SISTEM *BLOCKCHAIN* MENGGUNAKAN DISPLAY VISUAL UNTUK DESAIN RANTAI PASOK DAN PENYEWAAN TANGKI (STUDI KASUS: PT. KPBN DUMAI)

TUGAS AKHIR

Diajukan Sebagai Salah Satu Syarat
untuk Memperoleh Gelar Sarjana Teknik
Pada Program Studi Teknik Industri

Oleh:

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UIN SUSKA RIAU

PROGRAM STUDI TEKNIK INDUSTRI
FAKULTAS SAINS DAN TEKNOLOGI
UNIVERSITAS ISLAM NEGERI SULTAN SYARIF KASIM RIAU
PEKANBARU
2023

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يُؤْتِي الْحِكْمَةَ مَنْ يَّشَآءُ ۚ وَمَنْ يُّؤْتَ الْحِكْمَةَ فَقَدْ اُوْتِيَ خَيْرًا كَثِيْرًا ۗ وَمَا يَذَّكَّرُ اِلَّآ اُولُوا الْاَلْبَابِ

Allah memberikan hikmah kepada siapa saja yang dikehendaki-Nya. Dan barangsiapa yang di beri hikmah, sungguh telah diberi kebaikan yang banyak, dan tak ada yang dapat mengambil pelajaran kecuali orang-orang yang berakal. (Al-Quran: Al-Baqaarah (2): 269)

قَالَ لَا تَخَافَآ اِنَّنِيْ مَعَكُمَآ اَسْمَعُ وَاَرٰى

Dia Allah berfirman: "Janganlah kamu berdua khawatir, sesungguhnya Aku Bersama kamu berdua, Aku mendengar dan melihat" (Al-Quran: Ta-Haa (20): 46)

Segala puji bagi Allah Khaliqul A'lam yang telah menitipkan saya untuk lahir dan dibesarkan oleh keluarga serta orang-orang yang mencintai saya.

Kupersembahkan laporan tugas akhir ini untuk

Ayahanda Azman & Ibunda Juita Kandar

Papa, Bunda, terimalah bukti kecil ini sebagai kado keseriusanku untuk membalas semua pengorbananmu, dalam hidupmu demi hidupku kalian ikhlas mengorbankan segala perasaan tanpa kenal lelah, dalam lapar berjuang separuh nyawa hingga segalanya. Maafkan anakmu Papa, Bunda, masih saja Ananda menyusahkanmu.

There's no one in this world that can take your place
Oh, I'm sorry for ever taking you for granted
I will use every chance I get
To make you smile, whenever I'm around you
Now I will try to love you, like you, love me
Only God knows how much you mean to me

Hariku terlalu berat jika aku hanya mengandalkan diri sendiri tanpa melibatkan bantuan Allah SWT dan orang lain. Tak ada tempat terbaik untuk berkeluh kesah selain bersama orang-orang terbaik yang selalu bersedia membantuku jika kesulitan tiba. Ku persembahkan kepada semua. Beribu terimakasih kuucapkan, beribu cinta ku lemparkan, beribu kasih kusandingkan.

KATA PENGANTAR

Segala puji bagi Allah S.W.T atas segala Rahmat, Karunia serta Hidayah-Nya, Salawat dan salam semoga terlimpah kepada Nabi Muhammad S.A.W, sehingga penulis dapat menyelesaikan laporan tugas akhir ini dengan judul **"Sistem *Blockchain* Menggunakan Display Visual Untuk Desain Rantai Pasok Dan Penyewaan Tangki (Studi Kasus: PT. KPBN Dumai)"** sebagai syarat untuk memperoleh gelar sarjana teknik pada Jurusan Teknik Industri Fakultas Sains dan Teknologi Universitas Islam Negeri Sultan Syarif Kasim Riau, sesuai dengan waktu yang ditetapkan.

Banyak sekali pihak yang telah membantu penulis dalam menyusun laporan kerja praktek, baik secara moril maupun materil. Untuk itu pada kesempatan ini, Penulis ingin menyampaikan rasa terimakasih dan penghargaan yang tulus kepada semua pihak yang telah banyak memberi petunjuk, bimbingan, dorongan dan bantuan dalam penulisan laporan Tugas Akhir ini, baik secara langsung maupun tidak langsung, terutama kepada:

1. Bapak Prof. Dr. Khairunnas Rajab, M.Ag selaku Rektor **Universitas Islam Negeri Sultan Syarif Kasim Riau**.
2. Bapak **Dr. Hartono, M.Pd selaku Dekan Fakultas Sains dan Teknologi Universitas Islam Negeri Sultan Syarif Kasim Riau**.
3. Ibu Misra Hartati, S.T., M.T., selaku Ketua Program Studi Teknik Industri **Universitas Islam Negeri Sultan Syarif Kasim Riau** yang telah memberikan izin kepada penulis untuk melakukan praktikum.
4. Bapak Anwardi, S.T., M.T., selaku Sekretaris Program Studi Teknik Industri **Universitas Islam Negeri Sultan Syarif Kasim Riau**.
5. Bapak Nazaruddin, S.ST., MT. Selaku Koordinator Tugas Akhir Jurusan Teknik Industri Universitas Islam Negeri Sultan Syarif Kasim Riau.

6. Bapak Muhammad Riski, M.T., M.B.A. dan Ibu Fitriani Surayya Lubis, S.T., M.Sc. Selaku dosen pembimbing yang telah banyak meluangkan waktu, tenaga dan pikiran dalam membimbing dan pemberikan petunjuk yang sangat berharga bagi penulis dalam penulisan laporan Tugas Akhir.
7. Bapak Dr. Muhammad Isnaini Hadiyul Umam, M.T. dan Bapak Nazaruddin, S.ST., M.T. yang telah memberikan masukan dan saran yang membangun dalam penulisan Laporan Tugas Akhir ini.
8. Bapak dan Ibu Dosen Program Studi Teknik Industri **Universitas Islam Negeri Sultan Syarif Kasim Riau**, yang telah banyak memberikan masukan dan meluangkan waktu untuk berkonsultasi guna menyelesaikan laporan kerja praktek ini.
9. Bapak Iskandar selaku pembimbing lapangan di PT. KPBN Dumai.
10. Teristimewa untuk Papa Azman dan Bunda Juita Kandar yang telah berjuang membesarkan penulis tanpa lelah dengan segala kasih sayang, cinta, nasehat dan pengorbanan yang tak mungkin sanggup penulis balas. Teruntuk adek saya Prameswari Juazy yang telah menjadi *mood booster* saya selama ini. Tersayang, kepada Tante Irza Kandar dan Zuryati Kandar yang telah membantu penulis sebagai *support system* dalam penulisan laporan tugas akhir. Serta seluruh keluarga yang selalu mendoakan untuk kesuksesan dan memberikan motivasi hingga selesainya laporan Tugas Akhir ini.
11. Ucapan terima kasih kepada shaabat-sahabat terbaik saya, Lianny dan Muhammad Hakim, serta teman-teman seperjuangan kelas D 2019 yang selalu membantu saya saat proses pembuatan tugas akhir ini.
12. Teman-teman Teknik Industri angkatan 2019 sebagai keluarga pertama saya di jurusan Teknik Industri serta teman-teman IEOM dan adik tingkat saya yang telah memberikan dukungannya dalam penyelesaian laporan ini.
13. Rekan-rekan seperjuangan, Mahasiswa Teknik Industri **Universitas Islam Negeri Sultan Syarif Kasim Riau** yang namanya tidak dapat disebutkan satu-persatu yang telah memberikan semangat serta dorongan kepada penulis sehingga penulis dapat menyelsaikan Tugas Akhir ini.

