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Evaluation of An Existing System Using The System Usability Scale (SUS) as A Guideline for System Improvement

M. Khairul Anam[1*], Susanti[2], Nurjayadi[3], Fransiskus Zoromi[4], Atalya Kurnia Sari[5]

[1]Department of Informatics, Faculty of Engineering, Samudra University
[2,3]Department of Informatics Engineering, Indonesian University of Science and Technology
[4]Department of Information System, Indonesian University of Science and Technology
[5]Department of Business Digital, Indraprasta PGRI University
[1]Jl. Prof. Dr. Syarief Thayeb, Meurandeh, Langsa Lama, Langsa, Indonesia
[2,3,4]Jl. Purwodadi Indah, KM. 10 Panam, Pekanbaru, Indonesia
[5]Jl. Nangka Raya, Jakarta Selatan, Indonesia

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***Correspondence Address:**
khairula210@gmail.com

ABSTRACT

The e-Polvot system at the University of Science and Technology Indonesia (USTI) is a digital platform used for student elections, replacing traditional paper-based voting to enhance efficiency and minimize election fraud. This study evaluates the system using the System Usability Scale (SUS) to assess its usability, including efficiency, effectiveness, and user satisfaction. However, SUS alone does not determine failure points but provides a usability score that reflects user perception. A survey was conducted with 88 respondents from three different academic programs, which showed that while the system generally received a "Good" usability rating, certain areas require enhancement to improve user engagement and satisfaction. Based on the findings, this study recommends enhancing the user interface, providing targeted user training, and introducing additional features to broaden the system's application across academic units. Additionally, the study highlights the potential for expanding the system's functionality beyond student elections, supporting activities such as departmental voting and organizational decision-making processes. These improvements aim to increase user satisfaction and usability, making the system a more effective tool for various academic and institutional contexts.

Keywords : *e-polvot; system usability scale; recommendation; experience; academic.*

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1. INTRODUCTION

The e-Polvot system at the University of Science and Technology Indonesia (USTI) is a digital platform designed for the election of the Student Executive Board (BEM) [1]. This system replaces traditional paper-based voting methods to reduce potential fraud and improve election efficiency. Since its introduction in 2022, e-Polvot has been used twice for BEM elections. However, the system has not yet undergone a formal evaluation to identify weaknesses or areas needing improvement.

Evaluating the system is essential to ensuring optimal performance and enhancing user experience [2]. Through evaluation, developers can collect user feedback to improve user satisfaction and system usability [3]. Additionally, evaluation helps maintain system relevance by adapting to evolving user needs, ensuring its effectiveness and efficiency in performing essential tasks [4]. System security can also be strengthened by identifying and mitigating potential risks [5]. Regular evaluations enable continuous improvement, ensuring sustainability and competitiveness in academic environments [6].

Several evaluation methods can be used to assess information systems, including the Technology Acceptance Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT), Usability Testing, the DeLone and McLean Information Systems Success Model (D&M IS), and the System Usability Scale (SUS). Previous studies have used SUS to evaluate the Tokopedia application, revealing that users were not highly engaged with the app [7]. Another study applied the DeLone and McLean model to assess e-money implementation at an airport, finding that the quality of e-money information significantly impacted user satisfaction [8]. Additionally, a usability testing analysis of the Apotek Keluarga application found that most customers were unaware of its existence [9].

In this study, the SUS method was chosen after being compared with other evaluation methods. SUS is used not only to develop evaluation instruments but also as a key tool to gain deeper insights into user experience [10]. However, to ensure a more comprehensive evaluation, this study also explains how the SUS evaluation instruments were developed and applied in the research process [11]. SUS consists of ten standardized questions designed to measure system usability, providing quantitative data that can be easily interpreted by developers and designers [12]. Moreover, SUS is highly flexible and applicable to various types of systems, including software, web applications, and other technology-based products [13].

