WEB BASED AND BLOCKCHAIN APPLICATION FOR EDUCATIONAL INSTITUTION

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Abstract - *The Internet infrastructure, A Web technology, and the usability of the e-learning systems have all been significantly impacted by technical breakthroughs. The paper provides a summary of a student's online portfolio made with web development tools. There are many different option formats, languages, frameworks, and technological items available to web application developers. We review, cite, and contrast the technologies that facilitate the development of Web apps. We come to the conclusion that while the Web's connectivity issues have been substantially resolved, the proliferation of Web-based application technologies shows the absence of a reliable model specifically designed for this industry.*

Key Words: Web Development, ReactJS, NodeJS, MongoDB, CSS, ExpressJS, Blockchain.

1. INTRODUCTION

It's difficult for students to stay in the competition and to get a job they have to be skilled with new and upcoming technologies. They need to be aware of the new and upcoming technologies in the market. Our strategy is to implement essential key features for the students to tackle the problems. Pedagogies must be in accordance with the institutional "quality education" and the changes in the undergraduate student intake in order to develop "Future Educational System." In addition to the adjustments and interruptions brought on by Covid-19, students from the "non-traditional" backgrounds adjusting to the existing university institutions and how the procedures might accommodate to these students. These are the factors to be taken into account [1].The use of new technology is crucial in many areas of higher education. Modern scholarly communication approaches and procedures are essential for the dissemination of academic knowledge [2].

The vast majority of students watch a variety of videos, emphasising the value of videos in web-based learning. Search engines like Google are frequently used by people to find information online because they are a natural part of the web and they make it simple to access a tonne of resources for information on practically any subject [5]. The opportunity exists for interactive web documentaries to engage audiences with pertinent topics [4]. The Web is a techno-social system that represents the largest reconfigurable information architecture. The Web is most noticeable component of Internet and offers one of most widely used services [6]. The Web Speech API, which is now utilised by the majority of current browsers [3], is the foundation upon which the voice-based development methodology and software architecture are created**.**

Self - directed learning platforms can be created using portable phones and tailored to the requirements of specific students. Flexible methodologies can enhance educational standards . Policies should incorporate connectivist methods and active learning through the construction of a comprehensive curriculum and recognise the significance of each student's unique needs and talents, including socioeconomic and academic ones [1].

Blockchain technologies have recently been an intriguing research topic, and many different businesses have taken use of its advantages. Similar to the financial market, this new technology has enormous tangible opportunities for the healthcare, education, and other sectors because to its decentralized, security, and integrity [7].

Blockchain can be utilized to establish a peer-to-peer bitcoin transaction architecture that is secure, adaptive, and efficient [8]. It is a cutting-edge technology that emphasises secure data transfer between various dispersed applications. Its protocols are regarded as a distributed environment with some required characteristics, such as decentralisation [9].

2. LITERATURE REVIEW

A. TECHNOLOGY

The building of an entire application, including the front end and back end, is referred to as "full stack development." The user interface is on front end, and the back end is where the logic and application workflows are. The MERN stack is utilized to build the web application.

ReactJS:

The front-end library for the JavaScript programming language is called React.JS. React.JS, which is used to create single-page applications because it can render dynamically changing data quickly, was used to design our web application's user interface. Developers can construct User Interface components using React and JS coding. The primary goal of the research was to assess the library and

demonstrate that ReactJS is a compatible platform that can be used in situations where there are a variety of possibilities. This study covered the principles, core architecture, functionalities, data management techniques, acceptance, and popularity [10].
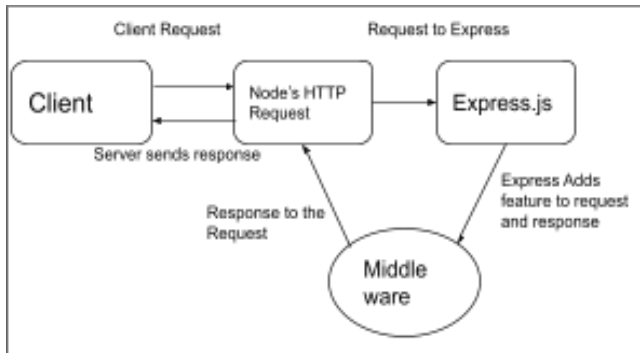
ExpressJS Request Flow

The Human Portal solution is focused on human resources management, and React js is a framework specifically made to deal with visualisation layer of online applications and their use in a commercial setting. The higher flexibility and use of the product were noted by the customers as a result of this approach, which allowed for the capabilities and optimization of the human resources management procedures [11]. It is expediently evolving into one of the simplest and fastest frontend libraries for web applications due to its completely component-based architecture. This incorporates the "View" notion from Model-View-Controller (MVC) model [12].