Penulis menyadari dalam penulisan laporan ini masih banyak terdapat kekurangan serta kesalahan, untuk itu penulis mengharapkan adanya masukan berupa kritik maupun saran dari berbagai pihak untuk kesempurnaan laporan ini. Akhirnya penulis mengharapkan semoga laporan ini dapat berguna bagi kita semua.

Pekanbaru, 14 Juni 2023
Penulis

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Blockchain System Using Visual Display for Supply Chain Design and Vessel Leasing

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Abstract: This study aims to improve the vessel ordering system and streamline transparency in data preparation so that data is not easily manipulated. The smart contract-based blockchain method is used to solve problems in PT. Kharisma Pemasaran Bersama Nusantara (PT. KPBN) Dumai. This company manages vessel lending services for Crude Palm Oil (CPO). Based on observations, the vessel lending system is conventional and not transparent, so the contract is easily manipulated and can cause losses and distrust between the company and the vessel borrower. The preparation of a framework and user interface (UI) design is based on the supply chain in the company, with a system design based on use case diagrams, activity diagrams, flowchart design and visual display ergonomic for the user interface. The results showed that the change in the contract system with the application of the smart contract-based blockchain method can help companies in vessel lending management that are professional and more transparent.

1. Introduction

According to data from the Badan Pusat Statistik (BPS) in Riau Province, in 2020, Riau Province had a total oil palm plantation area of 2,862,132 Ha with a total oil palm production of 8,542,118 tons. With the high production of oil palm, controlling the inventory and planning Crude Plam Oil (CPO) storage warehouses (vessels) is necessary [1].

PT. KPBN Dumai is a company engaged in renting stockpile vessels and CPO storage for companies that want or do not have a place to store palm oil before being used in the production process. The recording of PT. KPBN Dumai's CPO handling contract is made manually. Manual contracts have several disadvantages, such as the long waiting time for letter confirmation between companies, causing contracts to be easily manipulated, causing distrust between companies.

The total waiting time for vessel handling is around 22 days. This is caused by vessel checking and confirmation activities by PT. SAN Medan, checking and sending letters to PT. PN III Medan, as well as handling and contract letter confirmation activities by PT. PN III Medan. These activities have an average waiting time of 3 to 4 days, which should be completed in just 1 day. This is due to inaccurate information flow that causes the bullwhip effect in vessel rental activities.

In addition, there is a lack of synchronization of information regarding the number of vessels available for leaving and borrowing between PT. KPBN Dumai and PT. SAN Medan. Information regarding the number of vessels between the two companies is held directly by PTPN III.

Thus, the vessel rental company must submit a request letter first and wait for confirmation of vessel availability at PT. KPBN Dumai. If the vessel is full, PT. KPBN Dumai will advise the renting company to handle the vessel at PT. SAN Medan by submitting a letter of application for a new vessel loan and otherwise.

Additional space is needed to store all the handling archives. Many archives can produce piles of waste and additional space for archive storage. The large number of archives is a problem for the company. On December 14, 2021, the company merged with 3 subsidiaries. So that the archives that have been collected must be moved. Moving a large number of archives can take time and space, so creating an integrated system must minimise the number of archives. This ensures the archives remain safe, efficient, and not easily manipulated.

Previous research on using information systems to optimise supply chains using UML and blockchain found that re-modelling makes transactions more practical and transparent [2]. Research on the efficiency of blockchain-based supply chain adequacy results in a transparent new ecosystem that can reduce the risk of data tracking [3].

Research related to the design of the boiler chicken supply chain using blockchain produces a more detailed recording system and real-time transactions (transparent) [4]. Research on smart contract models to support supply chain finance can make transactions more transparent so that funders feel more confident that their funds will not be misused [5].

Previous research on supply chain RFID scenarios to shape the flow of goods delivery journeys found that simulation programs that can accommodate supply chain management data into the blockchain have transparency, traceability, and provide data security [6].

Based on previous research, the objectives are using blockchain studies based on smart contracts on CPO vessel leasing problems at PT. KPBN Dumai to improve and provide proposals for improvements to the contract system and the preparation of Crude Palm Oil (CPO) vessel leasing archives at PT. KPBN Dumai.

One of the appropriate uses of methods for changing the manual contract system into an integrated one is the smart contract-based blockchain method. The smart contract-based blockchain method based on the user interface (UI) can simplify the Crude Palm Oil (CPO) vessel handling process, increase trust between companies and vessel borrowers, assist companies in compiling archive data and become a solution to reduce the number of manual archives in the company.

2. Literature Review

3.1. Supply Chain Management (SCM)

Supply Chain Management is defined as the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain to improve the individual companies' long-term performance and the whole supply chain [7].

The objective of every supply chain should be to maximize the overall value generated. The value (also known as supply chain surplus) a supply chain generates is the difference between what the value of the final product is to the customer and the costs the supply chain incurs in filling the customer's request [8][9].

3.2. Blockchain

Blockchain technology refers to a fully distributed system for cryptographically capturing and storing a consistent, immutable, linear event log of transactions between networked actors. This is functionally similar to a distributed ledger that is consensually kept, updated, and validated by the parties involved in all the transactions within a network. In such a network, blockchain technology enforces transparency and guarantees eventual, system-wide consensus on the validity of an entire history of transactions [10].

The blockchain technology is based on the complex encryption system, where each block has its unique key. This feature of blockchain databases makes hacking almost impossible because hackers need to simultaneously access a copy of the database on all computers on the network for this. Even if the original document or transaction is subsequently changed, the data will receive another digital signature as a result, which will indicate a discrepancy in the system. This system is organized in such a way that each of its participants constantly verifies the incoming information. This guarantees the preservation and accuracy of the information [11].

Therefore, the supply chain deserves special attention among the many other activities that are likely to be transformed by blockchain. Sums up the three main reasons for and benefits of applying blockchain in supply chain management [12]:

1. Tamper-proof transaction records: a blockchain is a data structure that makes it possible to create a tamper-proof digital ledger of transactions and share them. Technically, public-private key cryptography is used to sign transactions among the parties [13].
2. Information sharing & synchronization: established information sharing between suppliers, manufacturers, and distributors based on blockchain technology. Applying blockchain can lead to identifying less efficient nodes in the supply chain scheduling problem [14].
3. Smart contract execution: the smart contract is the executable code and should adapt to reliable mass software production. The smart contract has higher requirements for its correctness. Hence, it requires a way to generate a credible contract code; The smart contracts will likely replace the contract's text in the future. Therefore, it is necessary to keep conformance with the regulations in law texts [15].

3.3. System Information

Data flow diagrams are often used to model requirements from a data flow-oriented perspective. Such a diagram can easily be constructed in different levels [16]. A Data flow visualization system allows users to compose a query for system specifications in visualization modules and construct the data flow diagrams [17].

