CITY COLLEGE OF CALAMBA

DEPARTMENT OF COMPUTING AND INFORMATICS
Bachelor of Science in Information Technology

BESIMS: BUROL ELEMENTARY SCHOOL INFORMATION MANAGEMENT SYSTEM

A Software Engineering 2 Project presented to the faculty of

Department of Computing and Informatics

of the City College of Calamba

Calamba City, Laguna

BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

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October 2025

CHAPTER I

THE PROBLEM AND ITS BACKGROUND

This chapter presents an overview of the research. It introduces the project's context, outlines the objectives, establishes a framework for understanding, emphasizes the importance of the study, and defines its scope and limitations. It serves as an introductory section, allowing readers to grasp the main points and anticipate the covered in the subsequent chapters.

Background of the Study

Efficient services delivery is crucial for all academic institutions, both private and public, particularly in the processing of necessary information such as student's grades, attendance, teacher's learning material such as lesson plans, and school evaluations. In Burol Elementary School, the current system for managing files and information and feedback from the stakeholders relies heavily in manual, which presents numerous challenges. These include human – errors, loss or missing documents, and time – consuming, leading to resentment among school staffs and stakeholders. Moreover, the manual process also places a significant problem to the school administration, who struggle to handle volume of information in an organized and timely manner.

As the demand for reliable, faster and efficient service delivery, many academic institutions are switching into digital system processes. According to study by Abid [1], traditional classroom instructions fall short of providing an immediate learning environment, faster evaluations, and more engagement. In contrast, digital learning tools fill this void. Additionally, a study by Gustafsson – Wright [2], emphasizes that collecting data in real time is inherently challenging. Paper-based systems of data collection can be

slow, administratively burdensome, and prone to human error. Digital technologies potentially offer more efficient collection and analysis of real-time data, allow for more flexibility and customizability, and can provide functionalities such as automatically generated visualizations and ongoing recommendations.

In the digital age, technology is essential for improving administrative efficiency and supporting data-driven decision-making in educational institutions. While many schools have fully digitized their processes, Burol Elementary School employs a hybrid approach, combining manual methods with third-party applications for feedback collection, analysis, and reporting. Although this system facilitates some aspects of feedback management, it remains limited by time-consuming processes, susceptibility to human error, and challenges in handling large volumes of data. To enhance the existing system, this project proposes the development of a data management and digital feedback platform that integrates with current practices. By streamlining feedback submission, and improving reporting accuracy, the system aims to optimize administrative efficiency, strengthen communication, and support institutional development while maintaining compatibility with the school's current processes.

Burol Elementary School, established in 1974, serves the residents of Barangay Burol and the surrounding rural upland areas of Calamba City, Laguna. Under the leadership of Mrs. Jessica E. Matanguihan, the school operates with a dedicated faculty of thirteen teachers, supported by two non-teaching staff members and two security personnel. While the institution remains committed to delivering high-quality education through traditional pedagogical methods, there is a growing need to enhance administrative

efficiency through improved smart learning and feedback management. However, the current feedback collection and reporting system requires considerable time and effort.

Although third-party applications assist in some digital processes, manual data entry and organization remain necessary, resulting in delays in data analysis and decision-making. Additionally, manual data management increases the risk of human error and data loss [3]. According to the school coordinator, reviewing and summarizing feedback requires extensive manual effort, making the process labor-intensive. Furthermore, reliance on external applications limits data security and customization options, potentially restricting the school's ability to optimize institutional improvements. Given these challenges, an innovative solution is required to create a more structured, efficient, and reliable feedback system.

To address these inefficiencies, this project proposes the development of an interactive and user-friendly data management and digital feedback system tailored for educators and school administrators. This system will facilitate structured feedback submission by faculty members while enabling school leaders to systematically collect, analyze, and utilize data-driven insights. Additionally, it will incorporate secure data storage and backup mechanisms to mitigate the risks of data loss and security breaches. By automating the smart learning and feedback process, the proposed solution aims to reduce errors, simplify data analysis, and support school administrators in making informed decisions based on real-time insights. Furthermore, the system's design will ensure ease of use and accessibility to accommodate the needs of all users.

The BESIMS: Burol Elementary School Information Management System will integrate several essential features to optimize efficiency and accuracy. This includes the

following features: Dashboard, Feedback feature and Schedule. Faculty members will be able to submit feedback through an intuitive digital interface, minimizing the need for manual data entry. Automated data analysis tools will categorize and synthesize responses, providing administrators with real-time insights. The system may also include an anonymous feedback submission feature to foster open and constructive communication. This initiative aligns with UNESCO's Guidelines for Designing Inclusive Digital Solutions and Developing Digital Skills, as highlighted by Broek [4]. Integrated data visualization tools will further assist school administrators in identifying patterns and areas for improvement. As noted by Cavalcanti [5], digital feedback systems have been found to support institutions in systematically analyzing stakeholder input and responding proactively. Implementing this system will enable Burol Elementary School to establish a more effective and structured feedback mechanism that supports institutional development.

Furthermore, the BESIMS: Burol Elementary School Information Management System is designed to enhance the educational environment by optimizing data management and streamlining feedback collection processes. The system's effectiveness will be evaluated using key performance indicators, while its compliance with ISO 25010:2023 standards will be assessed to ensure usability, maintainability, reliability, and security [6]. Adhering to these standards will contribute to the development of a robust, secure, and user-centric system for teachers and administrators. Furthermore, the adoption of digital solutions at Burol Elementary School presents an opportunity to refine administrative practices, enhance feedback collection, and facilitate data-driven decision-making. This initiative will improve administrative efficiency and allow educators to focus more on delivering quality instruction.

Current State of Technology

` In the digital age, technology plays a crucial role in administrative efficiency and data-driven decision-making. While many institutions have digitized processes, Burol Elementary School uses a hybrid system, combining manual methods with third-party applications for feedback collection, analysis, and reporting. This approach facilitates feedback management but remains limited by time-consuming processes, human error, and challenges in handling large data volumes. An interactive digital feedback platform is proposed, integrating automated data analysis and reporting tools to optimize administrative efficiency and support institutional development. By leveraging web-based technologies, the system aims to eliminate inefficiencies, enhance data security, and provide real-time insights to school administrators. This will streamline decision-making and create a responsive educational environment. It is expected to minimize delays, reduce third-party dependency, and improve feedback quality, ensuring faculty and students engage in a structured feedback system aligned with institutional objectives and technological advancements.

Research Problem

The feedback collection and reporting system at Burol Elementary School currently relies on manual data entry and organization, which demands considerable time and effort from staff. According to an interview with the school's ICT coordinator, managing feedback involves multiple steps, making the process labor-intensive and complex. For instance, personnel must manually record, organize, and analyze information from various stakeholders. Therefore, to address these challenges, this study proposes the development and implementation of BESIMS: Burol Elementary School Information Management

System, a web-based platform with integrated feedback and sentiment analysis. By streamlining operations, reducing administrative workload, and enabling efficient data management, the system aims to support informed decision-making and enhance overall administrative effectiveness.

Research Questions

1. What problems and challenges do Burol Elementary School personnel experience in the current feedback handling and information management process?
2. How can a web-based school information management system with integrated feedback features be designed and develop to address the needs of Burol Elementary School ?
3. How effective is the implementation of the proposed school information management system at Burol Elementary School based on ISO 25010:2023 in terms of:
    3.1. Performance Efficiency
    3.2. Usability
    3.3. Maintainability
    3.4. Reliability
    3.5. Security
    3.6. Functional Suitability

RESEARCH OBJECTIVES

General Objectives

This study aims to develop BESIMS: Burol Elementary School Information Management System, an interactive and user-friendly platform designed to enhance the school's feedback and information management processes. The system seeks to address inefficiencies and reduce human errors associated with traditional feedback handling by enabling real-time submission, automated data analysis, and accurate reporting. Additionally, it ensures compatibility with existing infrastructure, maintains security, and allows for scalability. By providing these features, the system supports informed decision-making and improves overall administrative efficiency.

Specific Objectives

The primary objective of the study is to implement an improved data and feedback management process through the development of the Burol Elementary School Information Management System (BESIMS). This study aims to provide efficient solutions and establish a framework for the system's implementation. Specifically, it seeks to:

1. To determine the problems and challenges encountered by Burol Elementary School in its existing process of feedback handling and information management.
2. To design and develop a web-based school information management system with integrated feedback features tailored to the needs of Burol Elementary School.
3. To evaluate the system's effectiveness using real-time data access by measuring its usability based on ISO 25010:2023 standards in terms of:
    3.1. Performance Efficiency
    3.2. Usability

3.3. Maintainability

3.4. Reliability

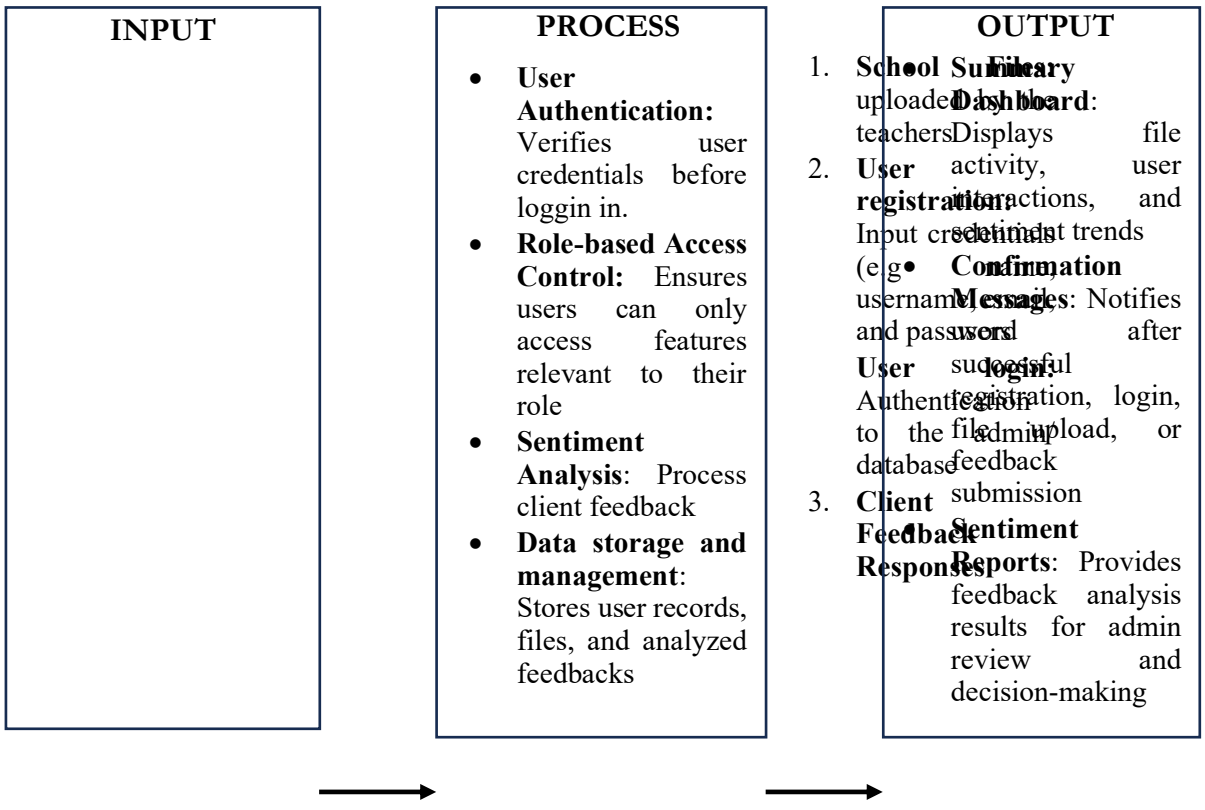
3.5. Security

3.6. Functional Suitability

Research Framework

Conceptual Framework

In this section, the researchers introduce the conceptual framework of the proposed system, which serves as a reference throughout the study. The framework outlines the input, process, and output (IPO) of the proposed study, providing a comprehensive perspective on the researchers' system proposal.



