PROJECT REPORT

Date	29 oct 2023
Team ID	NM2023TMID04076
Project Name	TRANSPARENT EDUCATION DATA MANAGEMENT

TRANSPARENT EDUCATION DATA MANAGEMENT

1.Introduction

1.1 Project overview

Transparent education data management using blockchain technology refers to the practice of collecting, storing, and disseminating educational information in a clear, accessible, and accountable manner. It involves the use of technology and standardized processes to ensure that data related to students, teachers, schools, and educational institutions is readily available to relevant stakeholders, such as educators, policymakers, and the public.

1.2 Purpose

Transparent education data management is crucial for creating a more effective, equitable, and accountable education system that benefits all stakeholders, with a primary focus on students' success.Allow parents and students to access information about schools and their performance, fostering greater engagement and involvement in the educational process.

2.Literature survey

2.1 Existing problem

The existing problem in transparent education data management lies in the lack of standardized data formats and definitions across educational institutions can make it difficult to compare and analyze data effectively.Education systems often use diverse software and data formats, making it difficult to integrate and share data seamlessly between different institutions and systems.

2.2 References

1.Dale Chu: Dale Chu is known for his work in education data management and policy analysis. He has written extensively on topics related to data transparency and accountability in education.

2.Rebecca Goldin: Rebecca Goldin's research focuses on statistical analysis and data transparency in education. She has written about the importance of clear and accessible data in education decision-making.

3.Andrew D. Ho: Andrew D. Ho is an author who has written about the use of data in education, including issues related to transparency and data-driven decision-making in schools.

4.Ellen Mandinach: Ellen Mandinach is an expert in education data management and has written about data transparency, data quality, and the use of data for educational improvement.

5.Daniel P. Mayer: Daniel P. Mayer is a researcher who has contributed to the field of education data management and has written about the importance of transparent data systems in improving education outcomes.

2.3 Problem Statement Definition

In the realm of education, there exists a critical need for the establishment of robust and transparent data management systems.

While educational institutions collect vast amounts of data pertaining to student performance, resource allocation, and administrative processes, significant challenges persist in ensuring the accessibility, accuracy, and ethical use of this data.

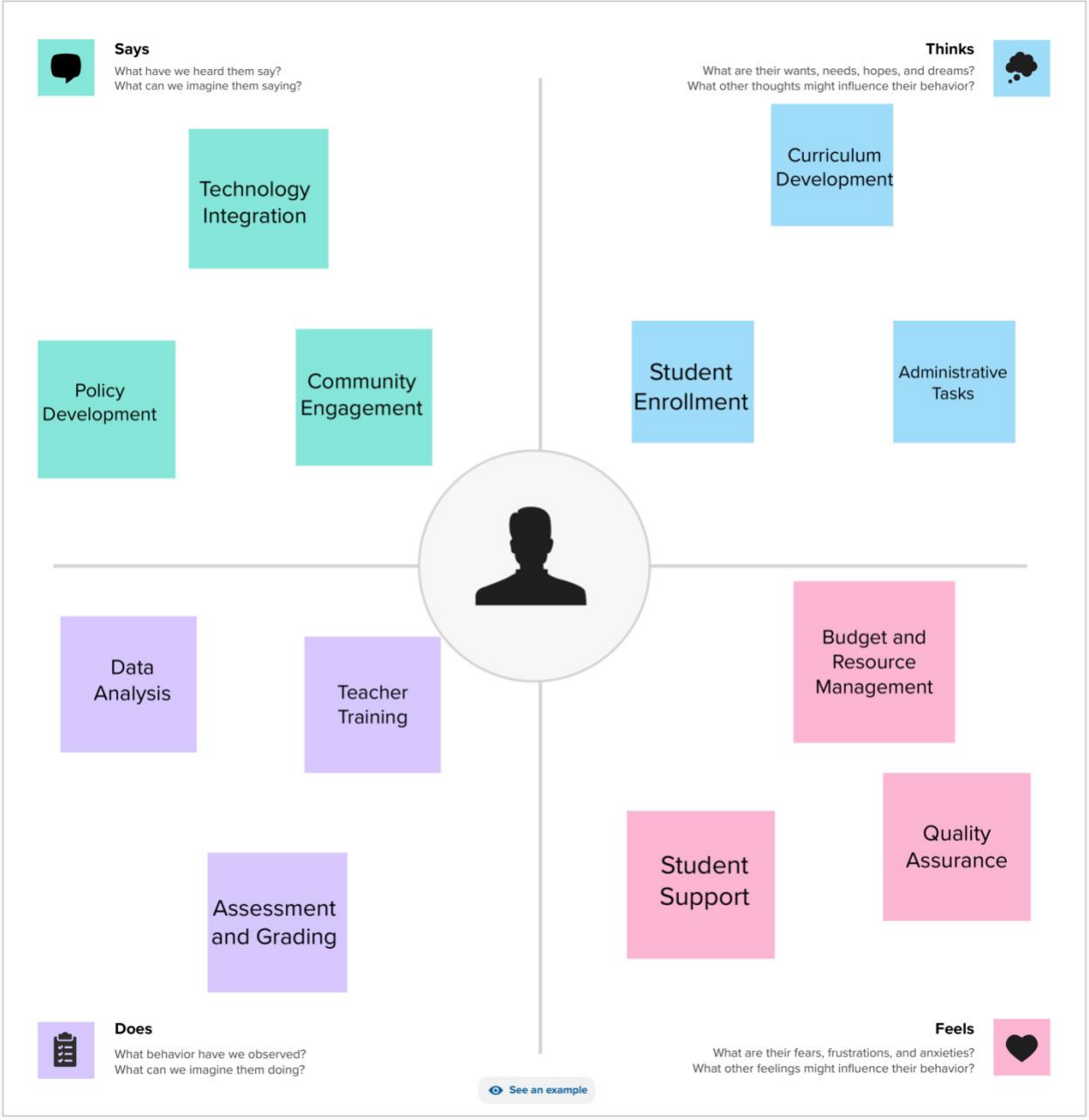
The lack of transparency in education data management hampers informed decision-making, accountability, and ultimately, the delivery of high-quality education.