The Use case Diagram shows the relationship of functions in the system as described by functional needs [18]. A use case describes the functionality of a system from the user's point of view. A user can be a person, a role, an organization, or another system. The name of the use case is derived from the goal of the use case from the user's point of view. The aim of defining use cases is to reach an agreement and a shared understanding about the behavior and scope of a system between project stakeholders. Use cases can be represented graphically or in text documents [19].

Activity diagrams represent the behavior of a system consisting of one or more subsystems. Activity diagrams represent the flow of control from start to finish in that system, showing the various decision paths that exist during the execution of an activity [20].

3.4. Visual Display

Displays are part of the environment that provide information to workers so that their tasks run smoothly [21]. There are three writing factors in labeling and marking [22]:

1. Comprehensibility. The recipient of the message can interpret a message that has been received. This possibility depends on the basic knowledge and language skills of the recipient.
2. Legibility. Factors that tend to influence readers to distinguish or recognize letters or numbers. The character, size, color contrast, and quality of the display results cause this tendency.
3. Readability. Readability It means that the writing or numbers are assumed to be readable by each individual. Height, spacing, borders, and layout determine this.

The dimensions of the letters are determined so that the display functions as a good way of conveying information. Determination of the ideal dimensions of the desired distance can be calculated using the following formula [22]:

$$Letter\ height = \frac{Visual\ distance\ (mm)}{200} \quad (1)$$

The unit of measure of letters is expressed in points (pt). 1 point (pt) is 1/72 in or 0.35 mm. Some examples of letter heights that are calculated based on the visual distance of the eye to the object being viewed are as follows in table 1 [22]:

Table 1 Sample letter height recommendation

Distance from eye (mm)	Height of small letters and number (mm)
Up to 500	2,5

Distance from eye (mm)	Height of small letters and number (mm)
301-900	5,0
901-1800	9,0
1801-3600	18,0
3601-6000	30,0

Activities related to the sense of sight can be done properly if the senses have been stimulated by light waves. Each color has a different psychological effect, between dark colors, bright colors and intense colors. The psychological effects of color can be seen in table 2 [23]:

Table 2. Physical effects of color

Color	Effect		
	Distance	Physical	Temperature
Blue	Far Away	Cool	Pleasant
Green	Far	Very cool to neutral	Very pleasant
Red	Near	Hot	Very distracting
Orange	Very close	Hot	Stimulating
Yellow	near	Very hot	Stimulating
Brown	Very close	neutral	Stimulating
Violet	Very close	cool	Aggressive gasp
White	close	neutral	clean

3.5 User Centered Design (UCD)

Ways to implement them. User-centered design (UCD) integrates the user in the solution design process, using their direct feedback to optimize the design of an intervention. Some benefits of implementing a UCD approach include gaining buy-in from intended users, domain knowledge that informs the design, and tacit knowledge that users bring to the table in the design process [24]. User Centered Design (UCD) method has 4 stages, which are [25]:

1. Plan the human centered process.
   The first steps is to identify and brainstorm on a problem.
2. Specify the context of use.
   The second steps is decide who will use the application by observing and interviewing potential system users.
3. Specify user and organization requirements.
   Identify functional desires based on user needs.
4. Produce design solution.
   Create a prototype application design.
5. Evaluate design against user requirements.
   Is the application testing that is carried out according to the user's wishes. Testing is complete when the prototype is in accordance with the user's wishes.

3.6. System Usability Scale (SUS)

The System Usability Scale (SUS) method is used to evaluate or assess an application by measuring the level of usability. This method uses a simple ten-question questionnaire to assess the application [26][27][28].

Usability calculation steps using the System Usability Scale (SUS) method are as follows [29]:

1. Problem identification and questionnaire preparation.
   The first step is to identify the problem. The entire data is analyzed and evaluated to be used as research results. The System Usability Scale (SUS) statement instrument is as follows in table 3:

Table 3 SUS questionnaire statement instrument

No	Statement	Score
1	I think that I would like to use this product frequently.	1-5
2	I found the product unnecessarily complex.	1-5
3	I thought the product was easy to use.	1-5
4	I think that I would need the support of a technical person to be able to use this product.	1-5
5	I found the various functions in the product were well integrated.	1-5
6	I thought there was too much inconsistency in this product.	1-5
7	I imagine that most people would learn to use this product very quickly.	1-5
8	I found the product very awkward to use.	1-5
9	I felt very confident using the product.	1-5
10	I needed to learn a lot of things before I could get going with this product.	1-5

2. Data collection.
   The second stage is to collect the data needed to conduct research. Some of the steps taken by converting respondents' responses are as follows:
   a. Each odd statement, i.e., 1, 3, 5, 7, and 9. The score given by the respondent is reduced by 1
   $$Odd\ SUS\ score\ = \sum (P_x - 1)\ (2)$$
   b. Each even statement is 2, 4, 6, 8, and 10. The score given by the respondent is reduced by 5.
   $$Even\ SUS\ score\ = \sum (5 - P_n)\ (3)$$
   c. The conversion results are then summed up for each respondent and multiplied by 2.5 to get a range of values between 0-100.
   $$\left(\sum odd\ score + \sum even\ score\right) \times 2{,}5\ (4)$$
   d. The next step is to find the average score by summing up all the score results and dividing by the number of respondents.
   $$\bar{X} = \frac{\sum x}{n}\ (5)$$
3. Analysis and evaluation.
   The SUS method has three points of view in assessing and evaluating the results of the present value range, namely, acceptability, grade, and adjective rating. The acceptability assessment has three levels, namely not acceptable, marginal, and acceptable. Grade assessment has five levels of present value from A, B, C, D, and F, while adjective

rating assessment starts from worst imaginable, poor, ok, good, excellent, to best imaginable.

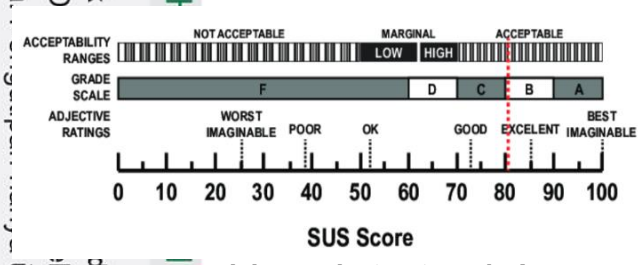


Fig. 1. *System Usability Scale (SUS) Method Assessment score.*

3. Methods

Data were collected by conducting observations, interviews, and collecting data through documents. This data collection aims to present information according to facts that can be accounted for its truth. The types of data used in this study are primary and secondary data. Primary data collection is done by interviewing employees and managers responsible for the CPO vessel handling section of PT. KPBN Dumai. Secondary data collection is obtained by tracing documents related to vessel loan contracts and proof of CPO vessel handling notes and archives.

The data that has been collected is then processed to obtain the desired results. Data processing aims to change the supply chain flow manual to be integrated using a blockchain system. Steps are taken in creating a blockchain-based framework, such as mapping supply chain management using blockchain, creating data flow diagrams, use case diagrams, and activity diagrams, and continuing to create user interfaces. After making the user interface, the system's usability is tested using the System Usability Scale (SUS) method.