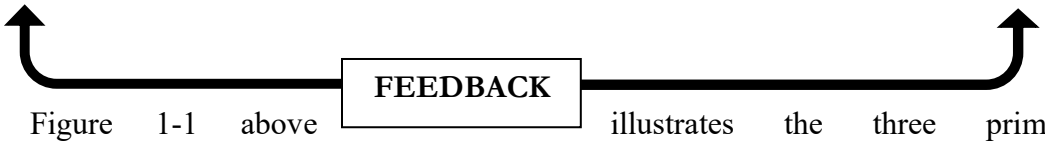


Figure 1-1 above illustrates the three primary components of the structure, which serve as the foundation for the study's concept. The system administrator is responsible for collecting and handling the user's data input, including personal details, addresses, identification numbers, feedbacks and important documents such as grades, attendance, teacher's educational plan, to ensure proper data management. Internal school records, guidelines, processes and legal frameworks are utilized to standardize procedures and maintain accurate records. The essential requirements for the system, such as technical specifications, software tools, and hardware resources, are identified and integrated into the system for ideal operation.

The BESIMS: Burol Elementary School Information Management System operates through several key processes. It begins with user authentication, verifying credentials before allowing login to ensure secure access. Role-based access control then ensures users can only access features relevant to their specific role. Once logged in, the system processes client feedback through sentiment analysis, extracting valuable insights, while data storage and management securely stores user records, files, and analyzed feedback. Once the data is gathered, the system automates and facilitates data management and feedback processing, validating user information to ensure accuracy. It handles all data with speed,

precision, and efficiency, reducing the burden on administrators and staff, minimizing human errors, and preventing the loss of data and documents, thereby improving overall school operations.

The system generates both tangible and intangible outputs that significantly enhance the school information management system. Tangible outputs include the summary dashboard, which displays file activity, user interactions, and sentiment trends, as well as confirmation messages notifying users upon successful registration, login, file upload, or feedback submission. Additionally, sentiment reports provide feedback analysis results to aid administrators in decision-making. Intangible benefits include improved convenience and efficiency, allowing users and stakeholders to remotely submit school files and access feedback systems, reducing the need for physical visits and manual verification. These outputs lead to faster document processing, enhanced data security, and more efficient communication between school staff and stakeholders, while the system's analysis of feedback provides valuable insights to inform decision-making and policy formulation.

Overall, the implementation of the BESIMS: Burol Elementary School Information Management System addresses common challenges in traditional school management while elevating public service by offering a digital, transparent, and accessible platform for all users. This system aims to demonstrate how technology can optimize educational services and enhance the experience of both staff and students at Burol Elementary School. By streamlining operations and improving service quality, the system leverages technology to provide faster, more transparent, and accessible public services at the school.

Scope and Limitation

The research scope is to develop and implement a BESIMS: Burol Elementary School Information Management System to manage essential information and feedbacks more efficiently and effectively. The system's primary objectives are to simplify the information and feedback management for school administration, staff and their clients, reducing the need to waste a lot of time, and improve communication between school officials and their clients. The system will also organize and streamline operations related to school information backups, including student's grades, lesson plan, and other teacher's file. Build using PHP and SQL, the system ensures secure data storage and user – friendly interface. These findings of the study brough benefits such as enhanced processing time, reduced human errors, reduce loss or missing files, and a more organized approach on handling files and documents.

However, the sytem's limitations may include its inability to fully automate certain tasks such as data analytics dashboard for the feedbacks. Additionally, the reliance on internet connectivity for real – time processing might limit accessibility, especially in areas with unstable network. The system's dependence on the availability and stability of telecommunication networks for uploading file confirmations or notifications may result in delays if network issues occure. Ultimately, the system does not handle complex administrative task beyond basic service system and sentiment analysis.

Technical Feasibility

The rapid evolution of technology needs an accompanying revolution in the education field. Recognizing this requirement, Burol Elementary School aims to implement an innovative school information management system. This effort seeks to transform

communication channels, expedite administrative procedures, increase data gathering and analysis, and, ultimately, improve accessibility and services for students, professors, staff, and other stakeholders. The primary goal is to provide a centralized, secure, and user-friendly system for efficiently handling faculty data, student information, stakeholder feedback, and academic progress. This study provides a thorough examination of the technical feasibility of deploying such an integrated system while adhering to Burol Elementary School's educational objectives, budgetary constraints, and existing infrastructure capabilities. The scope of this assessment includes the integration of automated reporting and analytics, comprehensive faculty and staff records management, efficient student information management, and a robust platform for community, parent, and stakeholder feedback, including sentimental analysis of said feedback. The successful implementation of this system stipulates a more efficient approach to online data management, feedback mechanisms, and administrative workflows, potentially allowing Burol Elementary School to serve a larger community via a hybrid or entirely online operational model. This research will thoroughly examine the hardware, software, network, security, and scalability requirements for successful implementation, as well as identify potential challenges and develop strategic recommendations to ensure seamless integration with the school's current academic ecosystem.

The envisioned school information management system consists of several critical components that work together. The functional modules at its core are Faculty Management (which tracks schedules and evaluations), a Feedback Portal (which allows parents, students, and staff to provide feedback via digital forms/surveys), a Student Database (which stores enrollment information, academic records, and attendance), and a Reporting

Dashboard. The underlying technical architecture includes a user-friendly and responsive frontend interface accessible via web browsers, a robust backend responsible for database management and server-side logic, stringent security measures such as role-based access control, encryption, authentication, and audit logs, and considerations for integration with existing systems, potentially including those mandated by DepEd. To ensure operating efficiency, several technical needs have been defined. Hardware requirements include a server infrastructure (either cloud-based through platforms like Hostinger or a local server), a minimum of 256 HDD storage for data and backups, a variety of End-User Devices (smartphones, tablets, desktops, and PCs), and a stable network infrastructure with a minimum bandwidth of 2 Mbps. Software requirements include a suitable operating system (e.g., Windows Server), a dependable database management system (e.g., MySQL Server), a development framework (e.g., PHP), a hosting environment (potentially a local host server during development), and comprehensive security software that includes role-based access, encryption, and multi-factor authentication. Furthermore, network connectivity necessitates a minimum bandwidth of 2 Mbps, along with an automated daily backup and recovery mechanism (cloud or local). Security and compliance will be in accordance with the Data Privacy Act and DepEd rules, with administrators, teachers, and community stakeholders given granular access controls. Finally, scalability, the potential for cloud hosting, and the ability to integrate with third-party tools such as SMS/email notification systems are critical design considerations.

The technical feasibility evaluation concludes that establishing an integrated BESIMS: Burol Elementary School Information Management System is both technically feasible as well as beneficial. The school has the necessary technical resources, and the

system is designed to automate record-keeping, eliminate errors, increase communication and feedback analysis, produce insights, and improve data security. The recommended implementation process is as follows: planning and pilot testing, deployment with training and notifications, and full implementation with continuing monitoring and security updates. The administration must approve the budget, appoint an IT coordinator, and oversee a staggered implementation.

Operational Feasibility

The objective of this operational feasibility study was to assess the prospective adoption of BESIMS: Burol Elementary School Information Management System. The proposed system seeks to improve administrative processes, data-driven decision-making, and communication among school community members, teachers, and stakeholders. The study evaluated to determine if the suggested system aligned with the school's daily operations, workflow efficiency, staff capabilities, and long-term viability.

The study began with an assessment of the present operational problems in data management and feedback gathering. Burol Elementary School's current data management practices rely heavily on traditional methods, such as paper-based feedback collection, handwritten grades and assessments, and manual recording of student records, school documents, and teacher education plans, which are then stored in physical archives. This reliance on human processes raises numerous major concerns, including time-consuming data input methods, data inconsistency and inaccuracies, and difficulties obtaining previous records, especially in the event of natural catastrophes.

The operational feasibility evaluation includes an assessment of user acceptance and readiness. The evaluation took into consideration the technological proficiency of a

variety of user groups, including administrators, teachers, other stakeholders, and the community. While managers often have basic computer abilities, teachers demonstrate a wide variety of competency levels, from basic to advanced. Other stakeholders and community members show varying levels of technological skill, with some lacking expertise and having limited access to gadgets. To address these issues, the report suggests mitigation strategies such as step-by-step training and an administrative support team for administrators and instructors, in-person tutorials for other stakeholders, and school-provided tablets for community usage in schools.

The study additionally examined to assess how the proposed system would integrate with the school's existing workflows. The successful deployment of the school information management system requires alignment with present school procedures, such as attendance record management, grade record management, and the creation of a centralized feedback portal. Potential difficulties, such as temporary slowdowns during the initial deployment phase, were recognized, and a phased implementation strategy was proposed to mitigate these interruptions. A thorough training and support strategy was established, which included pre-deployment workshops, pilot testing with hands-on experience, and continuing refresher sessions with specialized IT support.

Furthermore, the study focused on the proposed system's maintenance and sustainability. To ensure long-term viability, the study suggests designating a staff member to handle system maintenance and troubleshooting, maintaining daily data backups, and conducting quarterly surveys to gather user feedback for system enhancements. Potential hazards such as data privacy concerns, budget restrictions, internet connectivity challenges, and reluctance to change were all assessed. Mitigation plans were developed, which

included holding seminars on data security and compliance with relevant guidelines, obtaining external funding and integrating low-cost solutions, permitting offline mode for important operations, and performing training sessions for each new feature offered.

In conclusion, the operational feasibility study shows that implementing the school information managemeny system at Burol Elementary School is viable, assuming certain requirements are achieved. These criteria include adequate training for all professors, staff, and stakeholders, the use of a staged implementation strategy, and the availability of ongoing technical assistance. The system's effective adoption is projected to minimize administrative hassles, improve communication, and increase data accuracy, all of factors will contribute to improved institutional outcomes. The report advises that the institution begin with a pilot testing phase before full implementation, hold orientation sessions for everyone who is involved, employ a user-friendly interface, acquire sufficient financing, and develop a quarterly system performance monitoring and assessment process.

Schedule Feasibility

The BESIMS: Burol Elementary School Information Management System seeks to streamline student data, instructor instructional materials (lesson plans, attendance, monthly reports), and stakeholder feedback gathering. This research assesses the duration of the project, significant successes, resource allocation, and potential hazards to guarantee timely and effective execution.

The project will be implemented in an organized manner, with phases including planning, system design, development, testing, deployment, and assessment. Each phase will have clearly defined goals and deliverables to ensure that work is tracked and completed on time. Before complete deployment, beta testing will be carried out to detect

and resolve any potential difficulties. A post-deployment monitoring phase will be included to collect user input and make any necessary changes, guaranteeing an efficient rollout and effective adoption by all stakeholders. The plan will include buffer periods to address unexpected obstacles, ensuring that project deadlines are reached without compromising system quality.

The project involves five phases. The initial process, Planning and Requirement Gathering, is expected to take one month. Consultations with school administrators and faculty personnel will be conducted, as well as data collecting and system structure and design, including wireframes and preliminary designs. This phase's key deliverables are completed system requirements, wireframes, and prototypes. The second phase, System creation, is expected to last one month and will include final UI/UX design, database setup, and the creation of other system components. This phase's deliverables include a functional database, admin and teacher portals, as well as secure login and data encryption.

The third phase, testing and training, is expected to span one month. This phase will include user acceptance testing with teachers, administrators, staff, and stakeholders, problem fixes and optimization, and training seminars for school personnel. The intended deliverables include a tested and fully functional system, instructional guides, and instructional video clips. The fourth step, Pilot Implementation, will last one month and comprise a soft launch with selected participants, feedback collection, and final system improvements.

This phase will include an initial system performance report and stakeholder feedback. The third phase, Full Deployment and Maintenance, continues to be in progress, with the school-wide launch scheduled for twelve months. This phase involves ongoing

technical support and quarterly system updates, as well as the delivery of a fully operating BESIMS: Burol Elementary School Information Management Sytem with a maintenance and update plan.

A risk assessment was undertaken to identify potential issues and devise mitigation solutions. The highlighted hazards include poor user adoption, which is classed as medium risk, technical challenges, and internet connectivity, both of which are classified as high risk. Mitigation techniques include rigorous training and incentives for early adopters to address low user uptake, specialized IT support for technical challenges, and the ability to run important services offline to reduce internet connectivity issues.

Finally, the BESIMS: Burol Elementary School Information Management System can be completed within 8 to 12 months with good planning, resource allocation, and stakeholder engagement. It is suggested that the project maintains meticulously to the timeframe, develops a long-term maintenance strategy, assures early stakeholder involvement, and conducts pilot testing prior to full deployment.