Compared to other models like TAM, UTAUT, and D&M IS, SUS focuses more on usability and direct user experience assessment [14]. While TAM and UTAUT emphasize technology acceptance based on perceived usefulness and ease of use, and D&M IS evaluates system success from an organizational perspective, SUS offers a more practical and efficient approach to understanding user interactions with the existing system. Therefore, SUS was selected in this study because it aligns with the research's primary objective: evaluating system usability and providing user experience-based recommendations for improvement [15].

This evaluation aims to identify existing issues and implement system enhancements based on the findings. Additionally, the updated system design incorporates features requested by academic departments to extend its usability for various academic activities, increasing the system's functionality and benefits within the academic community.

2. METHODS

The methodology used in this study is adjusted to the main objective, which is to evaluate the user experience (UX) with the e-Polvot system, not to measure system adoption. Therefore, this study uses a usability evaluation approach using the System Usability Scale (SUS) and combines appropriate sampling techniques for selecting respondents. Figure 1 is the methodology flow in this study.

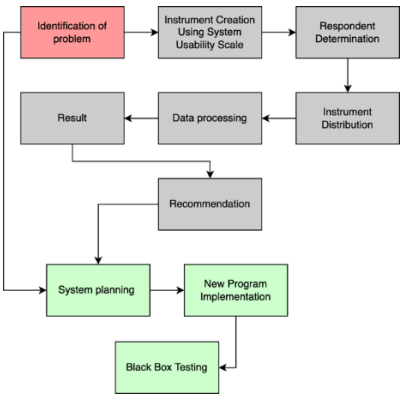

Figure 1. *Methodology flow*

Below is a more detailed analysis of the diagram that illustrates the evaluation and improvement process of the system using the System Usability Scale (SUS):

2.1. Problem Identification

The evaluation process begins with identifying issues within the system. This stage aims to find specific problems affecting performance or user experience. Identification is conducted through various methods, such as interviews, observations, and error report analysis. Identifying the correct problems is crucial to ensuring that subsequent improvement steps are targeted and effective.

2.2. Creating Instruments Using SUS

After identifying the problems, the next step is creating an instrument using the System Usability Scale (SUS). SUS is an evaluation method that uses ten standard questions to measure a system's usability [16]. This instrument is designed to collect quantitative data on user perceptions of the system, including aspects like ease of use, satisfaction, and efficiency. Utilizing SUS in instrument creation helps to obtain an objective view of the user experience. Table 1 shows the instrument used in this study [17].

Table 1. *SUS instrument*

No	Question
1	I would likely use this application whenever an election is held at my campus.
2	I found certain menu sections in this application quite cumbersome.
3	I find this website easy to use.
4	I feel I need expert assistance to use this website smoothly.
5	I believe the menus in this application are well-integrated.
6	I noticed many inconsistencies in this application.
7	I think others will be able to use this application very well in no time.
8	I feel this application is very difficult to use.
9	I find this application very efficient and practical for elections.
10	I need to learn many things before using this application.

2.3. Determining Respondents

This stage involves selecting respondents who will participate in the evaluation. Respondents are chosen based on criteria relevant to the system's context of use, such as demographics, prior experience with the system, or frequency of use [18]. Selecting the right respondents is vital to ensure that the data obtained truly reflects the users' experiences and needs [19].

The instrument used in this study is shown in Table 1 and was distributed to 88 respondents who are users of the e-Polvot system. These 88 respondents are from three study programs. Tables 2, 3, 4, and 5 present the demographics of respondents for evaluating the e-Polvot system.

Table 2. *Number of respondents per study program*

No	Study Program	Number of Respondents
1	Informatics Engineering	48
2	Information Systems	25
3	Information Technology	15

Table 3. *Number of Respondents per Semester*

No	Semester	Number of Respondents
1	Semester 2	24
2	Semester 4	20
3	Semester 6	20
4	Semester 8	24

Table 4. *Number of Respondents by Gender*

No	Gender	Number of Respondents
1	Male	48
2	Perempuan	40

Table 5. *Number of Respondents per Class*

No	Class	Number of Respondents
1	Regular Day	42
2	Regular Night	24
3	Non Regular	22

2.4. Distribution of Instruments

Once the instruments are prepared and respondents are determined, the next step is to distribute the instruments to the respondents. The instruments can be distributed physically or digitally, depending on the respondents' preferences and accessibility. Effective distribution ensures that all respondents have the opportunity to provide their input comfortably and easily [20].

