**LAN-Based Election System**

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| **Strengths** (as compared to Manual Election) | **Weaknesses** | **Issues** | **Proposed Solutions** |
| Conservation of Ink and Paper Resources | Not Cross-compatible | Computer Resources Have Not Been Maximized | Cross-compatibility (via Web |
| Automated Counting of Votes | Cumbersome Deployment | Delayed Start | Faster Deployment (via Downloading and Caching of Resources via Web) |
| Clear and Accurate Reports | Quirky User Interface | Confusion Among Voters | Improved User Interface (by making it more intuitive and interactive) |
| Faster Voting Process | Illogical Changing of Voters’ Status | Unwieldy Resetting of Votes | Logical Changing of Voters’ Status |
| More secured ballots | Manual Backup | Irregular Backup Times | Automatic Backup |
|  | Security Issues (Exposure of System Files on the Client’s File System) | Constant Monitoring Against Security Threats | Improved Security (via Isolation of System Files via Web) |
|  | Manual Presentation of Results | Reliability Issues (User Doubt) | Automatic (and Instant) Presentation of Results |
|  | Usability Issues | Long Queue Lines | Improved Usability (via Integration of Message and Status Dialog Boxes on the System’s UI) |

**Weaknesses** (Sorry, I’ll be mean.) ☺

1. *Not Cross-compatible*. In order to run, the system requires the .NET Framework which is not readily available on operating systems other than Windows.
2. *Cumbersome Deployment*. The system needs to be installed on each unit that will use it. Based from this year’s election, the installation process took about 30 – 45 minutes. (Needs to be verified)
3. *Quirky User Interface*. (Sorry if I can’t find any other word to describe it.☺) The background image deforms whenever the window is scrolled. Some candidates are preselected upon load. Candidate images look small (at least for me) plus the font (size, style and color) does not complement with the background image. A button labeled “Finish” (I don’t know what the exact label is but it’s something like that) on the USC category brought so much confusion to some of the voters. The button triggers the voting process to end without proceeding to the CSC category. Others thought that clicking it will make them proceed with their corresponding CSC. Because of that, some users had lost the chance to vote for the CSC (because they tend not to approach the organizers (R&D Members) and tell them about what happened) while some need to start all over again after their accounts have been reset. (The resetting of votes tends to decrease the reliability of the software a lot. If I am a candidate, the fact that a vote can be reset is a BIG question. Anyway, this is more of a reliability issue.)
4. *Illogical Changing of Voters’ Status*. The status of the voter is changed whenever the voter logs in the system. In other words, the system tags the voter as one who has voted already even if the votes have not been submitted yet. There has been a very big problem when the candidates for the CSC cannot be loaded because of network failure (or some other technical glitch). Voters who didn’t have the chance to vote cannot log back in because they have been tagged the system recognizes them as voters who have voted already. This results into an unwieldy resetting of voters’ accounts.
5. *Manual Backup*. The process of backing up the database is manual. It relies on the explicit action from the System Administrator.
6. *Security Issues* (Exposure of System Files on the Client’s File System). Any user who knows computers enough can delete or alter the system or any of its components. This may further result to system errors or system reinstallation.
7. *Manual Presentation of Results*. After the voting process ends, the next big thing is the result of election. But there has been a problem with the system’s results presentation module. (I don’t know what the exact problem is, but there surely is a bug that caused the organizers to prefer presenting the results manually.)
8. *Usability Issues*. In the registration module, a dialog box prompts the user about the status of registration. This delays the registration process. Every time a voter registers, the organizer must click “Okay” or press the Enter key instead of just barcode scanning ID’s or typing student numbers with a breeze.

