1.1 Introduction

In a bid to promote democracy within our institutions of learning, there is need for efficient and transparent election processes. The Real-Time School Election Tracking System aims to address this need by providing web based solution tailored to manage and monitor school elections in real-time. This project will help to revolutionize the traditional methods of conducting school elections by leveraging modern technologies to enhance accessibility, integrity, and efficiency. This proposed system will introduce a web-based platform for voter registration, candidate nomination, ballot creation, and result tabulation. The system seeks to streamline the election process while ensuring accountability and transparency. With the growing significance of student governance in educational institutions, the Real-Time School Election Tracking System emerges as a timely and indispensable tool to facilitate democratic practices and foster student engagement.

Problem Statement

The election procedure in schools has lately relied on manual processes, which require a lot of time. As a result, students may not be actively engaged or interested in the election due to the fact that they will need to queue during election time. Many election processes are prone to errors, and do not offer real-time feedback. From registration of voters to results release, there is a substantial administrative overhead associated with the traditional method. Also, the general credibility and openness of the election process are compromised by the lack of real-time monitoring and reporting. A Real-Time School Election System is a modern and innovative technologically advanced solution that must be developed and put into place rapidly to address these issues. This study seeks to provide solution to these challenges by designing and implementing a web based real time school election tracking system.

Aims

The Aim of the project is to create a Real-Time School Election Tracking System in order to improve, hasten the school election process, guaranteeing a transparent, encourage students participation during election, creating an efficient platform that is user friendly, secure, equitable, convenient and available to all parties involved.

Objectives

The following steps will be taken to achieve the aim of this project:

i. Create a real time election tracking system that has a user-friendly interface that is simple to use and intuitive so that students may easily use the voting system and have a straightforward and pleasant experience.
ii. Ensure the voting system is secure by implementing strong user authentication procedures that restrict voting to only qualified students.
iii. Ensure the real time election tracking system allows students who are interested in running for office to register as candidates and submit their manifestos and biographies by providing a simple and easy-to-use approach.
iv. To increase openness and confidence in the real time election tracking system by provide a real-time dashboard that shows real-time changes on the voting process and instantly announces the election results.
v. Making sure the election platform is accessible and that the voting system is usable by all students, accounting for different skill levels.
vi. Put strict security measures in place to guard the vote data's integrity and confidentiality and stop any unauthorised access or manipulation.
vii. To enable ongoing development and enhancement by setting up a feedback mechanism where students can share their experiences using the real-time voting system.

Legal Considerations

In order to ensure compliance with applicable rules and regulations, implementing a real-time school election system entails a number of legal issues. This study was done in compliance with data protection laws, such as the GDPR (General Data Protection Regulation) and local regulations. Compliance with accessibility standards was also considered to guarantee equal access to the voting platform for all eligible participants. The right to vote for all eligible participants and ensuring that the system does not discriminate based on any protected characteristics, such as race, gender, or disability was also considered. User authentication mechanisms were considered to prevent unauthorized access and maintain the confidentiality and integrity of the voting process.

Social Considerations

Considerations were given to ensure inclusivity, transparency, and education in the implementation of a real-time school election system. The voting system was designed to be inclusive and accessible to all students, regardless of background or abilities, while efforts were made to avoid biases that could disadvantage certain groups. Transparency was prioritized, with open voting procedures and clear communication about the system's operation and the voting process. Education initiatives aimed to promote civic engagement and informed decision-making among students, fostering a culture of democratic participation. By addressing these social considerations, the election system aimed to uphold fairness, trust, and integrity in the school community.

Ethical Considerations

Ethical considerations were given to ensure impartiality and fairness in the design and execution of the voting process. It was imperative to ensure that the voting system remained neutral and unbiased, refraining from favoring any specific candidate or group. Efforts were made to avoid conflicts of interest that could compromise the impartiality of the system, safeguarding the fairness and legitimacy of the elections.

Fairness was prioritized, with each student's vote carrying equal weight and all participants having an equal opportunity to express their preferences. Potential biases inherent in the system were addressed to ensure equity and justice, fostering confidence and trust among stakeholders in the electoral process.

Professional Considerations

professional considerations were made to uphold accuracy, fairness, and ethical standards. These considerations included ensuring the reliability of the voting system to handle expected loads without technical issues and having contingency plans in place for unexpected downtime. Additionally, means of providing adequate training and support to staff and students on the usage of the voting system was readily made available to facilitate smooth operations.