2.5. Data Processing

After data is collected from respondents, the data processing stage begins. Data processing involves statistical analysis to determine patterns or trends in user responses. The results of data processing provide insights into specific areas that need improvement within the system. Quantitative data from SUS can be used to calculate overall scores and analyze certain aspects of system usability [21].

2.6. Recommendation

Based on data processing results, recommendations for system improvements are formulated. These recommendations focus on addressing identified issues and enhancing user experience. Recommendations may include feature adjustments, user interface improvements, efficiency enhancements, or

other necessary changes to improve system usability.

2.7. System Planning

Once recommendations are made, the next step is system planning. At this stage, recommendations are transformed into concrete and measurable action plans. Planning includes developing implementation strategies, resource allocation, scheduling, and assigning team responsibilities. The goal is to ensure that each recommendation can be implemented effectively and efficiently [22].

2.8. Implementation of the New Program

With a clear plan, the system enters the implementation stage of the new program. During this step, the planned improvements or new features are applied to the system. Implementation must be carefully executed to ensure that changes proceed as planned and do not introduce new problems [23].

2.9. Continuous Improvement Cycle

After implementation, black box testing is conducted to ensure that the system functions well from a user perspective. This testing focuses on the output produced by the system without examining the code or internal structure. This testing is essential to confirm that the system meets technical specifications and provides an optimal user experience [24].

2.10. Continuous Improvement Cycle

If testing reveals further issues, the evaluation cycle returns to the problem identification stage, creating a continuous improvement cycle. This cycle ensures that the system is continually enhanced based on user feedback, remaining relevant and effective in meeting potentially changing user needs. The ultimate goal is to achieve continuous improvement, enabling the system to adapt to changing environments and user needs [25].

3. RESULTS AND DISCUSSION

Below are the results of the SUS calculation

Table 6. *SUS score calculation*

Grade	SUS	Percentile Range	Adjective	Acceptable	NPS
B+	77.2 – 78.8	80 - 84	Good	Acceptable	Passive

Overall, the SUS score received a score of 77.78. From the SUS score interpretation scale, the e-Polvot system received a grade of B+. In this grade, the percentile range is 80–84. The interpretation result of the approach based on nature (Adjective) shows that the e-Polvot system falls into the "Good" category, and its acceptance level (ACCEPTABLE) is acceptable. However, the overall NPS calculation result is Passive, meaning that some users of the e-Polvot system are neither rejecting nor refusing to use the system. Table 6 shows the SUS score interpretation results for the entire e-Polvot system.

The SUS score calculation is then done based on the respondents' demographics. Table 7 shows the SUS score calculation per study program. From this calculation, it can be seen that all study programs accept the e-Polvot system. However, some students in each program still seem indifferent to the e-Polvot system. The scores obtained are above 76 with grade B, then the nature-based approach falls into the "Good" category, and its acceptance level is considered acceptable. However, the NPS score for all programs falls into the Passive category.

Table 7. *SUS score per study program*

Study Program	Score	Grade	SUS Range	Percentile Range	Adjective	Acceptable	NPS
Informatics Engineering	78,38	B+	77.2 – 78.8	80 - 84	Good	Acceptable	Passive
Information System	77,2	B+	77.2 – 78.8	80 - 84	Good	Acceptable	Passive
Information Technology	76,83	B	74.1 – 77.1	70 – 79	Good	Acceptable	Passive

Next, Table 8 shows that eighth-semester students are very interested and proficient in using the e-Polvot system. The eighth semester scored 87.29, with an A+ grade, and the adjective approach falls into the "Best Imaginable" category. This is very different from the lower semesters, which still receive the "Good" rating, and the NPS score is still in the Passive category. In the eighth semester, the NPS score is Promoter, meaning that they can understand and accept this system overall.

