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Development of Polling System with Sentiment Analysis for Higher Education Institutions (HEIs)

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Abstract

Traditional polling systems in Higher Education Institutions (HEIs) be burdened by manual collection of feedback and analysis, causing considerable delays, recurrent errors, and excessive resource consumption. To solve these problems, this research study will design and test an automated polling system that will be integrated with sentiment analysis. This system used the Valence Aware Dictionary of Sentiment Reasoning (VADER) to interpret the reactions of the stakeholders in real-time and classify them into three sentiment classes: positive, negative, or neutral. Mixed-method approach was used. The qualitative component of the research, which included interviews and focus group discussions with the head of campus, office heads, and students, identified three challenges, namely, manual inefficiency, analytical capacity, and high resource usage. The quantitative aspect has measured the system quality by a structured questionnaire guided by ISO/IEC 25010:2011 and which measures system quality in relation to functional suitability, efficiency, usability, reliability, and security. Answers were analyzed with descriptive statistics (mean, weighted mean). Results show good performance of the system, where the average scores are 4.80 (functional suitability), 4.50 (performance efficiency), 4.80 (usability), 4.64 (reliability), and 4.68 (security). Real-time sentiment classification helped in the implementation of targeted interventions, for example, addressing student concerns on time and enhancing administrative features.

Article Info

Keywords:
Automated Polling System; ISO/IEC 25010; Sentiment analysis; Rapid Application Development; VADER; System evaluation

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INTRODUCTION

The Anti-Red Tape Act of 2007 prescribes for state institutions, including Higher Education Institutions (HEIs), the use of programs that will ensure efficient service delivery and satisfaction with service providers. In this regard, student feedback is an important tool to evaluate service quality, improve learning performance, and assess faculty performance (Williams, 2024; Kumar & Renu, 2015). Feedback is also used to improve the institution's service and infrastructure strategy (Williams, 2024).

Despite its importance, traditional feedback processes paper-based survey distribution, collection, and manual analysis, remain time-consuming, resource-intensive, and delay in producing actionable insights (Henderson, Ryan, & Phillips, 2019). Further, existing systems are not equipped to understand textual responses in a holistic manner that allows them to extract meaningful information from qualitative feedback (Agarwal et al., 2015). Semi-automated sentiment analysis techniques yield partial results but are generally not rich enough to support decision-making (Hussein 2018). These limitations emphasize the need for a more efficient, data-driven, and user-centric feedback mechanism within HEIs, one that can incorporate mixed-method quantitative and qualitative insights. This study fills this gap by creating an automated polling system with built-in sentiment analysis that can maximize the gathering, analysis, and use of student feedback for prompt and evidence-based decision-making.

II. RELATED STUDIES

It is required to analyze feedback for quality assurance and improvement of the academic systems. Sentiment analysis, a field of artificial intelligence (AI) and machine learning (ML), has developed and become a powerful analysis tool in the text analysis field, used to analyse opinions and classify text-based feedback (Abirami & Gayathri, 2016). Computational methods of textual analysis, such as natural language processing and text mining, are becoming very common for data analysis in education. An interesting alternative is using VADER, by Hutto and Gilbert (2014), which follows the rule-based lexicon approach and can determine positive, neutral, and negative sentiment in text. Its potential for use in a school setting has been proven. For instance, Nguyen, Dien, and Khoa (2020) used sentiment analysis on student feedback and concluded that the sentiment detection at the sentence-level provided insights that could aid interventions to the institutions in real time. Moreover, Nasim et al. (2017) used ML and a lexicon based on post-semester feedback that has been considered helpful for quality measurement of teaching and areas of improvement.

III. METHODOLOGY

Research Design

This study employed a combination of two research methods, qualitative and quantitative ones, to present a comprehensive analysis of the polling system. The qualitative method involved interviews and focus group discussions with the end-users so as to obtain the descriptive data of the issues and challenges of the existing system. These were the Campus Head, office heads, and students who were directly involved or affected by the existing system. The selection of participants was random (31 in total; 1 Campus Head, 10 Office Heads, and 20 Students), making sure that both administrative and end-user views were fairly represented. The interviews and the FGDs were audio-taped (with permission) and accompanied by written records, which guaranteed the accuracy and completeness of the answers. The feedback was centred on the usability, workflow, and real-world issues, and analysed thematically to give core themes to be used in improving and designing the system. The quantitative method incorporated the testing of the system on the basis of measurable indicators based on the ISO 25010:2011 software quality model. The characteristics that were taken into consideration within this framework were: performance efficiency, functional suitability, usability, reliability, and security, which would provide objective evidence of the quality and effectiveness of the system. All participants were given a structured questionnaire completed in a Likert scale range (1-Strongly Disagree to 5-Strongly Agree). The data was discussed with the help of the descriptive statistics (mean, weighted mean) in order to realize the overall evaluation of the system.

