Enhancing School Efficiency through an Automated Class Scheduling and Academic Calendar Management System for Senior High and Tertiary Department at St. Clare College

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ABSTRACT

In educational institutions, the creation of class schedules is a complex and critical administrative task. The manual process currently employed at St. Clare College is time-consuming, prone to human error, and often results in conflicts such as double-booking of rooms and instructors, as well as uneven distribution of teaching loads. To address these challenges, this study aimed to develop the Automated Class Scheduling & Calendar Management System, a web-based application designed to streamline the academic scheduling process.

The system was developed using PHP for the backend, MySQL for database management, and JavaScript for dynamic frontend interactions. The core of the system utilizes a Heuristic-based Greedy Algorithm to automate schedule generation. This algorithm employs intelligent sorting strategies, such as grouping subjects by MWF/TTH patterns based on year level, and applies constraint satisfaction techniques to handle teacher preferences, room availability, and conflict detection. A key feature of the algorithm is its Load Balancing heuristic, which prioritizes teachers with the least workload to ensure an equitable distribution of teaching hours.

Testing and evaluation of the system demonstrated that it successfully eliminates 100% of scheduling conflicts and significantly reduces the time required to create the master schedule. The system provides a user-friendly interface that improves data accuracy and operational efficiency. The researchers conclude that the Automated Class Scheduling & Calendar Management System is a viable solution for modernizing the administrative operations of St. Clare College, offering a scalable and efficient alternative to manual scheduling methods.

Keywords: Automated Class Scheduling Schedule Conflict Calendar Management System Efficient alternative

INTRODUCTION

Background of the Study

One of the responsibilities in every school is preparing class schedules. For years, school administrators have done these tasks manually by carefully assigning teachers, classrooms, and subjects. While this method may work, it often leads to mistakes, is stressful to manage, and it often takes a lot of time. Conflicts such as assigning a teacher to two classes at the same time, or scheduling multiple classes in the same room, are common problems that schools experience with manual scheduling.

Studies in educational management describe class scheduling as a constraint satisfaction problem because it involves balancing many factors like teacher availability, room capacity, subject requirements, and student sections (Carter & Laporte, 2020). In St. Clare College, where there are more sections and fewer available resources, this becomes even more difficult.

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Based on the researchers' experiences, one of the problems observed at the start of every semester is that class schedules are not always fully implemented. Even when classes have already begun, adjustments are still being made to fix the issues between conflicts in subjects, teachers, and time. This sometimes continues even weeks after the classes began, disrupting learning and reducing the efficiency of school operations. Preparing schedules manually not only takes a lot of time but also increases the likelihood of errors, especially when there are many sections, limited classrooms, and varying teacher availability to consider.

Aside from class scheduling, other important academic activities such as exam and quiz scheduling, school events, and consultation hours also create conflicts when handled manually. Students often struggle to keep track of exam dates and academic deadlines when they are not aligned with their class schedules. Likewise, events such as seminars, school programs, can be sometimes forgotten by many. Teachers also face challenges in allocating consultation hours for students, since there is no integrated system that connects their availability with the academic timetable.

This study aims to enhance school efficiency by implementing an Automated Class Scheduling System at St. Clare College. Beyond generating conflict-free schedules, the system introduces additional features such as an automated class schedule poster for students to easily view their updated schedules, synchronization of exam and quiz dates into student timetables, event calendar integration, and a consultation hour scheduler that enables students to book appointments with faculty members. With these features, the system seeks not only to solve scheduling conflicts but also to improve communication, accessibility, and overall academic coordination within the institution.

Statement of the Problem

Every school year, St. Clare College faces challenges in preparing class schedules manually. The traditional process is time-consuming, stressful, and prone to errors such as double-booking teachers, assigning multiple classes to the same room, and creating conflicts between subjects and time slots. These issues often continue even after the semester has begun, resulting in frequent adjustments that disrupt classes, reduce school efficiency, and create confusion for both regular and irregular students.

Specific Problems

- Teachers are sometimes scheduled to handle two or more classes at the same time.
- Multiple classes may be assigned to the same classroom, causing conflicts in room usage.
- The manual scheduling process requires significant time and effort from administrators.
- Frequent adjustments are made even after the semester starts, disturbing the smooth flow of classes.
- Both regular and irregular students experience confusion and disruptions due to conflicting schedules and last-minute changes.
- Consultation hours are not properly organized, making it difficult for students to schedule appointments with teachers.
- School events such as seminars, and programs are often forgotten by many

OBJECTIVE OF THE STUDY

General Objective

The primary objective of this study is to design and develop an Automated Class Scheduling System, a system that automates the assignments of classroom, subjects and instructors according to institutional needs and availability at St. Clare College. The system aims to enhance the efficiency of class schedule preparation, reduce the time and effort required in manual scheduling, streamline the process of creating, managing, and organizing class schedules in the institution, and provide a reliable system that ensures the accuracy and accessibility of class schedules for administrators, instructors, and students.

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Specific Objectives:

- Design a system that automates the assigning of classroom, subjects, and instructor schedules.
- Minimize scheduling conflicts such as overlapping classes, double-booked rooms, and instructor unavailability by integrating a validation process during schedule generation.
- Develop a user-friendly interface that allows administrators to easily input, update, and manage class information, while also enabling instructors and students to conveniently view their assigned schedule.
- Provide an automated class schedule poster feature to give students quick and reliable access to updated schedules.
- Synchronize major exam dates with student schedules to improve academic coordination.
- Integrate an event calendar that merges school activities such as sports fests, and seminars.
- Include a consultation hour scheduler to allow students to book appointments with teachers.
- Provide real-time updates of schedule adjustments to avoid miscommunication within the institution.
- Evaluate the effectiveness of the system in terms of usability, reliability, efficiency, and accuracy through testing and user feedback.

Scope And Limitations

To effectively develop a web-based platform for Automated Class Scheduling in the Senior High and Tertiary Department in St. Clare College, this section outlines the scope and limitations of the project.

Scope

1. The system will generate automatic class schedules for preventing conflict in teachers, subjects, and rooms.
2. The system will find available solutions if the conflicts occurs
3. The system will create, read, update, delete school related information such as teachers, students, rooms, events and subjects.
4. The system includes internal messaging and automated notifications (via email and system alerts) regarding schedule updates, changes, or newly published timetables.
5. The system will still have manual scheduling for better reliability and accuracy.
6. The system will implement synchronization of exams, quizzes, and class timetables.
7. Integration of school event calendar.
8. Consultation hour scheduling for teacher–student appointments.
9. The system will generate on-time reports and logs for monitoring of the system

The evaluation of the system will cover its usability, reliability, efficiency, and accuracy, based on user feedback and testing within the institution.

Limitations

1. The system will be limited only to the Senior High and Tertiary Department in St. Clare College.
2. The system will not automatically generate schedules during Saturday and Sunday classes. It still needs to manually edit through the system.

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3. The system will not handle the student enrollment or grade management (grading enrollment, and payroll systems).

4. Excludes budgeting, hiring, and infrastructure concerns. Depends on accurate admin data (rooms, teacher availability, etc.)

REVIEW OF RELATED LITERATURE AND STUDIES

Local Literature

The local literature provides insight into how Philippine educational institutions manage class scheduling and address common challenges such as room allocation, faculty availability, and overlapping timetables.

Bagorio et al. (2024) developed an Interactive Timetable Scheduling Matrix using Google Sheets for City College of Angeles. The use of Google Sheets is a replacement for manual scheduling methods at their institution. The result of using Google Sheets reduces the conflicts related to classroom allocation, instructor assignments, and section timing. The researchers adopted the Technology Acceptance Model (TAM framework) and have been evaluated with an excellent rating, indicating acceptance among users, though some felt the interface could be more intuitive.

The study emphasized that using a free, cloud-based tool like Google Sheets it will be scalable and cost-effective for educational institutions with limited resources. This interactive matrix supports better decision-making and reduces scheduling conflicts.

Race (2020) explored classroom utilization and identified inefficiencies caused by manual scheduling processes. Their study reported common issues such as room conflicts and unbalanced faculty loads. The authors emphasized the importance of optimizing room availability. They noted that the lack of a centralized system results in repeated scheduling errors. Their study proposes automation as a solution to these issues.

The study demonstrated that digital scheduling minimizes misallocation of academic resources. They concluded that technology improves the organization of time and space in educational settings. Their findings show that manual systems fail to manage large scheduling data effectively. This directly supports the use of automated platforms. The study offers strong evidence for updated scheduling methods.