Node.js :

Node.js is a JS operating system that was developed in the C++ programming language. Node.js was created utilising a single-thread architecture and leverages event-driven, asynchronous programming callback functions. The design of Node.js makes use of eventdriven as the fundamental core notion for its environment, giving us a variety of event-based and asynchronous APIs that have assisted us in developing the website implementing Node.js for our back-end development [10]. The drawbacks of the backdrop development language in the conventional sense are compensated for by Node.js using its own built-in and defined properties. It is a server-side Js interpreter that makes it simple to create online apps with quick response times and flexible growth [13]. Due to Node.js, Full Stack Programmers may now independently can handle both server and the client side. [14]. To create a fast and scalable backend database server, we use Node.Js. Because of its "event-driven design" and "non-blocking I/O," it is a server-side platform that is mostly used for the realtime applications. In terms of Input/Output operations, Nodejs is shown to be 10 times faster [15].

ExpressJS:

Express is used because it is a Node.js framework. Writing the back end code and putting it into the practise in a systematic manner became simpler and easier thanks to Express. Express supported many middleware's, which makes the code shorter and simpler to create, and this allowed us to more easily design the web apps and APIs needed for our project. Our application uses Express mostly for its single threaded design and asynchronous programming capabilities [10]. ExpressJS is a Node.js Web application framework that is small, flexible, and delivers a wide range of basic web application functionalities without hiding Node.js's capabilities.

Express makes it simple to create API's by granting access to middleware [16It offers a user-friendly Web interface, which is comparable to what Spring gives Java applications.
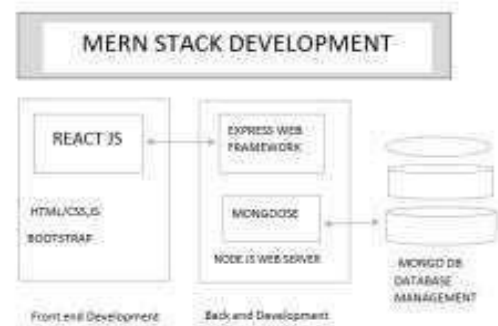

MERN Stack Architecture

MongoDB:

MongoDB is text-oriented NoSQL database. The JSON format is used to store data. It is used to store databases and is straightforward. It is a cross-platform document-oriented NoSQL database. The Web-based application is referred to by MongoDB as a database that holds data. For the application and its design, MongoDB is quite well-liked among other databases thanks to some fascinating characteristics [17]. We use MongoDB, a document-oriented database, for our project. MongoDB transforms our JSON data into a binary version in the background on the server, which is basically stored and queried more effectively. BSON is used by MongoDB to query databases [10]. By combining hierarchical, semi structural, and unstructured data, it tackles the challenge and test of the scalability, adaptability, and processing capacities of conventional relational database management systems (RDBMS). The databases must be horizontally scaled in order to work with the new frameworks. Unstructured data must be processed and stored in the databases in addition to structured data.

Similar to this, huge databases have been made. In order to comprehend how JavaScript writers, use distinct javascript libraries, a pragmatic study was conducted for this work.

The user interface of a web page is referred to as web design. Design is the global language of the visual world.