Respondents of the Study

The study participants were drawn from Central Philippines State University – Hinigaran Campus, located at Brgy. Gargato Municipality of Hinigaran. These respondents have been selected randomly based on the need to have a holistic view of the system's functionality and the quality, and the administrative personnel, as well as the students.

Table 1. Respondent Frequency Distribution

Respondent Category	Frequency	Percentage (%)
Campus Head	1	3.2
Office Heads	10	32.3
Students	20	64.5
Total	**31**	**100**

Ethical Considerations

Developed a system having security mechanisms that will ensure that only authorized users will be able to view and interpret the feedback on the students and the sentiment analysis result. The participants will be required to complete a consent form before they can use the system. The consent form will detail to them why the system will be utilized, how they will later use their feedback, and their right to participate. These kinds of precautions ensure that the privacy and confidentiality of data is ensured as well as make the processed student feedback ethical and secure.

System Development

To develop the system for polling and sentiment analysis, the Rapid Application Development (RAD) model was used. Its user-focused and iterative design was directly compatible with the mixed-method design of the study.

Figure 1. Conceptual framework of the study illustrating the iterative development and deployment of the polling system using the Rapid Application Development (RAD) model

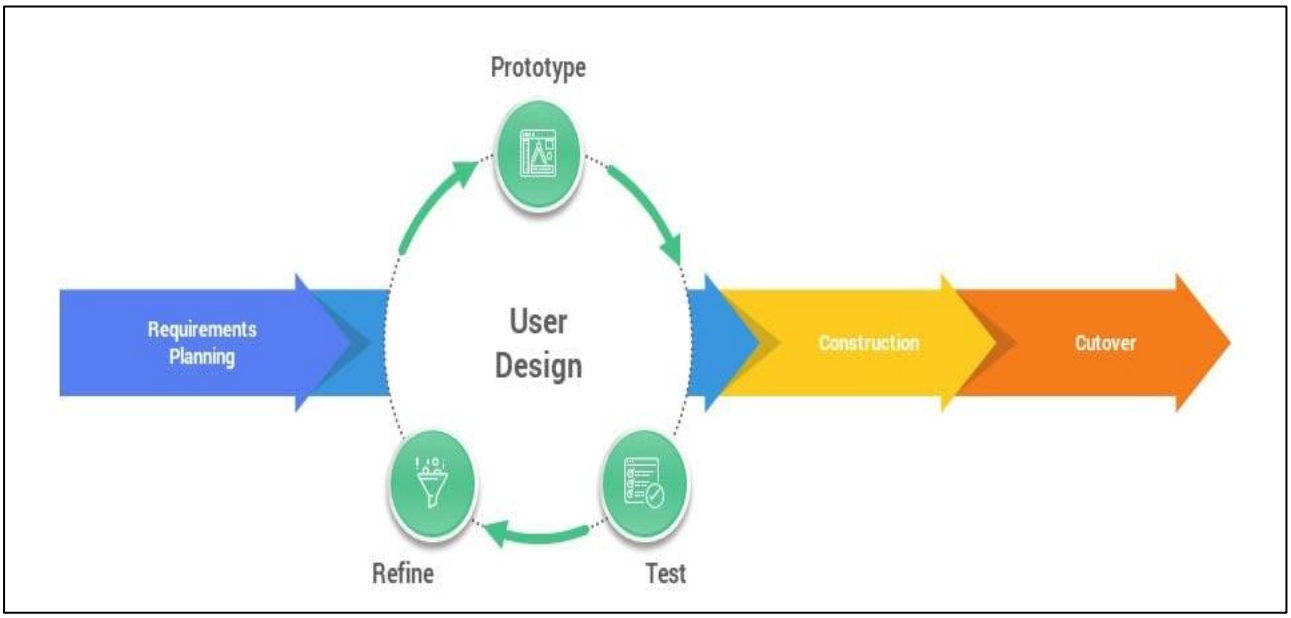

Figure 1. Conceptual Framework

Requirement Planning

In accordance with the qualitative component of the study, the requirements were collected based on the interviews and focus group discussions with the Campus Head, office heads, and students. This has ensured that the system captures the actual concerns and needs of the stakeholders.