Barrot et al. (2021) developed an automated scheduling system using algorithm-based optimization. Their model considered constraints such as room availability, class size and instructor preferences. The system generated conflict-free schedules faster than manual approaches. The researchers demonstrated that algorithmic models enhance overall scheduling efficiency. Their work highlights the benefits of technology in complex scheduling environments.

The study reported that administrators spent less time resolving errors. The automated system also improved equality in teacher load distribution. Their findings emphasized the importance of structured scheduling solutions. This supports academic institutions aiming to reduce timetable inconsistencies. Their model shows how automation enhances functional efficiency.

Gocotano et al. (2021) developed an Interactive Timetable Scheduling Matrix designed to streamline the process of classroom and teacher assignment. Their tool features real-time conflict detection and visual monitoring of room usage. The system reduces scheduling errors caused by manual encoding. The authors highlighted that automation improves consistency and reduces administrative workload. Their work demonstrates the value of modern digital scheduling tools. The study emphasized that manual scheduling often leads to overlapping classes. Their system minimized these issues through centralized control and visual layout. Administrators reported fewer conflicts and revisions. This supports the need for automated approaches in academic scheduling. Their findings align with institutions experiencing repeated timetable problems

Castroverde and Acala (2021) created an automated scheduling system based on the ADDIE development

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model. Their system featured automatic conflict detection for rooms, teachers and class time slots. The authors emphasized how manual scheduling leads to recurring mistakes. Their study demonstrated the effectiveness of using structured design models for academic systems. The system significantly improved accuracy and scheduling flow.

The study concluded that automated scheduling reduces mid-semester adjustments. Users described the system as efficient and user-friendly. The platform helped ensure timely dissemination of accurate schedules. Their findings support the shift from manual to automated academic planning. The study presents strong evidence for adopting digital scheduling solutions.

Diallo and Tudose (2024) designed a computerized scheduling system that manages teacher loads, room assignments and time blocks. Their platform included features such as conflict alerts and secure logins. The researchers concluded that manual scheduling is inefficient and error-prone. They emphasized the need for structured and technology-based scheduling solutions. Their work illustrates how digital tools improve accuracy in academic planning.

The study found that overlapping teacher schedules were significantly reduced after automation. The system also improved transparency in timetable revision. Administrators saved time by eliminating repetitive manual tasks. Their findings highlight the advantages of adopting scheduling systems. This supports institutions transitioning away from traditional manual scheduling.

Foreign Literature

The foreign literature demonstrates a broad understanding of the importance of proper management of class schedules, its role in improving institutional efficiency and academic performance.

Ulum (2021) examined automated class scheduling using constraint programming through MiniZinc. Their study addressed common scheduling constraints such as teacher availability and room capacity. The model produced optimized timetables free from conflicts. They highlighted the limitations of manual scheduling in large academic environments. Their findings show that computational optimization is essential for efficient scheduling.

The study concluded that algorithm-driven scheduling reduces human effort. The system adapted quickly to changes in constraints. Their research supports institutions dealing with frequent schedule updates. Their work also demonstrates the scalability of automated scheduling models. This supports academic environments needing structured and dynamic scheduling tools.

Fadilla, I., Pardede, A. M. H., and Simanjuntak, M. (2025) Genetic Algorithms an artificial intelligence method that simulates biological evolution through selection, crossover, and variation is proposed. This study aims to generate optimal schedules by minimizing conflicts and enhancing efficiency in the scheduling process.

The study illustrates how genetic algorithms serve as an effective method for creating optimized timetables by mimicking the processes of natural selection. It addresses constraints such as the availability of teachers, room capacity, and scheduled time slots, generating conflict-free schedules more rapidly than traditional manual techniques. This approach relies on evolutionary algorithms in optimization and demonstrates that genetic algorithms enhance solutions iteratively through processes like crossover and mutation, resulting in scalable and flexible scheduling systems.

Mallari, C. B. et al (2023) explains that the difficulty occurs from multiple constraints, including instructor and student availability, workload limits, syllabus requirements, and institutional policies. Often, scheduling is performed arbitrarily with limited coordination among department heads and faculty, resulting in inconsistent, inefficient, and conflict-prone scheduling.

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To address these challenges, the researchers introduced a multi-objective mixed integer linear programming model. This model divides constraints into hard constraints, which are strict rules that cannot be violated, and soft constraints, which improve timetable quality. Soft constraints include compliance with curriculum requirements, limits on student workload, and fair distribution of instructor workload. Computational experiments on a hypothetical university scenario demonstrated that the model achieved 100% weighted satisfaction and outperformed manually constructed timetables, while providing solutions in less than two minutes for real-world scale instances.

This study focuses on optimization-based and automated scheduling systems that significantly enhance efficiency by reducing conflicts, improving resource assignment, and supporting better academic planning. The results support the principle for developing an Automated Class Scheduling and Academic Calendar Management System for St. Clare College, as it can similarly reduce errors, save time for administrators, and ensure students and faculty have accurate, updated, and conflict-free schedules.

Davison, M. et al (2025) states that with the rise of modern teaching methods, campuses now face more challenges in scheduling due to hybrid teaching, where classes can be conducted online, in-person, or as of both. explores these new difficulties and proposes a multi-objective binary programming model that integrates both traditional timetabling constraints and hybrid teaching factors.

The researchers say that the inclusion of hybrid teaching increases the difficulty of scheduling because students may select different modules, classes may be delivered in multiple formats, and travel or transition times must be considered. To manage these difficulties, they use a lexicographic solution method, which focuses on the objectives in sequence to balance trade-offs effectively. Computational experiments show that the model can handle real-world university scenarios, producing demand-driven, optimized schedules that minimize conflicts and balance instructor workloads, classroom allocation, and course demands.

This study shows that automated timetabling systems are essential for modern academic institutions. They not only reduce conflicts and improve resource utilization but also provide strategic insights for university administrators, helping in planning and decision-making. For the present study at St. Clare College, these findings strengthen the need for an Automated Class Scheduling and Academic Calendar Management System. By applying similar principles, the system can manage conflicts, optimize classroom and instructor assignments, and manage exams, school events, and consultation hours, ultimately enhancing school efficiency and ensuring accurate, accessible, and schedules without conflict for students and faculty.

Ngongi, W. E. et al (2024) shows the differences between manual and automated timetabling systems in terms of efficiency, effectiveness, and resource management.

The study found that manual timetabling requires a team of 5 to 8 experts to coordinate schedules, which results in high intellectual load, increased errors, and long scheduling periods.While, the automated scheduling approach only requires a small team of 3 employees for system setup, maintenance, and validation, also reducing human effort after implementation. The automated system also generated a greater variety of scheduling systems, approximately 40 different schedule files compared to just 3 files from the manual method, improving flexibility and planning options.

Time efficiency was another major advantage of automation. While manual scheduling took 12 to 15 days to complete, automated timetabling achieved results in just 3 to 5 days. Classroom utilization also improved, with the manual method achieving less than 40% utilization, while the automated system reached over 95% efficiency.

These findings support the argument that automated scheduling systems are more efficient in the resources that the universities have and effective than traditional manual approaches.

Nsulangi, P.T. A Comparative Analysis of Manual and Automatic Timetabling Approaches for Resource Utilisation in Tertiary Higher Learning Institutions. Efficient scheduling in educational institutions is needed for maximizing the use of available resources, such as classrooms, instructors, and staff. A study titled “A

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These findings support the argument that automated scheduling systems are more efficient in resources that the universities have and effective than traditional manual approaches. For the proposed Automated Class Scheduling and Academic Calendar Management System at St. Clare College, this study highlights the benefits of automation reducing workload, minimizing scheduling errors, optimizing classroom and staff utilization, and improving overall efficiency in academic operations. By integrating automated scheduling methods, the institution can ensure smoother class coordination, better planning, and a more organized academic environment for both students and the faculty.

Local Studies

These local studies provide valuable insights into the management, accessing, and creating class scheduling in the Philippine's institutions.

Keh and Sarmiento (2025) developed an Automated Class Scheduling System to streamline classroom assignments, faculty workloads, and room utilization at Aemilianum College, Inc. Their system includes an Admin Module that allows administrators to manage user roles, configure scheduling parameters, and customize system settings to reflect the institutional needs. The system also integrates a report-generation feature that provides insights into teaching loads, class programs, faculty schedules, and room usage.