Significance of the Study

This section discusses all of the individuals and groups who gained advantages from the study. The primary objectives is to replace current manual data management and feedbacking process at Burol Elementary School with more efficient digital system. The findings of the study brough benefits for the following:

Burol Elementary School Administrative Office. The study improved the data management and feedbacking system, including administration processes, and client feedbacks regarding the services. The productivity of the staff increased as data management and feedbacking system were processed faster, and the record were better

organized and easier to retrieve. Furthermore, communication between school staffs and stakeholders was improved due to the system's feedbacking feature, which allow the clients to give, and suggests opinions and recommendations for the betterment of over all school service improvements. This enhancement led to better service delivery, better – decision making, and seamless administrative processes.

Stakeholders. The stakeholders were able to give feedback about their experience in school's service and administration without manually writing and answering the school's evaluation. This made the system more convenient and time – efficient for residents especially for those in hurry and do not have enough time to manually answer the question. The online accessibility of the feedback system allowed clients to efficiently answer the school's evaluation.

Teachers / Faculty Staff. Teachers experienced increased efficiency and effectiveness in handling documents through a centralized digital platform. They no longer needed to manage large volumes of paperwork manually, and the system also reduce errors and delays.

Researchers. The proposed study improved researchers' knowledge and skills in developing a digital using PHP and SQL, which will be valuable in their future careers. They gained practical experience and skills in designing the system, its development, and its implementation, learning how to address real – world problems and challenges.

Future Researchers. This study yield a solid foundation for future researchers who wish to explore the use of data management and feedbacking system in public schools. It offers insights into the application of technology in public schools, particularly in

improving service delivery, and administrative efficiency, and serves as a reference for future studies is system development.

Schools and Academic Institutions. The system could serve as a model for other schools aiming to transition from manual processes to digital systems. The study provides valuable insights into how digitization can enhance efficiency, transparency, and accessibility of school services. Schools adopting similar systems can streamline their operations, reduce administrative burdens, and improve the overall satisfaction of their consitituents.

Definition of Terms

This section provides clear and concise definitions of technical and operational terms used in the BESIMS: Burol Elementary School Information Management System:

Automated Reporting. Dashboards provide real-time analytics (e.g., feedback trends, attendance rates) to aid decision-making.

BESIMS (Burol Elementary School Information Management System). A centralized platform for Burol Elementary School that manages institutional files, gathers stakeholder feedback, and generates reports, ensuring data security, compliance, operational efficiency, and real-time analytics..

Cloud Hosting. An offsite server architecture (e.g., AWS, Google Cloud, Hostinger) that facilitates online system hosting, offering scalable storage, backup, and accessibility independent of physical school servers.

Data Privacy Act Compliance. Compliance with Philippine legislation (RA 10173) governing the collection, storage, and processing of personal data (e.g., student/parent information).

Encryption. Using techniques (like AES-256) to transform sensitive data (such student records and feedback submissions) into unintelligible code in order to prevent unwanted access.

Frontend Development. The user interface (UI) design (HTML, CSS, JavaScript) governs how users interact with the system, assuring responsiveness and ease of navigation.

ISO / IEC 25010:2023 Standards. An international software quality model applied to BESIMS to ensure effectiveness in six areas: Performance Efficiency, Usability, Maintainability, Reliability, Security, and Functional Suitability—covering speed, ease of use, updates, consistency, data protection, and task fulfillment.

Maintenance Schedule. To maintain system uptime, software upgrades, security patches, and data backups are scheduled at predetermined times (for example, quarterly).

Offline Mode. A feature that allows data entry (e.g., attendance, feedback) without the need for an internet connection, with automatic synchronization once connectivity is restored.

Pilot Implementation. A restricted pilot implementation of the system with a designated group (e.g., a specific grade level or department) to detect technical or usability challenges prior to institution-wide deployment.

Role-Based Access Control (RBAC). A security paradigm that limits system access according to user responsibilities

Scalability. The system's ability to manage increased data quantities and users (for example, additional pupils, feedback submissions) without degrading performance.

Sentiment Analysis. A comprehensive digital instrument that gathers, processes, analyzes, and reports stakeholder input to enhance educational services and decision-making.

Stakeholders. Individuals are entities engaged with or impacted by the system, including administrators, educators, students, parents or guardians, and community members.

System Integration. The process of integrating the BESIMS: Burol Elementary School Information Management System with existing technologies (such as DepEd systems, Google Forms, and SMS/email notifications) to enable smooth data flow.

Third – party Applications. The BESIMS will integrate or replace external tools (e.g., Google Forms, QR code scanners) that Burol ES is currently using to collect input.

User Acceptance Testing (UAT). Prior to the complete deployment of the system, actual end users—teachers, administrators, and a select group of parents and students—evaluate its functioning in the final review phase to ensure it meets operational requirements.

CHAPTER II

REVIEW OF RELATED LITERATURE AND STUDIES

This chapter presents a review of existing literature and studies relevant to the School Service System with Sentimental Analysis with Burol Elementary School, encompassing both foreign and local perspectives, as well as research on sentimental/feedback analysis in educational contexts. This review aims to establish a theoretical foundation for the current study by examining previous findings, identifying gaps, and highlighting the significance of the present research.

Digitization in Education

Automated school service systems are presented in numerous research studies to reduce manual labor and improve response time efficiency. These studies emphasize the importance of academic institutions proactively adopting digital transformation in order to remain relevant in the technologically advanced environment of today.

Digital transformation has become a critical component of educational systems worldwide, especially in the wake of the COVID-19 pandemic. In the Philippine context, Apales [7] provides an in-depth analysis of how the education sector has undergone significant digital shifts as a response to pandemic-induced disruptions. The study outlines how online learning platforms, virtual classrooms, and digital assessment tools became central to instruction delivery. However, these developments also exposed longstanding issues such as unequal access to internet connectivity, digital devices, and technical support among students and teachers, particularly in rural areas. Educators cited the lack of infrastructure and insufficient training as key barriers to effective technology integration. The paper further highlights the importance of aligning curriculum content with digital competencies

and calls for sustained professional development to enhance educators' ability to navigate digital tools. Apales advocates for a multifaceted strategy that includes infrastructure enhancement, teacher upskilling, student engagement, and institutional support to ensure the sustainability of digital transformation in education. These insights underscore the need for systemic reform that goes beyond temporary pandemic responses and seeks long-term improvements in digital education delivery.

Strategic digital investments can improve school operations and enhance student digital readiness, but their success is hindered by several barriers. Bucăţa [8] argues that addressing the diverse needs of stakeholders, including students, teachers, administrators, and parents, is crucial for successful digital transformation. This requires inclusive planning to accommodate varying expectations and access to resources. Additionally, institutional resistance to change, fueled by traditional methods and staff reluctance, can be overcome only through strong leadership and effective change management. Moreover, rigid organizational structures limit the flexibility needed for transformation, undermining the potential of digital investments. Supporting these claims, Feng et al. [9] highlight that successful e-learning adoption relies on technological readiness, institutional support, and faculty attitudes, with training programs being key to overcoming resistance. Voogt et al. [10] emphasize the importance of professional development, supportive leadership, and teacher involvement in ICT integration, further reinforcing that addressing these challenges is critical for the effective use of technology in education. Therefore, overcoming these barriers is essential for maximizing the impact of digital investments in education.

Rozhkova [11] posits that educational institutions should formulate comprehensive plans that integrate technical requirements with pedagogical approaches, specifically addressing

the prevalent issue of insufficient digital skills among both teaching staff and students. Researchers concur that achieving digital excellence in educational institutions necessitates complete system restructuring alongside tailored solutions for stakeholders, aligning with international educational technology standards to cultivate future-ready organizations.

Nevertheless, these foreign studies provide valuable insights into the general benefits and challenges of digitization. However, there is a limited focus on the specific nuances and implementation outcomes within the unique socio-economic and cultural contexts of developing nations like the Philippines, which this study intends to address.

The integration of technology in Philippine education faces challenges due to a lack of national policy and infrastructure, yet the pandemic has highlighted its potential benefits, as noted by Espinosa et al [10]. The effective utilization of EdTech can enhance learning experiences, mitigate educational inequities, and support teacher training. However, obstacles such as digital divides and inadequate resources persist. The study emphasizes that substantial public investment and a coordinated strategy are essential for establishing an ICT-ready educational environment for technology to be truly impactful.

As mentioned in the study by Grepon et al. [11], similar to other organizations, schools and universities require efficient systems for processes including data processing, report generation, and admissions. Currently, many organizations are adopting computer-based solutions to manage these procedures, particularly for transactions involving students and schools. The School Management Information solution (SMIS) was developed for a community college in northern Mindanao to address the complexity of these tasks and the absence of an automated system. This system aimed to resolve the difficulties associated with managing student information manually. The study's findings indicated the system's

functionality and significant improvement of the transaction process, benefiting teachers and staff through its high quality, reliability, and usability.

However, the current local research offers a fundamental comprehension of the advantages and disadvantages of technology integration. However, further research is required to investigate the long-term effects of these systems on student learning outcomes and teacher effectiveness in a variety of educational environments in the Philippines, which extends beyond administrative efficiency. This research is designed to address this gap.

Sentimental / Feedback Analysis

As stated in the study by Sri Kotha et al. [12], the implementation of Sentiment Analysis (SA) in education offers significant advantages, including the capacity to process large volumes of feedback beyond manual capabilities. Educators and administrators can promptly address emerging issues by monitoring student sentiments in real time. The analysis of sentiment patterns can inform the personalization of course design and learning pathways to better align with student preferences. Data-driven insights from SA also inform strategic decisions in curriculum development and resource allocation. Overall, the integration of sentiment analysis into educational feedback systems enhances the quality of instruction and fosters a more engaging and responsive learning environment.

Shaik et al. [13] concurs, asserting that student feedback is a crucial tool for evaluating and improving educational systems, encompassing learning management systems, course content, and instructional methods. Educational institutions typically gather feedback through surveys incorporating both quantitative data (e.g., ratings) and qualitative data (e.g., written comments). While quantitative data provides statistical insights, qualitative data offers a deeper understanding of student opinions. Natural Language Processing

(NLP) techniques, such as feature extraction, can analyze this understanding. Sentiment analysis categorizes student feedback into emotional tags (e.g., positive, negative, or neutral), with the extent of analysis depending on the application's specific needs. Artificial Intelligence (AI) methodologies, including deep learning and machine learning, automate the analysis of extensive student comments, thereby increasing the efficiency and accuracy of comprehending student sentiments and overcoming the limitations of manual labeling.

This study aims to investigate the specific application and effectiveness of sentiment analysis techniques within the Philippine educational context, taking into account the linguistic diversity and unique cultural expressions of feedback, despite the recognized benefits of sentiment analysis in enhancing teaching and learning. Unfortunately, current research offers limited exploration into these topics.

According to Timotheou et al. [14], global education systems have adopted ICT integration strategies due to the profound transformation of education by digital technologies. However, this shift has raised concerns about the quality of instruction and the system's adaptability to new technology, particularly highlighted during the COVID-19 pandemic. The pandemic revealed the unpreparedness of many schools for the digital age, exacerbating inequality and hindering learning. Consequently, schools are increasingly required to enhance their digital capabilities and readiness for a successful digital transition. A non-systematic literature analysis indicates that ICT integration impacts various facets of school operations and stakeholders beyond student achievement. The review identifies interconnected factors influencing digital transformation, emphasizing the importance of considering these issues to foster successful and efficient change in educational settings.

Digital transformation in school operations is increasingly influenced by emerging technologies like sentiment analysis.put here. Dervenis et al. [15] conducted a comparative study of lexicon-based and machine learning techniques for analyzing student feedback, revealing that while both methods offer valuable insights, machine learning approaches generally yield higher accuracy in capturing nuanced sentiments. Their work underscores the potential of sentiment analysis to enhance educational evaluation by systematically interpreting student opinions. Gkotsis et al. [16] further illustrate the reliability of sentiment analysis in detecting trends in large-scale online platforms, suggesting its adaptability to feedback-rich educational environments. While these studies demonstrate the potential of sentiment analysis in educational contexts, they primarily focus on broad applications and lack specific examination within the operational context of school service systems, particularly in elementary school settings like Burol Elementary School, which this study intends to explore.

Even though this foreign literature offers a general understanding of the effects of digital technologies, it does not specifically examine how these global trends and challenges manifest and are being addressed within the Philippine education system's particular policy frameworks and resource constraints. This study attempts to fill that gap.