User Design

Respondent comments were used to develop prototypes, connecting the outcomes of the thematic analysis with the real design of system workflows and interfaces. The relevance of the system was enhanced with the continuous input.

Figure 2. Process Flowchart of the Polling System in Collecting User Feedback

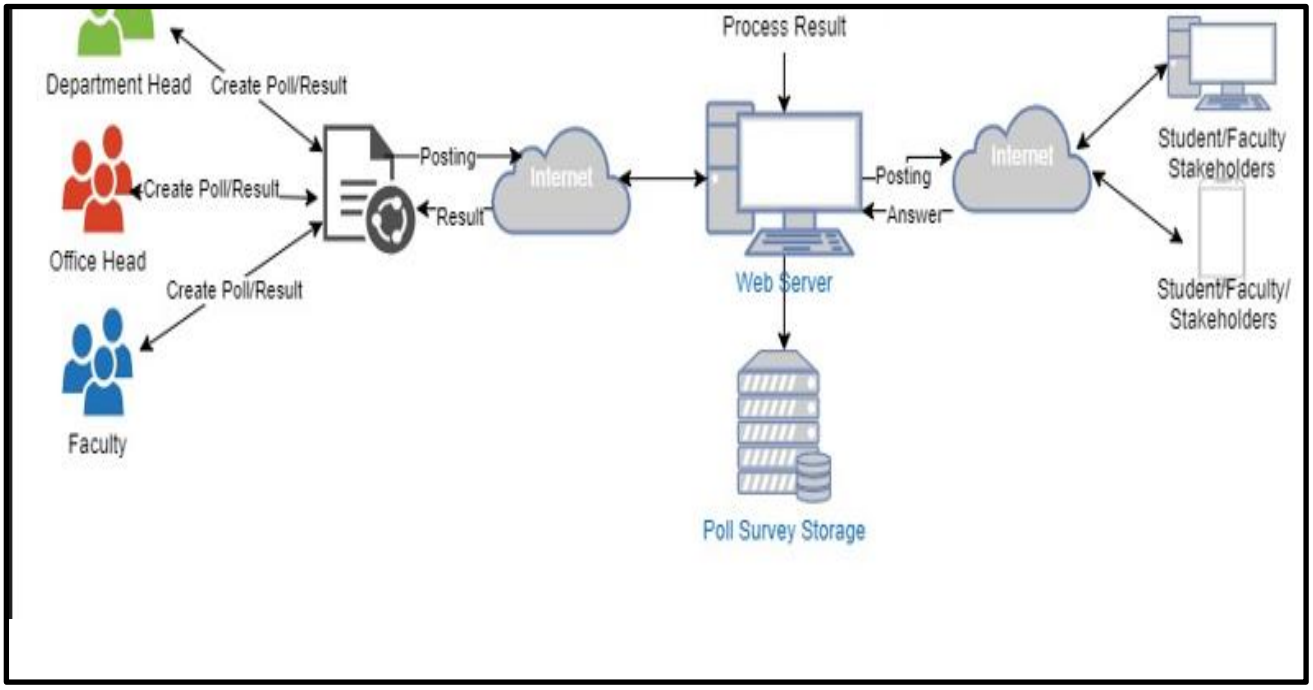

Figure 2. Process Flowchart

Construction Phase

The coding and system quality assessment framework based on ISO/IEC 25010:2011 was used in the quantitative part of the study. It included technologies like HTML, CSS, JavaScript, PHP, and MySQL, and sentiment analysis was provided with the VADER algorithm.

Cutover Phase

The pilot testing was provided to a random sample of the respondents (students, heads of offices, and the Campus Head), and their quantitative results, mean, and weighted mean of the system quality properties.

Figure 2, shows the feedback of the stakeholders was analysed to categorize into positive, negative, or neutral opinions.