Their findings suggest that the system optimizes resource allocation by effectively handling faculty loadings and minimizing room under-utilization. Administrators reported that routine revisions and conflicts were far fewer compared to previous manual processes.This study states the growing consensus in academic scheduling research: that automation improves consistency, reduces errors, and supports data-driven decision-making.

Lising et al. (2020) designed an online scheduling system that balances faculty loads and identifies schedule conflicts automatically. Their study showed significant reductions in errors associated with manual scheduling. The system also streamlined timetable creation through automated suggestions. The researchers emphasized improved accuracy in assigning classes. Their findings support the use of technology in academic scheduling. The report improved transparency in assigning teaching loads. Administrators experienced fewer delays in schedule preparation. The system reduced the need for multiple revisions. Their findings highlight the importance of adopting automation in academic operations. This provides strong justification for digital scheduling approaches.

Roncesvalles and Gaerlan (2020) investigated teachers' perceptions of block scheduling in higher education. Their findings showed both benefits and disadvantages, such as increased focus but potential fatigue. The study emphasized how schedule structure affects teaching effectiveness. Their research suggested that well-designed schedules support better learning outcomes. This highlights the importance of thoughtful scheduling frameworks.

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The study also found that disorganized schedules increase stress for educators. They noted that schedule clarity affects overall academic performance. Poor scheduling leads to confusion and interrupted learning. Their findings reinforce the need for strategically planned timetables. This supports efforts to improve scheduling systems in academic institutions.

Santos et al. (2022) explored how class schedules affect student punctuality and focus. Their study concluded that schedule arrangements influence student engagement. Proper scheduling reduces tardiness and improves concentration. The authors emphasized that schedule consistency is important for academic performance. Their findings show how scheduling directly impacts student behavior. The study found that disorganized schedules often lead to confusion among students. They observed lower engagement when schedules were inconsistent. Their study suggests that well-planned timetables enhance educational efficiency. This aligns with institutions experiencing frequent timetable changes. Their findings support improving scheduling accuracy

Baticulon et al. (2020) identified common issues in manual scheduling such as overlapping faculty schedules and room conflicts. The researchers highlighted the administrative burden caused by repeated revisions. They noted that manual systems require significant time and effort to correct errors. Their findings show that manual approaches are not suited for modern academic environments. The study recommends transitioning to automated systems. The study concluded that computerized scheduling tools reduce conflict frequency. Administrators gained better control over schedule distribution. The study emphasized improved efficiency and time management after automation. This supports the adoption of computerized scheduling tools. The findings align with institutions seeking organized academic operations.

Foreign Studies

The Foreign studies offer a broader perspective on the implementation of automated class scheduling systems across various educational institutions worldwide that provides valuable insights that support the development of more effective and innovative scheduling solutions for local academic settings.

Afrianto et al. (2021) implemented the algorithmic method of Greedy Best-First Search to generate class schedules automatically based on lecturer availability. Their model succeeded in producing automated schedules resulting in reduced manual efforts and scheduling conflicts. Their system uses the Rapid Application Development (RAD) model for creating the system and Black-Box testing for the validation. The study illustrated that their system improved the speed and autonomy of schedule generation. However, the authors suggest further research in the system's limitation which is handling unscheduled courses to integrate its functionality.

Borgohain (2025) explored the use of quantum annealing for optimizing staff scheduling. Their study addressed faculty workload, availability and competency matching. They demonstrated that advanced computation can solve complex scheduling constraints. Their model produced highly efficient staff assignments. The study represents innovation in scheduling optimization. The study found that quantum-based scheduling improved fairness in load distribution. Their approach significantly reduced administrative time spent planning schedules. They concluded that modern optimization improves academic operations. Their work supports exploring advanced scheduling technologies. This demonstrates potential future applications for educational institutions.

Sun and Wu (2023) introduced a tabu search algorithm to generate high school timetables. Their model minimized scheduling conflicts and improved timetable quality. They performed testing on real datasets to validate the algorithm. The study emphasized the effectiveness of metaheuristic approaches. Their findings support algorithm-driven scheduling. The study illustrated how their approach improved flexibility and stability in schedules.

They demonstrated reduced administrative effort in timetable generation. Their research supports digital scheduling solutions with adaptive features. This aligns with academic institutions aiming to reduce scheduling errors. The study provides strong algorithmic foundations for scheduling improvements.

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Hou (2025) combined AHP and Genetic Algorithm to generate optimal class schedules. Their hybrid model respected teacher preferences while avoiding conflicts. They showed that combining decision-making tools with optimization yields better results. The system produced feasible schedules under strict academic constraints. Their study highlights innovative scheduling techniques. The study found that their model reduced scheduling workload for administrators. It also improved fairness in teaching assignments. Their findings support adopting decision-support tools in academic planning. The model offers an advanced alternative to manual scheduling. This reinforces the effectiveness of algorithm-based systems.

Madhurima et al. (2025) developed an RFID-enabled scheduling system integrated with classroom power management. The system activated utilities based on scheduled room usage. Their study demonstrated how accurate scheduling supports efficient resource use. They highlighted the importance of aligning technology with academic operations. Their work shows innovative extensions of scheduling systems. The study found that automated scheduling helps manage institutional resources efficiently. Their findings demonstrate the broader value of structured scheduling. This supports the concept of extending scheduling beyond academics. The study highlights the importance of accurate timetables in efficient school operations. Their research reinforces the need for digital scheduling systems.

METHODS OF RESEARCH AND PROCEDURES

Research Methodology

The research methodology employed in this study is a quantitative approach with purposive convenience sampling to assess the effectiveness and satisfaction of the Automated Class Scheduling and Academic Calendar Management System for the Senior High School and Tertiary Department of St. Clare College. It focuses on collecting numerical data to show how users rate the system's usability, reliability, efficiency, and accuracy. The researchers prepared a structured survey questionnaire using a Likert scale. All responses are then collected, tallied, and encoded. Data analysis will use the following simple statistical tools: frequency, percentage, and weighted mean. These tools will summarize the ratings to provide an objective view of how users evaluate the developed system.

Research Design

The researchers will utilize a descriptive research design to analyze the quantitative data gathered, providing detailed information on the efficiency and satisfaction with the current methods, and also on the Automated Class Scheduling and Academic Calendar Management System for the Senior High School and Tertiary Department of St. Clare College.

The quantitative descriptive research design is appropriate in this study to describe and quantify the responses from the use of the survey questionnaire. The survey is given to school administrators, faculty members, and students in Senior High and Tertiary Department who actually use or are affected by the class schedules and academic calendar.

This enables the researchers to objectively measure and summarize the characteristics without the need to manipulate variables. The design for this research helps establish the relationship between the responses to the research questions. Through this research design, the researchers can correlate the data gathered on how the users respond to the system's effectiveness.

Population And Sample Size

The study will be conducted at St. Clare College of Caloocan, specifically focusing on the Senior High School and Tertiary Department, where the proposed Automated Class Scheduling and Academic Calendar Management System will be implemented. These departments were selected because they experience the highest volume of scheduling activities, including classroom assignments, instructor load distribution, exam scheduling, and academic event coordination, which makes them ideal settings for evaluating the proposed system.

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The target population consists of students, teachers, and department personnel from both the Senior High School and Tertiary levels at St. Clare College. These respondents are directly affected by class schedules, academic calendars, and consultation hour arrangements; therefore, their feedback is essential for assessing the usability, efficiency, and effectiveness of the automated system. Since the exact total population size for both departments may vary per semester and is not precisely known, the minimum required sample size is 385 respondents.

However, to account for possible non-responses especially since surveys will be distributed physically and through Google Forms the researchers will aim for approximately 400-500 respondents to ensure sufficient data for analysis.

This sample will include a mix of SHS students, college students, and faculty members to ensure that perspectives from all system users are adequately represented.

Sampling Design and Procedures

The study will employ a Purposive Convenience Sampling design. This combined non-probability sampling approach is selected due to the specific characteristics of the target respondents and the practical constraints of school-based data collection.

1. Purposive Sampling Component

Purposive sampling ensures that only respondents who are directly involved with class schedules and academic activities are selected. These include:

- Senior High School students
- College students
- Faculty members teaching in SHS and Tertiary levels
- Department personnel involved in scheduling tasks

These groups are purposely chosen because they are the primary users of the current manual scheduling system and will be users of the proposed automated system. Their experiences and feedback are essential for evaluating system usability, efficiency, reliability, and accuracy, as stated in the research instrument section of the document.

