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Development and Implementation of Election Management System for Student Government Organizations

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Abstract

The study Election Management System for Student Government Organizations was developed to provide an easier and faster process of voting and counting that will help the students to vote easily as well as the Commission of Student Election members to manage the election efficiently. It is capable of allowing the currently enrolled students to vote for their desired candidates through the voting module. Also, there is a means for the ComSELec chairman to upload photos of candidates with their party through candidates' module. In addition, it helps the admin to easily distinguish the role of ComSELec members and voters by providing the level of access. Another capability is importing student lists from the registrar's office to ensure that only currently enrolled students may vote through the import module. This management system helps the ComSELec members to determine the number of voters who participated in the election by comparing it to the currently enrolled students through the statistical report. Finally, it provides a way for a ComSELec chairman to monitor the status of user accounts and change the status from active to inactive if the ComSELec member is no longer connected to BPSU and generate election results. The system was developed using PHP as the programming language and MySQL as a database engine. It passes the users' acceptability evaluation based on ISO 25010:2011 with sub-criteria: functionality suitability, reliability, performance efficiency, usability, security, compatibility, maintainability, and portability.

Index Terms—*election management, intranet-based systems, management system, student government organizations*

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I. INTRODUCTION

The Bataan Peninsula State University (BPSU) Campus Student Government (CSG) has the main role which is to promote the interest of the school and the involvement of students in the affairs of the school, in cooperation with the board, parents, and teachers. A student Government has its own objectives: to enhance communication between students, management, staff and parents, to promote an environment conducive to educational and personal development, to promote volunteerism and passion to serve in the community, to support the management and staff in the development of the school, to represent the views of the students on matters of general concern with regards to them. In addition, the Student Government Organization must find a way to improve/innovate the different processes for the welfare of the students.

According to the Revised Constitution and By-Laws of the Federated Campus Student Government of Article XVII, System of Election, Section 2.3 "All CSG Officers shall be elected in a manner provided for by the ComSElec and the Office of the Student Affairs". Likewise, the ComSElec can adopt a system where it is more efficient and relevant to the needs of the election.

In this manner, it is necessary to encourage the students to participate in electing the officers that will be involved in Campus Student Government. Since the electoral officers that usually manage and oversee elections are composed of faculty members; it is advisable to find a way to help them to easily manage the election process.

Based on the existing system, the voters will need to go to the verification booth to verify if the voter is a bonafide student of BPSU. Then, he will proceed to the voting precinct to cast his vote. Furthermore, after the voting cut-off, the counting of votes shall commence. Moreover, the ComSELec chairman will prepare for the report of canvass. Afterwards, the declaration of winners will take place. Since the process of

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election is still manual, it would take several hours to produce the official tally of votes.

There is a need to apply a process improvement on the tallying of votes. It would be helpful not only to the voters but as well as to the Commission on Student Election members. In addition, the students will also be familiarized with the process of Automated National Election. It would be an additional learning experience for the students which will soon further a significant experience when they attend a particular election. Being exposed to computerized process is important since technology is fast-paced.

II. MARKET POTENTIAL

In the Philippine Software Industry Goals (2017-2022), PSIA President Jonathan De Luzuriaga stressed that they are looking at an increase in their global market from 12% to about 15%. They suggest that as the Philippine software industry seeks a bigger share of the IT outsourcing services, the country should focus now on developing the Filipino IT enthusiasts as technopreneurs. This will enable the country to raise the level of its information technology sector. PSIA is optimistic that the industry will continue to grow especially as the internet of things will lead to the convergence of hardware, software, and services. [1]

Digital transformation is currently a priority in any Philippine organizations, and state-owned university like BPSU is well-positioned for growth in this aspect. It is also anticipated that the Filipino software developers will increase from 123,000 to 207,000 by 2022.