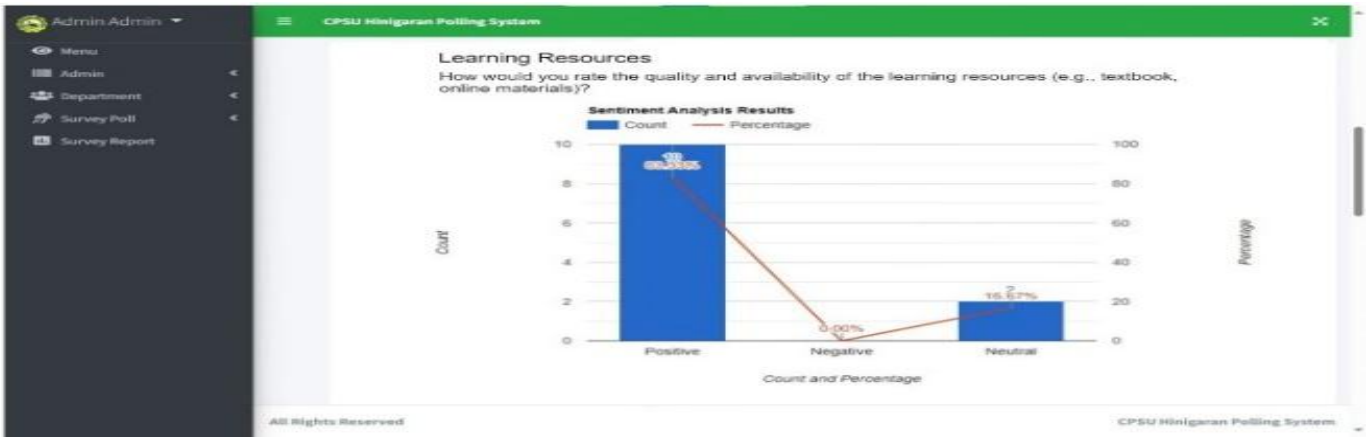

Figure 2. Sentiment Analysis Result

Figure 3 shows the user interface of the polling system for creating a feedback form