3.Ideation and Proposed Solution

3.1 Empathy Map Canvas

An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. Much like a user persona, an empathy map can represent a group of users, such as a customer segment. The empathy map was originally created by Dave Gray and has gained much popularity within the agile community.

Wants to ensure data accuracy and security



.3.2 Ideation and Brainstroming

A group problem-solving technique that involves the spontaneous contribution of ideas from all members of the group

RULES:

1.Lay out the problem you want to solve. ...

2.Identify the objectives of a possible solution. ...

3.Try to generate solutions individually. ...

4.Once you have gotten clear on your problems, your objectives and your personal solutions to the problems, work as a group.

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

Team gathering
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

Set the goal
Think about the problem you'll be focusing on solving in the brainstorming session.

Learn how to use the facilitation tools
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLEM

Develop a comprehensive education management system that streamlines administrative processes, enhances student-teacher communication, tracks academic performance, and ensures efficient resource allocation for a K-12 school, with a focus on improving overall education quality and institutional effectiveness

Key rules of brainstorming

To run an smooth and productive session

- Stay in topic.
- Defer judgment.
- Go for volume.
- Encourage wild ideas.
- Listen to others.
- If possible, be visual.

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP

You ca
and hit
sketch

Person 1

Data Privacy and Security: How can we ensure that sensitive student data is stored, transmitted, and accessed securely while maintaining transparency about data usage

Data Accessibility: How can we make education data easily accessible to authorized users such as teachers, administrators, and parents, while protecting student privacy and ensuring transparency in data sharing

Data Accuracy: How can we address the issue of inaccurate or incomplete education data and ensure that the data used for decision-making is reliable and up-to-date

Person 2

Data Integration: How can we improve the integration of various education data sources and systems to provide a holistic view of a student's educational journey while maintaining data transparency

Data Ownership and Consent: How can we establish clear guidelines and obtain informed consent from students and parents regarding the use of their education data, ensuring transparency and ownership

Data Analytics and Reporting: How can we enable educators and policymakers to perform data analytics and reporting for better decision-making while maintaining transparency in the methodologies and results

Person 3

Compliance and Regulations: How can we ensure that educational institutions comply with data protection and privacy regulations while maintaining transparency in their practices

Data Transparency Tools : How can we develop tools and platforms that allow stakeholders to easily understand and visualize the flow and usage of education data for greater transparency

Ethical Data Usage: How can we address the ethical concerns related to the use of education data, such as avoiding bias and discrimination, and maintain transparency in these processes

Person 4

Data Retention and Deletion: How can we establish clear policies for data retention and deletion to ensure that education data is not kept longer than necessary and to maintain transparency in these practices

Communication and Collaboration: How can we improve communication and collaboration among educational institutions, students, parents, and other stakeholders to ensure transparency in education data management

Data Auditing and Accountability: How can we implement systems for auditing and holding individuals and institutions accountable for the handling and use of education data to ensure transparency and ethical practices

3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

TIP

Add customi
notes to mak
browse, orga
categorize ir
themes with

Data Security and Privacy: Develop a transparent data breach notification system to inform stakeholders in the event of a security breach.

Data Accessibility and Sharing: Implement secure, auditable data sharing protocols between educational institutions and external partners.

Consent and Ownership: Develop a transparent consent process for data usage with clear opt-in and opt-out options.

Compliance and Regulations: Conduct regular audits of data management practices to ensure compliance and transparency.

4

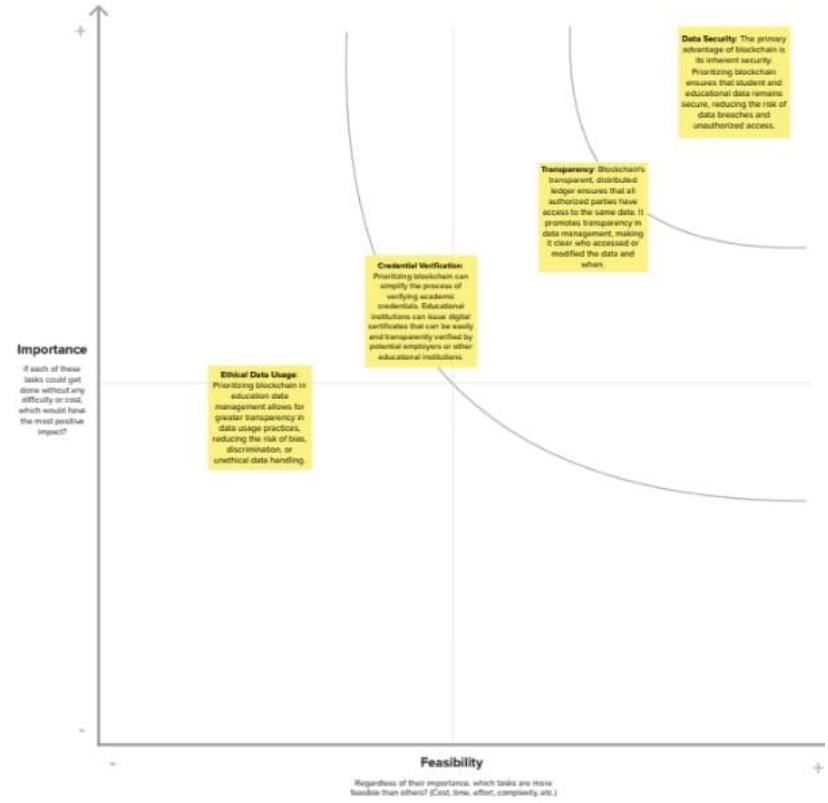
Prioritize

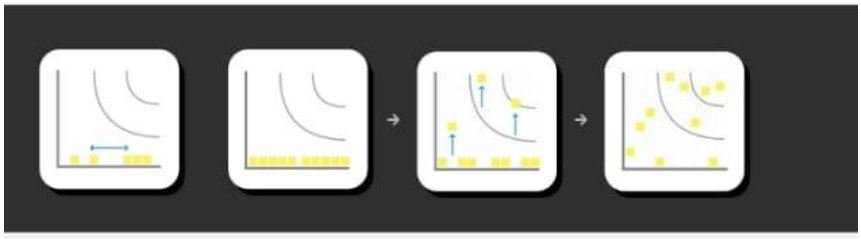
Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

TIP

Participants can use their cursors to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the **H key** on the keyboard.