Major developments in the Philippine educational system include the introduction of the K–12 curriculum and the more recent integration of digital learning tools. Driven by global technological advancements and the demands of modern education, the nation has embraced digital technologies such as learning management systems, virtual classrooms, and e-learning platforms to improve accessibility and quality. The Department of Education, in collaboration with the private sector and non-governmental organizations,

has spearheaded efforts to build infrastructure, integrate digital learning into curricula, and enhance digital literacy among teachers and students. Nevertheless, challenges such as limited device access, connectivity issues, and the digital divide between urban and rural areas persist. Despite these obstacles, the Philippines remains committed to developing an inclusive, forward-thinking educational system through ongoing policy adaptation, improved teacher preparation, and investments in sustainable digital infrastructure [17].

In the Philippines, the shift toward digital transformation in schools reflects a growing need for more efficient operations and responsive communication channels. Caratiquit [18] demonstrated the effectiveness of a web-based school information and publication system in reducing administrative workload and enhancing stakeholder engagement through accessible and timely information sharing. Supporting this, Abelito and Baradillo [19] explored the use of sentiment analysis to assess student feedback on online classes. Their findings indicated that sentiment analysis can provide valuable insights into student experiences, particularly regarding teaching performance, and has the potential to improve feedback collection and analysis in educational settings. While their study did not focus extensively on sentiment analysis, it highlighted the growing interest in using such tools to enhance educational practices. These studies collectively emphasize the promise of sentiment analysis and digital systems in transforming school operations and improving stakeholder engagement. This study aims to build on these findings by exploring how sentiment analysis can be effectively applied within Burol Elementary School, offering new insights into service delivery and decision-making in an elementary school context.

While local literature describes national efforts and current challenges in digital learning adoption, there is a need for more focused research on the effectiveness of specific digital

learning interventions and policies in improving learning outcomes and reducing educational disparities across different regions and socioeconomic groups in the Philippines, which this study will investigate.

Koufakou [20] applied deep learning models, including BERT and RoBERTa, to analyze sentiment in educational feedback, demonstrating how these models could classify sentiments (positive, negative, neutral) and extract key themes such as teaching quality and student engagement. This approach offers valuable insights for educational institutions to enhance services based on student feedback. Similarly, Mamidted and Maulana [21] conducted sentiment analysis on student feedback regarding online teaching performance at a Philippine university. By using Orange text mining software, they categorized sentiments to assess teaching effectiveness, highlighting the potential of sentiment analysis in evaluating and improving educational services. Although these studies emphasize sentiment analysis in broader educational contexts, there remains a gap in research on applying sentiment analysis specifically to improve the operational efficiency and stakeholder satisfaction within elementary school service systems. This study seeks to address that gap.

Olipas [22] conducted a sentiment analysis on the acceptance of Radio Frequency Identification (RFID) technology-based solutions among schools in Nueva Ecija, Philippines. The study utilized open-ended questions to gauge sentiments from school administrators and teachers, revealing predominantly favorable responses toward the implementation of RFID systems. This indicates a positive reception towards technological advancements in educational settings. Similarly, Castor [23] developed an NLP-based

decision support system for Public Utility Vehicle (PUV) management, focusing on enhancing services through passenger feedback analysis.

The system digitized the feedback process and employed Natural Language Processing techniques to provide actionable insights for PUV operators, aiming to improve service quality. While these studies highlight the application of sentiment analysis in educational and transportation contexts, they focus on broader applications. There remains a gap in research specifically examining how sentiment analysis can be applied to improve the operational efficiency and stakeholder satisfaction within elementary school service systems, a gap this study seeks to address.

Sentiment analysis has emerged as a powerful tool in educational institutions for interpreting qualitative feedback from stakeholders. In their study, Omas-as and Encarnacion [24] explored the use of sentiment analysis within a proposed unified feedback management system designed to improve institutional assessment. The system leverages natural language processing (NLP) techniques to analyze textual responses from students, parents, and staff, automatically classifying sentiments as positive, neutral, or negative. This automated interpretation enables administrators to gain insights into stakeholder satisfaction and concerns in real time.

The researchers emphasize that manual feedback evaluation is time-consuming and often inconsistent, whereas sentiment analysis provides a scalable and objective way to identify trends and emotional tones in large datasets. By applying sentiment scoring and classification, the system can support data-driven decisions and prompt timely interventions in response to negative feedback. The study demonstrates how sentiment analysis can enhance institutional responsiveness, ensure continuous quality improvement,

and align feedback processes with quality assurance standards such as ISO 9001. Thus, integrating sentiment analysis in educational feedback systems can significantly improve the effectiveness of monitoring service quality and stakeholder engagement.

Synthesis

This literature review synthesizes research on two major themes: the role of digitization in education and the application of sentiment analysis within school service systems. In the context of the global push for digital transformation in education, accelerated by the COVID-19 pandemic, challenges such as unequal access to technology remain, particularly in developing countries like the Philippines. At the same time, sentiment analysis is emerging as a powerful tool for analyzing student feedback in real-time, offering the potential to enhance school service systems. This review explores the intersection of these two themes, with a focus on their application at Burol Elementary School in the Philippines, and their potential to improve both educational services and learning outcomes.

The first key theme in this review is digitization in education. As global trends indicate, the digital transformation of education is essential for improving operational efficiency and teaching effectiveness (Apales [7], Bucăţa [8]). However, in the Philippine context, significant barriers such as the digital divide and institutional resistance to technology integration remain prevalent. Espinosa et al. [10] emphasize that, despite the availability of digital tools, many rural schools still lack the infrastructure necessary to fully leverage these technologies. Furthermore, Rozhkova [11] argues that successful digital transformation requires not only the integration of technology but also comprehensive teacher training and curriculum adaptation. Bucăţa [8] further suggests that digital systems must be designed to meet the diverse needs of all stakeholders—teachers, students, and

parents—to ensure equitable access and meaningful learning experiences. In conclusion, while digitization holds great promise for improving educational practices, overcoming infrastructure and socio-economic challenges is crucial for its successful implementation, particularly in rural schools like Burol Elementary.

The second theme explored is the use of sentiment analysis in education, which has shown promise in enhancing the understanding of student experiences through real-time feedback. Researchers such as Sri Kotha et al. [12] and Shaik et al. [13] highlight the value of sentiment analysis in analyzing open-ended student feedback, allowing educators to adjust teaching strategies promptly. Sentiment analysis can also help administrators understand student satisfaction with various services, such as school facilities and extracurricular programs, which is essential for continuous improvement. However, Dervenis et al. [15] and Gkotsis et al. [16] note that while sentiment analysis is widely used in higher education, its application in elementary schools remains underexplored. They argue that sentiment analysis must be adapted to the socio-economic and technological contexts specific to these schools. The synthesis of these findings demonstrates that sentiment analysis has significant potential for enhancing educational outcomes by providing actionable insights into student sentiment. Still, further research is needed to tailor this tool to younger students and rural school settings like Burol Elementary School.

In conclusion, this literature review highlights the critical role of digitization and sentiment analysis in modernizing school service systems and improving educational outcomes. While digital tools offer significant potential for enhancing operational efficiency, challenges such as unequal access and resistance to change must be addressed to achieve successful integration. At the same time, sentiment analysis presents a promising

opportunity for improving feedback mechanisms, allowing schools to respond quickly to student needs and concerns. However, the application of sentiment analysis in elementary schools, particularly in the Philippine context, remains an underexplored area of research. This review sets the stage for further investigation into how these technologies can be effectively integrated into the service systems of Burol Elementary School, with the aim of filling these gaps and contributing to more inclusive, data-driven educational practices.

CHAPTER lll

METHODOLOGY

This chapter presents the methods, processes, and procedures used in the conduct of the study and the development of the web-based service and feedback form system. It outlines the research design, locale, population, sampling technique, instruments, validation procedures, and the methodology followed in software development. It also includes discussions on data analysis, system modeling, design elements, technical specifications, and ethical considerations.

Research Design

The study adopted a descriptive research design that incorporates both qualitative and quantitative methods to thoroughly analyze the BESIMS: Burol Elementary School

Information Management System with Sentimental Analysis of Burol Elementary School. This digital system was built to improved the school service and feedbacking processing for teachers, administrative staff, and other stakeholders. According to Qualtrics [25], descriptive research design uses a range of both qualitative research and quantitative data to gather information to make accurate predictions about a particular problem or hypothesis. It is suitable for examining behaviors, conditions or patterns without manipulating variables. Siedlecki [26] states that the purpose of this descriptive study is to describe individuals, events or conditions by studying them as they are in nature.

The researcher does not need to manipulate any of the variables but rather only describes the sample and / or the variables. This study look at the characteristics of a population; identify problems that exist within a unit, an organization, or a population; or look at variations in characteristics or practices between institutions or even countries making it an effective method for observing and documenting the effects of the BESIMS: Burol Elementary School Information Management System with Sentimental Analysis on Burol Elementary School.

The study used a descriptive mixed-method approach to achieve a thorough knowledge of the system's effectiveness. Quantitative data will be obtained via structured surveys administered to the participants utilizing the system, capturing numerical information on transaction durations, user satisfaction metrics, and the reduction in in-person visits with school personnel and educators, providing insights into the system's strengths, weaknesses, and opportunities for enhancement.

As stated by Creswell [27], mixed methods strategically integrates or combines rigorous quantitative and qualitative research methods to draw on the strengths of each. Mixed

method approaches allow researchers to use a diversity of methods, combining inductive and deductive thinking, and offsetting limitations of exclusively quantitative and qualitative research through a complementary approach that maximizes strengths of each data type and facilitates a more comprehensive understanding of health issues and potential resolutions. This strategy will allow researchers to obtain a comprehensive perspective by integrating statistical analysis with human experiences and perceptions.

The study will include structured questionnaires, interviews, and observational techniques for data collecting. Surveys assessed clients' satisfaction, usability, and overall experience with the digital system. Interviews with school administrators, teachers, and staff will give qualitative data on their administrative experiences, issues they faced, and viewpoints on the advantages of digitization. Observational data will be collected during the system's implementation and first use phases, allowing the researchers to obtain more information into users. interactions with the platform, and to suggest potential areas for improvement.

Quantitative survey data will be analyzed using descriptive statistics to examine improvements in user satisfaction and service efficiency, whereas qualitative data from interviews and observations were thematically coded to uncover recurring themes such as ease of use, transparency, and accessibility. This mix of quantitative and qualitative data is consistent with the study's aims, allowing for a thorough evaluation of the BESIMS: Burol Elementary School Information Management System using Sentimental Analysis at Burol Elementary School.

In utilizing this descriptive mixed-method approach, the study aims to provide a thorough understanding of how the BESIMS: Burol Elementary School Information Management System with Sentimental Analysis affects Burol Elementary School's service efficiency,

increases user satisfaction, and contributes to the institution's modernized academic service.

Research Locale

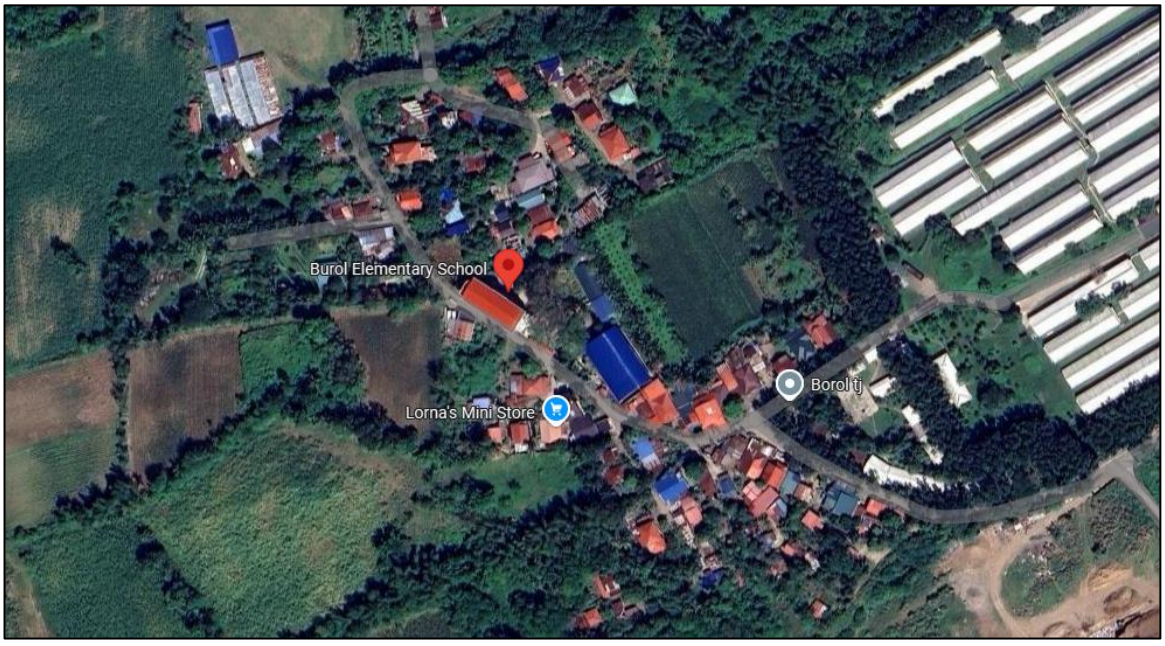


Figure 3-1. Burol Elementary School

The research was conducted at Burol Elementary School, located in Calamba City, Laguna. This public school served as the primary setting for data collection, user interaction, system

evaluation, and deployment. The locale was selected due to its accessibility to the researchers and its willingness to serve as a client for the system. The school's need for an organized and automated feedback mechanism for teachers and staff made it an appropriate site for the study.