Background

An election is a formal group decision-making process by which a population chooses an individual or multiple individual to hold office [1]. The global use of elections as a tool for selecting representatives in modern representative democracies is in contrast with the practice in the democratic archetype, as practiced in ancient Athens, where the elections were considered an oligarchic institution and most political offices were filled using sortition, also known as allotment, by which officeholders were chosen by lot.

One of the most important elements of democratic society are elections, which provide a forum for citizens to freely express their opinions and decide as a group [2]. A students' union or student union, also known by many other names, is a student organization present in many colleges, universities, and high schools [3]. In higher education, the students' union is often accorded its own building on the campus, dedicated to social, organizational activities, representation, and academic support of the membership. Students elections are important for encouraging a sense of leadership, responsibility, and participation among the student body in schools and universities. Paper ballots, ballot boxes, and manual vote counting have all been part of the traditional processes that have traditionally been used for school elections [4]. However, a more effective, transparent, and real-time school election system is desperately needed in this day of rapid technology innovation. There is an increasing need for a more real-time, high-tech school election system as people become aware of the shortcomings and inefficiencies of the current system. In addition to streamlining the election process, this method will give students a way to actively engage in the democratic governance of their school.

School elections play a pivotal role in fostering democratic values among students, offering them an opportunity to actively participate in decision-making processes [5]. Traditional methods of conducting school elections often involve manual tasks, leading to inefficiencies and potential challenges in maintaining transparency and accuracy [6]. The emergence of technology-driven solutions has paved the way for Real-Time School Election Tracking Systems, aiming to address these issues and streamline the entire electoral process within educational institutions.

Significance Of Study

This study on real-time school election tracking systems will be beneficial to educational administrator, students, technology developers, researchers and policy makers. School principals, administrators, and academic staff can utilize the findings to streamline and modernize election processes within their institutions. Implementing real-time election systems can enhance administrative efficiency, promote student engagement, and improve overall transparency in the electoral process.

Students will benefit from more accessible and interactive election procedures. Real-time systems provide students with the opportunity to track election progress and outcomes in real-time, empowering them to make informed decisions and engage in the democratic process.

Developers of voting system software and platforms can leverage the findings of this study to design and refine real-time election tracking solutions tailored.

Scholars and policymakers interested in educational governance, democratic participation, and technology integration in schools can utilize the findings from this study to inform their research and efforts. Findings from this study can contribute to discussions on electoral reform, digital literacy initiatives, and the promotion of civic engagement among students.

Project Overview

Report Overview

This report is divided into five sections with each section meticulously crafted to provide a comprehensive understanding of the project's development, challenges faced, and also the outcomes achieved. The sections are outlined below:

Section 1: Introduction**.** It is divided into problem statement; aims and objectives; legal, ethical, professional and social considerations; background to the project; significance of the project; and an overview of the project report.

Section 2. Literature and Technological review. In this section various literatures and technologies connected to the project were carefully reviewed to determine their benefits and limitation. The selected methodology for the project is influenced by the findings in this section.

Section 3. Design/Methodology. This detailed the approach to undertaking the project, answering how the project was executed. It covers design, testing and evaluation, project management, and technologies and processes.

Section 4. Implementation or Results. This section describes the practical application of the methodologies outlined in section 3. It answers the question of what was done, including design work, system architecture, and any significant coding efforts. This section also assesses the strengths and weaknesses of the project's outcome. This section included related work, discussing how the project compares to existing solutions and industry standards.

Section 5. Conclusion. This section summarizes the overall project and highlighted the extent to which aims and objectives were met.

LITERATURE REVIEW

2.1 Introduction

This section provides a comprehensive investigation into various aspects relevant to the development and implementation of a Real-Time School Election Tracking System (RSETTS). The historical evolution of voting techniques and the existing election tracking systems were all reviewed. The aim of this literature review is to inform the design, methodology, and implementation strategies of RSETTS, thereby enhancing its effectiveness, efficiency, and impact within educational settings.