4.Requirement Analysis

4.1 Functional Requirements

Requirements are traced forward through other development artifacts, including test cases, test runs, and issues. Requirements are traced backward to the source of the requirement, such as a stakeholder or a regulatory compliance mandate.

The purpose of requirements traceability is to verify that requirements are met. It also accelerates development. That's because it's easier to get visibility over your requirements.

Traceability is also important for analysis. If a requirement changes, then you can use traceability to determine the impact of change. You'll see what the requirement is connected to. And you'll be able to see how changing that requirement will impact related issues or tests.

4.2 Non Functional Requirements

For the technical requirements, the results of literature research, workshops and expert interviews are transformed into functional and non-functional user stories and summarized into application-oriented requirements. They contain a short description of the requirement: acceptance criteria describing which conditions the BBTS has to fulfill and other marginal data.

Data collected from the information sources "stakeholders", "documents" and "existing systems" are also systematically analyzed for the interoperability requirements. The analysis aims at an investigation of the systems already in use with regard to data and service interfaces for coupling with a blockchain. The interoperability requirements serve to incorporate all demands for digital frameworks.

When establishing the requirements, it must be ensured that the named aspects are objectively determined, validated and not contradictory. First, the objectivity of a usage requirement is ensured when several stakeholders / persons / sources formulate the same requirement for a specific usage context. Furthermore, the raised requirements must be traceable to the requirements of the context

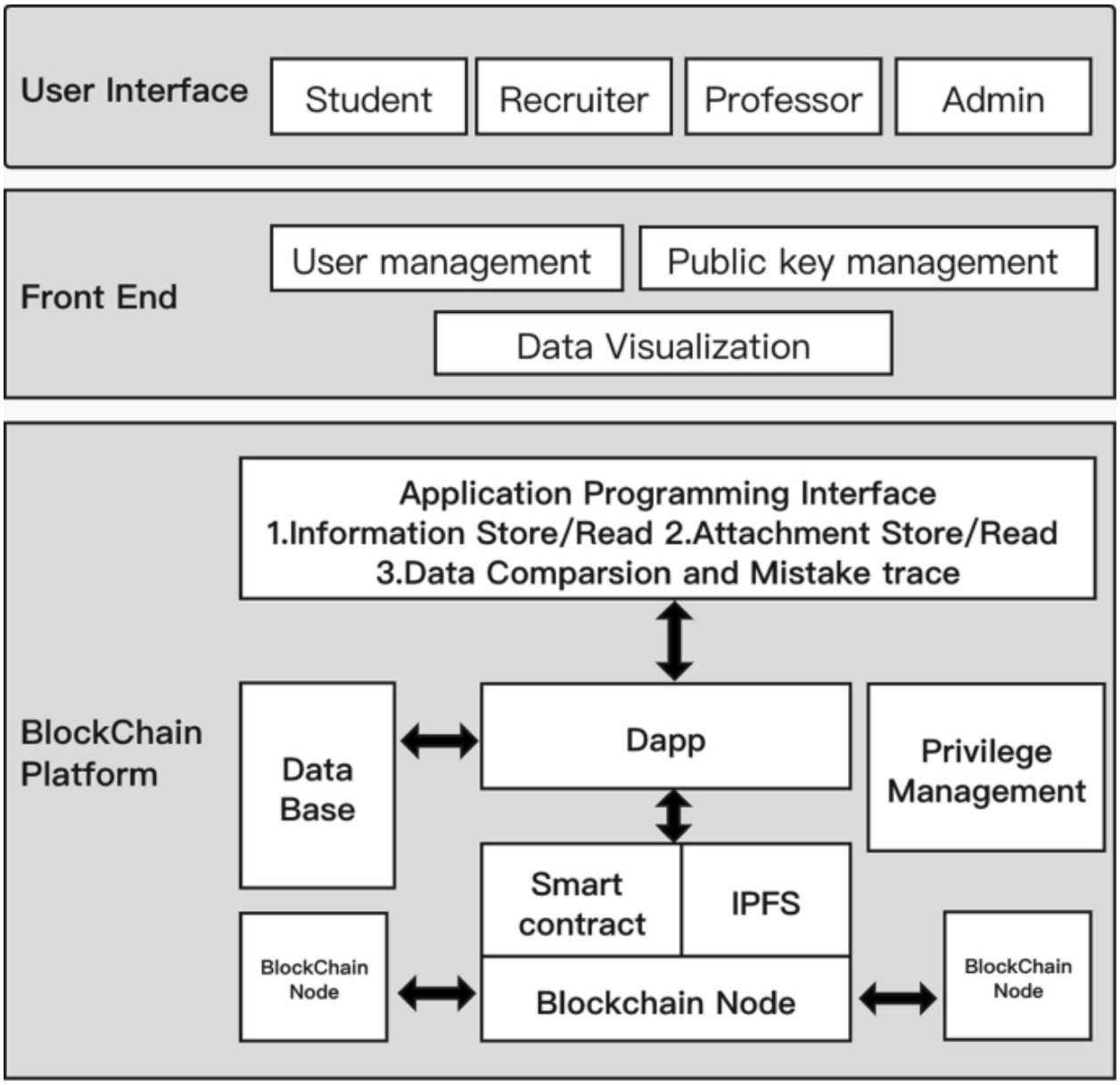
of use. To ensure that the requirements elicitation is done in the most unbiased way, an aspect is only declared as a fundamental requirement if at least two groups of stakeholders demand for it.