Table 8. *SUS score per semester*

Semester	Score	Grade	SUS Range	Percentile Range	Adjective	*Acceptable*	NPS
Semester 2	73,64	B-	72.6 – 74.0	65 – 69	Good	*Acceptable*	Passive
Semester 4	72,62	B-	72.6 – 74.0	65 – 69	Good	*Acceptable*	Passive
Semester 6	76,5	B	74.1 – 77.1	70 – 79	Good	*Acceptable*	Passive
Semester 8	87,29	A+	84.1 – 100	96 – 100	Best Imaginable	*Acceptable*	Promoter

In Table 9, it can be seen that male students understand the e-Polvot system better than female students. The resulting grades differ significantly, ranging from B- to A. With this data, it is necessary to have an approach to align perceptions regarding the use of the e-Polvot system to make it acceptable to all students.

Table 9. *SUS score by gender*

Gender	Skor	Grade	SUS Range	Percentile Range	Adjective	*Acceptable*	NPS
Male	81,25	A	80.8 – 84.0	90 – 95	Excellent	*Acceptable*	Passive
Female	73,75	B-	72.6 – 74.0	65 – 69	Good	*Acceptable*	Passive

Table 10 presents the SUS score per class, including Regular Day, Night, and Non-Regular classes. In this study, Regular Night received an NPS score with a Promoter category, meaning almost all students accept and can use the system well. This differs from the Regular Day and Non-Regular classes, which receive an NPS category of Passive.

Table 10. *SUS score per class*

Class	Score	Grade	SUS Range	Percentile Range	Adjective	*Acceptable*	NPS
Regular Day	74,69	B	74.1 – 77.1	70 – 79	Good	*Acceptable*	Passive
Regular Night	82,79	A	80.8 – 84.0	90 – 95	*Excellent*	*Acceptable*	Promoter
Non-Regular	71,59	C+	71.1 – 72.5	60 – 64	Good	*Acceptable*	Passive

Table 10 presents the SUS score per class, including Regular Day, Night, and Non-Regular classes. In this study, Regular Night received an NPS score with a Promoter category, meaning almost all students accept and can use the system well. This differs from the Regular Day and Non-Regular classes, which receive an NPS category of Passive.

To enhance the acceptance and enthusiasm toward the e-Polvot system, several improvements need to be made. First, provide more intensive training and support to female users and first-year students to improve their comfort and understanding of the system. This training can include live demonstrations of system usage, video tutorials, and regularly scheduled Q&A sessions. Second, conduct further surveys to identify elements or features within the system that may need improvement, especially for Regular Day and Non-Regular classes. These surveys should be designed to capture specific feedback on users' challenges and what features they expect from the system.

Third, organize regular feedback sessions with users from various backgrounds to listen to their needs and suggestions, allowing for adjustments or the addition of relevant features. This can include discussion forums or workshops where users can share their experiences and ideas directly with the development team. Fourth, pay attention to the system's aesthetics and usability to make it more user-friendly and attractive, which can enhance the overall user experience and satisfaction. For example, updating the user interface to be more modern and intuitive can help attract more users and make the system easier to use.

Additionally, consider adding extra features that allow the e-Polvot system to be used by other units, such as academic departments for voting in academic activities or electing organizational leaders. By expanding its scope of use, the system can become more beneficial and relevant in various contexts, increasing its value and adoption overall. This could also involve integration with other campus information management systems to ensure interoperability and efficiency. These improvement steps are expected to boost the adoption of the e-Polvot system and enhance user satisfaction in the long term.

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In an effort to improve the efficiency of the e-Polvot system, several developments have been made. Figure 2 shows the initial screen of the developed system.

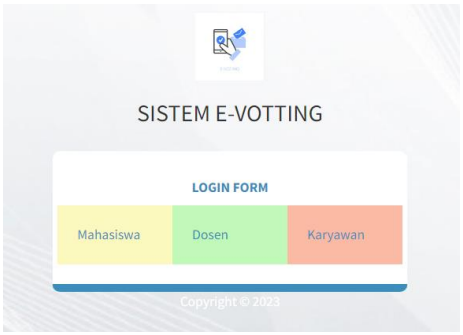

Figure 2. *Main interface*

The main interface of the e-Polvot system displays the home page that users see when they first access the system. It typically shows important information about the system, main navigation, and possibly highlights new or important features. This page is designed to be user-friendly, with a layout that facilitates users' exploration of all available features. Next, Figure 3 shows the main interface after logging in.