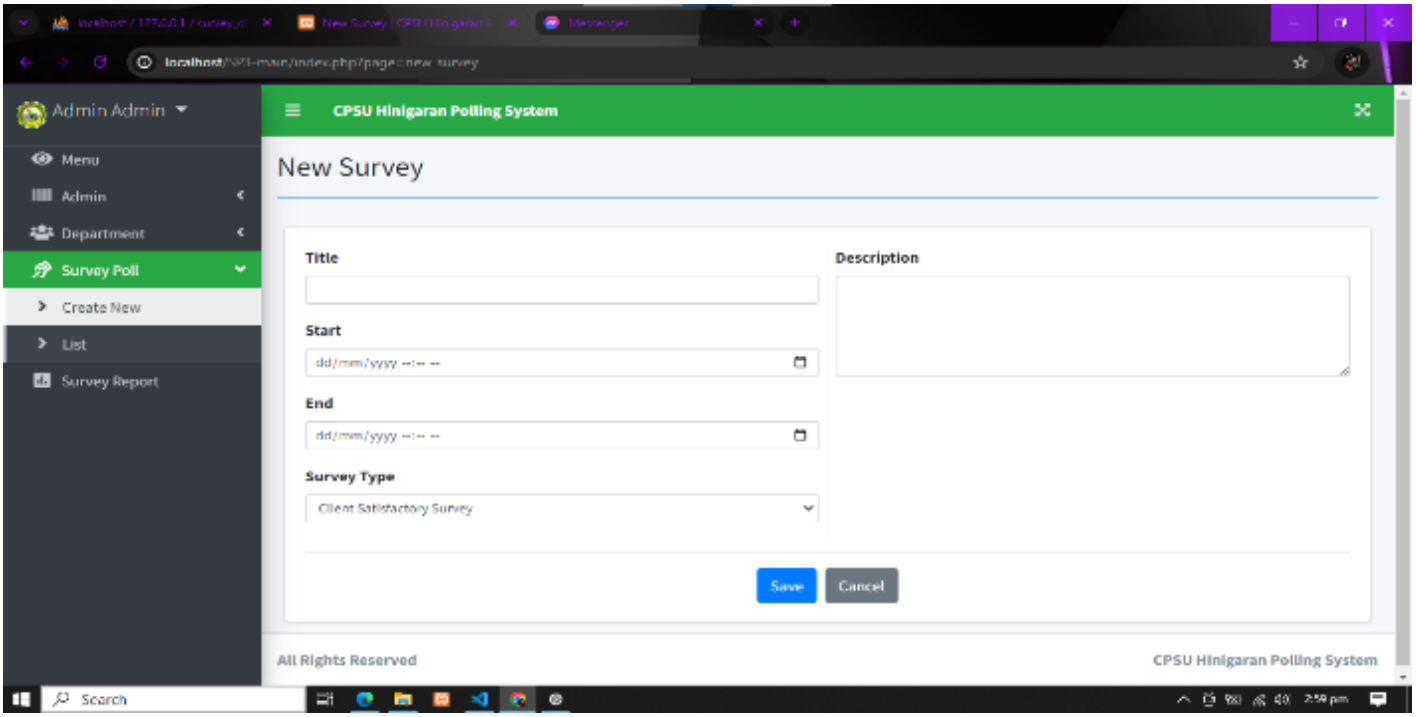

Figure 3. Feedback form

IV. RESULTS AND DISCUSSION

Thematic Analysis

Interviews and focus group discussions were conducted with the Campus Head, office heads and students to obtain qualitative data to be analyzed with the help of thematic analysis. The analysis produced three primary themes.

The Current System is inefficient. Stakeholders indicated that the paper-based feedback processes were time-intensive and error-prone, delaying decision-making that led to missing insights. The findings are congruent with the previous research studying the limitations of manual systems in higher education where inefficiency and inaccuracy affect the decision-making process in a timely manner (Nguyen, Dien, & Khoa, 2020; Chou & Chou, 2021). On the other hand, Al-Fraihat, Joy, and Sinclair (2020) highlighted that digital transformation minimizes processing mistakes and boosts decision-making.

Need for Advanced Analytics. Participants stressed the importance of real-time and sentiment analysis capabilities to produce actionable insights. This is congruent with evidence of the effectiveness of feedback loops based on AI in the context of higher education, where analytics can enhance institutional responsiveness and decision-making (Hutto & Gilbert, 2014; Shum & Ferguson, 2019). Enhanced trends: By providing administrators with a more effective way to identify trends, advanced analytics can enable the use of feedback mechanisms that are data-driven.

Resource Utilization Concerns. Lack of proper utilization of paper, ink, and storage space was another issue that was raised by respondents, as this resulted in greater costs and inefficiencies. This observation has been affirmed in past studies in which the results show that digital systems can help in enhancing sustainability through the minimization of material waste and operational costs (Bansal, 2020; Ozkan and Koseler, 2009). Switching to a digital feedback system will not only help to increase efficiency but also help to promote institutional sustainability initiatives.

Table 2. Frequency of Thematic Responses

Theme	Campus Head	Office Heads	Students	Total
Inefficiency	1	10	15	26
Advanced Analytics	1	9	16	26
Resource Utilization	1	8	15	24

Although these themes offer important information on the perception of the stakeholders, they were based on a rather limited and institution-specific sample (n = 31). By implication, the results might not be a complete representation of the views of the larger population, but should be viewed in this perspective.

System Quality Evaluation

Table 2 shows the result of the system quality evaluation rated by the office head, campus head and students.

Table 2. Result of the system quality evaluation

ISO 25010:2011 Characteristics	Total Mean	Description
Performance efficiency	4.50	Strongly Agree
Functional Suitability	4.80	Strongly Agree
System Usability	4.80	Strongly Agree
Reliability	4.64	Strongly Agree
Security	4.68	Strongly Agree
Total Weighted Mean	4.68	Strongly Agree

Results show excellent performance in all quality characteristics. The highest scores (4.80) were received in both functional suitability and system usability, which means the polling system meets the needs of stakeholders and offers a smooth user experience. Performance efficiency (4.50) implies that the system is reliable when it is used under the normal operating conditions, whereas reliability (4.64) implies that the system is dependable when used under the normal conditions. The system score on the security domain (4.68) is an indication that the system can protect the data against unauthorized access by keeping confidentiality and integrity. Comprehensively, the weighted average of 4.68 proves to deliver excellence and meets stakeholder expectations. However, restrictions are to be mentioned. These results are limited by the relatively small sample size (n = 31). Moreover, since the testing was carried out in the same institution where the system was created, there is the possibility that bias could have swayed the responses since those who were tested could have had a positive attitude towards the system. Future research ought to use bigger and more heterogeneous populations and use independent assessments to validate these results.