Second, the collected requirements must be valid, i.e. the data must be confirmed or, if necessary, corrected by representatives working in this context. In this paper, workshops with different participants of the supply chain were conducted as well as guideline-based interviews. The results can therefore be considered as valid.

5.Project Design

5.1 Data Flow Diagrams & User Stories

Data flow diagram

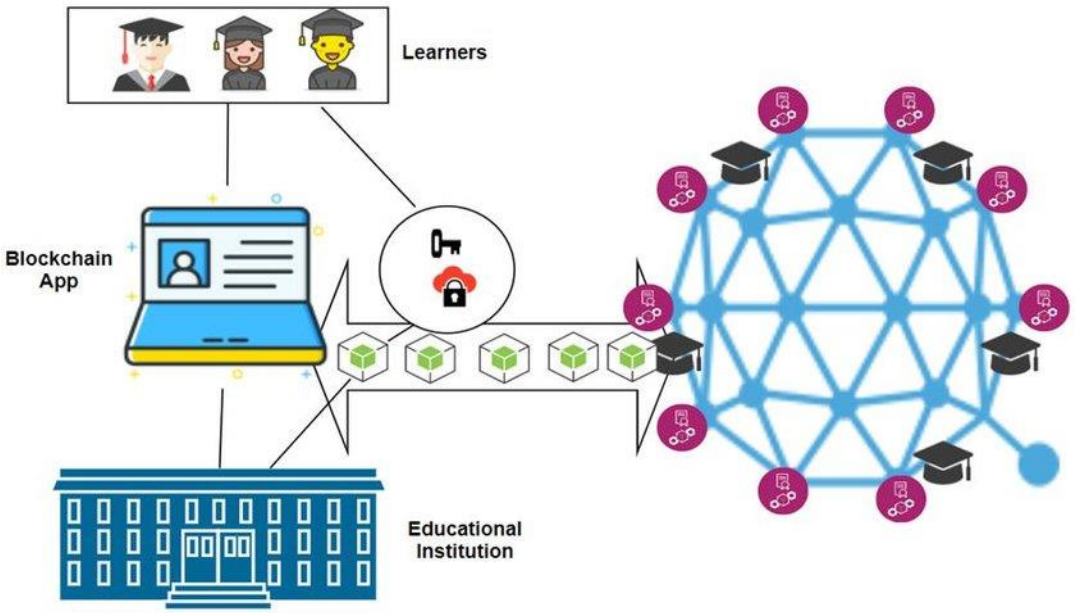


User Stories

User Story Number	User type/task	Priority
USN-1	I want an intuitive and user-friendly interface that allows me to navigate the system effortlessly.	High
USN-2	I need the ability to easily input, edit, and update student, teacher, and curriculum data.	High

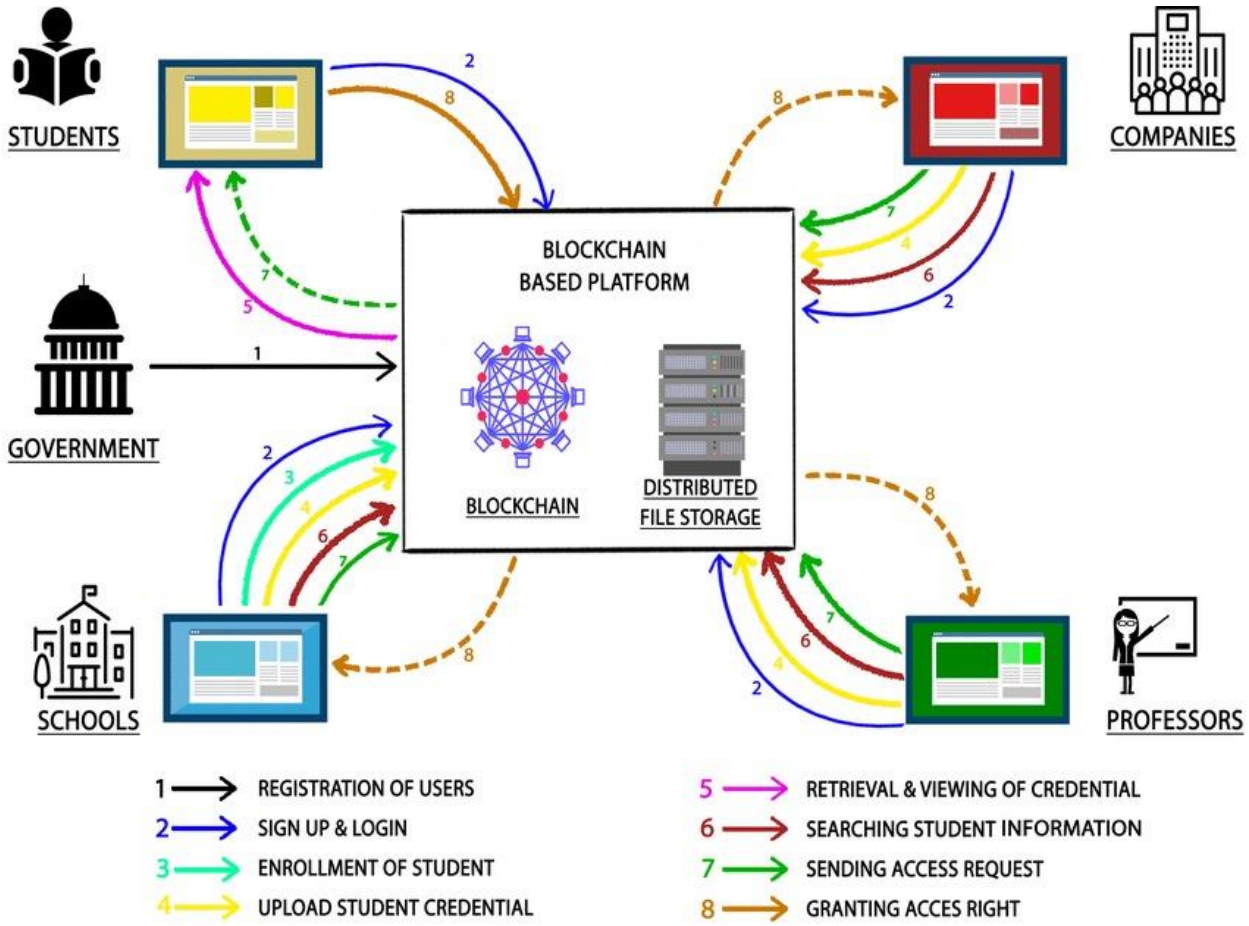
USN-3	The system must adhere to data security and privacy standards to protect sensitive information.	High
USN-4	The system should provide real-time access to data for authorized users, ensuring transparency.	High
USN-5	I want the ability to create custom reports and dashboards to analyze data based on specific educational goals and metrics.	Medium
USN-6	It should include data validation checks to maintain data accuracy and quality.	High
USN-7	The system should offer training resources and responsive customer support to help users make the most of the platform.	High
USN-8	The system should be scalable to accommodate a growing number of students, teachers, and educational programs.	Medium
USN-9	The system should include a feedback mechanism to gather input from users for continuous improvement.	High
USN-10	The system must adhere to education data management regulations, including FERPA in the United States or GDPR in Europe, to ensure compliance.	Medium