The design's primary objective is to focus on the content so that consumers can access and use it with ease.
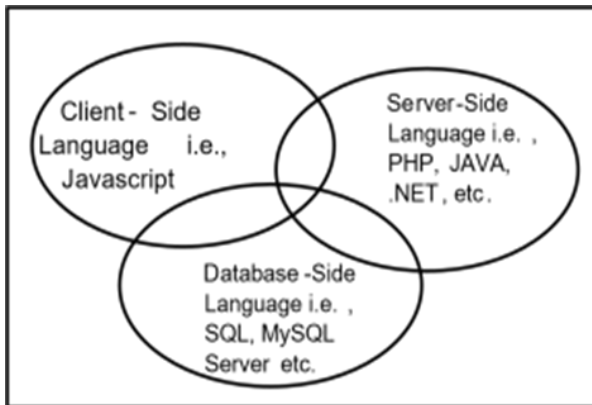
Full Stack

Web design has undergone significant change as a result of various technological advancements and displayed contents using a straightforward text page, to the second generation, which used lots of graphics and vibrant colours to create memorable web page fashion trends. From the first web generation, which   and finally to the simple and user - friendly web design we see today. The design and content of a website   should always be current javascript libraries, a pragmatic study was   conducted for this work.

TABLE I - Multiple Content-Based Search Methodologies

Authors	Year	Advantages
Derren Wilson et al. [43]	2022	We may start thinking about site's contribution to history of online design thanks to the collection of the source code for CSSZG that is currently available, especially the findings of the study of the CSS files.
D Kruger et al. [39]	2021	Speeding up implementation and oversight of essential quality improvement initiatives with the Realtime report is crucial considering, as was already indicated, the seriousness of unwise antibiotic usage in a number of African nations and the

|		consequences for the rising AMR rate.
Cindy Shuan Ju the [45]	2021	To continuously monitor epidemiological trends and the spread of MDRO in hospital environments, this information database's data linkages are meant to offer helpful information.
Georgios Labiris et al. [44]	2021	Automatic reading times calculation for the patient using acquired patient audio processing that can measure speak time and post-talk delay.
Asare Yaw Obeng et al. [46]	2021	The context-based model was expanded to include variables of technological adoption and acceptance information system success, and user satisfaction because the online educational learning system is viewed as an information system and is widely seen as successful.

B. BLOCKCHAIN TECHNOLOGY BACKGROUND

A distributed ledger technology is blockchain. It ensures open communication between all parties involved. Santoshi Nakamoto established the idea of shared ledger and peer-to-peer transactions [25]. It can be described as an encrypted digital book made up of data records or blocks that is spread over numerous computers connected by a public or private network. Blockchain offers immutable record made up of chain of time-stamped data blocks that include transactional information. As a result, each transaction is stored in a block, and each block is connected to one before it and the one after it, forming an irreversible chain where transactions are blocked together. [28].

TABLE II - Key Features of Blockchain

Features	Functionality Description
Immutable	A distributed ledger that cannot be changed.
Distributed	The data is not under the control of a single party in blockchain. Participants substantiate their participation with evidence of

	their work or stake.
Transparent	Users have access to transparent data on blockchains that are simple to update. Data cannot be changed because of blockchains' transparency.
Open Source	All network parties have open-source access to blockchain technology.
Autonomy	The blockchain network's nodes can securely store, transport, and update data without outside influence.
Anonymity	The identity of the person transferring data remains anonymous as it moves from one node to another.
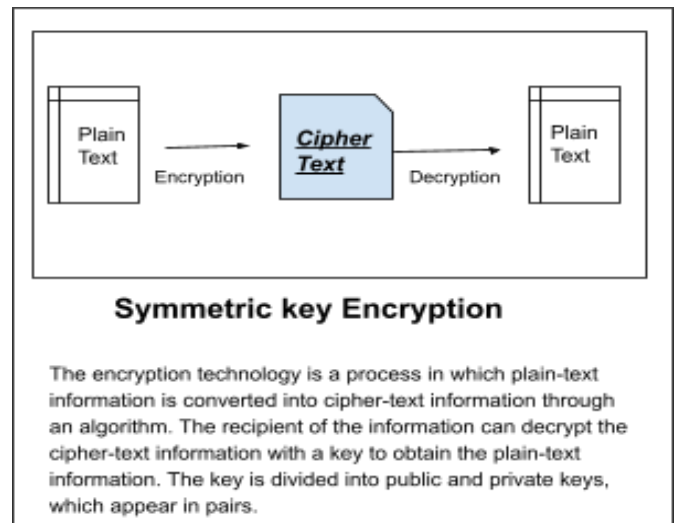
These blocks cannot be altered or removed after they have been linked together in a chain. Nodes are blockchain-based services that are part of certain communication networks and use a common protocol for communication. Two categories, anonymity (public/private) and consensus (permissionless/permissioned), are used to categorise blockchain protocols [27]. To use the network in the permissioned blockchain mode, you must have authorization. Private blockchain is another name for this kind of blockchain. Banks are one example of a company that employs this style. Blockchain is a system for keeping track of past transactions using dispersed medical records that is built on open, secure communication. Blockchain technology, for instance, can facilitate the transmission of data while preserving the data privacy, the integrity, and the accessibility [30]. Blockchain technology offers a decentralised paradigm where two parties can conduct business without the need for a middleman. The blockchain keeps a ledger that is accessible to both parties and the authenticity of the ledger is maintained using a consensus method to enable transactions between two parties who do not trust one another. A collection of records, such as Bitcoin cryptocurrency transactions, may be kept in the ledger [26]. A distributed digital ledger with blocks of transactions that have been cryptographically signed. Each block is verified and subject to a consensus decision before being cryptographically linked to the one before it. As new blocks are created, changing older blocks becomes more and more difficult. The most recent blocks are updated in the network's copies of the ledger, and any discrepancies are automatically resolved in accordance with predefined standards [29].