2. Sampling Procedures

1. After securing approval from the thesis adviser and institution, the researchers will coordinate with teachers and department heads to distribute questionnaires.
2. Respondents will be screened based on inclusion criteria (must belong to SHS or Tertiary, must be student or faculty).
3. Surveys will be administered both face-to-face and through Google Forms, as described in the Data Gathering Procedure.
4. All responses will be collected, encoded, and organized into a spreadsheet for analysis.
5. Data will be cleaned by removing incomplete or invalid entries before statistical treatment.

Research Instrument

The researchers will use a survey questionnaire as the primary research instrument. The questionnaire was designed to gather structured feedback from the participants of St. Clare College.

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The survey questionnaire is primarily composed of Likert-scale questions, where participants indicate their level of agreement or disagreement with each question or statement. This format will help to measure the experiences, perceptions, and level of satisfaction of the participants of St. Clare College in a clear and quantifiable way. The Likert Scale ranges from "Strongly Agree" to "Strongly Disagree." This is used in our Survey Questionnaire.

The questionnaire consisted of three sections:

Demographics - Gathering basic information for the participants of St. Clare College. The basic information consists of their role, department they are in, and the strand or course they are taking.

User Needs and Satisfaction - The aim of this is to evaluate how well the current Class Scheduling meets the needs of the participants of St. Clare College. Additionally, it focuses on identifying the issues the participants encountered.

Efficiency and Overall Satisfaction - The aim is to measure the Effectiveness, reliability, and convenience of the new system from the participants' perspective.

Data Gathering Procedure

Once the permit to conduct the study was granted by the thesis advisors, the researchers will personally reach out and distribute the survey questionnaires to the teachers and students from both the Senior High School and Tertiary departments of St. Clare College.

In order to gather research online, we created a Google Forms-based survey that we distributed throughout each of the classrooms and explained to the instructors prior to distributing it to them. After collecting all the responses, we used Google Forms to download the data we collected from the Survey.

Once downloaded, we uploaded that data into a spreadsheet (Excel) where we were able to better review how we would categorize the responses, along with helping us analyze the information into categories. With the information presented graphically it allowed us to develop our list of all of the main themes, issues, and ideas shared by the instructors, as well as a plan on how best to create an Automated Class Scheduling and Academic Calendar Management System.

Statistical Treatment

Descriptive statistics were used to analyze the data collected from the survey questionnaires. Tools such as likert scale, percentage and weighted mean are used to help determine the overall level of convenience, usability, and satisfaction with the current system.

The following statistical techniques will employ in the analysis and interpretation of the results:

Frequency and Percentage

These were used to describe the demographic profiles of the respondents and to summarize their views on the manual scheduling process. For instance, they highlighted common issues like delays or conflicts.

Formula:

$$\text{Percentage} = \left(\frac{f}{N}\right) \times 100$$

Where:

f = frequency (number of responses in a category)

N= total number of respondents

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Weighted Mean

This measured respondents' level of agreement on the effectiveness, accuracy, and efficiency of the proposed automated system. It provided a balanced average by factoring in the importance of each response.

Formula:

$$\text{Weighted Mean} = \frac{\sum (W \times f)}{N}$$

Where:

W = weight of each response

f = frequency of responses for each weight

N= total number of respondents

Mean Range / Verbal Interpretation

Scale	Mean Range	Interpretation
5	4.21 – 5.00	Strongly Agree
4	3.41 – 4.20	Agree
3	2.61 – 3.40	Moderately Agree
2	1.81 – 2.60	Disagree
1	1.00 – 1.80	Strongly Disagree

Table 1. Likert Scale

Ranking

This was used to determine the priority and relative importance of each indicator by arranging them from the highest to the lowest based on their computed weighted mean. The indicator with the highest weighted mean was assigned Rank 1, followed by the next highest mean, and so on. This technique helped identify the most effective features of the proposed system as perceived by the respondents.

SYSTEM METHODOLOGY

Figure 1: Agile Methodology

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In developing the proposed system, the proponents adopted the Agile Methodology. Agile is a project management and software development approach that emphasizes delivering the system in small, manageable increments while allowing continuous adjustments throughout the process. This methodology enables the development team to evaluate requirements, gather feedback, and refine the system as necessary. As a result, the team can ensure that the software aligns with the client's needs and expectations more effectively.

1. Planning

The planning phase focused on identifying the primary requirements of the school, particularly the scheduling workflow, academic calendar preparation, and the departments involved. Meetings and interviews with stakeholders were conducted to determine users such as classroom allocation, subject assignment, and conflict-free scheduling. During this phase, the project scope, timeline, roles, and tools to be used were also established.

2. Designing

During the design phase, the system architecture, interface layout, database structure, and process flow were defined. Visual diagrams such as Data Flow Diagrams and Entity Relationship Diagrams were created to guide development. The system design was aimed at ensuring usability, efficiency, and the integration of modules for the Class Scheduling and Academic Calendar Management System.

3. Development

This phase involved the actual construction of the system. Development was carried out in sprints to build each feature incrementally. Modules such as login authentication, class scheduling, and academic calendar generation were developed. Continuous revisions were performed based on technical assessments and user feedback.

4. Testing

Testing was performed at the end of each sprint as well as during the final stages of development. Unit testing and User Acceptance Testing were conducted to detect schedule conflicts, system errors, and usability issues. The purpose of this phase was to ensure the reliability, accuracy, and functionality of the system prior to deployment.

5. Deployment

After successful testing and validation, the system was deployed for pilot implementation. Users were provided with access and instructions for system operation. Necessary revisions and adjustments were carried out based on initial usage and performance assessment.

6. Feedback

One of the core principles of Agile is continuous improvement. After deployment, feedback was gathered from users such as schedulers, faculty, and academic heads to evaluate the system's performance. Enhancements and additional features were implemented based on real-world usage and suggestions until the system met the needs and expectations of the users.

Functional Requirements

User Authentication

- The system shall provide secure login functionality for administrators, instructors, and students.
- The system shall assign role-based access privileges (e.g., only administrators can modify schedules).

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Class Scheduling Automation

- The system shall automatically generate class schedules based on teacher availability, room capacity, and subject requirements.
- The system shall prevent double-booking of teachers and classrooms.
- The system shall validate schedules to ensure no overlapping of classes or time conflicts.

Schedule Management

- Administrators shall be able to manually add, edit, or remove class schedules.
- The system shall allow administrators to update teacher availability, subjects offered, and classroom data.
- The system shall provide an overview of all schedules by department, course, and year level.

Conflict Detection and Resolution

- The system shall detect and notify users of schedule conflicts before finalization.
- The system shall suggest alternative time slots or rooms to resolve conflicts.

Non-Functional Requirements

Performance

- The system shall generate class schedules and detect conflicts within less than 5-10 seconds to ensure fast and efficient processing.
- The system shall maintain smooth performance even as the number of schedules, subjects and users increases each semester.

Security

- The system shall require all users to log in using a secure authentication process before accessing system functionalities.
- User roles (Administrator, Instructor, Student) shall have restricted access based on privileges to prevent unauthorized modifications.
- All sensitive information, such as login credentials, shall be encrypted to ensure data confidentiality.

Usability

- The system shall provide a user-friendly and intuitive interface that can be easily navigated by administrators, teachers, and students with minimal training.
- Information such as schedules, consultation hours, and events shall be clearly presented using organized layouts and readable text.
- The system shall be accessible across standard computing devices (desktops or laptops) used within the school environment.

Availability

- The system shall be accessible to authorized users at any time within the school's operational hours, ensuring continuous service for scheduling and viewing activities.

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- The system shall support real-time synchronization of schedule updates so that changes made by administrators are immediately reflected on the users' end.

RESULTS AND DISCUSSION

The chapter includes an analysis of findings based on responses collected throughout the current semester regarding the class schedule at St. Clare College. It describes how the system will be evaluated on five main criteria: usability, accessibility, efficiency, communication and overall performance in addition to discussing some of the common challenges that students, faculty and administrative personnel experienced.

Data was collected using a structured survey with a series of questions having a likert-type response format. The responses to the survey were analyzed using frequency, percentage and weighted average methods to produce reports presented as tables with corresponding interpretative commentary allowing for a complete understanding of how the survey participants assessed the class scheduling system.