4. Result and Discussion

The steps in the process of creating a smart contract-based blockchain with user interface (UI) intermediaries are as follows:

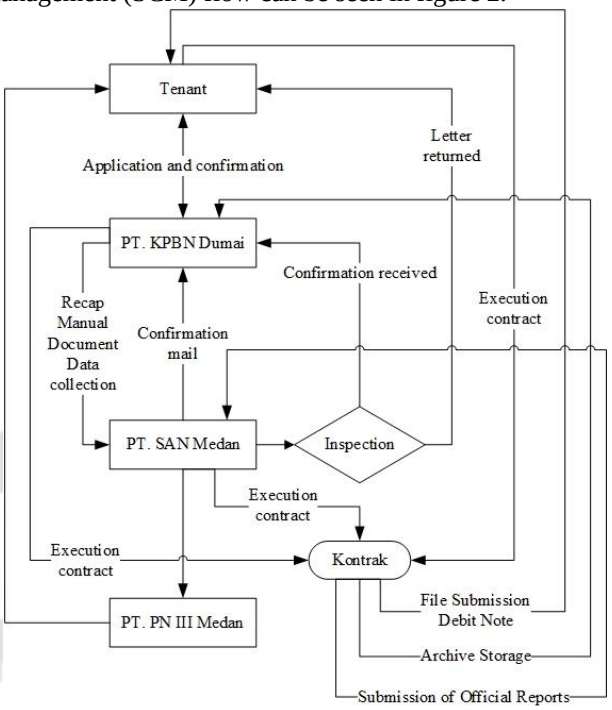
4.1. Blockchain-based Supply Chain Management

Blockchain is used to implement CPO vessel handling in contract activities where the manual handling process is converted into a blockchain-based smart contract. In addition, data collection on the number of remaining vessels at PT. KPBN Dumai and PT. SAN Medan are also systematically inputted into the blockchain system**.**

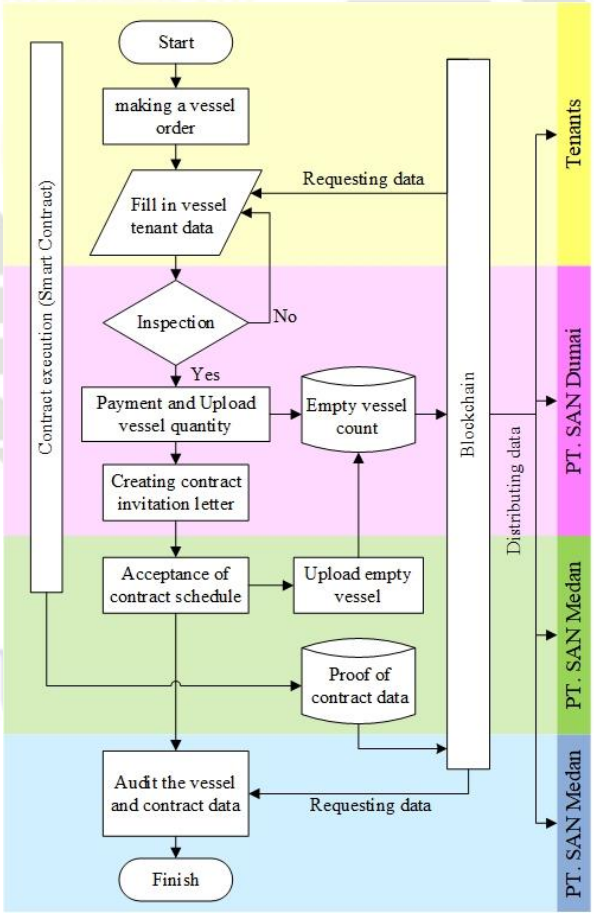
With blockchain in contracting activities, supply chain information flow becomes more organized and decentralized so that all companies can access information and minimize waiting time when submitting contracts.

The use of blockchain in the vessel handling system can affect the level of efficiency in terms of archive collection. The blockchain system makes the archive of agreements that were originally manual into a decentralised system using blockchain. The decentralised system makes the vessel handling archive more transparent. The contract archive becomes more accessible so that all companies can check the handling contract so as to minimise fraud.

Archives that have been grouped in the blockchain become more organised. With blockchain, data does not need a storage cabinet, so when the company merges, the company can move data easily. Blockchain in Supply Chain Management (SCM) flow can be seen in figure 2.



a



b

Fig. 2. Supply chain management information flow with blockchain
(a) Current Supply Chain Management, ***(b)*** Supply Chain via Blockchain (All Data Distribute)

The information and data flow model in the supply chain before the use of blockchain looks irregular. It can be seen in the processing of information about the number of vessels that cannot be directly accessed by the tenant company, checking manually, and distributing the database after the contract is not done. Contract archive data is only stored by each company.

The use of blockchain in the CPO vessel handling supply chain can shorten the waiting time when borrowing a vessel, and the contract execution process. This reduces reliance on manual processes, delivery of physical documents, and time-consuming verification processes. With transparently distributed and verified information, parties involved in the supply chain can quickly verify and execute contracts, reduce administrative bottlenecks, and speed up workflows that result in shorter contract execution lead times.

Where all data has been unified in the blockchain, each company gets the right to access all the data, making it easy for companies to handle vessels. The distribution of CPO handling data archives after contract execution becomes easier. Each company is given the appropriate archive, so the contract is not easy to manipulate.

4.2. Data Flow Diagram (DFD)

The Data Flow Diagram (DFD) used consists of a context diagram, a level 1 Data Flow Diagram (DFD), and a level 2 Data Flow Diagram (DFD). The context diagram in the CPO handling process at PT. KPBN Dumai describes the process of implementing vessel handling in general. There are 4 main entities: the tenant company, PT. KPBN Dumai, PT. SAN Medan, and PT. PN III Medan.

The Data Flow Diagram at level 1 describes the context diagram regarding a more complex CPO handling system. Data Flow Diagram (DFD) level 1 describes the flow of handling applications from the beginning to the end of the submission process.

Each process in DFD is interconnected, and all databases generated in each process are stored on the blockchain. The database is decentralized so all entities can find the data (both data on the number of available vessels, contract execution time, and contract archives) on the CPO handling operation.

From the level 1 data flow diagram, it can be seen that the mail flow process is more organized by using a blockchain-based system. Letters are easily sent to recipients so that there is no waiting activity. By making a smart contract on the implementation of the contract, the contract archive will be automatically stored in the blockchain. Archive data is also easier to distribute to other companies. In addition, using smart contracts in contracts can maintain the authenticity of archives and contracts so that data is maintained and not easily manipulated. Data Flow Diagram can be seen in figure 3.