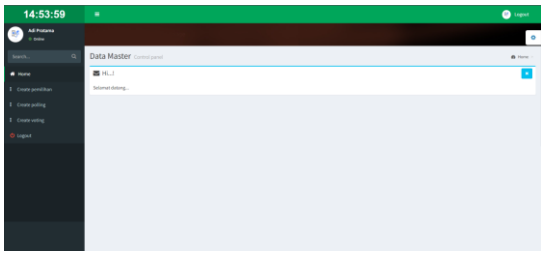

Figure 3. *Main interface after login*

After logging in, users are directed to the main interface containing various features and menus accessible to registered users. This display usually presents a dashboard with statistics, notifications, and shortcuts to other important features. This page should accommodate users' needs in accessing the most relevant and frequently performed information or actions. Figure 4 below shows the voting list interface.

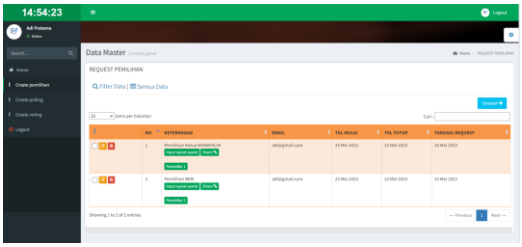

Figure 4. *Voting list interface*

Figure 4 displays the list of ongoing or past voting events. Users can view information such as the name of the voting, status, date, and possibly the number of votes cast. This design should provide easy access for users to select or review voting results. Next, Figure 5 shows the interface for adding a voting request.

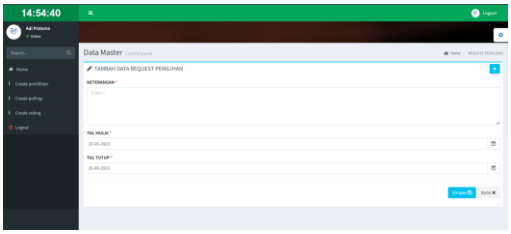

Figure 5. *Add voting request*

Figure 5 shows the form or interface where users can submit a request to conduct a new election. This feature may require input such as the title of the election, description, execution time, and voting options. The ease of filling out the form and its clarity will greatly assist in managing new elections. The next display, Figure 6, is the list of requirements needed for activities.

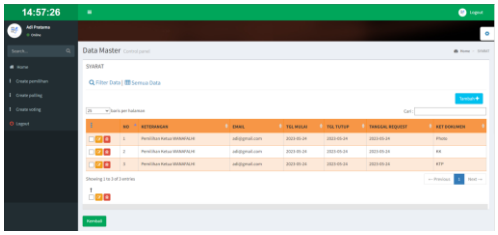

Figure 6. *List of requirements needed*

Figure 6 displays a list of requirements needed for an election. Users can view and verify the requirements that candidates or involved parties must meet in the election. This feature ensures transparency and adherence to applicable election rules. Figure 7 shows the addition of requirements.

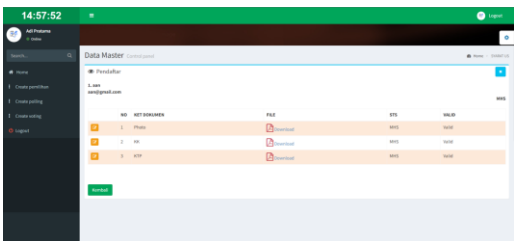

Figure 7. *Add requirements*

Figure 7 displays the interface for adding new requirements to the system. This allows admins or election organizers to update or adjust requirements as needed. This interface should be easy to use and ensure accurate data input.

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Next, Figure 8 shows the display that candidates or users who will become candidates can view.