The Evolution of Voting Systems

Historically, there have been a significant evolution of voting techniques. This evolution is greatly influenced by the advancements in technology, changes in societal norms, and shifts in governance structures. Understanding the historical evolution of voting methods gives a valuable insight into the challenges and opportunities inherent in contemporary electoral practices. It also offers valuable insights needed for designing RSETTS, highlighting best practices, identifying potential pitfalls, and informing decision-making processes.

Paper Ballots

The 19th century was a period characterized by rapidly increasing democratic movements and the pursuit of universal franchise. It was in this period that ballot papers were introduced [7]. Before the widespread adoption of paper ballots, electoral practices often relied on oral or public voting methods, which were susceptible to coercion, intimidation, and fraud [8]. The introduction of paper ballots revolutionized the electoral process. It provided voters with a private and anonymous means of voting, and through this enhanced the fairness and integrity of elections.

Paper ballot voting involves the distribution of printed ballots containing the names of candidates or options for a particular election [9]. Voters marked their preferences by manually indicating their choices on the ballot paper, typically by marking, filling in a designated space, or thumbprinting next to the candidate's name. Once voters have completed their ballots, they deposit them into secure ballot boxes, ensuring the confidentiality of their choices. Subsequently, the collected ballots are counted manually or using mechanical tabulation devices to determine the election results.

The paper ballot voting systems offered several advantages that contribute to their enduring popularity and widespread use in democratic elections. One of such advantage is accessibility. Paper ballots are accessible to voters of all demographics, including those with limited technological literacy or access to electronic devices. The use of paper ballot also improved the transparency of the electoral process, especially the use of open ballot where the counting of the ballot papers was done openly. The anonymity and privacy afforded by paper ballots instill confidence in voters and minimized concerns about coercion or intimidation. Paper ballots provided a tangible record of votes cast, enabling post-election audits and recounts to verify the accuracy of results and address any discrepancies. Lastly, Paper ballot voting systems are often more cost-effective to implement and maintain compared to electronic voting technologies, particularly in resource-constrained electoral environments.

Despite their numerous advantages, paper ballot voting systems also have inherent limitations and challenges. Manual handling of paper ballots increases the likelihood of errors during the counting process, leading to inaccuracies and delays in declaring election outcomes. The manual tabulation of paper ballots can be time-consuming, particularly in elections with a large voter turnout or complex ballot designs, potentially delaying the announcement of results. While paper ballots offer anonymity to voters, they are susceptible to tampering, ballot stuffing, and other forms of electoral fraud, especially in the absence of robust security measures and oversight. Paper ballots may pose accessibility challenges for voters with disabilities, such as visual impairments or mobility limitations, requiring additional accommodations to ensure their participation in the electoral process. Lastly, the production and disposal of paper ballots contribute to environmental degradation, including deforestation and waste generation, raising concerns about sustainability and ecological footprint.

Mechanical Lever Machines

Mechanical Lever Machines are also known as lever voting machines or lever voting booths [10]. In this system, mechanical devices are designed to streamline the voting process by providing a simple and efficient means for casting ballots. These machines were developed in the late 19th century and gained widespread popularity during the early 20th century, particularly in urban areas with large voter populations [4]. The functionality of mechanical lever machines was relatively straightforward yet innovative. Each machine consisted of a series of levers corresponding to different candidates or ballot options. To cast their votes, voters would enter a private booth equipped with the machine, where they could manipulate the levers to indicate their selections. Once voters had made their choices, they would pull a single lever to register their votes and reset the machine for the next voter.

The merits of Mechanical Lever Machines were evident in several aspects of the voting process. Mechanical Lever Machines were accessible to voters of all demographics, including those with limited literacy or mobility impairments. The machines provided a user-friendly interface that facilitated the casting of ballots with minimal assistance. The mechanical design of lever machines allowed for swift and efficient ballot casting and tabulation. Compared to manual counting methods, lever machines significantly reduced the time required to tally votes and declare election results. Lever machines offered high levels of accuracy in recording and tabulating votes. The mechanical mechanisms ensured that each vote was registered correctly, minimizing the risk of human error or tampering. Lever machines provided built-in security features to safeguard the integrity of the voting process. The enclosed voting booths and mechanical mechanisms protected ballots from tampering or unauthorized access, enhancing voter confidence in the electoral system.