**Issues**

1. *Computer Resources Have Not Been Maximized*. The computer laboratories at UE have varied operating systems. Some of which cannot be used because of incompatibility with the software.
2. *Delayed Start*. The installation of the system took a long time (about 30-45 minutes), enough to delay the start of the election for about an hour.
3. *Confusion among Voters*. The confusing “Finish” button caused some voters to lose their chance of voting for the CSC. Some voters requested to reset their accounts for them to vote for the CSC.
4. *Unwieldy Resetting of Votes*. When the candidates for the CSC cannot be loaded because of network traffic (or some other technical glitch), the voter must start all over again after his vote has been reset. This became one of the reasons for the COMELEC to declare failure of election.
5. *Irregular Backup Times*. Since the process of backing up the database relies on the administrator’s explicit action, the backing up occurred at inconsistent periods of time during the election.
6. *Constant Monitoring Against Security Threats*. Organizers have to keep an eye for those who may alter the system. This year’s election, a voter was caught accessing the system’s files on his computer unit. If organizers weren’t able to see such incident, the user might have altered the files. Plus, another threat shall arise when the code behind the system has been altered given that computer units on the laboratories provide development tools for altering source codes.
7. *Reliability Issues (User Doubt)*. After the voting process, everyone (candidates, voters, COMELEC) waited for the result for about an hour. There came to have a problem with the results presentation module so the organizers have to opt presenting the results manually. This tended to cause doubt on the outcome of the election on the side of the students.
8. *Long Queue Lines*. The usability of the registration module and the resetting of votes caused long queue lines outside the laboratories. This is also somehow related to the computer resources not being maximized because of incompatibility with the software. Plus, the amount of time that a voter was confused about how to use the system might also has contributed to the problem.

**Advantages of the Web-Based System over the LAN-Based System in Line With the Proposed Solutions**

1. *Cross-compatibility*. This might be the biggest advantage of jumping into the Web platform. The system can be used across varied computer units (PC & Mac) and operating systems (Windows, Mac OSX & Linux) currently present at UE.
2. *Faster Deployment*. The system removes the process of installing the software independently on each computer that will use it. The first time a client requests for a page, it downloads all the resources needed to run the software (this becomes the equivalent of the installation process in the LAN-Based system). The good thing is that these resources are cached to provide faster loads on succeeding requests. Resources such as source codes and images are optimized for the web for faster transmission. Administrator functions can also be done on any unit connected to the network.
3. *Improved User Interface*. Quirks from the old system’s design are gone. The system is created to fit most screen resolutions. Plus, the user interface is designed to be intuitive and interactive as well. Because the UI sits on top of the web browser, it can take advantage of the latter’s zooming capabilities for voters with visual problems.
4. *Logical Changing of Voters’ Status*. The status of the voter (if one has already voted or not) is only changed whenever the votes have been recorded into the database successfully. The system recognizes four voter states: 1.) When the voter is currently enrolled, 2.) If the voter has been registered 3.) If the voter has finished voting for the USC and 4.) If the voter has finished the whole voting process. In case of any network failure, interference, session expiration, or any technical glitch, the voter can continue from where he left off when the connection is live again or the session was renewed. This removes the process of resetting the users’ votes which is present on the old system.
5. *Automatic Backup*. The database containing the votes is so crucial to the election process that it needs to be backed up periodically. The system does it by storing data on files with encrypted filenames every period of time specified on the system settings.
6. *Improved Security*. All system files are isolated from the clients’ file system. Users cannot access documents without permission. The application server and database server is protected with passwords to make them inaccessible to users connected to the network. SQL Injection and XSS (cross-site scripting) attacks are avoided. Since source codes are minified (unnecessary code formatting symbols such as whitespaces and comments are removed), clients can hardly understand JavaScript codes behind the software. Web browser context menus are also disabled.
7. *Integrated Results*. The presentation of results is integrated on the system. After the voting process has finished, the results are available for presentation instantly and automatically.
8. *Improved Usability*. The status of registration has been integrated on the system rather than using dialog boxes that delays the registration process in a way. System configuration is centralized in one place. The design is more intuitive and also includes keyboard controls. Large pictures are used for selected candidates to isolate them from unselected candidates.

NOTE: I am not sure whether to include power shortage and physical network failure as a weakness because these events are both inevitable and can only be solved by the regular backing up of the database. Furthermore, both cannot be solved by the Web-Based approach. Another advantage of the Web-Based Election System is that the voting process can also be done on mobile devices (e.g. Laptops, Tablet PC’s, etc.) with JavaScript enabled web browsers provided that the system is on a live web server (such as the UE Website).

Stakeholders’ Concern

* SAO -
* Political Parties/Candidates - Reliable and Instant Results
* COMELEC - Smooth Election Process
* Students - User Friendliness, Security of Ballots, Reasonable Amount of Time it Takes To Vote

Minimum System Requirements (Web-Based Election)

Software

1. Apache HTTP Server
2. MySQL 5.0.5
3. PHP 5.3.8
4. JavaScript-Enabled Web Browser

Hardware

1. 800 x 600 Display

Web-Based Election System Flowchart