

# UNIVERSITY OF GUYANA

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Course: Software Engineering I  
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## Introduction

Voting is the process of electing someone to a position. It is the mechanism by which governments are elected in any democratic society. The Guyana Elections Commission (GECOM) oversees national elections in Guyana, which it has done approximately every five years since 2000. They also conduct elections for regional and municipal governments. Within the authoritative system, the corporation establishes policies for voter registration, voter list support, and the organization of all national, territorial, and local government elections.

At the moment, voting is done on poll paper, and the counting is done physically. As a result, it wastes time and increases the likelihood of incorrect votes due to human error. All of this makes the existing electoral system a hassle.

Our solution is Elections Management Software that is both simple and secure. The system should be able to identify all qualifying persons and undertake extensive checks against their profiles, including identifying documents and medical information. If the program detects duplicate votes from the same person, it will overwrite the primary vote and alert the client. The application will examine a person's medical history to identify whether or not they are deceased, and if they are, administrative employees will be notified of voter fraud.

Furthermore, the application provides an administrative overview, prompting authorized personnel to identify and declare abstentions. To reassure end users about the security of their personal information, a privacy policy will be developed, to which the user must agree before having access to the system. Penetration testing will also be done throughout the testing stage to test the program for any vulnerabilities where adjustments will be made to reinforce the system's integrity. The elections will be closely monitored by teams of IT specialists around the clock in the event of a network outage.

This program is especially delicate because security is one of the key constraints that affect project management. Not only is the material sense, but it is also available online, and access privileges must be clearly defined. Time constraints will also play a significant role, as the program must be completed before the next GECOM-hosted elections.

## Project Organization

Position	Responsibility
Project Manager	They are responsible for tracking the progress, liaison, documenting project reports, motivating the team members, and leading the team.
Technical Leader	Who manages a team of technical employees. They address all the technical difficulties related to software development and engineering activities.
Hardware Leader	They are responsible for the research, design, development, and testing of the system.
Software Leader	Software Leader is responsible for defining the complete architecture system of the project. (managing the daily scrum meetings and plans sprint for agile development, Post approval, and Developers)
Production Leader	Responsible for ensuring the projects are completed according to the timeframe, establishing rules and objectives, and managing budgets and schedules.
Engineers	Responsible for the research, development, maintenance, innovation, planning and project management, and analysis.
Software Developers	Responsible for application development, software testing, implementing quality assurance standards, writing and upgrading technical documentation, identifying areas for operational improvement, and implementing necessary modifications.

Programmer	Responsible for securing programs against cybersecurity threats, correcting coding errors, and upgrading existing programs.
Operational Leader	Responsible for ensuring the safety of all the personnel at a facility, monitoring the project team performance, and ensuring all the operations are carried out.
Penetration Testers	Responsible for testing the software for security vulnerabilities and collaborating with programmers to resolve those vulnerabilities.

## Risk Analysis

Risk	Description	Likelihood	Risk Reduction Strategy
Security Concerns	<p>Although security would be a problem for any software system, in terms of voting, security concerns may arise in terms of the data which has to be collected and processed for voting. Any Individual which is skilled enough and has the intent of committing some form of cybercrime would make attempts to rig such a system whether they have a specific agenda such as to make alterations to the number of votes cast to a party or to gain the personal data of the voters among other reasons. This would cause exposure and as such the system's credibility and reliability would be severely reduced which would lead to system failure.</p>	<p>There would be a 4 in 5 chance of a system being rigged at a general election as the rate of cybercrimes has risen drastically over the past five years. With persons from all over the world, including Guyana having the ability to commit such cyber attacks on such a system, it is one of the biggest concerns in the progression of the creation of this software.</p>	<ol style="list-style-type: none"> <li>1. Penetration Testers: The implementation of penetration testers who would be able to test the voting system for vulnerabilities.</li> <li>2. The use of a private network would reduce the chances of persons gaining access to this data.</li> <li>3. Incident Response: In the event that something does occur in terms of security breaches, an incident response team would be readily available to effectively deal with each instance of the security breach(es) to assess and perform damage control on the problem. This would include having a contingency plan ready for use so that the election may still run smoothly on the planned date.</li> </ol>
Data Collection	<p>Poor data collection strategies may lead to inaccurate data being entered into the system whether intentionally or unintentionally. A lack of proper verification methods</p>	<p>Although there is a small possibility of there being a storage issue (around a 2 in 5 chance), there is a greater probability of persons entering inaccurate data,</p>	<ol style="list-style-type: none"> <li>1. Data verification methods inclusive of               <ol style="list-style-type: none"> <li>a) Registering to vote before the date of the elections.</li> </ol> </li> </ol>