Meanwhile, Parlade shares some of the Philippine IT plans with its prospects and problems. In his paper, he stipulated that there is no industry with greater upside potential than that of the IT industry. All IT producing industries in the Philippines have experienced tremendous growth and is expected to grow as electronic commerce gains widespread acceptance. [2]

In the recently concluded Digital Transformation Strategy meeting 2018, some of the major players in the IT industry in the country express their interest in extending their technologies in the academe. These industries are now open to possible academic linkages in order to provide better learning mechanisms for IT Students and future software developers. They are looking at a possible increase in the market share of the seven billion dollars for 2017.

III. REVIEW OF LITERATURE

Trolian and Barnhardt examine to what extent to which several college's co-curricular involvement experiences during college contributes to students' civic commitments which are geared towards social and political involvement. Their study is drawn from the social capital theory. On their results, both the student's participation in religious groups and peer education groups were observed to have a positive and sizeable influence on cultivating student's civic commitments towards social and political involvement. [3]

Freeman in his study, "The Relationship between Extracurricular Activities and Academic Achievement" determined whether there is a relationship between the participants to extracurricular activities and academic achievement. This was measured by the composite score on the American College Test and the grade point average throughout the student's attendance in high school. The result showed that academics were positively related to extracurricular participation. [4]

Moreover, Dorozhkina, et. Al declared that the introduction of student government models in the professional development of students is one of the most effective mechanisms for developing the competence of the future graduates, which may significantly increase the demand for them in the labor market in the future. The purpose of their research is to develop a model for setting up a functioning student government body, to present the results of implementing the given structural-functional model, to study the positive effect of the student government body on the professional development of students, as well as on the integration of formal and non-formal education. It describes a model for setting up a functioning student government body, presents the results of implementing the structural-functional model of the student government body, specifies the basic conditions for effective work of the student government body, examines the positive impact of the student government body on the professional development of students, investigates the influence of the student government body on the integration of formal and non-formal education. The model is aimed at increasing the impact of student government on the effectiveness of professional development at the university; it is also oriented towards the development of non-formal education environment of the university. [5]

Additionally, Capulong (2014) believed that the qualities of student-leaders in the 21st century cannot be underrated. The ability to influence individuals in the context of boundless territories and worldwide integration is of paramount importance to education. [6]

In his paper, Butler (2017) adopts a constructivist, case-based research strategy to examine the development and implementation of intranet- and internet-based information systems (IS) in a single organization. Institutional theory is used to describe, explain and understand the commitment of social actors in the development of web-based IS. His findings illustrate that: (1) social and organizational problems similar to those that beset 'traditional' IS development arise in the development and implementation of web-based IS; (2) 'top-down' development and implementation strategies give rise to more conflict and change management problems than 'bottom-up' approaches; and (3) fostering high levels of commitment to organizational imperatives is key to the successful development and implementation of web-based IS. [7]

Likewise, the Journal of Computer Engineering and Information Technology mentioned that the Database Management System is a collection of computer software

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allowing the interface between users and databases. It is used to analyze the data using software applications. Furthermore, it is responsible for preserving the integrity and safeguarding the stored data and also to retrieve the information in case of system failure. Defining, creating, querying, updating and administration of databases are done by general-purpose DBMS which is a software system. DBMSs present are of various types ranging from small systems that will run on personal computers to huge systems running on mainframes. Some of DBMS can be listed as MySQL, MariaDB, Microsoft SQL Server, Microsoft Access, Oracle, SAP HANA, IBM DB2, LibreOffice Base, etc. [8]

Furthermore, OnlineThinkersTechnology.com emphasized that in creating a website, designers should prioritize the objective of attracting visitors and makes them stay longer on the website. It is important to get the end-users' attention and hook them up in accessing and browsing the website. Photography plays a main role in sustaining visitors to the website. Likewise, website creation and maintenance become the main tool of information in order to have a professional, precise and knowledgeable impression online. The success of the business online relies on the website design which could make or break it. The importance of having an online presence is highly recognized but the importance of having a good website design is still a rather subjective concept. [9]