Population Of The Study

The population involved in the study included personnel from Burol Elementary School, particularly the teachers and staff who are responsible for giving and receiving feedback. These individuals were chosen because they represent the end users of the system. Their participation was essential for gathering requirements, validating system features, and assessing usability. Their ideas and experiences helped the researchers understand the problems and improve the system based on actual needs.

- **Teachers**: As they know what happens inside the classroom and how feedback can support better learning and teaching. They also communicate with other staff and the school head. Because of this, they can help improve how feedback is shared and received in the school.
- **Non – Teaching Personnels**: This includes those who assist in daily schoolwork such as record keeping, filing documents, and helping with other school services. They are involved in work that also needs clear communication. They were included in the population to make sure their voices and needs were also heard.
- **School Head**: They help make decisions in the school. Their opinions were important to make sure the feedback system follows school rules and supports better work among the staff and teachers.

This set of individuals provides insight into how the digital BESIMS: Burol Elementary School Information Management System with Sentimental Analysis can improve service delivery by addressing the concerns of those in charge of managing important documents, and information and communicating with their clients on a regular basis. These respondents were chosen to represent the most relevant positions touched by the BESIMS: Burol Elementary School Information Management System with sentimental analysis and to offer a thorough assessment of its influence on school operations.

Sampling Design

This researchers utilized purposive sampling as the most appropriate sample method. This non-probability method allows researchers to select specific individuals who have in-depth knowledge and direct involvement with the BESIMS: Burol Elementary School Information Management. The study includes key personnel involved in document processing and administrative tasks.

Purposive sampling is optimal for identifying individuals whose roles and perspectives offer a thorough comprehension of the system's operation and effects. This study concentrates on these participants to obtain critical insights on system efficiency, user happiness, and administrative enhancements, hence facilitating pertinent and targeted data collecting to meet the study's objectives. This sampling approach enables a thorough assessment of the system's efficacy in improving local government operations, yielding actionable insights for prospective enhancements.

Type of Participants	Number of Participants
School Head	1

Teachers Non – Teaching Personnels	13 7
Total	**17**

Table 3-1. Respondents of the Study

The table shows the respondents of the study. The study's population consists of personnel involved in document processing and administrative function of Burol Elementary School. The participants include administrative staff, teachers, support staff, totaling 17 individuals.

Instruments of the Study

To evaluate the implementation and efficacy of the BESIMS: Burol Elementary School Information Management System utilizing Sentimental Analysis at Burol Elementary School, the researchers created a survey questionnaire that includes multiple research instruments. The study aimed to collect comprehensive information from school administrators, personnel, and teachers engaged in the BESIMS: Burol Elementary School Information Management System.

The research instruments comprised a structured questionnaire focusing on essential aspects: the efficacy of the BESIMS: Burol Elementary School Information Management System through sentiment analysis, user happiness, and the obstacles encountered in the shift from manual to digital processes. This approach allowed the researchers to obtain both quantitative data on processing times and qualitative insights regarding system usability and service impact.

In addition, a custom-designed questionnaire was used to collect particular input on the system's operation. This includes the system's accessibility and reliability, as well as the perceived improvement in school services as a result of the upgrade. These findings contribute to a more comprehensive assessment of the system's influence on administrative efficiency and satisfaction with the system.

Validation of the Instrument

In order to establish the validity of the study instrument, the researchers will use a rigorous validation approach. First, the questionnaire will be examined by the research adviser and other faculty members from Calamba City College's Department of Computing and Informatics. These individuals contributed useful views and criticism based on their knowledge of digital systems and educational service applications.

In addition, the researchers will engage with a statistician to calibrate the questionnaire's form and confirm that it met statistical data gathering requirements. The statistician's participation will be critical in ensuring that the questions were clear, unbiased, and capable of yielding accurate data for quantitative analysis.

After obtaining suggestions from these professionals, the researchers will carefully review and incorporate the ideas to improve the questionnaire's substance and clarity. This procedure will enable the researchers to address any potential flaws and increase the instrument's performance in gathering useful data on the BESIMS: Burol Elementary School Information Management System with Sentimental Analysis for Burol Elementary School. Once the necessary revisions have been completed, the questionnaire will be ready for data collection.

Data Analysis

In the data analysis plan, researchers evaluated and interpreted the acquired data to determine the efficiency of the BESIMS: Burol Elementary School Information Management System with Sentimental Analysis for Burol Elementary School. To obtain a thorough grasp of the interview and survey results, both qualitative and quantitative methodologies were used.

OBJECTIVES	PROCEDURE	SOURCE OF DATA	STATISTICAL ANALYSIS
1. To develop a BESIMS: Burol Elementary School Information Management that incorporates real-time data collection, centralized data storage, and interactive dashboards for improved accessibility	Interview	Interview Transcripts	Qualititative
2. To optimize data processing and feedback management workflows to ensure timely and accurate evaluation of school services	Interview, and System Usage Data	Interview Transcripts, and System Logs	Qualitative and Quantitative
3. To evaluate the system's effectiveness using real-time	Survey	Survey Responses	Quantitative

data access by measuring its usability based on ISO 25010:2023 standards in terms of: • 3.1 User – Friendliness • 3.2 Maintainability • 3.3 Reliability • 3.4 Security			

Table 3-2. Data Analysis Plan of the Study

Table 3-2 presents the objectives of the study, which will guide the researchers in achieving the study's goals and gaining deeper understanding of the research topic. Through the use of interviews, questionnnaires, and system usage data, researchers were able to gather valuable insights that supported the development of an effective and efficient BESIMS: Burol Elementary School Information Management System with Sentiment Analysis for Burol Elementary School. This systematic approach allowed the researchers too assess the system's impact on service delivery, user satisfaction, and the overall efficiency of school operations.

Statistical Treatment of Data

This section will offer a methodical approach to the analysis and interpretation of the data collected in order to evaluate the BESIMS: Burol Elementary School Information

Management System of Burol Elementary School through Sentimental Analysis. The primary instrument in this study was a Likert scale, which was chosen for its simplicity and efficacy in measuring opinion strength. This made it an ideal choice for capturing the users' perceptions and satisfaction with the system. The researchers employ a five-point Likert scale to derive meaningful insights from the data and contribute to the existing body of knowledge.

Weighted Mean

The weighted mean method was used to calculate the average of the responses, assigning different weights according to their level of importance. This method enabled a more accurate evaluation of user satisfaction, providing deeper insights into feedback on system efficiency and usability. By focusing on these responses, the researchers can gain a clearer understanding of user suggestions, which will support the refinement and improvement of system functions.

Formula for the Weighted Mean:

$$\text{Weighted Mean} = \frac{\sum_{i=1}^{n} Xi\, Wi}{\sum_{i=1}^{n} Wi}$$

Where:

n = total number of respondents

X_i = computed mean values of responses

W_i = weights assigned to each level of response

4-Point Likert Scale

The Likert scale was employed by the researchers to interpret the questionnaire results, which were categorized into the following numerical values and descriptive ratings:

Rating	Weighted Mean Range	Descriptive Value
4	3.26 – 4.00	Excellent
3	2.51 – 3.25	Very Satisfactory
2	1.76 – 2.50	Satisfactory
1	1.00 – 1.75	Poor

Table 3-3. Interpretation of Likert Scale

This table acts as the foundation for the interpretation of the weighted mean calculation, enabling researchers to ascertain the equivalent descriptive value for the responses collected in the study. This scale allows for systematic analysis of user feedback, assisting in analyzing the system's influence on service delivery and identifying areas for improvement.

Software Development Methodology

The researchers utilized Agile Development techniques for developing the "BESIMS: Burol Elementary School Information Management System with Sentiment Analysis for Burol Elementary School." This method was chosen due to its iterative and flexible approach, which allows for continuous feedback and adaptation throughout the development process. Agile promotes collaboration between developers and stakeholders, enabling the team to refine features based on user input and evolving requirements.

As Nguyen [28] explains, Agile's strength lies in its ability to deliver functional software quickly while accommodating changes even in the later stages of development. For this study, Agile facilitated the incremental delivery of system features—such as sentiment analysis integration and digital feedback tools—ensuring that the evolving needs of Burol Elementary School were continuously addressed.

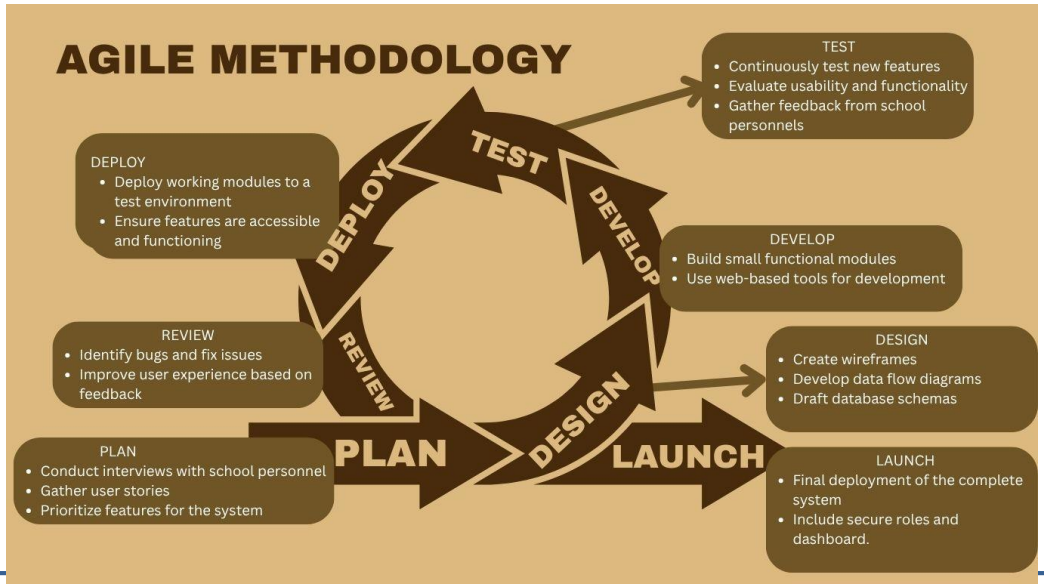


Figure 3-2. Agile Model

Phase 1: Requirements Planning

During the initial planning sprint, the team conducted interviews with school personnel to gather user stories and prioritize system features. These features included secure user roles, intuitive form navigation, multilingual support, and a summarized dashboard for viewing feedback responses. These priorities were added to the product backlog and refined through regular discussions.

In each development sprint, the team worked on small functional modules, beginning with the core components such as user authentication and feedback submission. These features were iteratively designed, developed using web-based tools, and quickly deployed to a test environment. The system was evaluated continuously by school representatives who provided feedback after each sprint.

Phase 1.1: Hardware and Software Requirements

Hardware Specifications

Table 3-4 presents the minimum hardware requirements necessary for the effective operation of the BESIMS: Burol Elementary School Information Management System . The system requires a dedicated server—either cloud-based (e.g., Hostinger) or locally hosted—to run the application and manage the database. To support efficient storage of student records, sentiment feedback, and routine system backups, at least 256 GB of HDD storage is needed. The system must also be accessible via various end-user devices, including smartphones, tablets, desktop computers, and laptops, to accommodate user interaction through both web and mobile browsers. Furthermore, a stable internet connection with a minimum speed of 50 Mbps, whether through Wi-Fi or LAN, is crucial

to ensure smooth access and real-time data transmission. Collectively, these hardware components are critical to maintaining the system's functionality, accessibility, and overall performance

Table 3-4. Minimum Hardware Requirements and specifications to Run the System

Components	Specifications	Purpose
Server	Cloud – based (hostinger) or local server	Hosting the database and the system
Storage	Minimum 256 GB HDD	Storing students records, feedback data, and backups.
End – User Devices	Smartphones, tablets, desktops, and PCs.	Acessing the system via web / mobile
Networking	Stable Internet Connection (Wifi, LAN – minimum 2 Mbps)	Ensuring seamless data access.