	<p>would open system vulnerabilities.</p> <p>As data is being collected for every eligible Guyanese, storage may become an issue over time. This may result in data loss if proper measures are not put in place.</p>	<p>especially if they are not cognizant of these mistakes or if they do not know how the system works. It may also be intentional (approximately a 3 in 5 chance).</p>	<p>b) Providing proof of citizenship and identification.</p> <p>2. Ensuring that all data is backed up to multiple sources such as an external hard drive and using cloud-based storage.</p>
Novices	<p>All eligible Guyanese are currently au fait with the process of going to the polling station and placing a tick within the box next to the party of their most favored party, followed by marking their right index finger with ink as an indication that they would have placed their vote.</p> <p>With the implementation of an electronic voting system, individuals may not be able to adjust quickly enough to have knowledge of how the system works and how to navigate it, especially since National elections are held at five-year intervals.</p>	<p>With an approximate probability of 3.5/5, this risk poses a big problem especially in the elderly population as it relates to the proper navigation of the system.</p>	<p>1. Beta testing can be done before deploying the software. By doing this, the most optimal user interface can be easily identified and an efficient system created.</p> <p>2. To get more people involved in knowing how to navigate the system, televised advertisements can be done which would reach a vast majority of eligible Guyanese. These advertisements would outline how the electronic voting process takes place.</p>
Time Estimation	<p>Time estimation, regardless of experience, will, in most cases, always pose a problem. It is therefore difficult to make an accurate time estimation. This is</p>	<p>The estimated likelihood of this occurring is 3 out of 5. This estimation is a</p>	<p>By not conforming to a strict time schedule, in the case that a delay arises, there would be some flexibility. In addition, by thoroughly planning the schedule and through</p>

	mainly due to unexpected issues, out of the team's control arising. This can negatively affect the project as it can delay the projected deadline.	result of the team being first-time developers.	constant tracking of events, the problem's likelihood of occurring is reduced.
Networking Issues	The software will be utilized by a great number of users so when it comes to issues relating to traffic and server crashes, there is a great likelihood. Networking problems (server crashes, connectivity issues, internet trouble) from traffic and other network-related issues will disrupt the flow of the voting process. This leads to chaos; ranging from disgruntled users( in extreme cases, loss of voters) to delays in the overall process.	Given the fact that this operation is so massive and the economic standing of the country(poor service quality) and development team, the chances of such an error occurring are highly probable, giving it a 3.9/5.	To avoid these issues: 1. Keep the equipment in an accommodating environment. 2. Have backups whether it is to replace the equipment or an alternative power source. 3. A team assigned to calm the upset or worried voters, providing reassurance. 4. Use of good coding practices (optimal use of computing resources) will help to alleviate these issues. 5. Use of firewalls to block unwanted traffic 6. Incorporating a server balancing solution into the program.