5.2 Solution Architecture



6.Project Planning & Scheduling

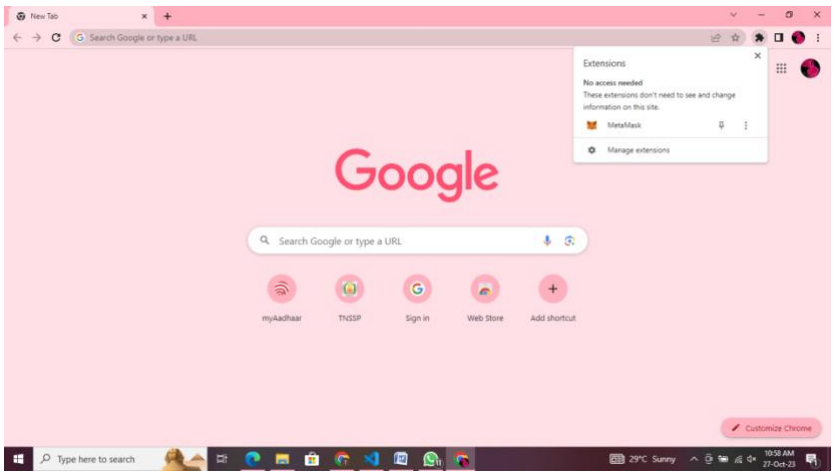
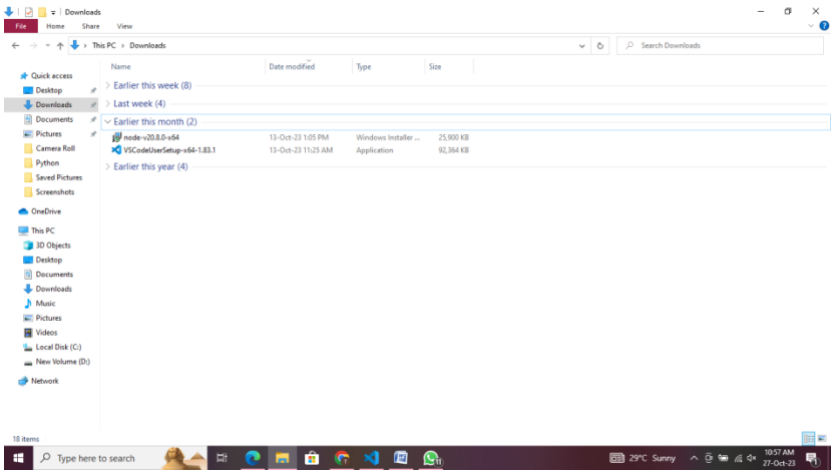
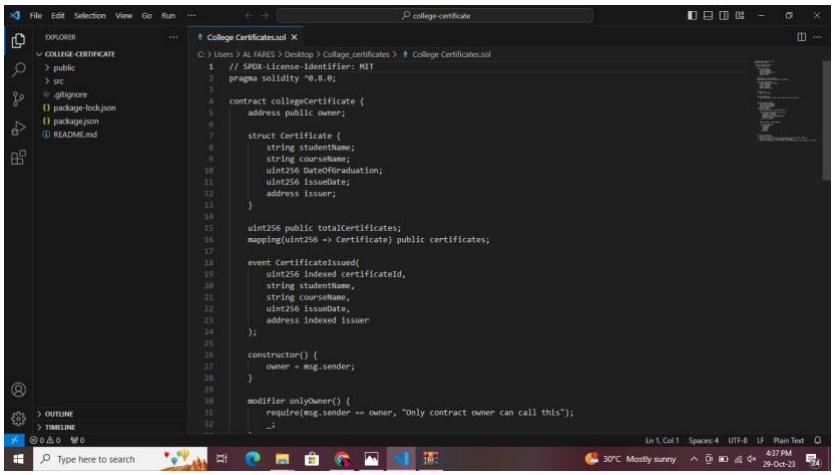
6.1 Technical Architecture

