

**DEPARTMENT OF COMPUTER SCIENCE AND
ENGINEERING**

CS64: MINI PROJECT WORK
TERM: March-July 2022

MINI PROJECT

Submitted to
Dr. Ganeshayya Shidaganti

TEAM MEMBERS

Sl. No	USN	Name
1	1MS19CS080	Narasimha Bharadwaj M R
2	1MS19CS089	Prajwal S
3	1MS19CS092	Pruthviraaj U
4	1MS18CS039	Dhan Somaiah

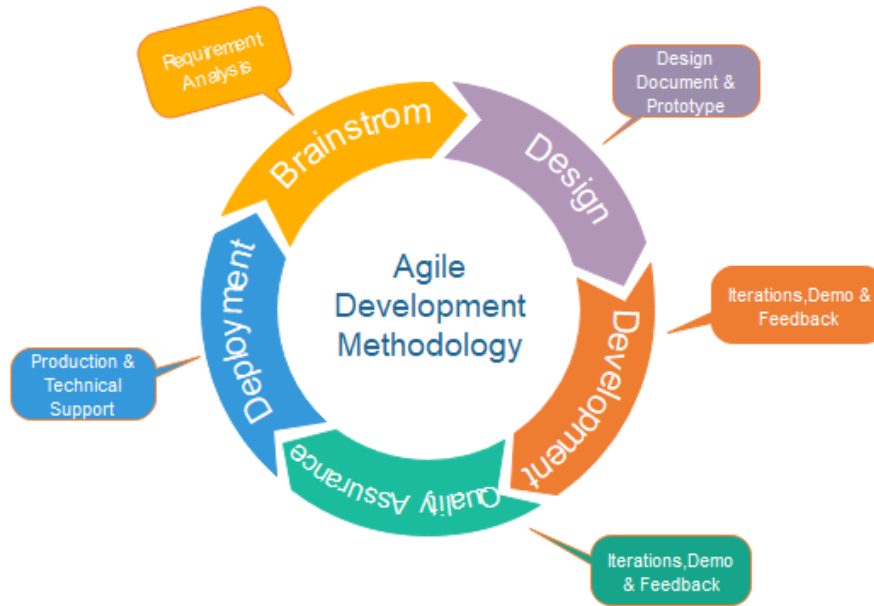
Signature of Guide

M.S. RAMAIAH INSTITUTE OF TECHNOLOGY
(Autonomous Institute, Affiliated to VTU)

PROJECT ORGANIZATION

Software Process Models

The model chosen for this project is **agile**. It provides an iterative approach to view the problem as bits and solve one at a time, which is simpler and easier to manage.



- In the brainstorm phase, the main focus is to collect research papers and analyze our requirements for the project. The collected research papers and information related to it forms the literature survey.
- The design phase primarily aims to provide a view of our project and how an end user sees it. It forms our use case diagrams.
- The development phase of our project uses a specified techstack to implement the design which will be proposed.
- Quality assurance is the phase where feedback is taken from the testing environment and changes are made as per user's requirements.
- Deployment phase uses our project to be deployed on live servers so as to provide its functionalities to our actual end users.

Roles and Responsibilities

Name	Responsibility
Narasimha Bharadwaj M R	Full stack development
Prajwal S	Blockchain Development
Pruthviraaj U	Front end development
Dhan Somaiah	Blockchain Development

LITERATURE SURVEY

Introduction:

In this project report, a literature survey or literature review is the portion that highlights the numerous analyses and research done in the topic of interest, as well as the results already published, while taking into account the project's many aspects and scope. It is the most significant portion of a report because it directs the research in the right way. This literature review is produced for a project, and this includes the findings of numerous analysts, as well as methodology (which is essentially their abstract) and conclusions. .

Confirmation of the argument thus used is also shown. Reviews may or may not be included in descriptive papers, however reviews will be included in analytical articles.