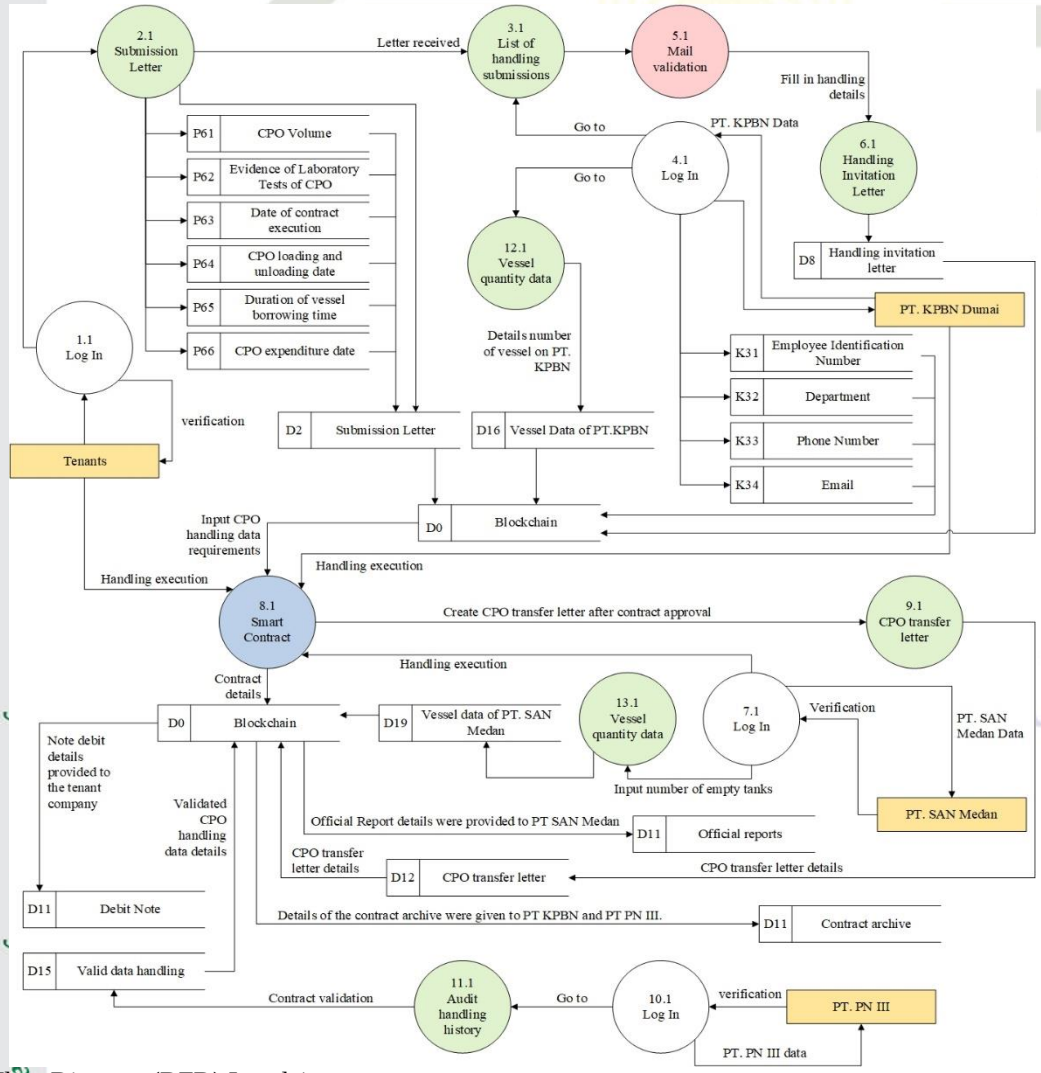


Fig. 3. Data Flow Diagram (DFD) Level 1

Calculating the amount of database to be stored is carried out, from the calculation of the total amount of database as much as 86. The data consists of 4 company login data, official report data, submission letter data, and smart contract data. All of this data is stored in the blockchain.

4.3. Blockchain Diagram Model

A suitable blockchain model for use in modelling vessel handling systems is to use a consortium blockchain. The consortium blockchain model can be used by several organisations or entities working together to maintain the security, privacy, and reliability of data in the supply chain [30][31].

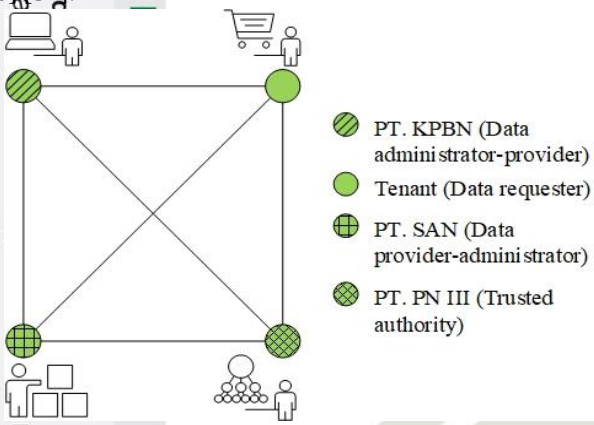


Fig. 4. Consortium Blockchain

Each consortium member is privileged and responsible for maintaining data integrity and validating transactions on the blockchain. The participation of each entity is governed by an agreement between the members of each entity. Each member in the entity must follow the rules and policies that have been set. Each consortium blockchain user is given trust and power in each entity, but there is still centrally managed control and security [32][33][34].

The transaction system when leasing CPO vessels is carried out using smart contracts. The smart contract model is used as a storage tool for information when making contracts as well as archives in the form of contract details, official reports and debit notes.

Some important components contained in the use of smart contracts during the CPO vessel handling process are tenant data, members of each company (members registered in the blockchain), data details, terms and conditions of contract submission, verification and approval.

With this smart contract design, the use of consortium blockchain in vessel handling leasing will provide benefits such as transparency, security, and trust distribution among members in the network. The leasing information will be securely recorded in the block chain, and verification by consortium members will ensure the validity of the transaction. Thus, smart contracts on vessel handling leasing within the consortium blockchain will improve efficiency and reliability in the vessel leasing supply chain. Consortium blockchain architecture can be seen in figure 5.