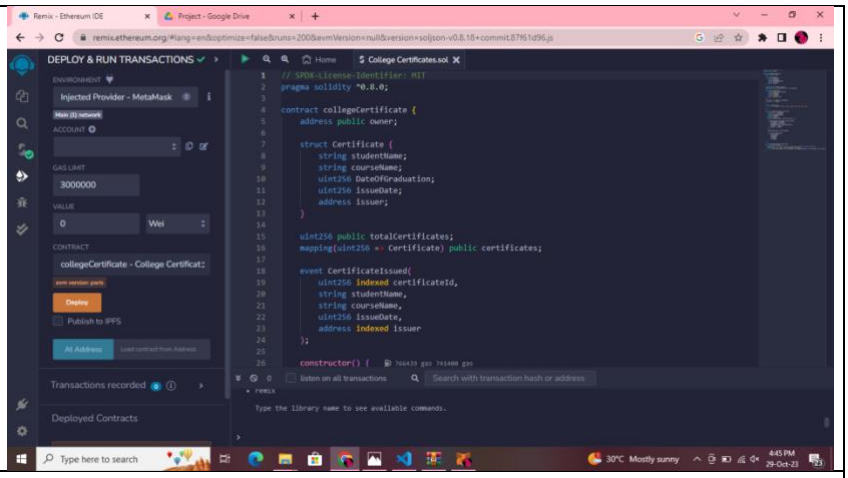
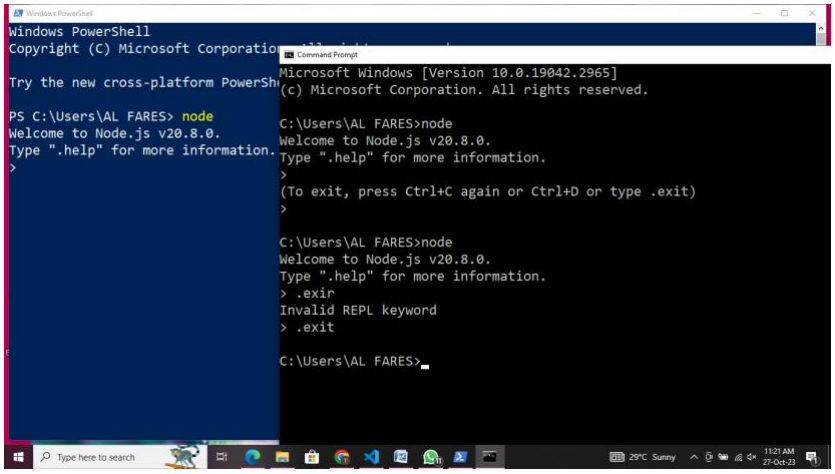
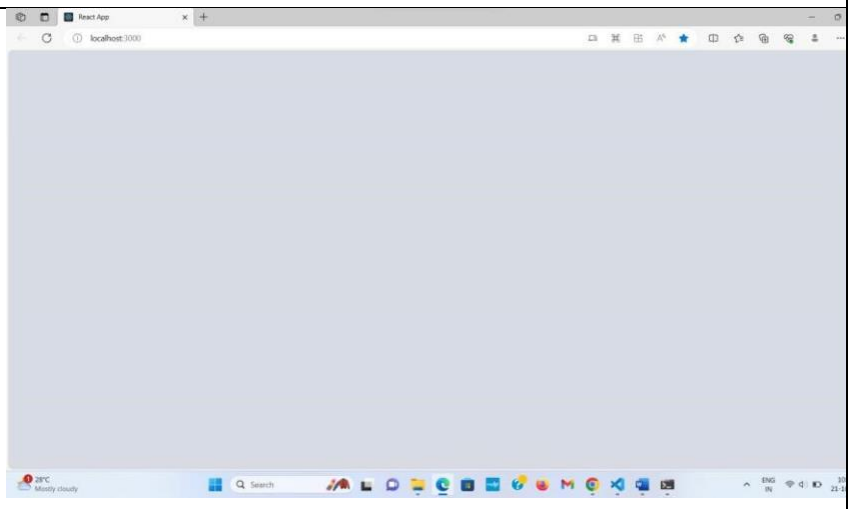