The review of papers analyzed are as follows:

Ref No	Year	Title of the Paper	Methodology used	Outcome	Issues
1.	2016	Blockchain and its Potential in Education	Blockchain Architecture	This paper concluded that the core blockchain principles could immeasurably improve the quality of educational entities. Decentralization eliminated bottlenecks, scalability allowed	There are various issues with regard to implementing security protocols. Legality of the technology also is questioned. There are various latency issues and there is an issue with

				processing of large information, reliability ensured authenticity and security protocols could be implemented.	European General Data Protection Regulation (GDPR) compliance.
2.	2018	Exploring blockchain technology and its potential applications for education	Blockchain Technology	<p>The paper concludes that blockchain can be used to construct a balance to measure learning process and outcomes. It is reliable and an equal proof of value for everyone.</p> <p>Theoretically, blockchain can solve the problems of information asymmetry and trust among strangers because of its decentralization and transparency.</p>	<p>Immutability features of blockchain can be a bane as modification of documents even in emergencies is impossible;</p> <p>implementation of a complex system is hard;</p> <p>latency issues.</p>

				It ensures authenticity because the information and value are published and maintained collectively.	
3.	2017	Blockchain technology and education	BCT architecture	The paper evaluated the applications of blockchain technology in educational fields; It suggested implementation of a trustable proof-of-truth mechanism, a payment mechanism and smart contracts. All these system are incentive based and suggested that students have a greater inclination for online	The subsystems involved are complex and massive, security protocols are not yet reliable and there are various scalability issues associated with it.

				learning if implemented properly	
4.	2017	Blockchain Technology Adoption Status and Strategies	Blockchain Technology	The paper evaluated blockchain, distributed ledger, value exchange transactions, bitcoin, ethereal, dash, monero, ripple, token and cryptocurrency applications of blockchain. It made observations on economic viability, social impact and computing power needed. It also evaluated various implementation methods used by the industry	As the tech involved is still in its infancy, protocols aren't standardized throughout. As the paper was based in the US, it also expressed donuts over the political and economical ramifications of the technology throughout the state.
5.	2022	A Critical Review of Blockchain	Blockchain Architecture.	This paper studies on the acceptance models used to	It is noted that there is a lack of a comprehensive

		Acceptance Models–Blockchain Technology Adoption Frameworks and Applications		<p>examine blockchain adoption due to the importance of investigating this subject as a new technology. It briefly encapsulates the various blockchain adoption, blockchain adoption models, blockchain adoption frameworks, blockchain acceptance, blockchain acceptance models, and blockchain acceptance frameworks methods of integration. Various articles were analyzed and categorized</p>	<p>blockchain technology acceptance model. The paper also doesn't analyze blockchain models referencing privacy, security and general quality of the services offered. This all but concludes that the technology is still in its infancy and there is a lot of protocols to be yet invented.</p>
--	--	--	--	---	---

				<p>into various tranches of supply chains, different industries, financial sectors, and cryptocurrencies. There is a comprehensive overview of implementation in each of these methodologies.</p>	
6	April 2021	Blockchain based on framework for educational certificate verification	Blockchain technology	<p>This research identified and discussed the security themes required for educational certificates verification in the blockchain. In addition to that, a blockchain-based framework for educational certificate verification focusing on</p>	<p>The subsystems involved are complex and massive, security protocols are not yet reliable and there are various scalability issues associated with it.</p>

				<p>specific themes is proposed based on Hyperledger Fabric Framework. The security themes required for educational certificates verification in the blockchain are authentication, authorization, privacy, confidentiality and ownership. Authentication will prove to the employer that the student is trustful and will be able to physically verify the educational claims made by the student.</p>	
7	2021	Application of blockchain in education: GDPR-	Blockchain technology	These challenges are individually addressed by this innovative	None of the initiatives analyzed in which blockchain

		compliant and scalable certification and verification of academic information		contribution. The proposed solution allows, on the one hand, to reliably store and make verified by a third party any type of academic record without compromising the privacy of personal data and complying with the requirements of the GDPR. On the other hand, the system layout, based on a set of blockchains, enhances the performance and scalability of the system.	is presently applied in the world of education complies with the GDPR, registers any type of academic information, or conveniently addresses the scalability problem in case the system is massively adopted and the volume of transactions increases exponentially, which, in turn, limits their global applicability.
8	2020	A Study on Blockchain Technology as a Dominant Feature to	Blockchain technology	If implemented effectively, blockchain technology's inherent features could provide substantial	Multiple forms of blockchain networks are operating differently. This contributes to interoperability

		<p>Mitigate Reputational Risk for Indian Academic Institutions and Universities</p>		<p>mitigation against some of the identified reputational risks. As part of the institutes' enterprise risk management plan and institutes strategy, use-cases may be proposed. Such use-cases may provide for evaluating various scenarios and potential blockchain architectures. Indian universities may adopt an interdisciplinary approach to review, assess, and validate risk institutes' risk profiles and risk decisions.</p>	<p>problems where these chains are unable to interact efficiently.</p>
--	--	---	--	--	--