Despite their numerous advantages, Mechanical Lever Machines also had several notable demerits. As mechanical devices, lever machines required regular maintenance and upkeep to ensure proper functionality. Over time, wear and tear could affect the accuracy and reliability of the machines, leading to concerns about malfunctions or breakdowns during elections. The initial investment and ongoing maintenance costs associated with lever machines could be substantial for electoral authorities. Also, the need to periodically update or replace outdated machines added to the financial burden of implementing and maintaining these systems. Lever machines lacked flexibility in accommodating changes to ballot designs or electoral procedures. Updating or modifying the machines to accommodate new candidates, ballot initiatives, or voting regulations could be cumbersome and time-consuming. While lever machines were accessible to many voters, they posed challenges for individuals with certain disabilities, such as visual impairments or fine motor control issues. The mechanical interfaces and physical levers may have been difficult for some voters to navigate independently.

Punch Card

Punch card voting systems originated in the late 19th century. Their introduction provided a novel solution to the challenges associated with traditional paper-based ballots [11]. Punch card voting systems allow voters to punch holes on computer-readable ballot cards to indicate their choices in an election. Some implementations utilize mechanical hole-punching devices, while others provide voters with pins to punch out the holes. However, the latter method has been associated with incomplete punches, leading to errors in reading the cards. Voters mark their preferences by punching holes in designated areas on the ballot cards, corresponding to the candidates or options of their choice. Once voters have completed their

ballots, the punched cards are collected and tabulated using specialized equipment, such as optical scanners or mechanical devices, to determine the election results.

Punch card voting systems offer a user-friendly interface, accessible to voters of all demographics, including those with limited technological literacy. The automated tabulation process associated with punch card systems enables swift and accurate counting of votes, facilitating timely declaration of election outcomes. By eliminating the use of paper-based ballots, punch card systems reduce the risk of ballot tampering and fraud, enhancing the security and integrity of the electoral process. The mechanical precision of punch card tabulation devices minimizes the likelihood of errors or discrepancies in the vote-counting process, ensuring the accuracy of election results. Punch card systems provide a tangible record of votes cast, enabling post-election audits and recounts to verify the integrity and accuracy of results, thereby enhancing transparency and accountability.

Despite their user-friendly design, punch card voting systems may still be perceived as complex or intimidating by some voters, particularly those with limited familiarity with technology. The mechanical components of punch card tabulation devices are susceptible to wear and tear over time, potentially leading to malfunctions or inaccuracies in the vote-counting process. Punch card systems may be prone to errors or misinterpretations, particularly if voters fail to accurately punch holes in the designated areas on the ballot cards, resulting in invalidated or miscounted votes. The initial setup and maintenance costs associated with punch card voting systems, including the procurement of specialized equipment and training of election personnel, can be prohibitive for some electoral jurisdictions. Despite their intuitive design, punch card systems may pose accessibility challenges for voters with disabilities, such as visual impairments or motor disabilities, requiring additional accommodations to ensure their participation in the electoral process.

Optically Scanned Ballot

Optically scanned ballots are also known as mark-sense or Bubble Ballot Paper. They Originated in the late 20th century and offers voters a user-friendly interface, featuring offices and the names of candidates alongside small circles, akin to radio buttons [12]. Voters indicate their preferences by shading the small circle adjacent to their preferred candidate, marking their choice on the ballot paper. The ballots are then scanned into a machine equipped with an optical scanner, which automatically counts and tabulates the votes.

Optically scanned ballots offer a straightforward and intuitive voting experience, accessible to voters of all demographics, including those with limited technological literacy. The automated counting process associated with optically scanned ballots enables swift and accurate tabulation of votes, facilitating timely declaration of election outcomes. The precision of optical scanners minimizes the likelihood of errors or discrepancies in the vote-counting process, ensuring the accuracy and integrity of election results. The use of optical scanners reduces the risk of ballot tampering and fraud, enhancing the security and transparency of the electoral process. Optically scanned ballots provide a tangible record of votes cast, enabling post-election audits and recounts to verify the integrity and accuracy of results, thereby enhancing transparency and accountability [13].