In addition, www.techopedia.com explains that web development broadly refers to the tasks associated with developing websites for hosting via intranet or internet. The web development process includes web design, web content development, client-side/server-side scripting, and network security configuration, among other tasks. Web development is the coding or programming that enables website functionality, per the owner's requirements. It mainly deals with the non-design aspect of building websites, which includes coding and writing markup. Web development ranges from creating plain text pages to complex web-based applications, social network applications, and electronic business applications. [10]

Lastly, according to Encyclopedia Britannica, automation is the application of machines to tasks once performed by human beings or, increasingly, to tasks that would otherwise be impossible. Although the term mechanization is often used to refer to the simple replacement of human labor by machines, automation generally implies the integration of machines into a self-governing system. Automation has revolutionized those areas in which it has been introduced, and there is scarcely an aspect of modern life that has been unaffected by it. [11]

As a summary, the study intends to provide an innovative manner of the voting process that will help the students to easily vote their desired candidates as well as help the officers to easily manage the voting process the soonest possible time.

IV. METHODOLOGY AND MATERIALS

The study was conducted at Bataan Peninsula State University intended for Government Student Organizations.

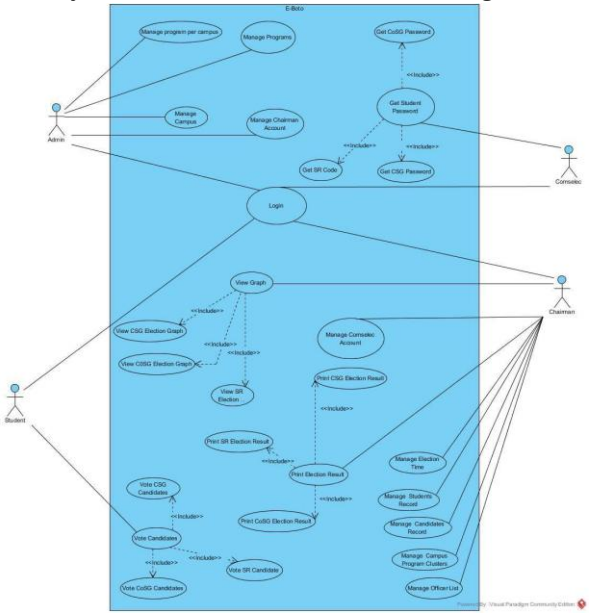

Fig. *1*. Use Case Diagram

Fig. 1 shows the Use Case Diagram of the Developed System where it has four actors involved which includes the administrator which can control and manages user accounts. He will manage the programs per campus. Another actor is the chairperson; he will manage the ComSELec account. In addition, he will manage the election time to ensure that the election will take place according to the plan. Moreover, he will also manage records of the students, candidates and officer unit as well as print out election results.

The other actor is the ComSElec member which is a part of the team that will oversee the election process. The member will get the voter's passcode and provide it to the students. Furthermore, the student is the last actor that will serve as the voter during the election process.

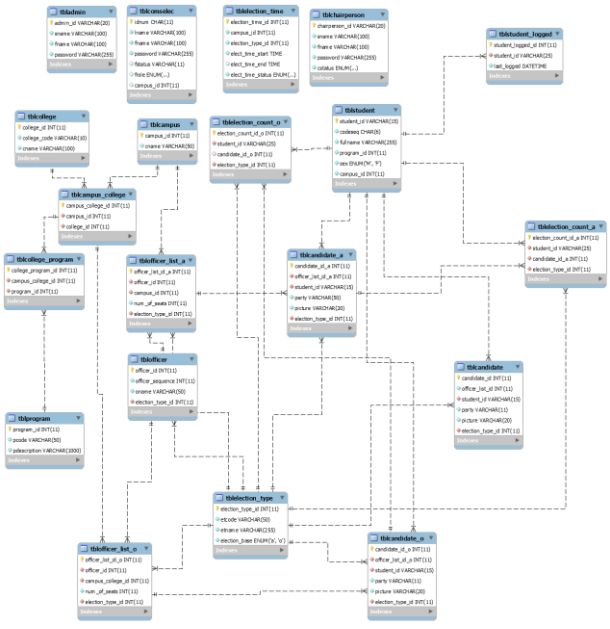

Fig.2. Entity Relationship Diagram

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Fig. 2 shows the Entity Relationship Diagram of the developed system where it comprises of different tables such as table admin where it consists of the name and password of the administrator. In addition, it also has table ComSElec, Table College, table Campus, table Election time, table candidate, table student, and table election count.