				Managing and designing a robust blockchain-based control design solution may require a diverse risk skill as this may impact multiple processes in university.	
--	--	--	--	--	--

9	2021	Blockchain Ecosystem for Credit Transfer in Education	Blockchain technology	<p>The work details existing technologies in the educational system with blockchain and then proposes a framework for decentralized credit transfer in educational systems.</p> <p>It follows a distributed approach with load sharing and thereby reduces the complexity of using the educational system with security.</p> <p>The system converts the credits of students into tokens which can be used for enrolling in different courses at universities.</p>	Implementation of a complex system is hard latency issues.
---	------	---	-----------------------	---	--

				The proposed scheme provides security and scalability of student data in the educational systems.	
10	2019	Blockchain-Based Applications in Education: A Systematic Review	Blockchain technology	First, it indicated that blockchain technology is mostly used to: issue and verify academic certificates, share students' competencies and learning achievements, and evaluate their professional ability. A wide range of other applications are emerging rapidly. Second, it shows that blockchain could bring significant benefits to	Despite the numerous advantages of conducting a systematic review, there are some limitations that need to be considered: selection bias, publication bias, inaccuracy in data extraction, and misclassification

				<p>education including providing a secure platform to share students' Data, lowering cost, and enhancing trust and transparency. Third, it illustrates that the use of blockchain technology is not without challenges. Managers and policymakers should consider challenges related to security, privacy, cost, scalability, and availability before adopting the technology. Lastly, it shows that the educational areas in which blockchain</p>	
--	--	--	--	--	--

				<p>technology was applied are still limited.</p> <p>Therefore,</p> <p>The potential for blockchain is still unexploited.</p>	
--	--	--	--	--	--

Conclusion

As it has been said, it is critical to research the adoption of new technology.

Blockchain technology is now used in a wide range of transactions and operations all around the world. This upward tendency is expected to continue. In these studies, authors have determined a list of factors to consider in their adoption models and analyzed the collected results to obtain the most significant factors among them. In various educational related domains, blockchain technologies can be implemented.

SOFTWARE REQUIREMENT SPECIFICATIONS

1. Purpose

The main purpose of this project is to test if blockchain builds a more environment-friendly and secure platform to store and retrieve records using a decentralized structure rather than a centrally stored database.

This project aims at providing a clear insight as to how blockchain can influence storage mechanisms, and finally deciding if it makes the whole process of record maintenance easier.

2. Scope

- **Record maintenance:** Using blockchain technology, this project aims to secure record storage and maintenance.
- **Easy to use GUI:** The main aim of this project is to work on the underlying technology to implement blockchain. However, it still provides a GUI which is easily understandable.
- **File storage security:** Using blockchain, the project aims to display the security features and its distinguishable properties from a regular database storage system.
- **Scalability:** The project **does not** aim to be very scalable to a large audience as it is meant for development purposes. However, scalability can be improved and is a part of the **future scope**.

3. Overall Description

1. Product Perspectives

This project is primarily focussed on developing a newer and better storage facility for users so as to maintain security and foolproof digital documents. It mainly functions on the Blockchain Technology and Web3.0 standards to make its working decentralized.

2. Product Features

The product provides a web interface to upload documents, which will be validated and stored on the blockchain.

Storage mechanisms are decided by the blockchain and once it is uploaded, the document becomes permanently available and tamperproof. This defines the security feature of the product.

Users can upload their documents and retrieve them, once they are authorized.

This product mainly revolves around helping the educational field but has scope for potentially all record storage and management platforms.

3. Operating Environment

With the ability to work on any PC which can run javascript on its browser, this product is flexible to any operating system and environment but limited to PCs, which means it is not yet in compliance with mobile standards.