7.Performance Testing

7.1 Performance Metrics

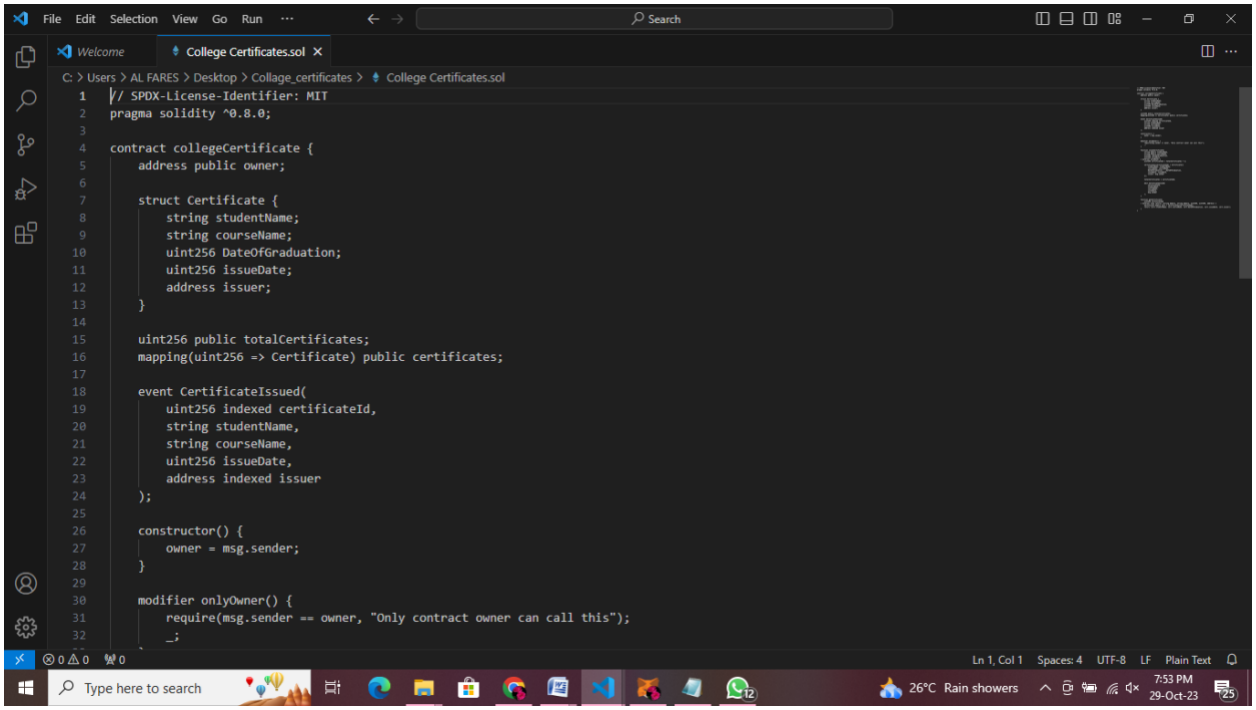
S. No	Parameter	Values	Screenshot

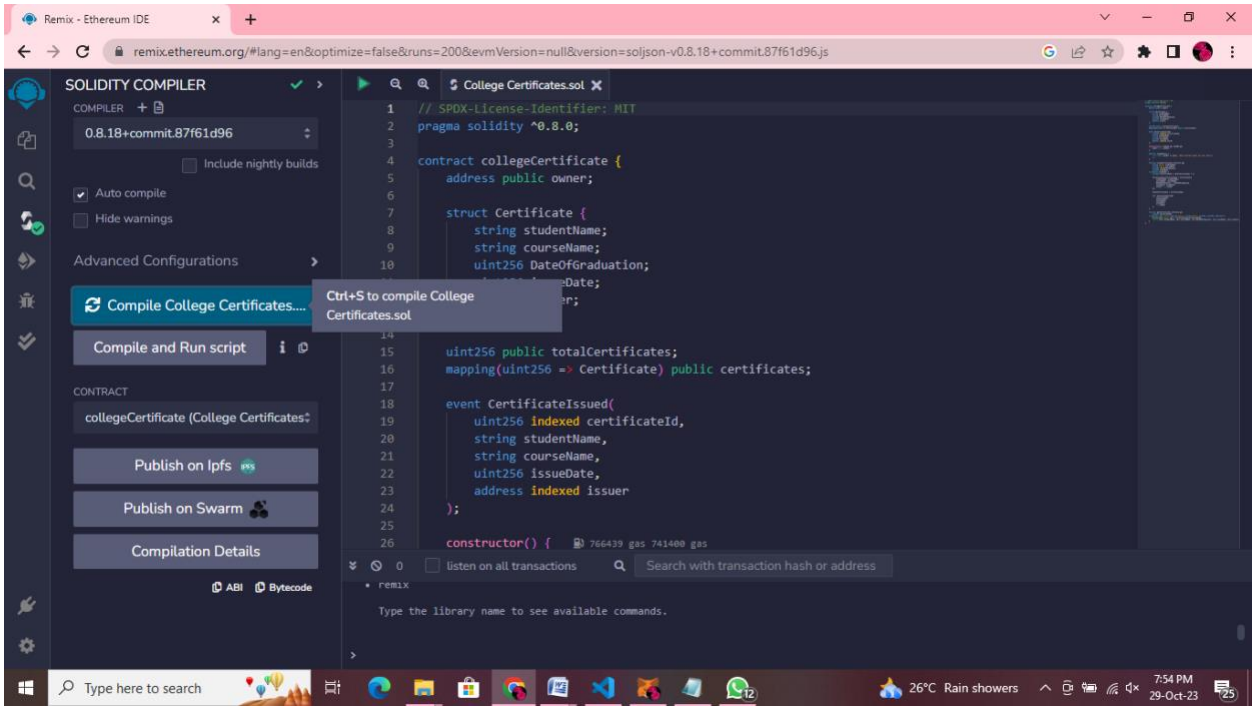
1	Information Gathering	Setup all the prerequisite	 Metamask  VS code & node js
2	Extract the zip file	Open to vs code	
3.	Remix ide platform explorating	Deploy the smart contract	

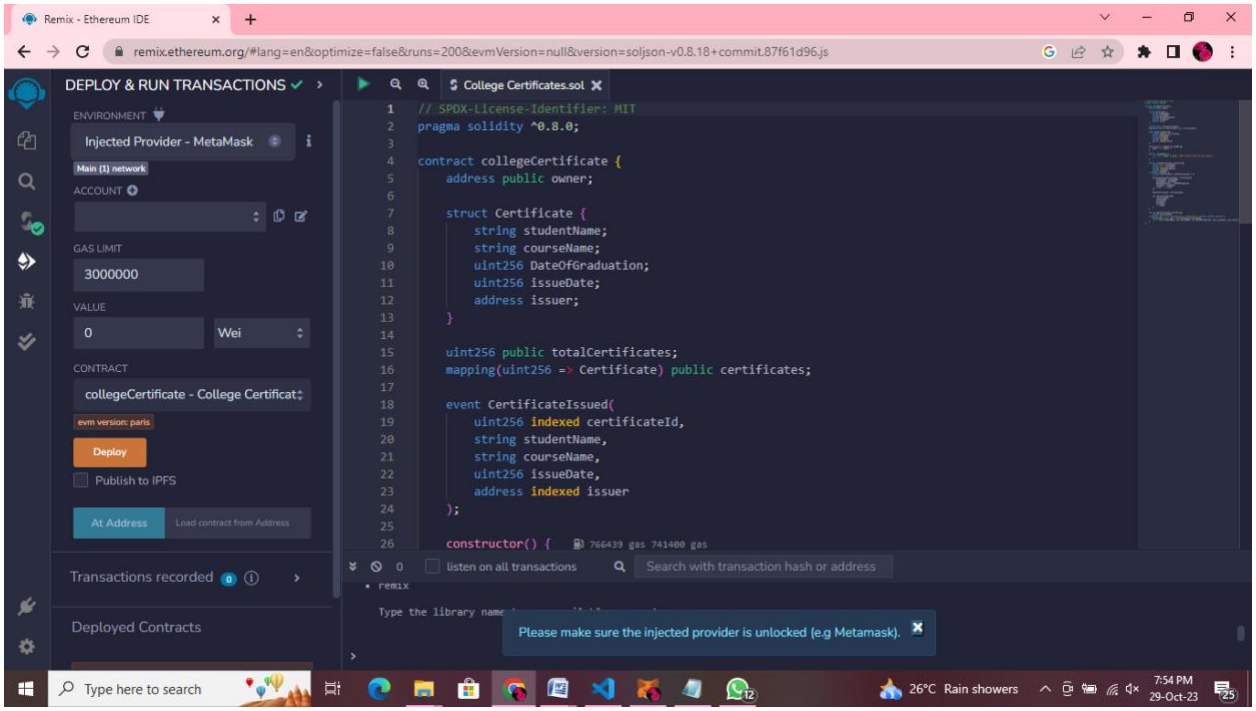
		code Deploy and run the transaction. By selecting the environmen t - inject the MetaMask.	
4	Open file explorer	Open the extracted file and click on the folder. Open src, and search for utiles. Open cmd enter commands 1.npm install 2.npm bootstrap 3. npm start	
5	Local host IP address		