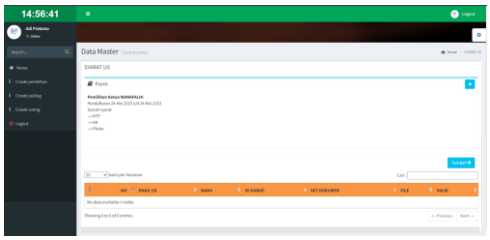

Figure 8. *Voting selection*

Figure 8 shows how users view the profile page or personal settings that may be available. This may include account settings, preferences, or user statistics display. It's important to provide a personal experience that can be customized according to individual user needs. Next, Figure 9 is the interface for selecting voting.

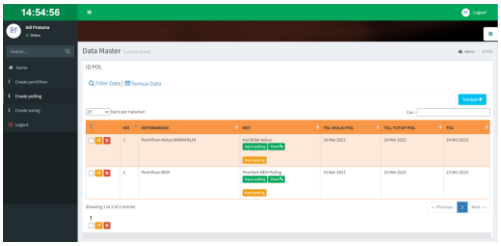

Figure 9. *Voting selection*

Figure 9 provides users with the option to choose the voting they wish to participate in. This interface must be clear and guide users through the necessary steps to participate in the desired polling. This display emphasizes ease and accessibility. Next, Figure 10 shows the polling process.

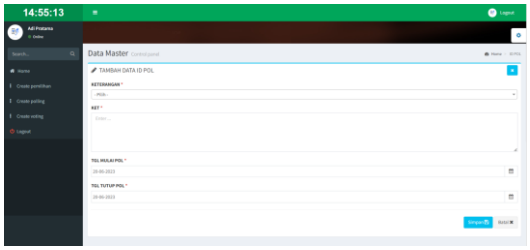

Figure 10. *Polling process*

Figure 10 illustrates the actual voting process, where users cast their votes for available choices. The design should be intuitive and ensure that each step in the voting process can be carried out easily and securely, minimizing user errors or system failures.

After the design is completed, black box testing is conducted before implementation. Table 11 shows the results of the black box testing conducted.

Table 11. *Black box testing*

No	Feature Tested	Test Scenario	Steps	Expected Outcome	Information
1	Login Form	Entering valid credentials	- Enter a valid username. - Enter a valid password. - Click the login button.	The user successfully logs in and is directed to the main page.	Successful
2	Login Form	Entering an incorrect password	- Enter a valid username. - Enter an incorrect password. - Click the login button.	An error message appears, indicating that the password is incorrect.	Successful
3	Login Form	Entering an incorrect username	- Enter an incorrect username. - Enter a valid password. - Click the login button.	An error message appears, indicating that the username was not found.	Successful
4	Login Form	Leaving the username and password fields empty	- Leave the username field empty. - Leave the password field empty. - Click the login button.	An error message appears, indicating that the fields cannot be empty.	Successful
5	Voting List	Viewing the available voting list	- Log into the system. - Navigate to the voting list page.	All available voting events are displayed with complete information.	Successful
6	Voting List	Selecting a voting event from the list	Click on a specific voting event from the list.	The user is directed to the detail page of the selected voting event.	Successful
7	Add Voting Request Data	Adding a new voting request	- Navigate to the add voting request page. - Fill in all required fields with valid data. - Click the submit button.	The new voting request is successfully added and appears in the list.	Successful