V. DISCUSSION OF RESULTS AND FINDINGS

The survey instrument used in this study adheres to the standard of ISO 25010:2011 which focuses on different criteria in terms of functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. Each criterion was assessed using the five (5) point Likert scale with the corresponding rating.

Table 1. Likert's Scale

Numerical Rating	Equivalent
5	Highly Acceptable
4	Very Acceptable
3	Acceptable
2	Moderate Acceptable
1	Not Acceptable

Table 1 shows the Likert scale which was used as a basis of numerical rating and verbal interpretation of respondent's evaluation.

The researchers concluded several testing procedures to guarantee the efficiency of the system. System modification was also performed to ensure that the system fulfilled the needs of the organization. The selected respondents of the system were composed of students, IT experts, and end-user at the Office of Student Affairs. Their suggestions and comments were used in improving systems capabilities and interface.

Prior to the evaluation, the system was presented to the target respondents. They were given the opportunity to use the system and assess the functionality of the system. The results were based on the data gathered from the questionnaires answered by a group of respondents. Each criterion of the software quality factors enumerated on the survey is illustrated in this section. Also, its calculated mean and equivalent descriptive ratings were also discussed.

Table 2. Summary of Project Evaluation

SOFTWARE QUALITY FACTOR	**AVERAGE MEAN**	**DESCRIPTIVE INTERPRETATION**
A. Functional Suitability	4.82	Very Acceptable
B. Performance Efficiency	4.75	Very Acceptable
C. Compatibility	4.74	Very Acceptable
D. Usability	4.78	Very Acceptable
E. Reliability	4.72	Very Acceptable
F. Security	4.74	Very Acceptable
G. Maintainability	4.78	Very Acceptable
H. Portability	4.73	Very Acceptable
OVERALL MEAN:	**4.76**	**Very Acceptable**

The table presented a summary of the project evaluation. For functional suitability, the results inferred that it is possible for the users to manage their own data. For performance efficiency, it indicates the system that the response and processing times of the system meet the requirements. For compatibility, the result inferred that the system can perform its required functions efficiently while sharing a common environment and resources with other systems. For usability, users can easily navigate the interface design which will lead them to the appropriate system. For reliability, the result shows that the system is operational and accessible when required for use. For security, the result implies that the system ensures that data are accessible only to those authorized to have access. For maintainability, the result shows that the system can be maintained easily since the chosen beneficiary covers huge numbers of transactions. With regard to portability, results show that the system can effectively and efficiently be adapted for different or evolving hardware or software environments.

The overall findings obtained a mean of 4.76 with a descriptive interpretation of Very Acceptable in terms of functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. This shows that the system is Very Acceptable to the needs of the target end-users.

To achieve this end, the acceptability of the system was evaluated. The analysis of the study findings identified the following:

1. Functional suitability criterion got a mean of 4.82 with a descriptive interpretation of Very Acceptable. The findings ascertained that the system had provided modules that can manage user requests.
2. Performance Efficiency criterion got a mean of 4.75 with a descriptive interpretation of Very Acceptable. The findings showed that the system had delivered a real-time exchange of research transactions per user.
3. Compatibility criterion got a mean of 4.74 with a descriptive interpretation of Very Acceptable. The findings revealed that the system was far more compatible across Android platforms
4. Usability criterion got a mean of 4.78 with a descriptive interpretation of Very Acceptable. The findings proved that similar controls are evident in each web page which facilitated the sharing of research data.
5. Reliability criterion got a mean of 4.72 with a descriptive interpretation of Very Acceptable. The findings indicated that the front-end side of the system had shown the appropriate set-up for the RDO website.
6. Security criterion got a mean of 4.74 with a descriptive interpretation of Very Acceptable. The findings exhibited that the system is protected since

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research projects and protocols were routinely collected and recorded per user access.