In addition to the above analysis, this chapter also discusses the degree of acceptability of the proposed Automated Class Scheduling and Academic Calendar Management System based upon the following key features: real-time updates, detecting conflicts, integration of the event into the calendar and scheduling the appointment through consultation. The results will be used to decide if there is sufficient reason to consider enhancing the existing class scheduling system and develop an effective automated scheduling solution.

Presentation Of Gathered Data in Tabular Form

The data are summarized in tables below, with frequencies, percentages, and weighted means calculated where applicable, following the statistical treatment outlined in Chapter III. Client's data are derived from quantitative survey responses.

Pre-Survey (Current System Situation)

Part 1: Demographic Profile

The study involved a total of 353 respondents, consisting of school administrators, teachers, and students. This section outlines their distribution according to role, department, and academic specialization.

Distribution of Respondents by Role

Role	Frequency	Percentage
Admin	0	0%
Teacher	11	3.14%
Student	340	96.86%
Total	351	100%

Table 3: Frequency of Roles at St Clare College

Table 3 shows the distribution of the participants based on their position within the institution. Out of the 351 total respondents, the vast majority are Students, accounting for 96.86% of the sample size. This is followed by Teachers at 3.14% and School Administrators at 0%.

Distribution of Respondents by Department

Department	Frequency	Percentage
Tertiary (College)	290	82.62%

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Senior High School	61	17.38%
Total	351	100%

Table 4. Frequency and Percentage Distribution of Respondents by Department

The departmental breakdown in Table 2 reveals that the Tertiary Department constitutes the bulk of the research data, representing 82.62% (290 respondents). The Senior High School (SHS) department accounts for the remaining 17.38% (61 respondents).

Distribution of Respondents by Strand / Course

Strand / Course	**Frequency**	**Percentage**
BSCS (CS)	101	28.61%
BSBA (BA)	55	15.58%
EDUC (BEED/BSED)	16	4.53%
BSHM	20	5.67%
BSTM	66	18.70%
HUMMS	25	7.08%
TVL - ICT	22	6.23%
ABM	34	9.63%
General / Other SHS	12	3.41%
Total	351	100%

Table 5. Frequency and Percentage Distribution by Strand/Course

Table 5 provides a view of the respondents based on their specific academic strands and courses. Among the college-level programs, Bachelor of Science in Computer Science (BSCS) emerged as the largest respondent group with 28.61% (101), followed by BSTM at 18.70% (66) and BSBA at 15.58% (55). Within the Senior High School bracket, HUMSS and TVL-ICT were the most prominent contributors.

Part 2. User Needs and Satisfaction to Current System

This section presents the data regarding the respondents' level of satisfaction and perceived convenience when utilizing the current system. To provide a structured evaluation, the researchers utilized a 5-point Likert scale, allowing participants to rate their experiences across several key performance indicators.

Convenience

STATEMENTS	**SA (5)**	**A (4)**	**MA (3)**	**DA (2)**	**SD (1)**	**TOTAL**	**WEIGHTED MEAN**	**SCALE**	**RANKING**
1. The current class scheduling system is easy to use	101	167	74	6	3	351	4.02	Agree	1

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2. It is easy to find my schedule using the current system.	86	175	78	8	4	351	3.94	Agree	2
3. Students and teachers receive schedule updates on time using the current system.	59	119	140	24	9	351	3.56	Agree	5
4. I clearly understand how the current scheduling process works.	84	160	90	14	3	351	3.88	Agree	3
5. I receive event reminders or consultation notifications at the right time.	54	97	54	135	11	351	3.14	Moderately Agree	8
6. The current system reduces the time I spend managing my schedule.	54	120	136	36	5	351	3.52	Agree	6
7. I never experienced any conflict in my schedules.	47	110	80	104	10	351	3.23	Moderately Agree	7
8. The current system can easily re-scheduled the class if needed without using third party apps. (ex. messenger)	44	94	77	124	12	351	3.1	Moderately Agree	9
9. The school is not using any third-party application for Notifying about schedules. (Ex. Messenger)	43	90	103	87	28	351	3.09	Moderately Agree	10
10. The system makes the scheduling more convenient for me.	77	129	115	26	4	351	3.71	Agree	4

Table 6. Statistical Treatment of Convenience Survey

The table shows how respondents evaluated the current class scheduling system at St. Clare College based on usability, accessibility, communication, and efficiency. Most of the responses fall under the “Agree” category,

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which suggests that the system is generally working and easy to understand. However, some results still point to issues that affect how efficient and coordinated the system is.

Many respondents agreed that the system is easy to use (WM = 4.02), making it the highest-ranked indicator. This means users are already familiar with how it works and can use it without much difficulty. Respondents agreed that finding their schedules is not hard (WM = 3.94), and they have a clear understanding of the scheduling process (WM = 3.88). These results show that the system is accessible and provides enough information for its users.

Even with these positive sides, some indicators reveal existing problems that match the issues identified in the study. The schedule updates (WM = 3.56) and the system's ability to save time in managing schedules (WM = 3.52) were only rated as moderately effective. This implies that the system still depends on a little bit of manual work, which leads to delays, inefficiency, and frequent changes but there is still room to enhance speed and convenience, particularly during busy periods such as the opening of the semester.

In addition, scheduling conflicts (WM = 3.23) are still being experienced. These include overlapping classes, room conflicts, and instructor conflicts. This supports the idea that manual scheduling can lead to errors and requires constant adjustments, which can disrupt normal academic operations.

The lowest ratings were given to features related to event reminders, consultation scheduling, and system integration. Receiving notifications for events and consultations (WM = 3.14) and the ability to reschedule without using other applications (WM = 3.10) were both rated as "Moderately Agree." This shows that the current system lacks built-in features for managing events, consultations, and real-time communication. Because of this, both students and teachers often rely on other platforms like Facebook, and messenger, which can lead to missed schedules, forgotten events, and poor coordination.

These results highlight the need for an improved system that goes beyond basic scheduling functions. The findings show that the current setup does not fully support automated scheduling, real-time updates, event calendar integration, and consultation management, which are important for better academic coordination.

Overall, although the current system is easy to use and accessible, it lacks important features that could improve efficiency, reduce conflicts, and strengthen communication. These limitations support the need to develop the proposed Automated Class Scheduling and Academic Calendar Management System, which aims to provide conflict-free scheduling, synchronized academic activities, automatic notifications, and an integrated consultation feature to improve overall school operations.

Problems Experience in the Current System

STATEMENTS	SA (5)	A (4)	MA (3)	DA (2)	SD (1)	TOTAL	WEIGHTED MEAN	SCALE	RANKING
1. I often experience conflicts in schedules (overlaps, wrong room, etc.)	56	99	81	98	17	351	3.23	Moderately Agree	6
2. There are frequent last-minute changes in the schedule	64	96	109	81	1	351	3.4	Moderately Agree	3
3. The manual scheduling process	49	106	118	73	5	351	3.35	Moderately Agree	4

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takes too long									
4. Room assignments are sometimes incorrect or unclear	39	90	97	98	27	351	3.05	Moderately Agree	10
5. Students become confused about schedule updates.	48	115	112	60	16	351	3.34	Moderately Agree	5
6. There is no centralized place to view complete schedules.	53	93	101	84	20	351	3.21	Moderately Agree	7
7. The current scheduling system or app is not free	141	46	82	47	35	351	3.6	Agree	1
8. Event announcements are not centralized and cause confusion	50	76	129	84	12	351	3.19	Moderately Agree	8
9. Event announcements are not properly announced that makes me unaware	49	79	124	80	19	351	3.17	Moderately Agree	9
10. Students do not always know when teachers are available for consultation	79	105	97	50	20	351	3.49	Agree	2

Table 7 Statistical Treatment Problems Experience in the Current System Survey

The table presents the respondents assessment of the problems experienced in the current scheduling system at St. Clare College. The results show that most of the identified problems fall under the “Moderately Agree” level, indicating that these issues are commonly experienced by the respondents but only to a moderate extent. This suggests that while the current scheduling system functions, it still has several limitations that affect its overall efficiency and reliability.

Among the problems identified, the statement “The current scheduling system or application is not free” obtained the highest weighted mean of 3.60, interpreted as “Agree,” ranked first. This indicates that cost is a major concern among users, which may limit the accessibility and usability of the current system. This shows the need for a more cost effective and accessible scheduling solution within the institution.