IV. CONCLUSION

The proposed system was evaluated based on the ISO 250110:2011 focuses on functionality, usability, reliability, and security. The result of the evaluation implies that the system runs efficiently, capable of handling multiple requests and processes simultaneously while optimizing resource utilization. The stakeholders expressed high satisfaction with the well-organized and visually appealing interface, which enables the system to be accessible to a wide range of users. Moreover, the system demonstrates excellent reliability and usability, operating continuously without errors or issues, which ensures reliable performance. The results highlighted the potential system to significantly enhance feedback collection, distribution, and analysis of textual data. The results emphasize the possibilities to eliminate the inefficiency of the feedback process, resource-intensive aspects such as labor and materials, and delays in the feedback result that hinder the ability of the administrator to respond promptly.

V. RECOMMENDATION

Although the developed system has shown favourable achievements, there is a need to refine it to achieve the maximum. The subsequent areas are suggested as areas to be explored in the future, but are not opposed to immediate needs: A number of promising avenues for future research and development are discussed. One of the key directions is to incorporate natural language processing models and machine learning classifiers, which can be used to increase the accuracy and sophistication of sentiment analysis beyond what can currently be achieved by the system. Furthermore, the scalability of the system needs to be tested by implementing it in other HEIs to test how general the system is to different contexts and to check to what degree the results are consistently achieved. Security is also an important area, in which including additional measures like stronger encryption methods, frequent security patches, and multi-factor authentication can further safeguard student and institutional sensitive data.

VI. REFERENCES

Abirami, A. M., & Gayathri, V. (2016). A survey on sentiment analysis methods and approach. *Proceedings of the Eighth International Conference on Advanced Computing (ICoAC)*, 72–76. IEEE. https://doi.org/10.1109/ICoAC.2016.7562780

Agarwal, B., Mittal, N., Bansal, P., & Garg, S. (2015). Sentiment analysis using common-sense and context information. *Computational Intelligence and Neuroscience, 2015*, 715730. https://doi.org/10.1155/2015/715730

Chaudhry, H. N., Javed, Y., Kulsoom, F., Mehmood, Z., Khan, Z. I., Shoaib, U., & Janjua, S. H. (2021). Sentiment analysis before and after elections: Twitter data of U.S. election 2020. *Electronics, 10*(17), 2082. https://doi.org/10.3390/electronics10172082

Elbagir, M., & Yang, J. (2019). Twitter sentiment analysis using natural language toolkit and VADER sentiment. *Proceedings of the International MultiConference of Engineers and Computer Scientists (IMECS)*, 12–16. International Association of Engineers.

Henderson, M., Ryan, T., & Phillips, M. (2019). The challenges of feedback in higher education. *Assessment & Evaluation in Higher Education, 44*(8), 1237–1252. https://doi.org/10.1080/02602938.2019.1599815

Hussein, D. M. E. M. (2018). A survey on sentiment analysis challenges. *Journal of King Saud University – Engineering Sciences, 30*(4), 330–338. https://doi.org/10.1016/j.jksues.2016.04.002

Hutto, C. J., & Gilbert, E. (2014). VADER: A parsimonious rule-based model for sentiment analysis of social media text. *Eighth International Conference on Weblogs and Social Media (ICWSM-14)*, 216–225. AAAI.

ISO/IEC 25010:2011. *Systems and software engineering – Systems and software quality requirements and evaluation (SQuaRE) – System and software quality models*. International Organization for Standardization.

Kumar, A., & Jain, R. (2015). Sentiment analysis and feedback evaluation. *Proceedings of the IEEE 3rd International Conference on Computing for Sustainable Global Development (INDIACom)*. IEEE.

Nasim, Z., Rajput, Q., & Haider, S. (2017). Sentiment analysis of student feedback using machine learning and lexicon-based approaches. *2017 International Conference on Research and Innovation in Information Systems (ICRIIS)*, 1–6. IEEE. https://doi.org/10.1109/ICRIIS.2017.8002532

Nguyen, T. P. G., Dien, T. T., & Khoa, T. T. M. (2020). Sentiment analysis for university students' feedback. *Proceedings of the 2020 International Conference on Advanced Computing and Applications (ACOMP)*, 55–66. IEEE. https://doi.org/10.1109/ACOMP50827.2020.00015

Williams, A. (2024). Delivering effective student feedback in higher education: An evaluation of the challenges and best practice. *International Journal of Research in Education and Science, 10*(2), 473–501. https://doi.org/10.46328/ijres.4040