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# RECORDING ORGAN TRANSFERS AND DEPOSIT PROCEDURES WITH BLOCKCHAIN-BASED TECHNOLOGY

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## ABSTRACT

Organ donation and transplantation systems face numerous challenges related to registration, donor-recipient matching, organ retrieval and delivery, and transplantation itself, complicated by legal, clinical, ethical, and technical barriers. Consequently, establishing a robust organ donation and transplantation system is crucial to ensuring a fair and efficient process that enhances patient satisfaction and trust. This paper proposes a decentralized solution using a private Ethereum blockchain. We develop smart contracts and detail six algorithms, describing their implementation, testing, and validation. We evaluate the system's performance through privacy, security, and confidentiality assessments, comparing it with existing approaches.

**Keywords:** Privacy, Organ Donation, Transplantation, Blockchain.

## I. INTRODUCTION

An injury or disease causes organ failure or damage. It reduces one's quality of life and, in rare situations, causes death. Donating an organ is one of humanity's most noble acts in order to save patients' lives through organ transplantation. For a successful transplant, the organ must be in good operating order, with donor-recipient matching, and its removal must not endanger the donor's life. In 1954, a kidney transplant between twin brothers was the first successful organ donation. The yearly number of transplants has continuously climbed since then. However, the demand for organ donations continues to outnumber the number of donors. In reality, twenty individuals die every day while waiting for an organ transplant, and a new patient is born every day.

More crucially, being able to access the organ donor waiting list is a fundamental prerequisite for organ allocation. Geographic and socioeconomic considerations can also influence transplant referral. As a result, the waiting list allocation method should not discriminate against certain categories of patients.

Organ donation can take place in two ways: dead donation and live donation. Figure 1 depicts a typical flow chart for donating and transplanting an organ to a patient. First, the hospital transplant staff examines the donor, and if the donor is deceased, a brain death test is conducted. Meanwhile, if the donor is still alive, physicians evaluate him or her to determine that the donor is healthy enough to donate blood.

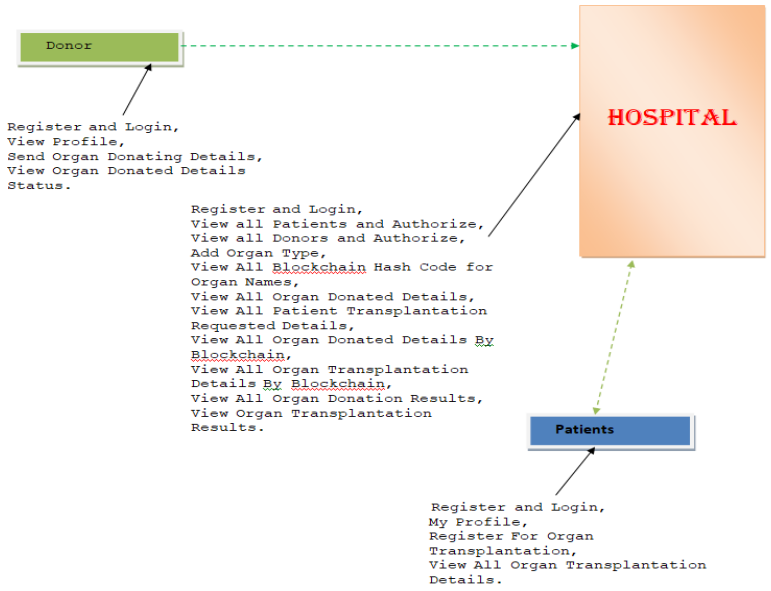


**Fig. 1.** Proposed Architecture

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The procurement organiser is then notified of all medical records. The procurement organiser is in charge of assessing the donor's health to determine whether he is a suitable donor and ensuring that the donor is appropriately recorded in the medical system. The procurement organiser then provides all of the data to the organ transplantation organiser if the evaluation confirms that the donor is qualified for donation. This stage may only be completed if the donor agrees to donate to an anonymous person. The organ transplantation organiser then performs the matching procedure between available donors and patients on the waiting list. As a consequence, the transplanting surgeons are given a ranked list as an output.

## II. LITERATURE REVIEW

According to L A Dajim proposed that [1] The suggested system is a blockchain-based decentralised software for organ donation. It would be an online application that would allow patients to register their information, including their medical ID, blood type, organ type, and state. Unless a patient is in severe condition, the system would operate on a first-in, first-out basis.