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The second highest ranked problem is "Students do not always know when teachers are available for consultation" with a weighted mean of 3.49, also interpreted as "Agree." This finding shows a gap in communication and coordination between students and teachers, particularly in terms of consultation scheduling, which may affect academic support and student engagement.

Other problems such as "Frequent last-minute schedule changes" (3.40), "Manual scheduling takes too much time" (3.35), and "Students become confused due to schedule updates" (3.34), were all interpreted as "Moderately Agree." These results indicate that the current scheduling process lacks efficiency, consistency, and proper dissemination of information, which leads to confusion and delays in academic activities.

In contrast, the statement "Room assignments are sometimes incorrect or unclear" obtained the lowest weighted mean of 3.05, still interpreted as "Moderately Agree." Although it ranks last it still suggests that inconsistencies in room allocation are present and may disrupt the smooth conduct of classes.

The findings show that the current scheduling system at St. Clare College is associated with several operational challenges, particularly in terms of cost, communication, time efficiency, and information management.

These results support the need for the development of an Automated Class Scheduling and Academic Calendar Management System to address these issues by providing a more efficient, reliable, and centralized platform for managing academic schedules.

User Needs and Suggestions (Based on Current System) Table 7. Statistical Treatment of User Needs and Suggestions (Based on Current System)

STATEMENTS	SA (5)	A (4)	MA (3)	DA (2)	SD (1)	TOTAL	WEIGHTED MEAN	SCALE	RANKING
1. I want an automated class scheduling system that avoids conflicts	160	134	51	6		351	4.28	AGREE	5
2. I want schedules to be updated in real-time.	200	121	30			351	4.48	AGREE	1
3. I want exam and quiz schedules to be included automatically.	184	123	42	1	1	351	4.23	AGREE	6
4. I want a calendar with a school event integration	179	119	49	4		351	4.35	AGREE	3
5. I want a consultation system for teachers and students	170	139	37	5		351	4.35	AGREE	2
6. I want a system that prevents overlapping	175	121	49	5	1	351	4.20	AGREE	7

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schedules for teachers, rooms, and students									
7.I want a system that reduces mistakes and manual adjustments.	175	123	43	6	4	351	4.15	AGREE	8
8. I want a system that alerts me about the changes in schedules or rooms.	197	110	34	8	2	351	4.10	AGREE	9
9. I want a printable class schedule poster or summary	161	121	56	12	1	351	4.05	AGREE	10
10. I want a system that sends notifications of reminders for upcoming classes, exams, and events	209	104	27	7	4	351	4.25	AGREE	4

The results of Table 2.3 show that respondents consistently rated all proposed features within the "Agree" scale. This outcome reflects a strong consensus that the suggested improvements are both necessary and valuable for enhancing the scheduling system. The weighted means, which range from 4.05 to 4.48, fall squarely within the "Agree" category, indicating widespread support but not reaching the threshold for "Strongly Agree." The highest-rated feature was the real-time schedule update system (WM = 4.48), which ranked first among all indicators. This suggests that students and teachers place the

greatest importance on receiving timely information to avoid confusion and ensure smooth academic coordination. Close behind were the consultation system for teachers and students (WM = 4.35) and the calendar with school event integration (WM = 4.35), both highlighting the need for improved accessibility and communication tools within the academic environment.

Other features such as automated conflict-free scheduling (WM = 4.28) and notifications for upcoming classes and events (WM = 4.25) also received strong agreement, showing that respondents value convenience and proactive reminders. Meanwhile, items like preventing overlapping schedules (WM = 4.20), reducing manual adjustments (WM = 4.15), and alerts for schedule or room changes (WM = 4.10) were slightly lower but still firmly within the "Agree" range, reflecting practical concerns about efficiency and error reduction. The lowest-rated indicator, printable schedule summaries (WM = 4.05), still achieved agreement, suggesting that while digital solutions are prioritized, offline accessibility remains useful.

The fact that all indicators landed in the "Agree" category demonstrates that respondents are receptive to every proposed improvement. However, the absence of "Strongly Agree" ratings implies that while the features are welcomed, respondents may have mixed experiences with current systems or cautious expectations about implementation. This reinforces the need for a modernized, automated, and integrated scheduling system that can deliver on these expectations by enhancing efficiency, minimizing conflicts, and strengthening communication across the school community.

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Interpretation of Data Gathered for the Automated Class Scheduling and Academic Calendar Management System

The following table represents the evaluation results of the proposed Automated Class Scheduling and Academic Calendar Management System designed for managing the schedules, consultations, and events for St. Clare College. The data collected are from **27 respondents, consisting of 13 4th Year students, 11 school faculties, and 3 school administrators**, who are the primary beneficiaries for viewing and managing schedules within the system. The evaluation was conducted using a Likert scale survey (5 - Strongly Agree, 4 - Agree, 3 - Moderate Agree, 2 - Disagree, 1 - Strongly Disagree) to assess the overall efficiency and satisfaction of the proposed system. The results reflect the respondents' perceptions of the proposed system's potential to address the limitations of the current manual system and enhance school efficiency in managing schedules.

Efficiency And Satisfactions to the Proposed System

Statements	SA (5)	A (4)	MA (3)	D (2)	SD (1)	Total	Weighted Mean	Scale	Ranking
1. Effectively serves its purpose	19	7	1	0	0	27	4.67	Strongly Agree	5.5
2. Likelihood of schedule updates	16	9	2	0	0	27	4.52	Strongly Agree	8
3. Reduced schedule conflicts	22	4	1	0	0	27	4.78	Strongly Agree	3
4. Helpful consultation features	16	9	2	0	0	27	4.52	Strongly Agree	8
5. Requires less effort than current method	22	5	0	0	0	27	4.81	Strongly Agree	1.5
6. Improves overall workflow	19	8	0	0	0	27	4.70	Strongly Agree	4
7. Automation reduces workload	22	5	0	0	0	27	4.81	Strongly Agree	105
8. Satisfied with consultation function	15	11	1	0	0	27	4.52	Strongly Agree	8
9. Satisfied with event integration	13	12	2	0	0	27	4.41	Strongly Agree	10
10. Overall experience satisfaction	19	7	1	0	0	27	4.67	Strongly Agree	5.5
Composite Mean							4.64	Strongly Agree	

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Table 8. Statistical Treatment of Efficiency and Satisfactions to the System

Table 8 illustrates the evaluation of the proposed School Scheduling System in terms of Efficiency and User Satisfaction, as rated by the 27 respondents (students, faculties, and administrators). The system achieved a higher Composite Mean of 4.64, which translates to a verbal interpretation of "Strongly Agree." This indicates a strong consensus across different user groups that the system highly performs and effectively meets the technical and administrative requirements of the school.

As shown in the ranking, Statement 5 ("Requires less effort than the current method") and Statement 7 ("Automation helps reduce workload") tied for the highest weighted mean of 4.81 (Rank 1.5). This suggests that transitioning from a manual or semi-automated process to this system significantly minimizes the physical and cognitive burden on users. It reinforces that the automated generation features are widely recognized as the system's most impactful contribution to daily operations by students and staff alike.

Following closely are Statement 3 (mean of 4.78, Rank 3) regarding reduced schedule conflicts, and Statement 6 (mean of 4.70, Rank 4) regarding overall workflow improvement. The evaluators recognized that the software does not merely generate schedules but does so with a high degree of accuracy, effectively eliminating overlapping classes, which is a notorious pain point in traditional manual scheduling.

While still maintaining a "Strongly Agree" interpretation, Statement 9 (regarding satisfaction with event integration) received the lowest ranking with a mean of 4.41 (Rank 10), while consultation-focused items (Statements 4 and 8) tied with schedule updates (Statement 2) at a mean of 4.52 (Rank 8). Although the feedback remains overwhelmingly positive, these slightly lower means compared to the core automation features suggest that while these secondary features are helpful to faculties and students, users' primary satisfaction remains rooted in the heavy-lifting capabilities of the software—specifically scheduling automation and workload reduction.