Software Specifications

Table 3-5 outlines the minimum software requirements and specifications necessary to operate the BESIMS: Burol Elementary School Information Management System with Sentiment Analysis. The system is designed to run on a Windows Server operating system, providing a stable environment for hosting enterprise-level applications. For data management, it utilizes a MySQL Server as the database platform, ensuring efficient handling of student information and sentiment data. The application is developed using the PHP framework, known for its compatibility with web-based systems and ease

of integration. Hosting can be implemented through a local server, offering greater control and security over system operations.

In terms of system protection, the software must support essential security measures including role-based access control, data encryption, and multi-factor authentication, all of which help safeguard user data and ensure secure access to the platform. These software components collectively contribute to the reliability, security, and efficiency of the system.

Table 3-5. Minimum Software Requirements and specifications to run the System

Components	Options
Operating System (OS)	Windows Server
Database	MySQL Server
Development Framework	PHP
Hosting	Local host server
Security	Role – based Access, Encyption and Multi – factor Authentication

Phase 2: User Design

Design and analysis were not confined to a single phase. Instead, wireframes, data flow diagrams, and database schemas evolved as requirements became clearer through user interactions. Flexibility was maintained to adapt to changes or enhancements suggested during each review session.

Phase 2.1: System Design

A data flow diagram is visual depiction of the complete research process, providing the fundamental structure upon which the proposed system is constructed.

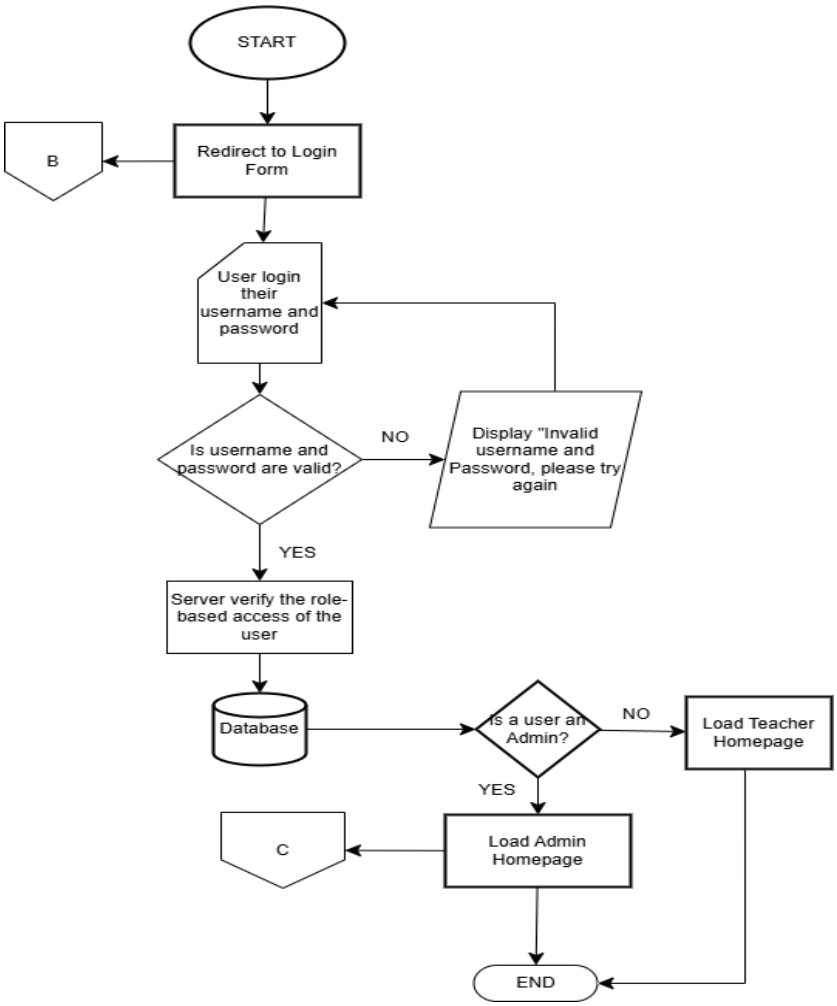


Figure 3-4. System Flowchart : Page 1 Login Form

Figure 3-4 presents the login process flow for the system.It demonstrates how the system authenticates and authorizes users based on their credentials and roles. When a user inputs a username and password, the system validates the data. If incorrect, an error message—

"Invalid username or password, please try again"—is shown. Upon successful validation, the server checks the user's role through role-based access control and interacts with the database. Depending on the verified role, the system either loads the admin homepage and connects to Page C or directs the user to the teacher homepage. This ensures secure and role-specific access to the system's functions.

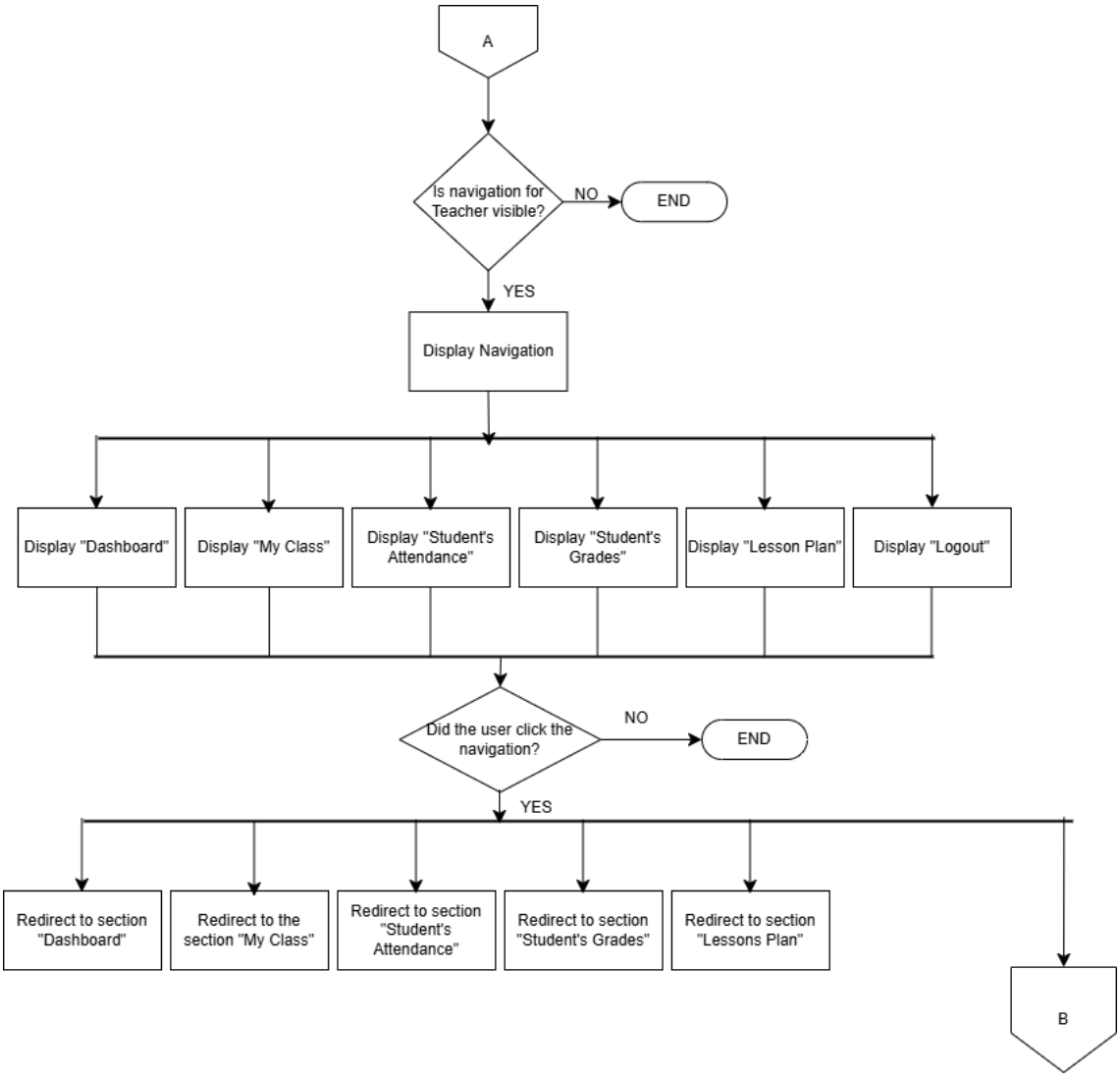


Figure 3-5. System Flowchart : Page 2 Login Form

Figure 3-5 presents the login form, the page 2 and continuation of the flowchart 1. This flowchart demonstrates the navigation tabs of the website. This part process and navigate to the section. When they click particularly section it process and be interpreted in flowchart B.

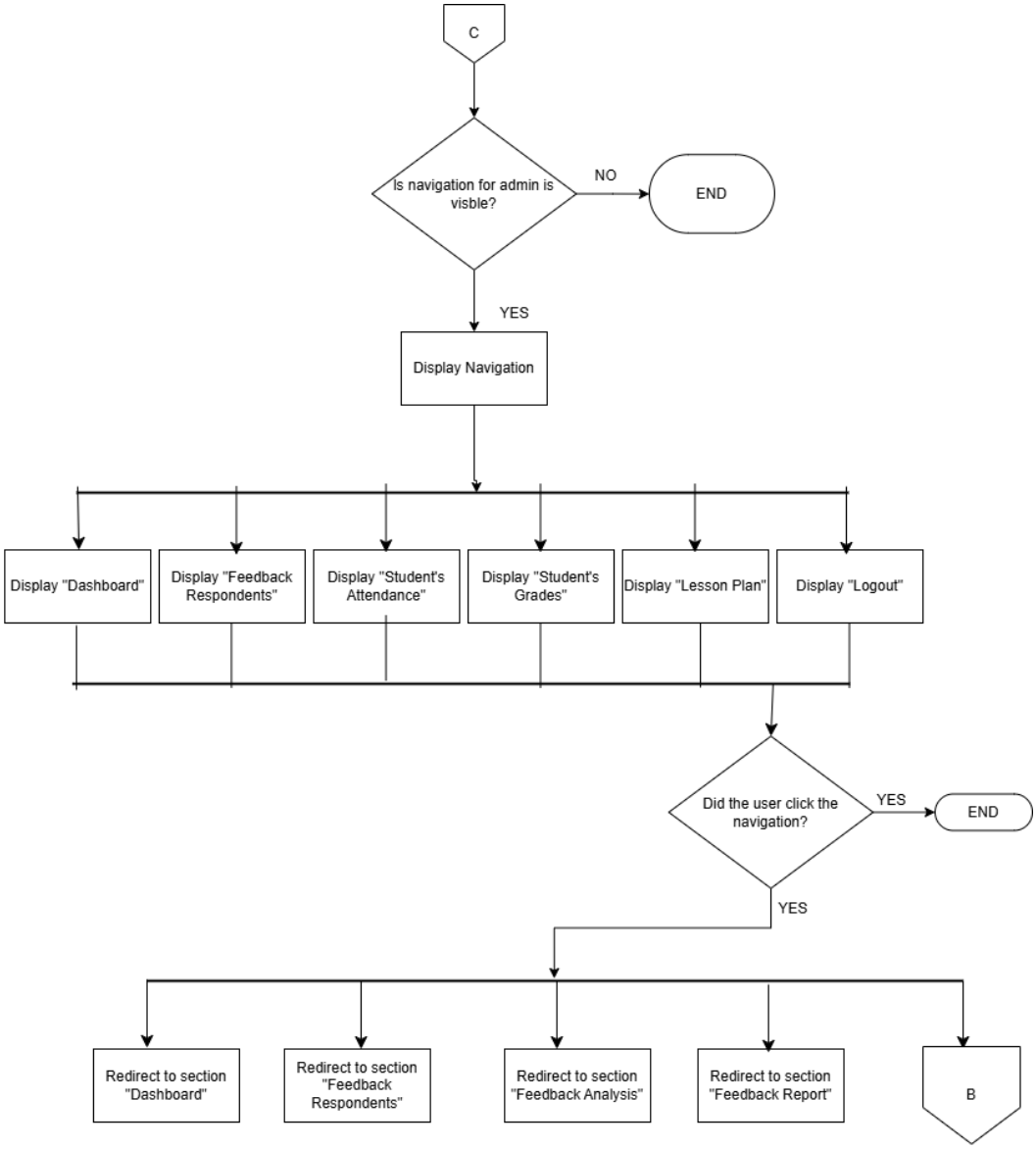


Figure 3-6. System Flowchart : Page 3 Login Form

Figure 3-5 highlights the structured layout and functionality of the login form's page 5, emphasizing the system’s navigational flow. This page showcases essential sections such as Dashboard, Feedback Respondents, Student Attendance, Student Grades, Lesson Plan, and Logout. Each section serves a specific purpose in supporting user access to school service features. Additionally, the interface includes options that allow users to redirect to

their desired section upon clicking. Once a selection is made, the process continues and transitions to the next part of the flow, as illustrated in Page Connector B.