Symmetric key Encryption

The encryption technology is a process in which plain-text information is converted into cipher-text information through an algorithm. The recipient of the information can decrypt the cipher-text information with a key to obtain the plain-text information. The key is divided into public and private keys, which appear in pairs.

Blockchain makes it possible for several participants in network to share a single ledger that everyone can rely on to be accurate [30]. the activities taking place in a supply chain or the status of a group of Ethereum-compatible smart contracts. Ethereum is a distributed blockchain network that makes use of the same blockchain technology as the well-known digital currency Bitcoin [26]. In 2015, Ethereum was formally unveiled. This paper aims to explore the potential challenges, opportunities, and limitations of blockchain technology as well as how traditional intermediaries may need to adapt to a potential implementation of this technology because blockchain in combination with the smart contracts could be important in these operations.

Most people are familiar with blockchain through its use in cryptocurrencies like the Bitcoin [22]. Numerous sectors, including financial, voting, business, industrial and numerous educational and the healthcare applications, depict major areas for blockchain applications as a result of the growing interest in blockchain and its implementation in a variety of industries and sectors [19], [20]. Blockchain is a revolutionary technology that emphasises secure data transfer amongst several distributed apps.

Despite its extensive use, several regions still need more investigation to understand their performance characteristics [21]. Healthcare, auto industry, transportation, aviation and the real estate may all use blockchain technology [24].

Digital identity: It is crucial to identify an entity (a person, an organisation, or an object) in order to carry out transactions or produce data in a variety of fields, including banking, governance, healthcare, education, social networking, logistics, etc. An innovation ecosystem is a collection of interlinked businesses that are linked to a focal company or platform and comprise actors from both the production and usage sides who employ innovation to create and monetize new value [27].

Centralized Identity Management for the entity authentication: In Centralised Identity Management System, a centralised IDP will be in charge of identity (such as an Email address, Phone number, Government identification, or patient identification) and will be accountable for upholding the trust factor connected to those identities. Credential-based authentication is a well-known first line of defence for identification mechanisms. In the case of EHRs, where the privacy and security of the data records are critical, credential-based protection is a first-th century solution that is reasonably easy and customizable. However, it is vulnerable to privacy invasion, spoofing assaults, and identity theft. Multifactor authentication offers an additional layer of security to existing credentials-based authentication by combining secondary factors like One Time Passwords (OTPs), captchas, patterns, or biometrics [32].

Decentralized Identity Management for entity authentication: The simple premise behind this is that a transaction involving the transfer of a good or asset between two parties is confirmed by the participating nodes via the consensus process. An unchangeable distributed ledger has this transaction recorded in it. The First practical distributed-ledger technology that introduced concept of the decentralisation into processing of financial transactions was called blockchain. Later, the platform was expanded to include the entire healthcare ecosystem by adding smart contract programming capabilities. The notion to use blockchain in design of healthcare for decentralised Identity Management was first proposed by Yue et al. (2016). Mohammed et al (2021),created a distributed hash table architecture using IPFS and the blockchain enabling quicker access to medical records [32].