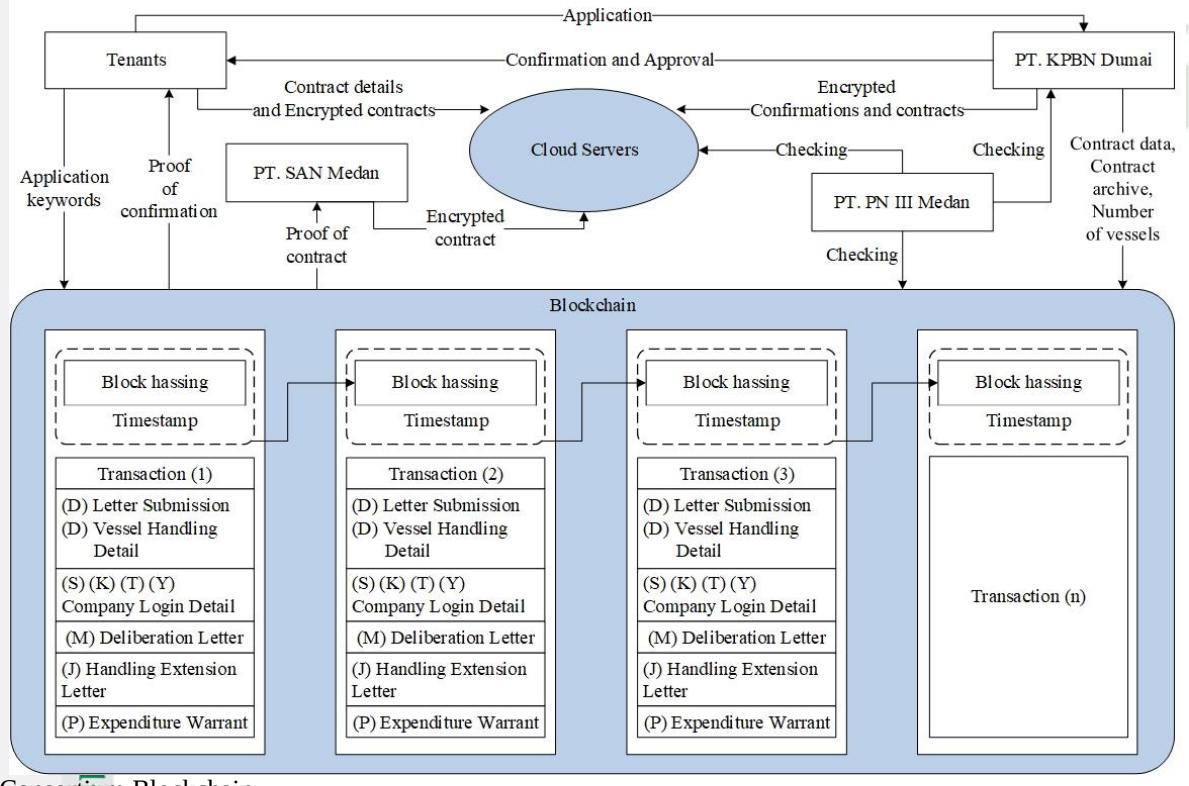


Fig. 5. Consortium Blockchain

4.4. Use Case Diagram

The use case diagram of the CPO handling process is divided into 4 actors (companies) that represent user activities in each system. The use case diagram illustrates the relationship between the system and actors. Use case diagrams in the CPO handling process are divided into 4 interconnected types: use cases on tenants, PT. KPBN Dumai, PT. SAN Medan and PT. PN III Medan. Each use case is interconnected.

Use cases can also be interpreted as a description of the system model (User Interface) that each actor will run on the application. Use case diagram can be seen in figure 6.

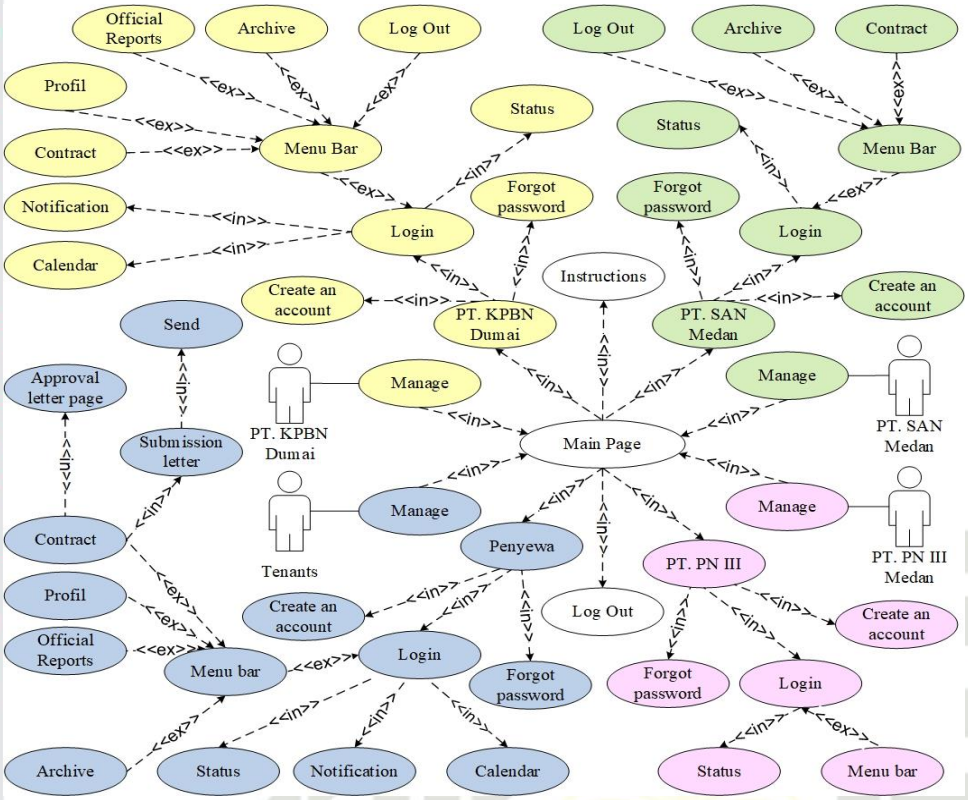


Fig. 6. Use Case Diagram

4.5. Activity Diagram

The activity diagram in the CPO handling process describes the interaction between users and the system. The activity diagram in the smart contract menu includes implementing CPO vessel handling of tenant companies to PT. KPBN Dumai and PT. SAN Medan. Activity diagram on smart contract activities can be seen in figure 7.