Figure 3-7. System Flowchart :Feedback form

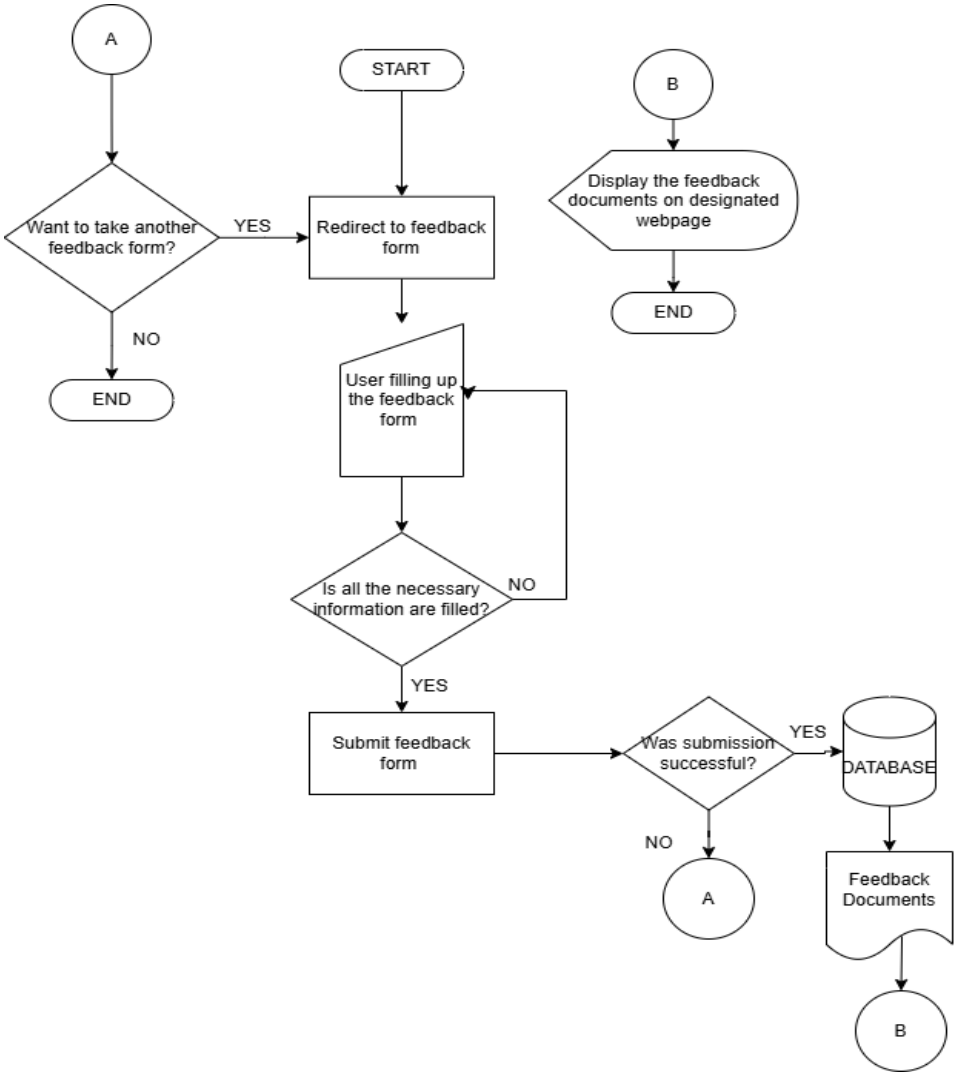


Figure 3-7 illustrates the system flowchart for the feedback form, emphasizing both user interaction and data processing. The diagram showcases a circular decision point labeled "A," which prompts users to indicate whether they want to submit another feedback entry.

If they choose to do so, they are redirected back to the feedback form. The flow continues with user interaction as they complete the form, leading to another circular point labeled "B." At this stage, the submitted feedback is displayed on the designated web page. If the submission is successful, the feedback is stored in the database and generates official feedback documents.

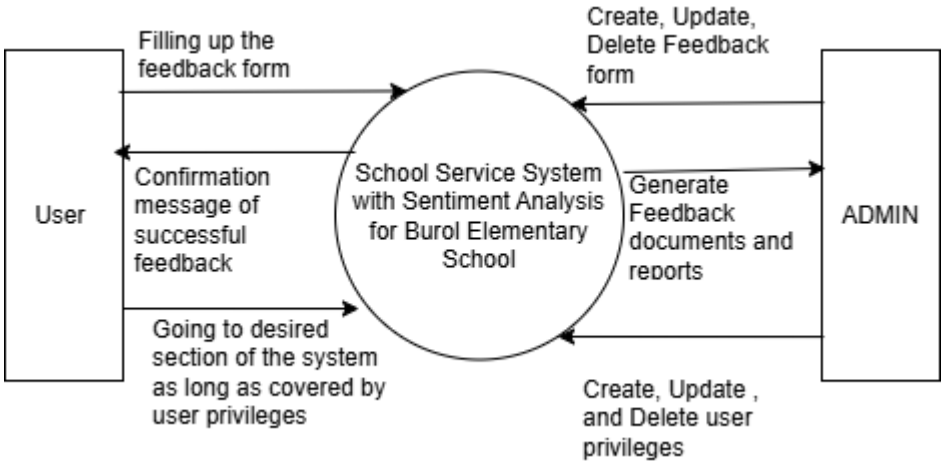


Figure 3-8. Data Flow Diagram

Figure 3-8 illustrates the basic flow of interactions within the primary entities, the user and admin, and the BESIMS: Burol Elementary School Information Management System with Sentiment Analysis for Burol Elementary School. This includes the functions that users and admin can perform within the system

Phase 2.2: User Interface and Functions

This phase presents the system's graphical user interface along with its primary functionalities. The researchers implemented an intuitive and user-centered design to facilitate seamless navigation and effective system utilization.

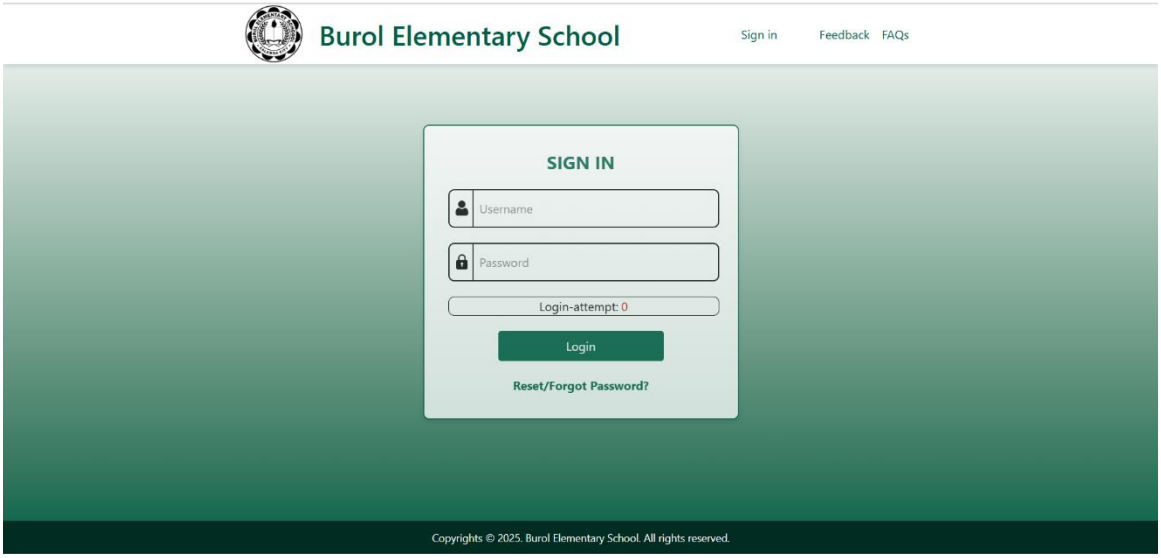


Figure 3-9. Sign-in Page

Figure 3-9 demonstrates the sign-in page, which displays the section where users and administrators can enter their credentials to log in to the system. This interface ensures that only authorized individuals are granted access, maintaining the security and integrity of the system. The design is intended to be user-friendly and straightforward, allowing both users and admins to efficiently authenticate their access.

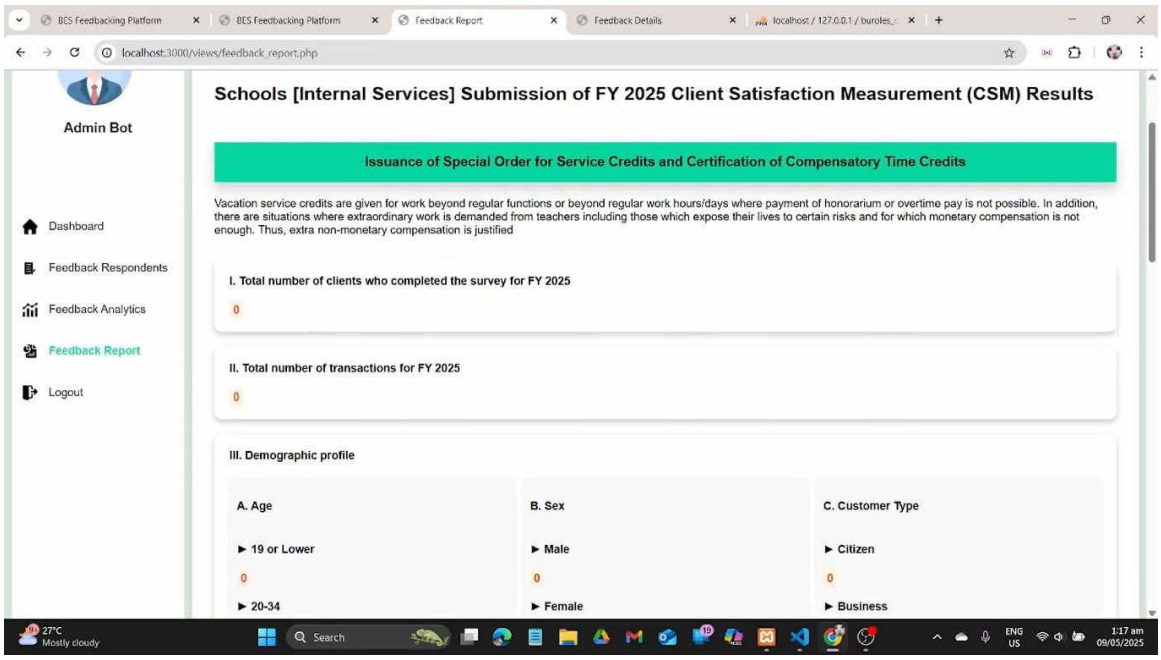


Figure 3-10 Feedback Report

Figure 3-10 showcases the Feedback Report, which is one of the reports used by Burol Elementary School. An example of this is the School [Internal Services] Submission of FY 2025 Client Satisfaction Measurement (CSM) Results. This report includes several key components such as the report header, a description, descriptive analysis based on user input, and a summary of the feedback. These features help the school evaluate client satisfaction and improve its internal services accordingly.