7. Maintainability criterion got a mean of 4.78 with a descriptive interpretation of Very Acceptable. The findings depicted that research services are viable.
8. Portability criterion got a mean of 4.73 with a descriptive interpretation of Very Acceptable. The findings revealed that research services can be easily accessed in portable devices.

The overall rating system evaluation derived a mean rating of 4.76 with a descriptive interpretation of Very Acceptable.

VI. CONCLUSION

Based on the findings of the study, the following conclusions are met:

1. The Election Management System for Student Government Organizations was designed that is capable of:
   a. Allowing the currently enrolled students to vote their desired candidates through the voting module;
   b. Providing a means for the ComSELec chairman to easily upload photos of candidates with their party through candidates module;
   c. Helping the admin to easily distinguish the role of ComSELec Members and voters by providing the level of access;
   d. Importing student list from the registrar's office to ensure that only currently enrolled students may vote through import module;
   e. Helping the ComSELec Members to determine the number of voters who participated in the election by comparing it to the currently enrolled students through statistical report;
   f. Providing a way for a ComSELec chairman to monitor the status of user accounts and change the status from active to inactive if the ComSELec Member is no longer connected to BPSU; and
   g. Generating reports such as candidates per party and election results.
2. The systems' software requirements are PHP, HTML, CSS, and JavaScript, which are used for the front-end and back-end development, and MySQL for establishing and managing the database. The hardware requirements include a Computer system.
3. The system was tested and improved in terms of functional suitability, reliability, performance efficiency, usability, security, compatibility, maintainability and portability; and
4. The acceptability of the system was interpreted as Very Acceptable. The results revealed an overall mean of 4.76. This inferred that the system can be utilized by the target end-users.

VII. RECOMMENDATIONS

The following are based on the limitations of the study which can be improved and recommended to the future researchers for further improvement of the project.

1. Improve the report generation module for the result including Sex of the voters.
2. Include a summary of Election results per College per Campus.
3. Include a mobile application for the system.

REFERENCES

[1] J. D. Luzuriaga, "Philippine Software Industry Goals (2017-2022)," PSIA, Manila, 2018.

[2] C. V. Parlade, "Philippine IT Plans," 6 October 2018. [Online]. Available: https://www.wto.org/english/tratop_e/inftec_e/claro.doc. [Accessed 26 November 2018].

[3] T. L. &. C. L. B. Trolian, "Shaping Student's Civic Commitments: The Influence of College Cocurricular Involvement," Journal of College Student Development, vol. 58, no. 2, pp. 141-158, 2017.

[4] R. Freeman, "The Relationship Between Extracurricular Activities and Academic Achievement," 15 January 2016. [Online]. Available: https://digitalcommons.nl.edu/diss/245. [Accessed 16 March 2017].

[5] E. V. Evgenij M. Dorozhkina, Impacts of Student Government Bodies on Students' Professional Development, Chicago: College Journal, 2014.

[6] N. M. Capulong, "Choosing the Qualities of Student Leaders: A Matching of Student Voting Preference and Election Results as a Basis for Policy Formation," Asia Pacific Journal of Multidisciplinary Research, p. 265, 2014.

[7] T. Butler, "An Institutional Perspective on Developing and Implementing Intranet and Internet-Based Information Systems," 2017.

[8] Journal of Computer Engineering and Information Technology, "Database Management," 2017. [Online]. Available: https://www.scitechnol.com/information-technology/articles-on-database- management-systems.php . [Accessed 16 April 2018].

[9] Online Thinkers Technology, "Web Design," 2017. [Online]. Available: https://www.onlinethinkers.com/articles/. [Accessed 2018 17 April].

[10] Technopedia, "Web Development," 2017. [Online]. Available: https://www.techopedia.com/definition/23889/web-development . [Accessed 17 April 2018].

[11] E. Britannica, "Automation," 2017. [Online]. Available: https://www.britannica.com/technology/automation. [Accessed 17 April 2018].