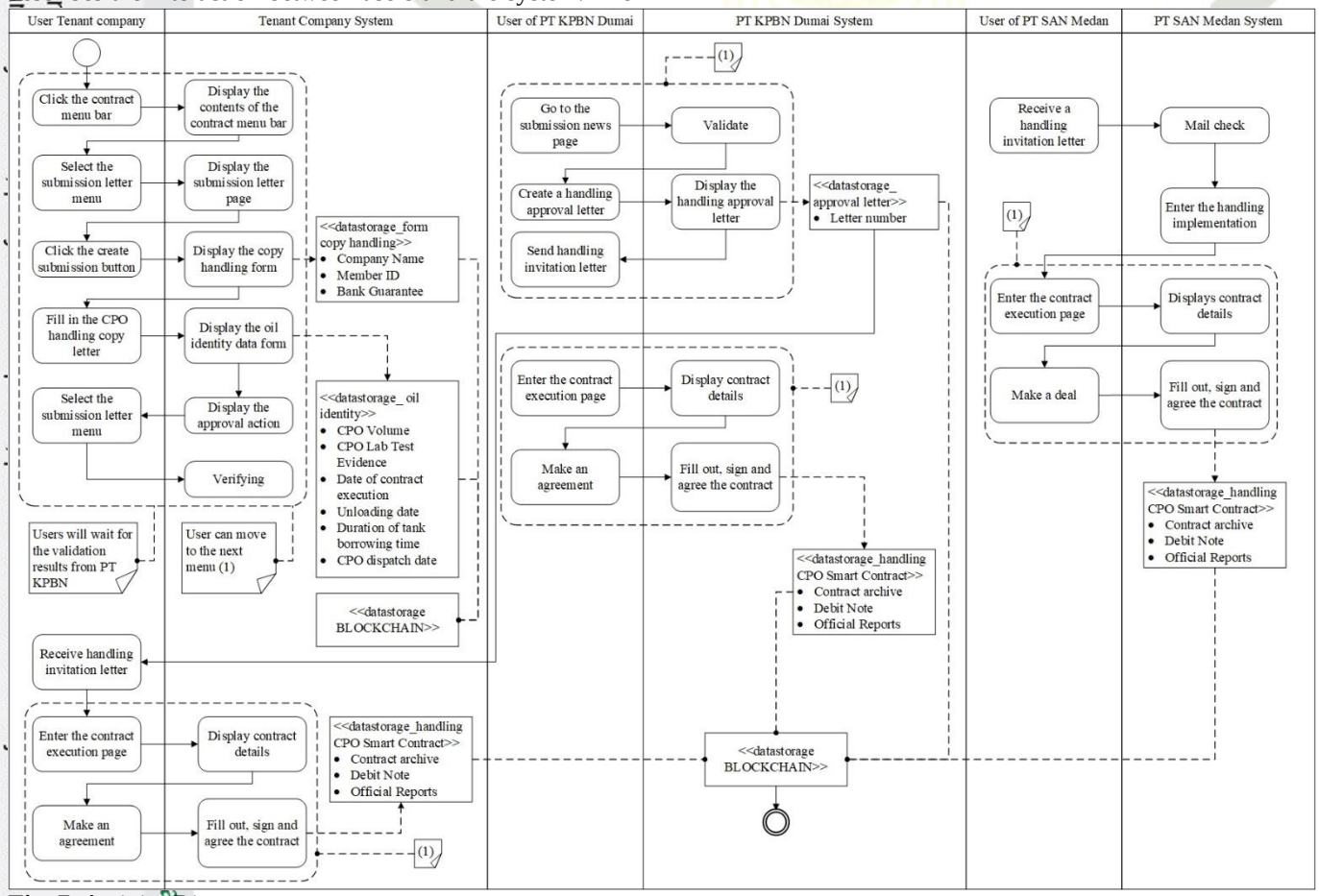


Fig. 7. Activity Diagram

4.6. User Interface Generation

The first step is to brainstorm the problems in the CPO handling process that occur at PT. KPBN Dumai, including:

1. Unsynchronised and complicated information flow regarding the loan process and the number of empty vessels that the tenant does not know, so the tenant must submit a request letter repeatedly.
2. The long waiting time for vessel handling (22 days) is caused by vessel checking and confirmation activities.
3. The use of manual contracts in the process of CPO handling activities so that much space is needed to store manual archives.
4. A large number of manual archives causes the company to experience difficulties during mergers when moving archives.

The next step is to identify potential users of the vessel handling website. 10 employees are responsible for the CPO vessel handling rental process, including:

Table 4 Recapitulation of Prospective Users of CPO Vessel Handling Website

No	Name	Age	Gender	Job
1	Jarwa Rahmanta	51	Male	Head of unit
2	Lamhot Samosir	45	Male	Head of Operations
3	Zulkifli S	49	Male	Operational Field
4	Muhammad Solahuddin	37	Male	Engineering
5	Bambang Palgunadi H	27	Male	Administration Staff
6	Muhadi	51	Male	Operational Field
7	Lila Tiara Sari	48	Female	Business Administration
8	Dedi Irwandi	53	Male	Laboratory
9	Sri Mukaromah	38	Female	Administration Staff (Cashier)
10	Iskandar	55	Male	Head of Finance

Interviews were conducted regarding the opinions and readiness of PT. KPBN Dumai employees as potential users of the CPO vessel handling website.

Based on the problem that has been described in the previous step, there are several user needs and desires for websites that need to be developed, including:

Table 5 User Problems and Needs

User Needs	Comfortable to the eye.
	Website display is easy to understand.
	Easy-to-read fonts.
	Website colors are not flashy.
	Database display is easy to read.
Functional Solution	The website design must be simple, concise, and easy to understand by all employees.
Non-Functional Solution	The socialisation of the newly created website
User Suggestion	A tutorial is needed to make the website easy to understand.

The next step is to design the user interface. User Interface (UI) design is done using the Figma application. Based on user needs regarding font size, the minimum font size that can be applied to the website, if known, is the viewing distance of the operator's eyes to the computer screen is 60 cm (600 mm), then the font height is 3 mm.

The rules for calculating the font size in point (pt) on the letters are by converting millimeters into point (pt) units, where 1 point (pt) = 0.35 mm, so the letter height in point (pt) is 8.57 pt or rounded to 9 pt. Each company has its type of prototype user interface. User interface each company can be seen in figure 8.

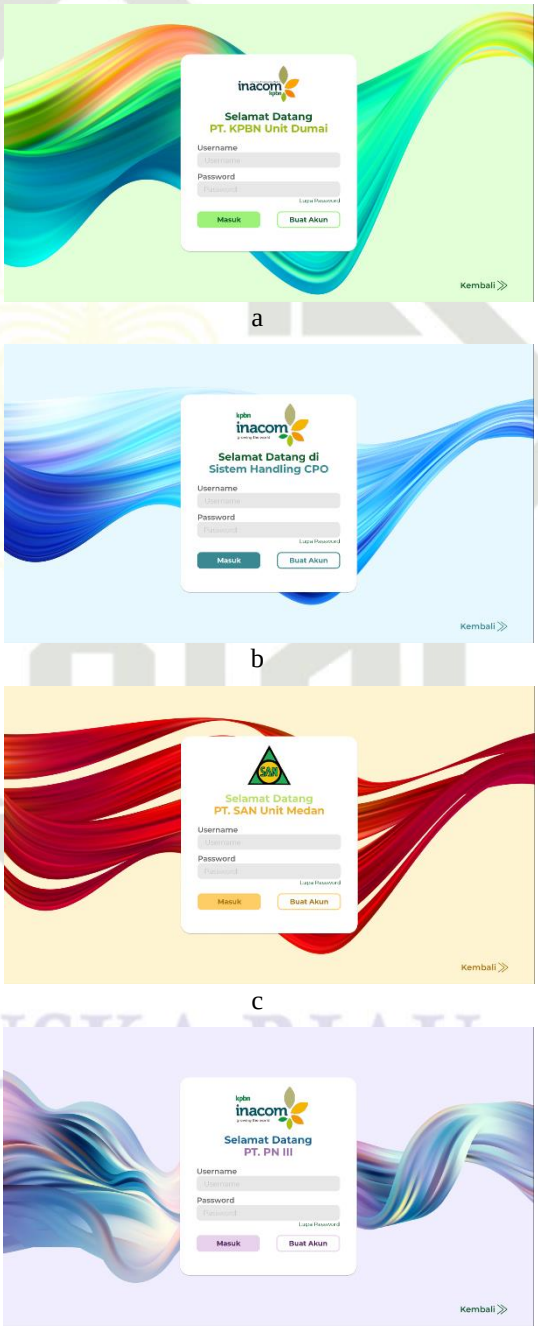


Fig. 8. User Interface (UI) each company
(a) PT. KPBN Dumai, **(b)** Tenants, **(c)** PT. SAN Medan, **(d)** PT. PN III Medan

1. User Interface Prototype of PT. KPBN Dumai
The green colour dominates the user interface of PT. KPBN Dumai. It is a delightful color for the eyes. The green colour is also based on the colour of the PT. KPBN logo which is dominated by green.
User Interface Prototype of the tenant company
The blue colour dominates the user interface of the tenant company. Blue is a cool colour, and very comfortable in the eyes. Blue is the basic colour in text of PT. KPBN.
User Interface Prototype of PT. SAN Medan
The user interface of PT. SAN Medan is dominate by the yellow-orange colour. The yellow and orange colours in the user interface can stimulate workers' vision.
User Interface Prototype of PT. PN III Medan
The user interface of PT. PN III Medan is dominated by the lilac-purple colour. The colour purple gives a cool look and stimulates the eyes.