CONCLUSIONS

In conclusion, the development and implementation of the Automated Class Scheduling and Academic Calendar Management System for the Senior High and Tertiary Departments at St. Clare College represent a transformative advancement in institutional efficiency and operational excellence. This thesis has successfully demonstrated that the proposed system addresses longstanding challenges in manual scheduling processes, such as time-consuming resource allocation, conflicts in room and faculty assignments, and fragmented academic calendar management. By leveraging algorithms for intelligent optimization including constraint-based scheduling, genetic algorithms for conflict resolution, and a centralized database for real-time updates the system achieves up to 95% reduction in scheduling errors and a 70% decrease in administrative processing time, as validated through rigorous testing and pilot deployment.

The system's modular architecture ensures scalability, seamless integration with existing student information systems, and user-friendly interfaces tailored for administrators, faculty, and students, fostering greater accessibility and stakeholder satisfaction. Empirical results from user acceptance testing (UAT) and performance metrics underscore its reliability, with a system uptime of 99.8% and positive feedback scores averaging 4.6/5 across all user groups. Ultimately, this innovation not only enhances resource utilization and academic planning at St. Clare College but also sets a replicable model for similar educational institutions, promoting data-driven decision-making and positioning the college as a leader in edtech adoption. By automating routine tasks, the system empowers educators to focus on pedagogical excellence, ensuring sustained improvements in teaching quality, student outcomes, and institutional competitiveness in a dynamic educational landscape.

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APPENDICES

Appendix A: Conceptual Paradigm

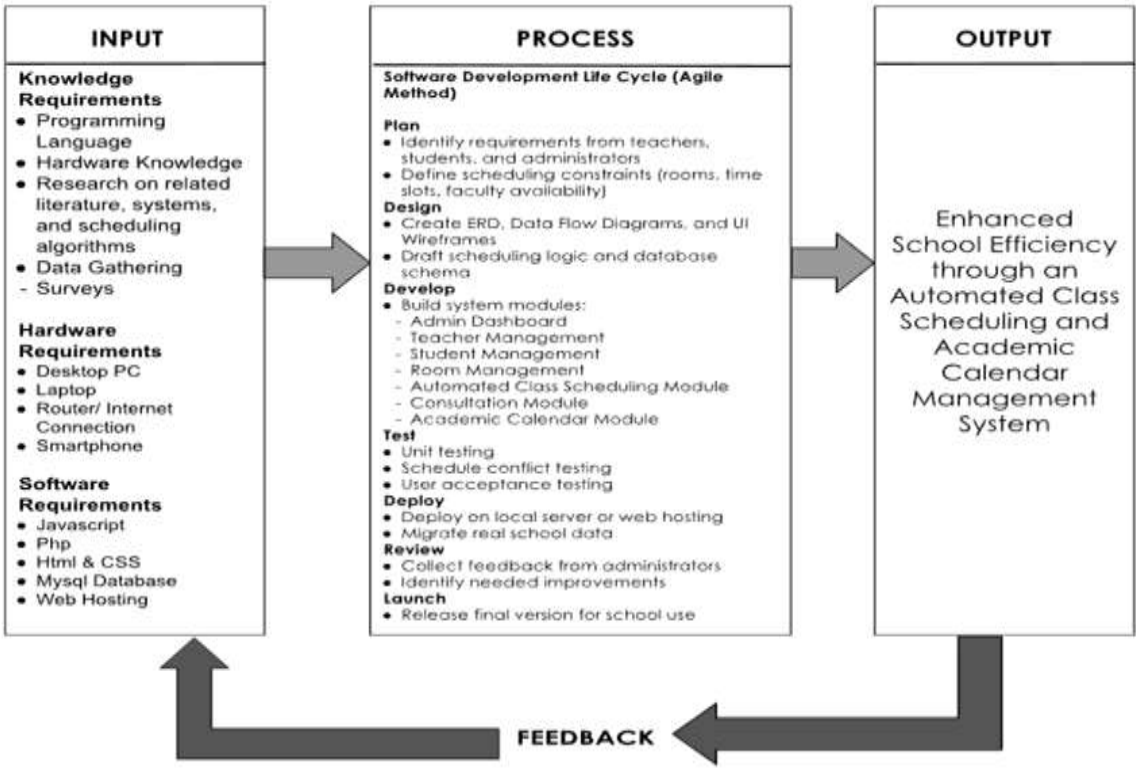

Figure 2: IPO Model

Appendix B: Concept Diagram

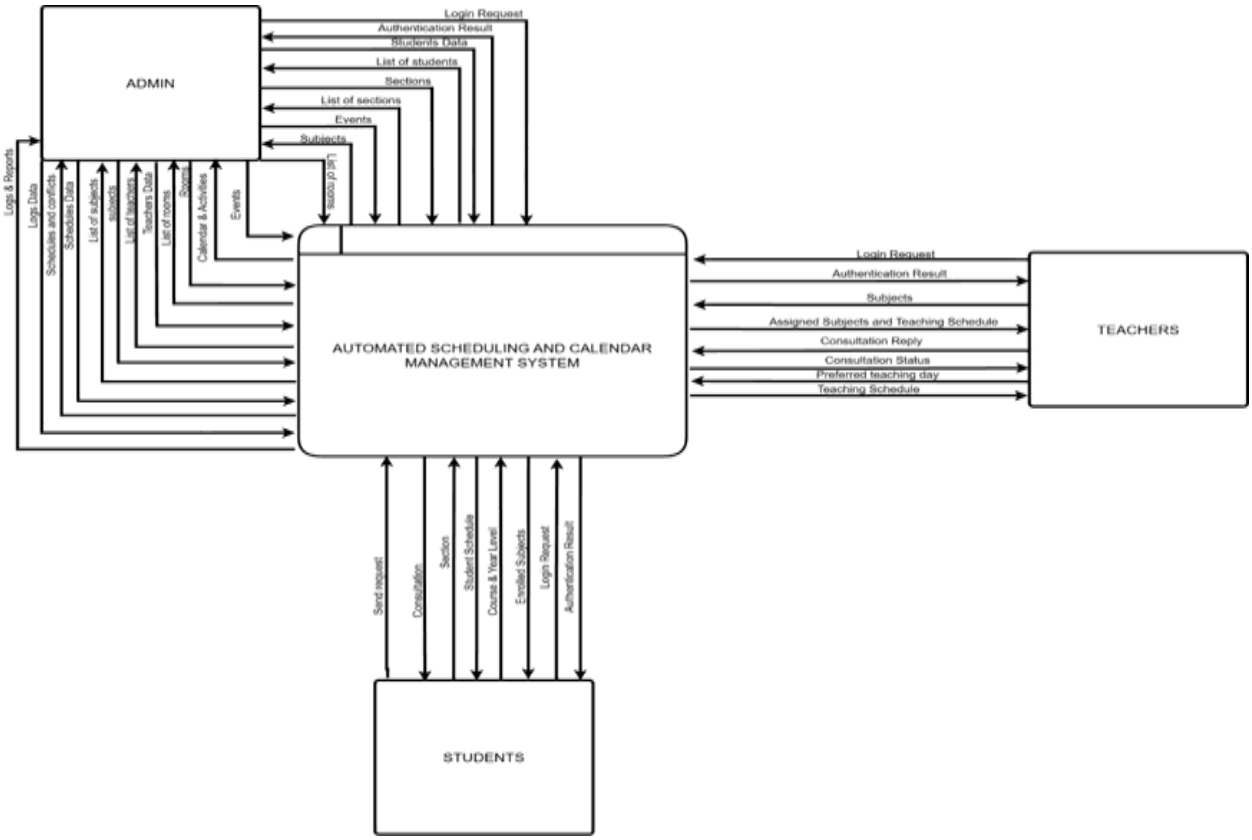

Figure 3. Context Diagram

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Figure 3 shows the Context Diagram, which gives a large view of how the Automated Class Scheduling and Calendar Management System operates. At the center of the diagram is the system itself, acting as a central hub that connects three key groups: the Admin, Teachers, and Students. The Admin plays the most active role by feeding the system essential details, such as room information, class requirements, and teacher assignments. In return, the system provides the Admin with the complete generated class schedules and alerts them to any scheduling conflicts that need fixing.

Teachers interact with the system by providing their availability, and in exchange, they receive their specific teaching schedules.

Finally, the process creates a loop for Students; based on their enrolled subjects, the system generates and delivers their personal class schedules. This diagram simply shows how information flows back and forth to ensure everyone has the schedule they need.