Despite their user-friendly design, optically scanned ballots may still be perceived as complex or intimidating by some voters, particularly those with limited familiarity with technology. The performance of optical scanners may be affected by various factors, including machine malfunctions, misreads, or calibration errors, potentially leading to inaccuracies in the vote-counting process. Optically scanned ballots may be prone to errors or misinterpretations, particularly if voters fail to accurately shade the small circles adjacent to their preferred candidates, resulting in invalidated or miscounted votes. The initial setup and maintenance costs associated with optical scanning systems, including the procurement of specialized equipment and training of election personnel, can be prohibitive for some electoral jurisdictions. Despite their intuitive design, optically scanned ballots may pose accessibility challenges for voters with disabilities, such as visual impairments or motor disabilities, requiring additional accommodations to ensure their participation in the electoral process.

The Direct Recording Electronic (DRE) Voting System

The DRE system was a major shift from traditional voting methods, offering electronic and automated casting, counting, and tallying of votes [14]. Unlike its predecessors, such as lever machines or paper-based ballots, the DRE system leverages electronic ballots displayed on a screen, allowing voters to select their preferred candidates with a simple thumbprint [15]. Once the vote is cast, the system generates summaries and tallies automatically, streamlining the election process and minimizing errors. One of the notable features of the DRE system is its versatility, accommodating various e-voting setups to suit different electoral contexts. Polling Place e-Voting involves casting votes through electronic voting machines within designated polling booths, while Remote e-Voting enables voting from any location outside the polling station via the Internet or telephone. Whether at polling stations or remotely, the DRE

equipment, often equipped with touch screen mechanisms, provides voters with unprecedented convenience and accessibility.

The DRE system offers numerous advantages that contribute to its widespread adoption and popularity in electoral administration [16]. The use of touch screen monitors minimizes common mistakes associated with traditional paper-based ballots, leading to greater accuracy in the voting process. Voters receive immediate feedback on votes cast, allowing for prompt error correction if needed, thereby enhancing the integrity of election results. This system leverage on electronic verification mechanisms to reduce the likelihood of multiple voting tendencies, ensuring fairness and transparency in the electoral process. Electronic voting eliminates the need for paper ballots and even physical presence at polling stations, offering voters unprecedented convenience and flexibility in participating in elections. The automated tallying of votes enables swift processing of election results, facilitating timely declaration of outcomes and reducing administrative burden. The DRE system offers backup of votes for audit trail purposes, enhancing confidentiality, transparency, and trust in the electoral process. Through features like headphones and Braille keypads, the DRE system provides a user-friendly voting platform for individuals with disabilities, ensuring inclusivity and equal participation in the democratic process.

However, despite its many advantages, the DRE system is not without its challenges and limitations. The DRE system may be susceptible to over-voting or under-voting, potentially leading to inaccuracies in the election results and undermining voter confidence. Simultaneous transmission of results from polling booths to headquarters may result in broadcast storms, causing disruptions and delays in data transmission. Like any electronic system, DRE equipment may experience malfunctions during elections, leading to delays or inaccuracies in vote counting, and raising concerns about the integrity of the electoral process. Proprietary source code and poorly implemented security measures may pose vulnerabilities to fraud, hacking, and election rigging, undermining the credibility of election outcomes. Some DRE systems run on operating systems that may require security upgrades to prevent virus and worm attacks, posing additional challenges to ensuring the integrity and security of electronic voting data. Wiretapping by hackers during vote transmission poses a significant threat to the confidentiality and integrity of electronic voting data, raising concerns about the potential for unauthorized access and manipulation of election results.

The Need for Online Real Time Election Tracking System

The need for a secure, online, real-time voting system cannot be overstated. Traditional methods of voting, such as manual paper ballots and electronic voting machines, face significant limitations that hinder the efficiency, accessibility, and security of the electoral process. As technology advances and the internet becomes an integral part of our lives, there exists a compelling opportunity to revolutionize the way we conduct elections.

One of the most pressing issues with traditional voting systems is the lack of accessibility and convenience for voters [17]. Physical polling stations require citizens to allocate substantial time and effort to cast their votes, potentially leading to decreased voter turnout, especially among individuals facing mobility challenges or residing in remote areas. This disparity in accessibility undermines the fundamental principle of democracy, which emphasizes equal participation and representation for all citizens.

Traditional methods are also prone to errors in voter registration, vote counting, and result tabulation, casting doubts on the accuracy and integrity of election outcomes [18]. Manual processes are inherently susceptible to human error, while electronic voting machines may malfunction or be subject to manipulation. These discrepancies undermine the credibility of election results and erode public trust in the democratic process.