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Table 11 continued…

No	Feature Tested	Test Scenario	- Steps	Expected Outcome	Information
8	Add Voting Request Data	Adding a request with empty fields	- Navigate to the add voting request page. - Leave one or more required fields empty. - Click the submit button.	An error message appears, indicating that required fields cannot be empty.	Successful
9	Select Polling	Selecting a polling event and casting a vote	- Log into the system. - Select a polling event from the list. - Cast a vote for the desired option. - Click the submit vote button.	The vote is successfully cast, and the user receives a success confirmation.	Successful
10	Select Polling	Selecting a completed polling event	Select a polling event that has already ended from the list.	A message appears, indicating that the polling has ended and voting is no longer possible.	Successful
11	User Profile	Viewing and changing user profile settings	- Navigate to the user profile page. - View the displayed information. - Change some settings and save the changes.	The user's information is updated according to the saved changes.	Successful
12	Election Requirements	Adding new election requirements	- Navigate to the add requirements page. - Fill in the requirement fields with valid data. - Click the submit button.	The new requirement is successfully added and appears in the list.	Successful
13	Election Requirements	Adding requirements without completing all data	- Leave some requirement fields empty. - Click the submit button.	An error message appears, indicating that all requirement data must be filled in.	Successful
14	Polling Process	Participating in the entire polling process	- Log into the system. - Select an active polling event. - Follow the polling instructions. - Complete the polling process.	The polling process completes successfully, and the user receives a participation confirmation.	Successful
15	Polling Process	Accessing polling without logging in	Attempt to access the polling page before logging in.	The system prevents access to polling, prompting the user to log in first.	Successful
16	Additional Features	Accessing features for other units, such as academic and organizational	- Log in as a user from another unit. - Navigate to features specific to units such as academic or organizational.	Features can be accessed and function correctly according to the needs of the related unit.	Successful
17	Additional Features	Utilizing additional features for organizational leader elections	- Log into the system. - Access the organizational leader election feature. - Follow the election process.	The organizational leader election process is successfully conducted according to the applicable procedures.	Successful
18	Aesthetic Display Features	Checking the aesthetic display and user interface	- Access various pages of the system. - Observe the design, layout, and ease of navigation.	The interface design is consistent, attractive, and easy for users to navigate.	Successful

This black box testing plan for the e-Polvot system is designed to evaluate its functionality from a user's perspective, ensuring that it meets the required specifications and delivers a seamless user experience [26]. The testing process focuses on several key areas, beginning with the login form. Here, we verify that users can successfully log in with valid credentials and receive appropriate error messages when entering incorrect information. This ensures that users understand what went wrong and how to correct it, thus improving usability.

The plan also examines the voting list and polling functionalities. These tests ensure that users can view available voting events, participate in ongoing polls, and understand when a poll has concluded. By covering both active and completed polling scenarios, we aim to ensure that users have a clear understanding of their voting options and the system's response to different states of polling.

Adding requests and election requirements is another crucial area of focus. These features are tested to confirm that users can submit requests and requirements accurately, with appropriate feedback when mandatory fields are left incomplete. This testing is crucial for maintaining data integrity and ensuring that the process of creating or modifying voting events is intuitive and error-free [27].

The user profile management tests ensure that users can easily access and update their personal information, reflecting changes immediately and accurately. This aspect of the testing plan is vital for personalizing the user experience and ensuring data consistency [28].

Additionally, the plan explores the system's additional features designed for different units, such as academic or organizational settings. This includes testing functionalities specific to organizational leader elections, confirming that they work correctly and meet the needs of various user groups.

Lastly, aesthetic and usability testing focuses on the overall design and layout of the system. A consistent, attractive, and easy-to-navigate interface is crucial for enhancing user engagement and satisfaction. The plan ensures that the system's design supports user tasks effectively, making it accessible and user-friendly for all types of users [29].

In summary, this black box testing plan aims to identify any functional issues, enhance usability, and support continuous improvement of the e-Polvot system. By focusing on critical functionalities and user interactions, the plan ensures a reliable, efficient, and satisfying experience for all users involved [30].

CONCLUSION

The evaluation of the e-Polvot system using the System Usability Scale (SUS) revealed that while the system effectively supports student elections at USTI, there are opportunities for improvement to enhance user experience and engagement. The analysis showed that although the system was rated as "Good" and "Acceptable," many users remained passive in their support, indicating room for increased satisfaction and adoption. By addressing the identified usability issues and expanding the system's capabilities to include additional features for academic and organizational voting, e-Polvot can become a more versatile and widely-used tool. Key recommendations include improving user interface design, providing comprehensive training for new users, and integrating features that allow the system to be utilized for various academic purposes beyond student elections. Implementing these changes will likely lead to higher user satisfaction and broaden the system's applicability, reinforcing its role as an essential platform within the academic community.

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