The architecture of a system, a container, cloud, blockchain, and the web application are the four main components of the proposed system. To manage these various subsystems interoperability, overall system uses various communication [32].
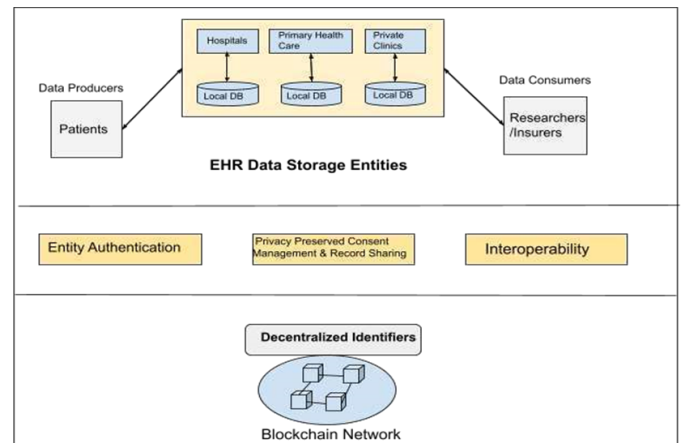
System Architecture for blockchain based Decentralized Identifiers for Entity Authentication in EHRs [32].

The whole system employs a client-server architecture along with a variety of communication channels and the protocols to manage the interoperability of these various subsystems. This gives an extensive summary of the suggested architecture. In order to record infractions the IOT container communicates with both the Ethereum blockchain and the cloud (to store the noncritical data). The container is connected to Ethereum and the cloud through a 4G connection. The container and the mobile client, as well as Ethereum, use the Ethereum client to conduct API requests. The mobile client uses a more straightforward method to carry out customer interactions with the Ethereum smart contract. It uses the Azure IoT Hub service as a gateway to communicate with the cloud by sending messages to it.

A web app that is hosted in the cloud gives users access to monitoring tools. The web application then retrieves the stored data and uses the application front-end to visually present it to the users. The online application also makes use of a database to keep track of various users and their corresponding registered shipping containers. Through the online application, users can access monitoring and tracking functionalities using a web browser.

3. METHODOLOGY

Design and the Implementation:

We specify the design and the implementation of a prototype web based app focused on college going students and a decentralized server architecture, that is intended to facilitate easy decentralized money transaction when required. The features involved in this architecture is based on:

i.Basic portfolio page for every student:

Students can showcase their projects and skills to everyone including students, professors and potential hiring managers. Building statistical models to explain relationships between important factors, such as the

customer engagement, behaviour intention, service failure, service recovery, website service quality, and eservice quality, was the main goal of many studies. Scientific approaches to assess customer satisfaction, such as the E-service Quality (ES- QUAL), have been developed as a result of SQCS research [35].

ii. A page where all the opensource projects from college students will be showcased:

Students working on projects can make them opensource and other students interested can start contributing to these projects, inculcating an opensource environment in the college. Students are obligated to complete their coursework and can participate in the learning process while doing so. The complete rate was less than 30% if the subgroup was left out of the completer analysis. The small student subsample also resulted in a low level of work experience among graduates [36].

iii.Articles section for students to write and host articles:

Students will write and publish articles/blogs and get paid through adds using cryptocurrency exchange. Blockchain is a cutting-edge technology that operates decentralised and transparently to store and transport data. In peer-to-peer network, this technology takes form of the transaction log. These transactions are organised into blocks that are connected by links. Every block has data, a previous block's hash, and the time stamp. The data saved in the Blockchain is backed up and verified by all network nodes, giving it a great resistance against assaults that could tamper with the data's integrity [37].

iv.Discussion Forums :