Security concerns also loom large over traditional voting systems [19]. Instances of fraud, and tampering pose significant threats to the legitimacy of election results. Ensuring the confidentiality, integrity, and authenticity of votes in the digital era has become an urgent priority for preserving the core principles of democracy. Without robust security measures in place, the sanctity of the electoral process is compromised, leaving elections vulnerable to manipulation and undermining the democratic foundation of society.

In response to these challenges, the development of an online, real-time election tracking system offers a viable solution. This system leverages on the power of technology and the internet, and can provide voters with a secure and convenient platform to cast their votes from anywhere, at any time. Real-time tracking capabilities enable election authorities to monitor voting activity, detect anomalies, and ensure the integrity of the electoral process.

Also, an online voting system enhances accessibility for individuals with mobility challenges or those residing in remote areas, thereby promoting inclusivity and equal participation in the democratic process.

This system streamlines voter registration, ballot casting, and result tabulation, and therefore minimize errors and discrepancies, enhance the accuracy and transparency of election outcomes.

Previous Works on Online Election Tracking Systems

A study presented the design and development of a secure and user-friendly Online Voting System [20]. The persisting concerns regarding the safety and security of traditional voting methods were addressed by leveraging fingerprint and Aadhaar card authentication. The proposed system allows voters to scan their fingerprints, which are then matched with images stored in a government Aadhaar card database, ensuring high performance and security. Also, the voting process is simplified, requiring users to log in using their Aadhaar card number and select their preferred candidates to cast their votes. The study proposed system was aimed at mitigating the risk of fraudulent voting and enhancing the overall security of the electoral process by incorporating biometric fingerprint authentication.

In another study, the development of an efficient and secured E-Voting Mobile Application using Android technology was carried out [21]. The study emphasized the critical importance of security in e-voting applications, given the rapid expansion of the Internet and the proliferation of cyber threats. To address this concern, the researchers develop an Android application with a three-step security process designed to prevent phishing attacks and safeguard the integrity of the voting process. This security protocol ensures that students can securely cast their votes online from any location, at any time, using their mobile devices. Android Studio was used for the development and deployment of the application. The result of this research was a user-friendly mobile application tailored specifically for students, offering practical functionality and incorporating three levels of security measures to protect the integrity of the voting process. This innovative solution not only enhances accessibility and convenience for voters but also strengthens the security and trustworthiness of the electoral system in the digital age.

In another study, an election tracking system for university settings, where students have the flexibility to cast their votes anytime and anywhere using a variety of fixed and mobile electronic devices, including personal computers, personal digital assistants, smartphones, and regular phones was designed and implemented [22]. One of the key challenges addressed in the implementation of this system was the need to ensure seamless accessibility and consistency of content across different devices without the need for web content replication. To address this challenge, the implemented system employed a strategy of separating the data content from its presentation format. This separation was achieved through the use of modern technologies such as extensible markup language (XML) to represent web data content

and extensible style language transformation style sheets (XSLT) to customize the presentation of this content on various connecting devices. By adopting this approach, the system achieved a write once, publish to any device design and implementation, thereby ensuring uniform accessibility and usability across different platforms.

Another study proposed the development of an electronic voting system designed to minimize rigging and manipulation of results to a great extent [23]. The researchers argue that the implementation of such a system in Nigeria would enhance the integrity of the Independent National Electoral Commission (INEC) and the credibility of the election results it produces. The electronic voting system developed by the researchers utilized a combination of programming languages and technologies, including PHP, MySQL, Java Query, CSS, and HTML. These tools were employed to create a user-friendly graphical interface, ensuring accessibility for individuals with varying levels of computer literacy.

In another study, the authors presented the development and formal verification activities related to an e-voting system named ProVotE [24]. ProVotE is an end-to-end e-voting system equipped with a voter-verified paper audit trail (VVPAT), developed as part of a larger initiative aimed at assessing the feasibility of introducing e-voting in the Autonomous Province of Trento. Notably, ProVotE was utilized in trials and elections with legal validity in Italy.