8.Results

8.1 Output screenshots







9.Advantages & Disadvantages

Advantages:

- Immutability: Data once recorded on a blockchain cannot be altered or deleted, ensuring the integrity and security of education records.

- Cryptography: Strong cryptographic techniques are used to protect data, making it difficult for unauthorized parties to tamper with or access sensitive information.

- Consent Management: Blockchain can facilitate transparent management of consent for data sharing, ensuring that students have the final say.

- Efficient Verification: Employers and educational institutions can quickly and transparently verify academic credentials, reducing the time and effort required for manual checks.

- **Distributed Ledger**: The decentralized nature of blockchain ensures that all authorized participants in the network have access to the same data, promoting transparency and trust.

Disadvantages:

- Scalability Issues: Blockchain networks can struggle to handle a large number of transactions, which could be problematic for institutions with a high volume of data to manage. Scaling up a blockchain network can be complex and costly.

- Energy Consumption: Many blockchain networks, especially those that use proof-of-work consensus mechanisms, are energy-intensive. This can lead to high energy consumption and environmental concerns.

- Complexity: Implementing and maintaining a blockchain system can be technically complex and may require specialized expertise. It can be challenging for educational institutions to navigate this complexity.

- Costs: Developing and maintaining a blockchain system can be expensive. This includes costs associated with hardware, software, personnel, and ongoing maintenance.

- Data Privacy: While blockchain provides transparency, it may also expose more data than is needed for certain operations. Striking the right balance between transparency and privacy can be challenging

10.Conclusion

Blockchain technology holds great promise for transparent education data management. It offers a powerful solution to the challenges of data security, accessibility, and ethical handling in the education sector. By leveraging the advantages of blockchain, such as immutability, transparency, and self-sovereign identity, educational institutions, students, and stakeholders can benefit in numerous ways.

Blockchain technology provides a secure and tamper-proof ledger for storing education data, ensuring its integrity and authenticity. This not only reduces the risk of data breaches and fraud but also empowers individuals with control over their educational records, fostering trust and transparency.

Moreover, the automation capabilities of blockchain through smart contracts streamline administrative processes, reduce costs, and enhance data management efficiency. This, in turn, allows educators and policymakers to make data-driven decisions, leading to improvements in education quality and outcomes.

11.Future Scope

The future scope for blockchain in transparent education data management is promising, and its potential impact continues to grow as the technology matures. Here are several key areas where blockchain can play an increasingly significant role:

1. Credential Verification and Verification Services: Blockchain will likely become a standard for verifying academic credentials. This includes degrees, certificates, and other qualifications. Students, employers, and institutions will rely on blockchain-based verification services to quickly and securely confirm educational achievements.

2. Self-Sovereign Identity (SSI): The concept of SSI, enabled by blockchain, will gain prominence. Students will have greater control over their personal data and educational records, allowing them to manage their identities and consent for data sharing across different institutions and services.

3. Data Portability: Blockchain will facilitate the seamless transfer of education data between institutions, making it easier for students to switch schools, colleges, or universities without losing their educational history. This can be especially valuable for international students.

4. Standardization and Interoperability: As the use of blockchain in education grows, there will be increased emphasis on standardizing data formats and protocols, improving interoperability between different institutions and systems.

5. Smart Contracts for Educational Processes: The use of smart contracts will expand to automate various educational processes, such as enrollment, grading, and financial transactions. These contracts will increase efficiency and reduce administrative burdens.

12.Appendix

Source code

```
// SPDX-License-Identifier: MIT

pragma solidity ^0.8.0;


contract collegeCertificate {

    address public owner;


    struct Certificate {

        string studentName;

        string courseName;

        uint256 DateOfGraduation;

        uint256 issueDate;
```

```
    address issuer;
}

uint256 public totalCertificates;
mapping(uint256 => Certificate) public certificates;

event CertificateIssued(
    uint256 indexed certificateId,
    string studentName,
    string courseName,
    uint256 issueDate,
    address indexed issuer
);

constructor() {
    owner = msg.sender;
}

modifier onlyOwner() {
    require(msg.sender == owner, "Only contract owner can call this");
    _;
}

function issueCertificate(
    string memory studentName,
```

```
    string memory courseName,
    uint256 _dateOfGraduation,
    uint256 issueDate
) external onlyOwner {
    uint256 certificateId = totalCertificates + 1;

    certificates[certificateId] = Certificate({
        studentName: studentName,
        courseName: courseName,
        DateOfGraduation : _dateOfGraduation,
        issueDate: issueDate,
        issuer: msg.sender
    });

    totalCertificates = certificateId;

    emit CertificateIssued(
        certificateId,
        studentName,
        courseName,
        issueDate,
        msg.sender
    );
}
```

```
    function getCertificate(
        uint256 certificateId
    ) external view returns (string memory, string memory, uint256, uint256, address) {
        Certificate memory cert = certificates[certificateId];
        return (cert.studentName, cert.courseName, cert.DateOfGraduation, cert.issueDate, cert.issuer);
    }
}
```

GitHub link

https://github.com/mohamedshathikrms/TRANSPARENT-EDUCATION-DATA-MANAGEMENT.git

Project Demo link

https://drive.google.com/file/d/122-kgUH9sveX9XCJcHQvXzYlyiYuYbN0/view?usp=drive_link