4. System Features

1. Functional Requirements

Identified Requirements	Tag	Cross References
To provide an interface to interact with the block chain via wallets	FR1	-
To decentralize the document storage	FR2	-
To provide a facility to upload documents safely and securely	FR3	FR2

To provide a single place to store and track a users documents	FR4	-
To develop a mining feature that allows document verification	FR5	FR3
To provide a feature to redact documents	FR6	-
To provide the stored data for governmental/institutional use	FR7	-

2. Non-Functional Requirements

Identified Requirements	Tag
Stable and Secure Blockchain	NFR1
Good User Interface	NFR2
Validators	NFR3
Institutions	NFR4
Educational Records	NFR5

3. Use Case Description

Use Case 1

Connecting to a wallet

Primary Actor: User/Student

Precondition: The user has a wallet on the blockchain

Main Success:

Scenario 1:

The user logs into his wallet on his browser

Scenario 2:

The user then interacts with the website to connect his wallet to the app

Scenario 3:

The user's wallet address is saved in a state and is used for future functionalities

Exception Scenarios:

- The user fails to create a wallet
- The user fails to authenticate

Use Case 2

Uploading Documents

Primary Actor: User/Student

Precondition: The user has connected their wallet with the application

Main Success:

Scenario 1:

The user uploads the document along with its description/metadata

Scenario 2:

The user submits the request and waits for the response from the validators/mining

Scenario 3:

On successful verification user will be acknowledged with a record id

Scenario 4:

On failure of verification user will be notified of the same

Exception Scenarios:

- The file to be uploaded is corrupt
- The upload is queued due to demand on the IPFS

Use Case 3

Verification/Validation

Primary Actor: Authorized Validators

Precondition: The validator needs to have the copy of blocks

Main Success:

Scenario 1:

The Validator mines the record uploaded

Scenario 2:

They verify the genuinity of the record in the p2p network

Scenario 3:

If found genuine across the network the transaction is approved and a record id is send to the user/student

Scenario 4:

On failure of verification by at least one peer the transaction is discarded and the user is notified

Exception Scenarios:

- Lack of computational power
- Lack of correct data to validate

Use Case 4

Dashboard

Primary Actor: Users

Precondition: The user needs to have at least one document uploaded/verified

Main Success:

Scenario 1:

The user logs on to the application and views the documents that have been verified or rejected

Use Case 5

Record Redaction

Primary Actor: Users

Precondition: The user needs to have a verified record

Main Success:

Scenario 1:

The user needs to make changes in the record

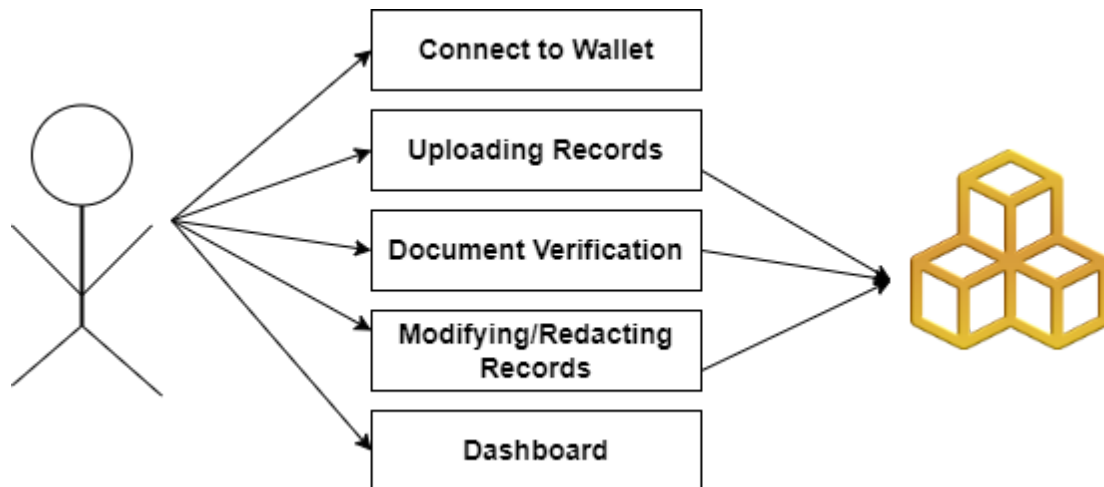
Scenario 2:

They request for cancellation of the document

Scenario 3:

This request is mined and acknowledged

4. Use Case Diagram



External Interface Requirements

User Interfaces

The user can interact with the application using his/her wallet on any javascript enabled browser. The interface is a web application with intractable and responsive components for a good user experience.

Software Interfaces

The software interfaces required for the implementation of our solution is React JS for the frontend and user interface, ethers.js for interacting with the smart contracts, Solidity for writing the smart contracts, Polygon as the block chain and IPFS for storing the records in a decentralized manner.