A Powell suggested that Organ donation and transplantation systems have unique needs and obstacles in terms of registration, donor-recipient matching, organ removal, organ delivery, and transplantation, all of which are hampered by legal, clinical, ethical, and technical restrictions. To improve patient experience and confidence, end-to-end organ donation and transplantation platforms are essential to ensure a fair and efficient procedure. We offer a private Ethereum blockchain-based system for managing organ donation and transplantation in a completely decentralised, secure, traceable, auditable, private, and trustworthy manner. We create smart contracts and three web-based modules for detail validation.

We assess the performance of the suggested solution by conducting privacy, security, and confidentiality assessments and comparing it to the present system.

Organ donation,[3] transplantation, Blockchain, Ethereum, and Decentralised are some of the terms used.

The procedure of physically taking an organ or tissue from one person (the organ donor) and implanting it into another person (the recipient) is known as organ donation. Transplantation is required when the recipient's organ fails or is damaged due to illness or accident.

One of the most significant advancements in contemporary medicine is organ transplantation. Unfortunately, the demand for organ donors outnumbers the number of persons who give. Every day, 21 individuals in the United States die while waiting for an organ transplant, and over 107,380 men, women, and children await life-saving organ transplants.

**Previous System:**

The authors of created a multi-agent software platform to reflect the information pipeline model shared between donor hospitals, regulators, and recipients. This platform optimises pre-transplantation tasks, potentially increasing process efficiency. Furthermore, it enables the storage of possible donor information and enhances direct contact between all parties in the organ donation process. The built platform was used to mimic an information workflow, and the saved time was estimated to be between three and five hours.

The TransNet in is a system that uses barcode scanning technology at the moment of organ recovery to help label, package, and monitor organs and other biological commodities for transplantation. It entails augmenting the labelling system with a DonorNet-compatible programme and a portable barcode printer. During organ recovery, procurement coordinators will print labels and scan all organs to be delivered using the operating room's system. Similarly, several supply chain management solutions have relied on barcodes, RFID tags, and Electronic Product Codes (EPC) to identify and share product information, allowing things to be tracked through multiple stages.

**Related Work:**

The system provides a private Ethereum blockchain-based solution for managing organ donation and transplantation in a decentralised, secure, reliable, traceable, auditable, and trustworthy manner.

The system creates smart contracts that register actors and assure data provenance by establishing events for all of the actions required during the organ donation and transplantation stages. The code for smart contracts is freely available on Github.1 Based on particular parameters, the system creates an auto-matching process

between the donor and the beneficiary via a smart contract.Six algorithms are presented, together with detailed implementation, testing, and validation information.

The system does a security analysis to ensure that the suggested solution is safe from common security threats and weaknesses. To demonstrate the originality of our solution, we compare it to current solutions. Our suggested solution is generic and may be simply tailored to fit the requirements of a wide range of related applications.

The system is developed an organ donation based on blockchain technology, which is more rapid and safe. The system is implemented an automatic procedure of human organ donation in the suggested system.

## III. MODULE DESCRIPTION

**1) Donors:**

The Donor will register and login in this module, then submit their organ donor data to the hospital and do the following operations: View Profile, Send Organ Donating Details, View Organ Donated Details Status.

**2) Patients:**

Patients connect in to this module using their user name and password. After logging in, the user will do certain actions such as My Profile. Register for an Organ Transplant and View All Organ Transplant Details.

**3) Hospital:**

The hospital monitors hospital data in order to enable organ storage for donation and transplantation, as well as the following operations: view and authorise all patients view and authorise all donors include organ type, view all organ names block chain hash codes view all organ donation details, view all patient transplantation requested details, view all organ donation details using block chain view all block chain organ transplantation details, view all organ donation results, as well as organ transplantation results.

## IV. FUTURE SCOPE

In the future, our solution can be improved by developing an end-to end dapp. Furthermore, the smart contracts can be deployed and tested on a real private ethereum network. Finally, the quorum platform can provide better confidentiality because transactions among entities can only be viewed by specific participants and nobody else, which is not the case in our solution, where transactions between two participants are viewed by other actors authorized in the private block chain.

## V. CONCLUSION

This paper introduces a decentralized and secure system for managing organ donation and transplantation using a private Ethereum blockchain. We have developed smart contracts that ensure data integrity by automatically recording all events. Additionally, we present six algorithms along with comprehensive details on their implementation, testing, and validation. Our focus includes rigorous security assessments to safeguard smart contracts against common vulnerabilities and attacks, comparing our solution with existing blockchain-based alternatives. We discuss the scalability of adapting our approach to address similar challenges faced by other systems. Future enhancements may include developing a comprehensive DApp for end-to-end functionality. Furthermore, implementing and evaluating smart contracts on a real private Ethereum network, such as Quorum, enhances confidentiality by restricting transaction visibility to authorized participants only, unlike our solution where authorized actors in the private blockchain can view transactions between two participants

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