



Figure 9. Detailed View of Document Data

System Implementation

The system implementation stage involves defining an application system in a manner that prepares it for operation.



Figure 10. Home Page Display



Figure 11. Dashboard Page Display

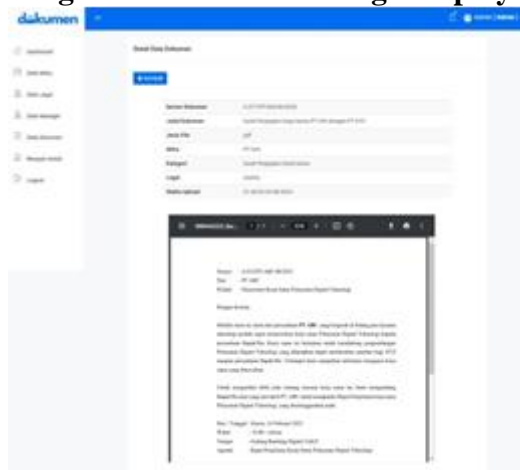


Figure 12. Document Data Details Page Display

System Testing

System testing is a procedure used to assess the quality of a system or software in order to validate its functionality. The main objectives are to verify the system's adherence to specifications, detect and address any issues, and mitigate the risk of failure during system production or usage. The system is tested using the White Box Testing approach, precisely the Execution Path Testing technique. The findings of this testing are as follows:

- a. Testing the Login Process



Figure 13. Flowchart and Flowgraph of the Login Process

Cyclomatic Complexity (CC) Login Process

E = number of edges (arrows)

N = number of nodes (nodes)

Cyclomatic Complexity (CC)

$$\begin{aligned} \text{Calculation } CC &= E - N + 2 \\ &= 7 - 7 + 2 \\ &= 2 \end{aligned}$$

Independent Path Login Process

From the calculation results, there are 2 independent paths to the login process, namely:

1. Line 1 = 1-2-3-4-5-7
2. Line 2 = 1-2-3-4-6-2-3-4-5-7

b. Testing the Process of Accessing Data Document

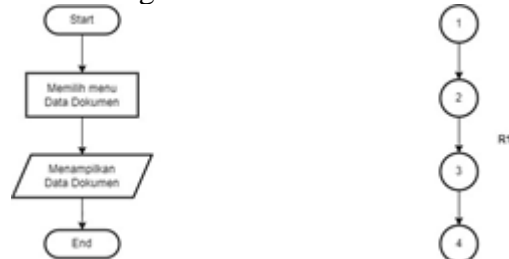


Figure 14. Flowchart and Access Flowgraph

Cyclomatic Complexity (CC) Process Access

Document Data

$$\begin{aligned} CC &= E - N + 2 \\ &= 3 - 4 + 2 = 1 \end{aligned}$$

Independent Path Process of Accessing Data Document

From the calculation results, there is 1 independent path in the process of accessing document data, namely:

1. Line 1 = 1-2-3-4

CONCLUSION AND RECOMMENDATION

Based on the author's research and the identified limits of the problem, the utilization of this system leads to numerous conclusions. A computerized system facilitates the management,

input, and storage of cooperative document data within the Digital Business and Technology Division, which is integrated with partners. This condition allows for automatic document data storage and access by all internal parties requiring it. This system enables data automation, integration, and efficient organization, resulting in automatic updates and eliminating the need for repetitive data collecting. Utilizing this approach may mitigate the potential for loss or harm to collaborative document data, as the documents are maintained methodically and organized within the collaboration document management system.

Future researchers should consider various suggestions to ensure data security. It is crucial to maintain software and hardware to ensure seamless user operation. Additionally, frequent data backups should be performed to mitigate the danger of system damage to enhance future research, it is advisable to implement improved cooperation functionalities, as well as notifications for the uploading of partner data and papers. This condition will enhance the efficiency of team collaboration and expedite the collaborative process.

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