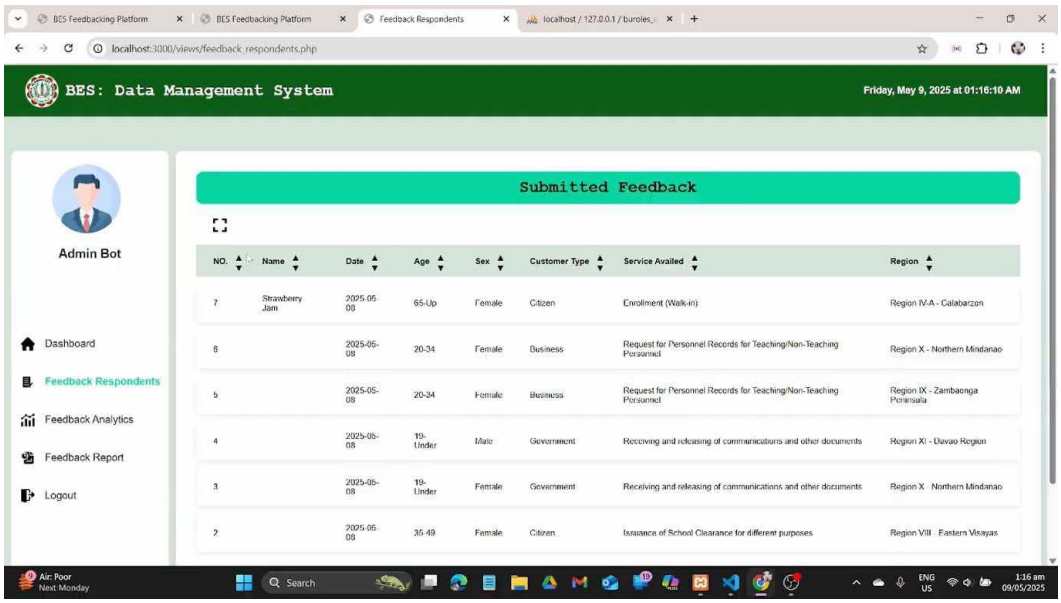


Figure 3-11 Feedback Respondents Page

The Figure 3-11 Feedback Respondents Page showcase the tabulation of the respondents of the feedback system visible only to the admins. The table presents the no. their name, date of submission of feedback age sex customer type service availed and region. As noticeable on the

Phase 3: Development

During the development phase, the researchers applied the Agile Development Methodology, which emphasizes continuous progress through short, manageable sprints. In each sprint, specific system features were developed, tested, and improved based on feedback. To build the user interface, front-end technologies such as HTML, CSS, and JavaScript were used, ensuring that the system was both responsive and user-friendly. Meanwhile, PHP and MySQL were utilized to manage the server-side operations and database functionalities. Throughout this phase, the team collaborated closely through regular meetings, allowing them to quickly address any issues and make adjustments as

needed. As a result, each module was developed effectively and prepared for testing in the next phase.

Phase 4: Testing

Following each sprint, the testing phase was carried out to evaluate the performance and quality of the developed features. In line with Agile principles, testing was performed continuously rather than waiting until the end of the project. To begin with, unit testing was conducted to check each module for errors. This was followed by integration testing to ensure that all components—such as the front-end, back-end, and database—worked together seamlessly. For instance, the feedback submission and sentiment analysis modules were tested thoroughly to confirm their accuracy and reliability. After completing technical tests, User Acceptance Testing (UAT) was conducted with selected staff members from Burol Elementary School. Through their feedback, the team was able to identify and resolve usability issues. In this way, early and regular testing helped ensure the system's overall functionality and user satisfaction.

Phase 5: Deployment

Once the core modules were tested and finalized, the system was ready for deployment. As recommended in Agile methodology, deployment was done incrementally, allowing users to interact with the system while further improvements were still ongoing. The system was hosted on a secure online platform, accessible only to authorized personnel of Burol Elementary School. Through this early deployment, the school was able to begin using the system for managing feedback and data more efficiently. Additionally, the researchers provided orientation and training sessions to guide users on how to operate the

system effectively. Therefore, the deployment phase not only introduced the system to its actual environment but also ensured that users were prepared and supported.

Phase 6: Review

After each sprint and deployment, the review phase was conducted to assess the progress and make necessary adjustments. These reviews allowed the team to gather feedback from users, identify areas of improvement, and plan for the next iteration. For example, after observing how users navigated the feedback forms, the interface was modified to make it more intuitive. Furthermore, regular review meetings helped the team stay aligned with the project goals and user needs. By consistently reviewing and refining the system, the researchers ensured that each version was better than the last and more aligned with the expectations of Burol Elementary School.

Phase 7: Maintainance

The final phase, maintenance, focused on keeping the system operational and responsive to users' evolving needs. Even after deployment, the team remained available to provide technical support and fix any issues that arose during daily use. Feedback collected during this period was used to implement small updates, such as improving report generation and fine-tuning sentiment analysis results. In addition, the system was monitored regularly to ensure security and performance. Through continuous maintenance and user engagement, the researchers ensured that the system remained useful, reliable, and adaptable over time.

System Overview

The feedback system developed in this study was created to serve both teachers and staff of Burol Elementary School. It replaces the manual feedback method and allows users to submit and manage feedback digitally. The system includes a login page for both roles, a

submission form for teachers, and a feedback review panel for staff members. This organized structure allows each user to focus only on the tasks they are responsible for.

The system was created to help improve communication between teachers and staff. It gives teachers a place to submit concerns or suggestions, while staff can respond and record all feedback in a structured way. This removes the need for paper forms, manual encoding, and delays caused by misplaced documents or unclear handwriting.

Teachers can log in using their employee number and other identification, fill out a feedback form, and submit it instantly. The staff can then view all entries, organize them by category, and provide a report of the results. The system also allows responses to be marked as addressed, ensuring that no feedback is missed.

This platform makes the feedback process more efficient and reliable. It helps both internal and external users interact with the school in a clearer and faster way. With easy access, proper security, and simple design, the system supports better communication and improved satisfaction across the school community.

Software Development Process

The development process began with gathering all system requirements based on user interviews. This stage is called requirements modeling. The researchers carefully listed each feature requested by the users, including role-based access, easy login, language selection, feedback categories, and data organization. These requirements served as the basis for the system structure.

In the input and output design phase, the team focused on what data would be entered by the users and how the system would present the results. For example, inputs included

employee numbers, feedback messages, and ratings. Outputs included a feedback list, user summary, and system alerts. These were designed with a clean layout for easier use.

During the data design stage, the researchers planned the structure of the database. They created tables for users, feedback entries, roles, and categories. Each table was connected to ensure smooth flow of data without duplication or confusion. This data structure was tested before starting the system build.

In the development, the researchers wrote the code to bring the planned features into stage a working system. The software specification document was then created to describe the system's function, user roles, system behavior, and response process. This document served as a guide for users and future developers to understand how the system works and how to maintain it properly.

Requirements Modeling Design

The requirements modeling design is the process where the researchers identified and documented the specific needs and expectations of the intended users. This phase began with conducting face to face interviews with teachers and staff of Burol Elementary School. During these interviews, the researchers gathered important information about the current manual feedback collection process and the desired improvements they expected from a computerized system. The goal was to clearly understand what the users wanted the system to accomplish.

Two main roles were defined based on the interview responses. These are the teacher and the staff. The teacher is the one who submits feedback about school services, while the staff is responsible for viewing, managing, and responding to the feedback. The feedback

includes ratings and comments that are organized by category. Teachers also requested that their identity should not be visible to protect their privacy. Staff members asked for a dashboard to easily monitor and sort the feedback entries.

The requirements were organized into functional and non functional categories. Functional requirements included submitting feedback, logging in, managing accounts, sorting responses, and printing reports. Non functional requirements included usability, responsiveness, and security. The researchers created diagrams that represent how users interact with the system. These include data flow diagrams and use case diagrams that show how each role uses the features of the system. These models served as the guide for the next steps in development.

Input and Output Design

The input and output design focused on how users give information to the system and how the system presents results back to them. This part of the process is important to make sure the system is easy to use and that it shows useful information to the users. The main input comes from teachers who answer the feedback form. The form includes fields such as name, position, department, service being reviewed, satisfaction rating, and personal suggestions.

The researchers designed the form to be clear and easy to understand. Required fields are marked and the system checks if users entered valid information before accepting the form. Dropdown lists were used in some fields to make selection quicker and avoid errors. The design also supports devices with different screen sizes, since many teachers use mobile

phones to access the internet. This makes the system more convenient and practical for daily use.

The output part of the system is used by staff. After teachers submit feedback, the staff can view the results in a table format. The entries can be sorted based on date, category, or service. Staff members can search for specific feedback using filters. There is also a summary view that shows total number of feedback entries, most common concerns, and average satisfaction ratings. These outputs help the staff make better decisions. Reports can also be saved or printed for future use.

Data Design

The data design stage is where the researchers organized how data is stored, retrieved, and managed in the system. The structure of the data must support the needs of both teachers and staff. All feedback entries must be stored securely and be easy to access when needed. The researchers created tables in the database to hold important information such as user accounts, feedback entries, roles, service categories, and ratings.

Each record in the feedback table includes a unique identifier, the teacher's input, the category selected, and the date of submission. The account table holds login information and role assignments. All tables were linked through keys to maintain relationships between data. The system uses validation to prevent duplicate entries and to ensure all fields contain complete data. Proper organization of data supports faster searching, sorting, and reporting.

The data design also considered security and privacy. Passwords are stored using a secure method. Only staff accounts are allowed to access the management page of the system. Teachers can only submit feedback and cannot view other responses. This separation

protects the information and prevents unauthorized access. The database is also backed up to avoid data loss in case of technical problems.

Development

Software Specification

The software developed for Burol Elementary School was specified based on a set of functional and non-functional requirements identified during interviews and refined through continuous stakeholder collaboration in Agile sprints. Functionally, the system includes role-based login for teachers and staff, a feedback submission form with rating scales, comment sections, and service categories, as well as a dashboard for staff members to monitor, filter, and manage feedback efficiently. It also includes features for anonymous submissions and report generation, which can be printed or exported for administrative purposes.

In terms of non-functional requirements, the system was designed to be user-friendly, responsive on both desktop and mobile devices, and secure. Security was implemented through encrypted passwords and role-based access control, ensuring that only authorized users could view or manage feedback. To address language inclusivity, the interface supports both English and Tagalog. The system is also modular and maintainable, allowing future developers to update components easily based on changing school needs.

The system was developed using HTML, CSS, and JavaScript for the frontend, PHP for backend processing, and MySQL for the database. It was designed to be web-based, accessible through modern browsers like Google Chrome, and deployable either on a local area network or online, depending on the school's internet availability. Agile project management tools such as Google Docs for documentation, GitHub for version control,

and regular sprint planning and review meetings ensured that all development aligned closely with user feedback and changing requirements.

Hardware Specification

The feedback system does not require advanced hardware to operate. A standard desktop or laptop computer with a minimum of four gigabytes of memory and a basic processor is enough to run the system. These specifications are usually present in most schools, making it easy to implement without purchasing new equipment.

Users will need access to a web browser such as Google Chrome. The system works entirely on a web platform, so there is no need to install any application. A stable internet connection is required to allow users to log in, submit feedback, and view reports. For schools with limited internet, the system can also be used on a local area network.

A display with a normal screen resolution is enough to show all system pages clearly. It was tested on both old and newer monitors to ensure visibility and usability. The system was also designed to be responsive, meaning it adjusts to different screen sizes.

Overall, the hardware requirements are light and practical. The system can be installed on existing school computers without any extra cost. This makes it accessible and easy to implement in any public school setting, including Burol Elementary School.

Ethical Considerations

The researchers will uphold ethical standards to protect participants' rights and ensure that the objectives of the study are fully achieved. To ensure compliance, the team followed the Data Privacy Act of 2012 [29] and the ISO/IEC 25010:2023 standards [30]. Accordingly, formal approval was obtained from the school administrator, and the purpose of the system was clearly communicated to all participants. Moreover, verbal consent was secured before

each interview to promote transparency and informed participation. With regard to data collection, no sensitive personal information was gathered; only names, roles, and feedback were recorded.

These records are securely stored and are accessible only to authorized users with verified login credentials, thereby ensuring the privacy and protection of all participants. Furthermore, the system was designed in accordance with ethical digital practices, including secure access controls and role-based permissions. For example, teachers are permitted to submit feedback but are restricted from viewing others' responses. Lastly, all sources and software utilized in the development process were properly cited, demonstrating the researchers' commitment to academic integrity and respect for intellectual property.

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