Technology Review

Front End Development

Front-end development is a very important part of website development. Everything a user sees and interacts with on the website is a function of the front end. It includes designing and implementing user interfaces, creating visual elements, and adding interactivity to web pages. Front-end technologies are pivotal for creating websites that are modern, responsive, and user-friendly. The following are some of the common front-end technologies that are used in website development:

1. HTML (Hypertext Markup Language): is the backbone of any website. It provides a standardized structure for the creation of web pages. Its advantages lie in its simplicity, ease of use, and compatibility across various browsers and devices. HTML excels in defining the essential structure of a webpage through elements like headings, paragraphs, and lists. However, HTML faces limitations when it comes to creating intricate and interactive user interfaces.

2. CSS (Cascading Style Sheets): CSS complements HTML by enhancing the visual presentation of web pages. It has the ability to style and format HTML elements consistently across a website, ensuring a polished and professional appearance. CSS helps in creating responsive designs and improving user experience across different devices. However, CSS is limited when it comes to browser compatibility. Additional codes and adjustments are usually required to ensuring consistent rendering across various browsers.

3. JavaScript: JavaScript is a programming language that helps to add dynamic and interactive elements to websites. It runs on the client side, reducing server load and enhancing user experience. JavaScript's asynchronous nature enables non-blocking operations, fostering smooth interactions. Despite its advantages, JavaScript faces challenges related to browser compatibility. Different browsers may interpret JavaScript code differently, potentially leading to inconsistencies in functionality. Relying on client-side execution also raises concerns about security.

4. Bootstrap: Bootstrap is a popular front-end framework that provides a set of pre-designed components, such as navigation bars, forms, buttons, and typography. Bootstrap makes it easy for developers to create responsive and mobile-first websites.

5. React: React is a JavaScript library for building user interfaces. It allows developers to create reusable components that can be easily composed to build complex UIs. React is widely used for single-page applications and is known for its performance and flexibility.

6. Angular: Angular is a powerful front-end framework developed by Google. It provides a comprehensive set of tools and features for building complex web applications. Angular has a steep learning curve but is well-suited for large-scale applications.

7. Vue.js: Vue.js is a progressive JavaScript framework that is gaining popularity in the front-end development community. It provides a flexible and easy-to-learn approach to building user interfaces. Vue.js is known for its simplicity and performance.

8. Sass: Sass (Syntactically Awesome Style Sheets) is a preprocessor for CSS that allows developers to write more maintainable and modular CSS code. Sass provides features such as variables, mixins, and nesting, which make it easier to manage large CSS files.

9. Gulp: Gulp is a task runner for front-end development. It allows developers to automate tasks such as compiling Sass, minifying JavaScript, and optimizing images. Gulp makes it easy to streamline the development process and improve efficiency.

Back End Development

1. **PHP:** PHP is a server-side scripting language, was selected for its versatility, wide usage, and compatibility with various web servers. PHP is embedded within HTML code, facilitating dynamic content generation. Its open-source nature, extensive community support, and seamless integration with databases make it a preferred choice for web development. The limitations of PHP include its perceived performance lag compared to some other languages. Additionally, some developers find the syntax less elegant than that of newer languages.

2. Node.js: This is a JavaScript runtime built on Chrome's V8 engine and is well-suited for handling concurrent connections and following an event-driven architecture. It has the ability to use JavaScript for both frontend and backend development. This streamlines the development process. However, Node.js operates on a single-threaded event loop, making it less suitable for CPU-intensive tasks. Asynchronous programming may also introduce challenges for developers unfamiliar with this.

3. Django: Django is a high-level Python web framework that prioritizes quick development and. It offers a comprehensive set of tools for building robust and scalable web applications. While Django is powerful, it might be perceived as more complex for smaller projects. Its opinionated structure may require developers to conform to Django's conventions.

4. MySQL: This is a relational database management system (DBMS) that is renowned for its reliability and efficiency in data storage and retrieval. It supports complex queries, transactions, and relationships, making it suitable for the demands of a robust online booking system. However, MySQL may face scalability challenges in certain scenarios, and its data type options are relatively limited compared to some modern databases.

After careful consideration, PHP, Javascript, HTML, CSS, and SQL were the chosen technologies for the execution of this project. These technologies were chosen for ease and the flexibility of online use. A PHP framework was used as the backend technology for this project. The framework was chosen as it allows for many libraries and functions without writing from the scratch. MySQL was chosen as the database management system due to its compatibility with PHP. It also provides an interface for easy usage.