The implementation of the blockchain model can also be found in the user interface of each company. The first blockchain model is found on the new account registration page on each company page. Each company has a data form that must be filled in. All data will be coded so that registration and log in data between companies are not mixed up. Account data stored in the blockchain database is displayed on the company profile page, correspondence page as mailing data, and the CPO handling contract page. Profile data on each display can be accessed, making it easier for each company to check user profiles when carrying out contract activities.

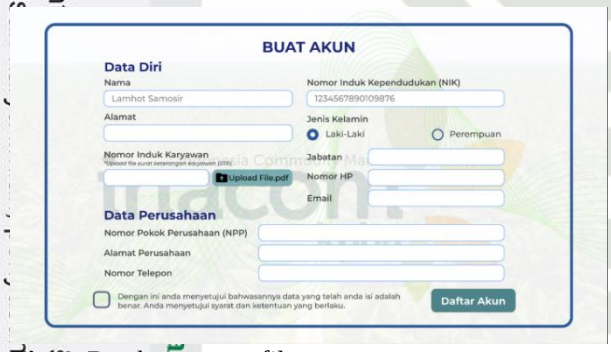


Fig. 9. Database on profile page

In addition, blockchain can also be found in the CPO handling data archive. Data archives containing details of contract activities are then put together on a page. It can be accessed and viewed by all members of the company and cannot be edited. The details of the archive page will continue to grow as the CPO handling contract activities in the company progress.

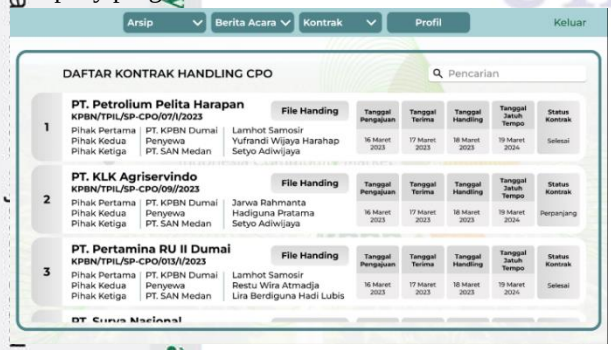


Fig. 10. Database on contract activity

At PT KPBN Dumai and PT SAN Medan, the blockchain model is found on the number of vessels page, when the company inputs data on the number of vessels in the company. Where the inputted vessel data will enter the data base, stored, then the data is distributed throughout the company. By using this system, the CPO handling process becomes more flexible, due to the reduced waiting time for the process of submitting a vessel application letter which was originally done manually and facilitates the auditing process.

Fig. 11. Database on number of vessel data

Blockchain can also be found in the user interface of the tenant company. Where, all correspondence data that has been done will remain stored in the blockchain database. The correspondence data is used in the CPO vessel handling process. By providing a code for each data in each letter, it will make it easier to group data. Letters become more secure, and transparent.

The application of smart contract-based blockchain can be seen on the CPO handling contract page. At that time, all incoming and outgoing data comes from the blockchain. Incoming data in the form of company data, bank guarantees, data on the number of vessels, oil volume data, and contract agreement date data. While the outgoing data is divided into 3 documents, namely official report, debit notes and report archives.

Fig. 12. Database on smart contract handling CPO

The distribution of documents after the CPO handling contract used to be done manually, documents were delivered using couriers to each company. This is very time consuming, and the documents are not well preserved. The use of blockchain can minimise mail delivery time, overcome the impact of loss on documents, and avoid data manipulation.

4.7. Usability Testing

Usability calculations use the System Usability Scale (SUS) method. 10 respondents have filled out 10

statements for the recapitulation of filling out the System Usability Scale (SUS) questionnaire, including:

Table 6 Recapitulation of System Usability Scale (SUS) Ratings

Respondents	Statement									
	1	2	3	4	5	6	7	8	9	10
R1	4	2	4	2	3	2	4	2	5	2
R2	5	2	5	3	2	2	5	3	4	4
R3	4	2	5	2	4	2	5	2	4	3
R4	5	2	5	2	5	2	5	2	5	5
R5	3	5	4	2	5	2	5	3	5	2
R6	4	2	4	2	5	2	4	2	4	2
R7	4	2	5	4	4	2	5	2	5	5
R8	5	2	4	3	4	2	4	2	5	2
R9	5	2	5	2	3	3	3	2	3	4
R10	5	2	4	4	4	2	4	3	4	5

Calculation of the System Usability Scale (SUS) value using formulas 2, 3, and 4 so that:

$$\text{SUS Score} = ((P1-1) + (5-P2) + (P3-1) + (5-P4) + (P5-1) + (5-P6) + (P7-1) + (5-P8) + (P9-1) + (5-P10)) \times 2.5)$$

Then the System Usability Scale (SUS) score value in each statement includes:

Table 7 System Usability Scale (SUS) Score

Score									
1	2	3	4	5	6	7	8	9	10
75	67.5	77.5	80	70	77.5	70	77.5	65	62.5

The average score was calculated using formula 5 by summing up all the score results and dividing by the number of respondents. So that the average value is 72.25.

Based on the average SUS score results, 72.25 is obtained. This value has an acceptable meaning because it is in the range of 71-100. The average score is in the range of percentile scores $\geqslant$ 68 and 74 in grade C so the User Interface is at a Good level.

With a good user interface model, the implementation of blockchain will be maximised. A good user interface design allows users to easily interact with blockchain technology, and maximise the benefits offered by blockchain, such as transparency, security, and efficiency in the implementation of handled CPO in the company.

5. Conclusion

This research demonstrates that using blockchain-based smart contracts is suitable for contract management and execution at PT. KPBN Dumai. By utilizing blockchain technology, the vessel contract handling system can be enhanced in terms of transparency, reliability, and data security. Through the implementation of smart contracts, the contract execution process can be automated, reducing the risk of human errors and improving operational efficiency.

Furthermore, this research has produced a user interface model that has been tested through usability testing. The user interface model scored 75.25 based on the test results, indicating good quality. This indicates using a blockchain system for supply chain design and vessel leasing at PT. KPBN Dumai can enhance user experience in contract management and accessing archive data.

This research proposes improvements to PT to address the challenge of a large amount of archive data. KPBN Ex. PT. SAN Unit Dumai. The proposals include implementing blockchain technology for storing and managing archive data. By leveraging the advantages of blockchain in terms of security, transparency, and data integrity, PT. KPBN Dumai can reduce the risk of data loss or damage and improve efficiency in searching and retrieving data.

This research demonstrates that using blockchain-based smart contracts can significantly improve the vessel contract handling system and organize archive data at PT. KPBN Dumai. With proper implementation, blockchain technology can provide efficient and secure solutions to overcome the challenges faced by the company.

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held between 10th to 12th July 2023

Assoc. Prof. Dr. Lenin Gopal
General Chair | GEn-CITy 2023
University of Southampton Malaysia

Prof. Rebecca Taylor
Honorary Chair | GEn-CITy 2023
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