There will be discussion forums for all topics, Students can join any of these forums to get more knowledge and ask doubts in specific forums to get quick relevant solutions. Our initial review of the literature (To gather sources and notes, the team worked together in a Zotero Reference Manager Library) and our discussions with the staff who had taught a course completely online and had used emergent technologies were the main sources of inspiration for this study. We also drew on our combined experiences of researching, teaching and providing services in the higher education. At this point, we were interested in identifying Education 4.0 trends as well as how to classify the key advantages and disadvantages of these novel technologies and strategies. The facilitators provided conversation guidance and collaborated on trend evaluation [38].

v.Team building for hackathons:

Students looking for team members for a hackathon or other team-based competitions can come here to find perfect team mates. The user's participation can take many different forms, such as submitting digital content, responding to

surveys, translating papers, or participating in chat sessions. When using the experience mode, which takes place in a real world, users can, for instance, access different material based on their precise location in a city or within an interactive exhibit [4].

vi. Resume builder for job seeking students :

Students can create their resumes according to industry standards from this page. The resume will be auto filled with information from the portfolio page and the profile page. On the basis of user comments via a usability questionnaire, the app's usability was also assessed. The co-authors' experiences were used to construct a series of questions for the questionnaire, which included inquiries about a perceived value of app and time it took to complete every form [39].

4. APPLICATIONS

Blockchain technology is transforming several industries quickly, grabbing the interest of business leaders, professionals, policymakers, researchers, smart contracts, and crypto-economics. Academics, governments, and other stakeholders identified the potential opportunities that this technology brings for their own operations even though it was the first to be created to bypass traditional middlemen in the money issuance. Even the banking sector was adversely affected by the advent of the bitcoin currency and the resulting capacity of blockchain technologies to cut expenses. Digital payments, business registrations, social networking, insurance, the real estate market [33], public administration, and healthcare are just a few examples of the applications for blockchain.

Software and tools for web application development are constantly updated for improved performance. Even computer languages regularly receive updated versions to make sure they perform better and are less troublesome [42]. In order to stay up with these new innovations, an average developer may have to put in a lot of work. A full stack web developer, on the other hand, is already familiar with the connections between various technologies. So, for him or her, staying current with new updates and integrations is simple. Last but not least, full stack developers already keep learning new things about the web development, so they will remain in the huge demand for dealing with new technologies for now and in future as well.

There are other JavaScript frameworks available, but we will just discuss React.JS in this article because it is simpler to use than the other frameworks like Angular. Js and others. Facebook Community oversees and creates React.JS [41]. Web-based project management tools focus on relationships between staff members, project portfolio managers, various stakeholders, and top management by integrating knowledge management concerns with collaborative tools [40]. Utilizing the following features, some enterprise project

management tools assist enterprises in efficiently managing project portfolios: Demand management, Portfolio Analysis and Selection, Task Management and Resource Schedule, Financial, Time, Team Collaboration, Reporting, Issues and Risk Management, Business Intelligence and Program Management.

5. CHALLENGES

Challenge	Description
Security & Privacy Data	In a blockchain architecture, the records can be verified by the entire community as opposed to a single outside party. Data security and privacy risks could potentially affect it [30].
Managing data storage	When it comes to data transactions, where the speed is critical, event searching and the editing can be very slow [30].
Interoperability Issues- data exchange	Blockchain, which is distributed and, on the cloud, has a radically different design from current databases, which are offline, centralised, local databases. The majority of international legislation still stipulate that central health authorities must oversee data exchanges, and they also demand that data transactions be completed in compliance with data privacy laws [30].
Standardization challenges	Systems for exchanging data are not entirely integrated [30].
Behavioural challenge	Blockchain technology is still in its early stages, hence it still has behavioural issues [30].
Monetary cost	The cost of implementing blockchain technology across all IT systems could be high [30].

6. CONCLUSIONS

This paper describes the application of web and blockchain in online student portfolio. This paper deals with Four technologies make up the MERN(MongoDB, ExpressJS, ReactJS, Node Js) Stack: It is intended to simplify and streamline the development process. Each of these four potent technologies plays significant role in creation of web

apps and offers developers an end-to-end environment in which to operate. This paper also specifies about block chain wherein we use it for publishing articles and getting paid through adds. This transaction involves bitcoins. Blockchain technology is used by Bitcoin to allow user-to-user transactions on a decentralised network. After the project is finished, it will act as a platform for students to advance along the success ladder and learn from professionals and alumni.

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