# Hardware and Software Resource Requirements

## Hardware

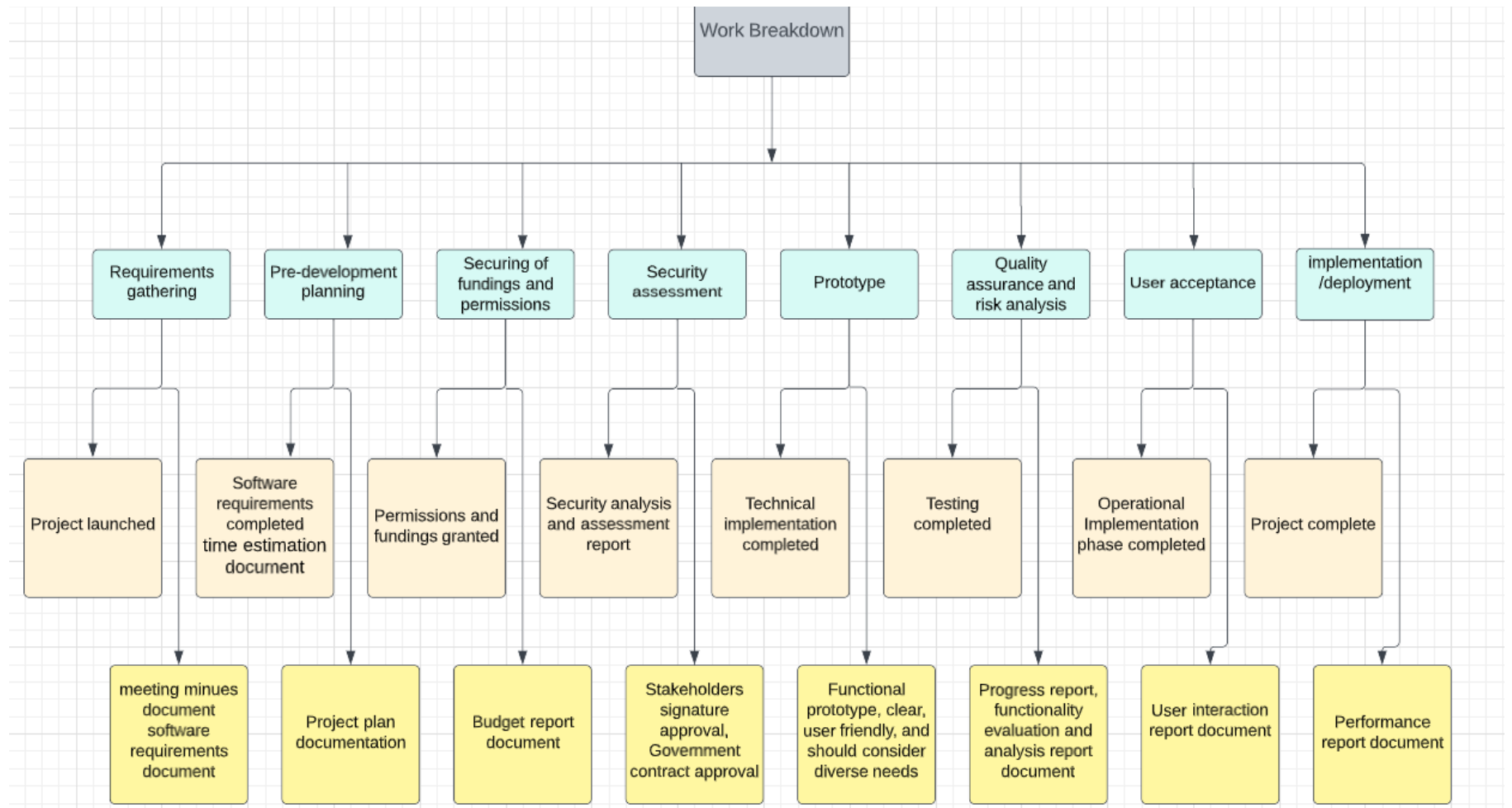
1. Computers:
  - a. Intel Pentium IV or higher
  - b. 256MB RAM
  - c. 1GB Hard Free Drive Space
  - d. 12” Screen or wider
  - e. US English Keyboard
  - f. Mouse (wireless or wired)
2. Backup storage solutions:
  - a. Hard Drive, SSD, Network Drive, or other
  - b. 128GB Disk Space or more
3. Router: connecting developers and other project contributors
4. Testing Hardware:
  - a. Cellular and Mobile Devices
  - b. Laptops
  - c. Wireless Access Point (WAP): connecting the users to the project