Summary Tables

Table 1: Benefits of Modern Voting Systems

Aspect	**Modern Voting Systems**
Accessibility	Offers remote voting options, enabling voting from anywhere with internet access.
Familiarity	Embraces technology to streamline the voting process, potentially appealing to tech-savvy voters.
Integrity	Can incorporate advanced security features such as biometric authentication and blockchain technology to enhance integrity.
Verification	May incorporate voter-verified paper audit trails (VVPAT) or digital confirmation mechanisms to ensure accurate recording of votes.

Table 2: Limitations of Traditional Voting Systems

Aspect	**Traditional Voting Systems**
Accessibility	Requires physical presence at polling stations, potentially limiting participation for those with mobility issues or living in remote areas.
Efficiency	Counting and tallying of paper ballots can be time-consuming, leading to delays in results.
Security	Susceptible to fraud, tampering, and human error during the handling and counting of paper ballots.
Verification	Limited ability for voters to verify the accuracy of their votes once cast.

CHAPTER THREE

Design or Methodology

Design

The study involves the design and implementation of a web-based application that allows for the management and monitoring of school elections. Key features of the system include voter registration, candidate nomination, ballot creation, real-time voting, and result tabulation. Our design has been influenced by the findings of our literature review, which highlighted the shortcomings of traditional paper-based voting systems and the potential benefits of modern electronic voting systems. Additionally, insights from our technology review have guided our selection of appropriate technologies to build our application, ensuring scalability, security, and user-friendliness.

The Real-Time School Election Tracking System will be developed using a combination of front-end and back-end technologies. The following are the technologies used for this project:

1. **PHP - Server Side Programming Language:** PHP will serve as the primary server-side programming language for the project. Its versatility and capability to seamlessly integrate with databases make it an excellent choice for handling dynamic content and server-side functionalities.
2. **Javascript:** Javascript will be employed to enhance the project's interactivity and user experience on the client side. Its ability to create dynamic content, handle asynchronous requests, and manipulate the Document Object Model (DOM) will contribute to a more engaging and responsive user interface.
3. **HTML - Hypertext Multimedia Language:** HTML, as the backbone of web content, will be utilized to structure and organize the project's information. Its semantic elements will ensure proper document structure, accessibility, and compatibility across various browsers.
4. **CSS - Cascading Stylesheet:** CSS is integral for styling and layout design. By employing CSS, we can achieve a visually appealing and consistent presentation of the project across different devices and screen sizes. This includes the management of fonts, colors, spacing, and overall aesthetic elements.
5. **SQL - Structured Query Language:** SQL will be the language of choice for database management. Its powerful querying capabilities will facilitate efficient data retrieval, storage, and manipulation. By utilizing SQL, we ensure a robust and organized database system that aligns with industry standards for data management.

Why These Technologies?

The following are some of the main reasons why these technologies were selected for this project:

- **Scalability and Performance:** PHP, with its server-side capabilities, ensures efficient processing and management of server resources, contributing to the project's scalability and performance.
- **Dynamic User Interface:** Javascript enables the creation of dynamic and interactive user interfaces, enhancing the overall user experience by providing real-time feedback and seamless interactions.
- **Structured Content:** HTML's semantic elements will be employed to maintain well-structured and accessible content, which is crucial for search engine optimization and user accessibility.
- **Aesthetic Consistency:** CSS ensures a consistent and visually appealing design across various pages, contributing to a cohesive and professional appearance for the entire project.
- **Effective Data Management:** SQL's robust querying capabilities will be crucial for effective data management, ensuring data integrity, security, and efficient retrieval.

Alternative Approaches

Alternative approaches considered for our project included the use of different programming languages and frameworks, such as Python with Django or Ruby on Rails, for the back-end development. However, we opted for the technologies stated above due to their asynchronous capabilities, which can enhance the real-time nature of our application.

Project Management Approach

The project management strategy utilized for this project is the Agile methodology, specifically Scrum. This approach helps to facilitate iterative development and continuous feedback. Scrum was chosen for its flexibility and adaptability to changing requirements. This approach was selected over traditional waterfall methodologies due to its emphasis on flexibility and responsiveness, which aligns with the dynamic nature of software development projects. Project management tools will be utilized to streamline communication and task tracking throughout the project lifecycle.

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