## Software

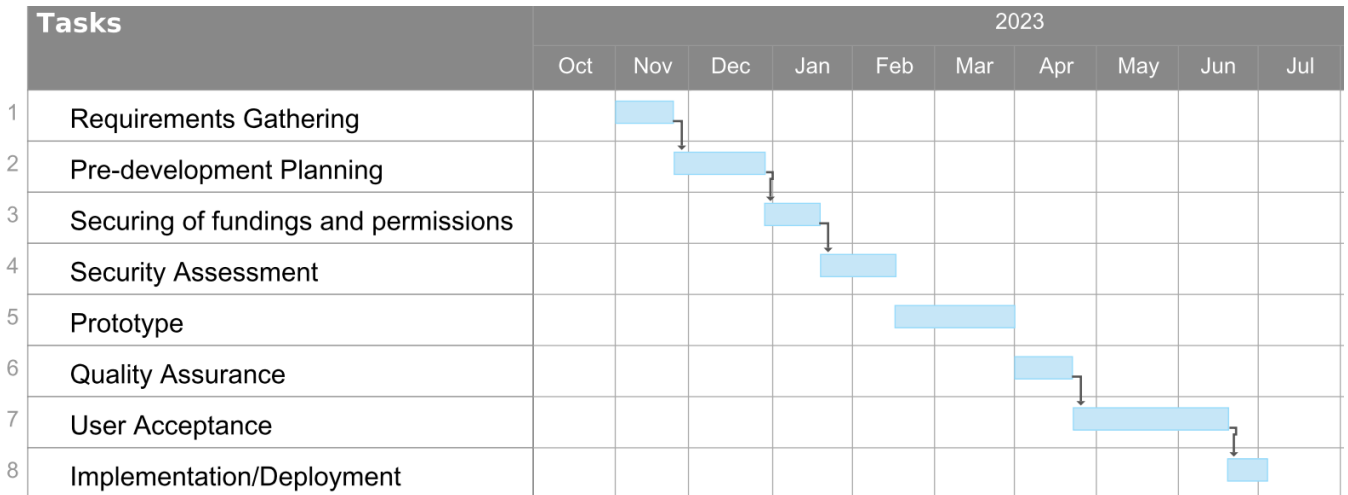
1. Penetration Testing Software:
  - a. WireShark
  - b. Astra's Pentest
2. Languages to Code the software:
  - a. HTML, CSS, Javascript ( User interface design)
  - b. SQL, Python (Database Management)
  - c. PHP, (Connecting the database to the system)
3. Integrated Development Environments
  - a. MySQL Server
  - b. PyCharm, Visual Studio, Visual Studio Code
4. Microsoft Word 2016 or later
5. Operating System
  - a. Windows 10 or Later
  - b. MAC OS
  - c. Linux
6. Web Browser
  - a. Firefox
  - b. Safari
  - c. Google Chrome
  - d. Microsoft Edge
7. Service(s) to facilitate communication among the developers
  - a. Whatsapp
  - b. Gmail
  - c. Google Suite

## Work Breakdown

Activities	Milestones	Deliverables
Requirements gathering	Project launched and teams organized	Meeting/sprint minutes document and software requirement document
Pre-development planning	Software requirements completed	Project specification documentation and time estimation document
Securing of fundings and permissions	Permissions and fundings granted	Budget report, Stakeholders signature approval, Government contract approval
Security assessment	Security testing completed and the application shows high-level of security	Security analysis and assessment report(documentation)
Prototype	Technical implementation completed	Functional prototype, clear, user friendly, and testable
Quality assurance and risk analysis	Testing completed	Progress report, functionality evaluation report, and analysis document
User acceptance	Software is user-friendly and acceptable to end users	User interaction report
Implementation /Deployment	Project complete, Operational Implementation phase completed	Performance report



# Project Schedule



Tasks	Assigned To	Start	Duration
Requirements Gathering	Project Manager, Production Leader, Stakeholders, Software Developers, Software Leader, Technical Leader, Hardware Leader, Operational Leader, Engineers, Programmers, Penetration Testers	11/01/22	22d
Pre-development Planning	Project Manager, Production Leader, Software Developers, Software Leader, Technical Leader, Hardware Leader, Operational Leader. Engineers, Programmers, Penetration Testers	11/23/22	36d
Securing of fundings and permissions	Production Leader, Project Manager, Stakeholders	12/29/22	21d
Security Assessment	Penetration Testers, Software Developers	01/19/23	29d
Prototype	Software Developers, Engineers, Programmers, Production Leader, Project Manager	02/17/23	43d
Quality Assurance	Project Manager, Technical Leader, Software Developers, Engineers	04/01/23	22d
User Acceptance	Project Manager, Production Leader, Stakeholders, Software Developers, Engineers, Software Leader, Technical Leader, Hardware Leader	04/23/23	57d
Implementation/ Deployment	Project Manager, Production Leader, Stakeholders, Software Developers, Software Leader, Technical Leader, Hardware Leader, Operational Leader, Engineers, Programmers, Penetration Testers	06/19/23	15d

## References and Citations

Sommerville, I. (2016) Software Engineering. 10th Edition, Pearson Education Limited, Boston.

Project stage	References and Citations
Project Organization	Nichols, Brian, and CyberDegrees.org Staff. "Penetration Tester Career Overview: Cyber Degrees." Explore Cybersecurity Degrees and Careers   CyberDegrees.org. CyberDegrees.org, 13 Oct. 2022. Web. 24 Oct. 2022.
Risk Analysis	<p>Alenezi Mamdouh, Almuairfi Sadiq (September 2019). "Security Risks in the Software Development Lifecycle". Retrieved from: <a href="#">(PDF) Security Risks in the Software Development Lifecycle (researchgate.net)</a></p> <p>Khan, Hina (May 12, 2017). "Top 10 Advantages and Disadvantages of Electronic Voting Machines (EVM)". Retrieved from: <a href="#">Top 10 Advantages and Disadvantages of Electronic Voting Machines (EVM) - World Blaze</a></p> <p>Resonate, (8 Nov. 2019) "Web Server Overload: Causes, Signs, and Prevention." Retrieved from: <a href="https://www.resonatenetworks.com/2019/01/11/web-server-overload-causes-signs-and-prevention/">https://www.resonatenetworks.com/2019/01/11/web-server-overload-causes-signs-and-prevention/</a></p> <p>Westland, Jason (Sept. 26, 2019). "Time Estimation in Project Management: Tips &amp; Techniques". Retrieved from: <a href="https://www.projectmanager.com/blog/time-estimation-for-project-managers">https://www.projectmanager.com/blog/time-estimation-for-project-managers</a></p>
Hardware and Software resource requirements	<p>"Networks and Internet Technologies." Siyavula   Intranet vs Internet. Siyavula Education. Web. 25 Oct. 2022.</p> <p>Basu, Saumick. "17 Best Penetration Testing Tools/Software of 2022 Reviewed]." <i>Astra Security Blog</i>. Astra, 03 June 2022. Web. 24 Oct. 2022.</p>

Work Breakdown	<p>T Morphy (2008): Milestone List Template</p> <p>Retrieved from:</p> <p><a href="https://www.stakeholdermap.com/project-templates/milestone-list-template.html">https://www.stakeholdermap.com/project-templates/milestone-list-template.h ml</a></p> <p>Hannah Donato(2021): Work Breakdown Structure (WBS) Retrieved from:</p> <p><a href="https://project-management.com/work-breakdown-structure-wbs/">https://project-management.com/work-breakdown-structure-wbs/</a></p>
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