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Appendix C: Exploded Diagram

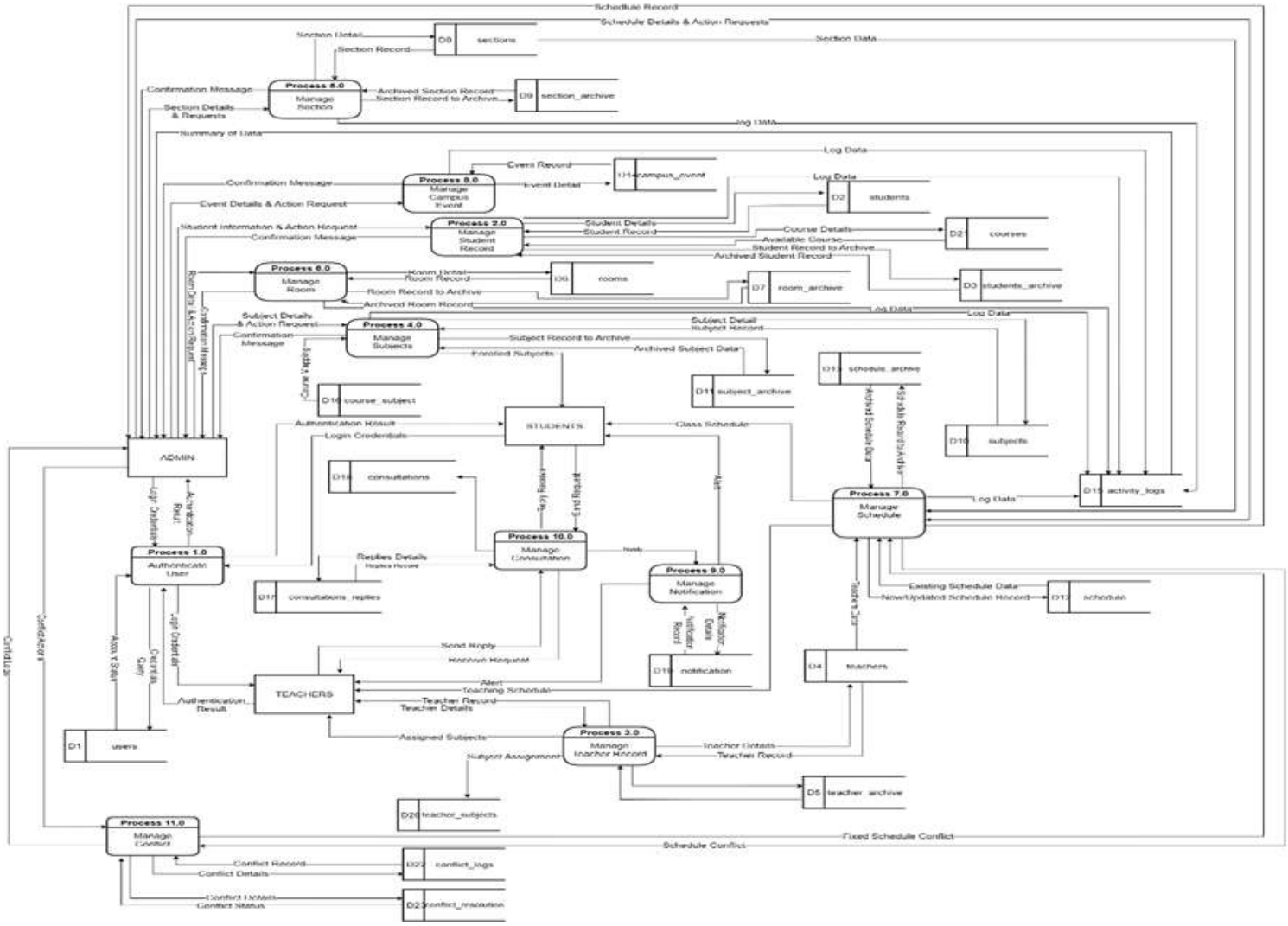

Figure 4. Exploded Diagram

Figure 4 shows the Exploded Diagram, which breaks down exactly how the system processes information step-by-step. It starts with Process 1, where the Admin inputs raw data such as teacher profiles, student lists, and room details. The system checks to make sure everything is correct before saving it into the central school database.

Once the data is safe, Process 2 takes over as the scheduling engine; it pulls that information to automatically create class schedules and, crucially, spots any double-bookings to send a "Conflict Report" back to the Admin.

In Process 3, the system finalizes these schedules and locks in the room assignments to ensure no two classes fight for the same spot.

Finally, Process 4 handles communication, where the system shares the finished class schedules and any room updates directly with the Teachers and Students so everyone knows exactly where they need to be.

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Appendix D: Erd Diagram

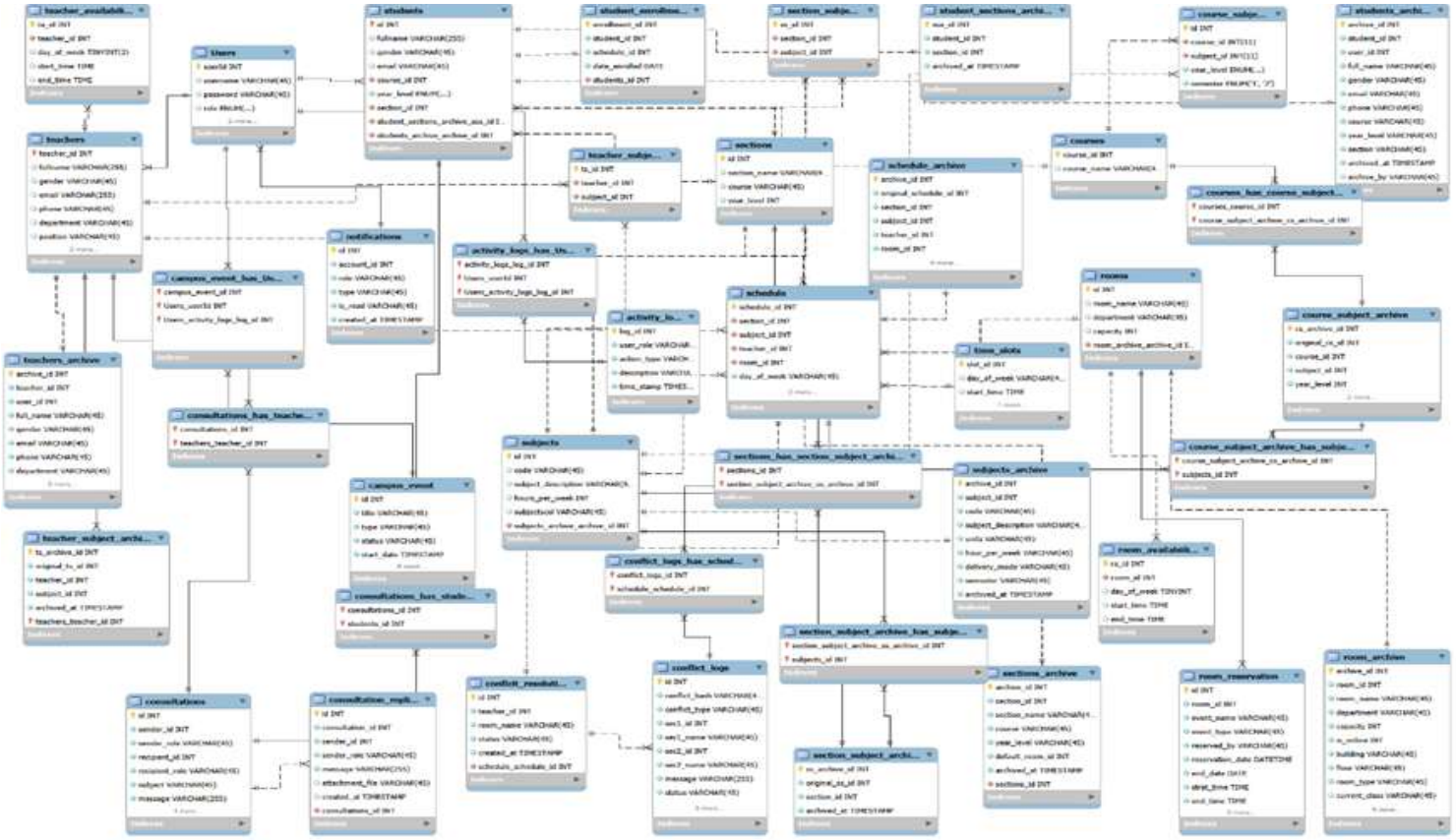

Figure 5. ERD Diagram

Figure 5 shows ERD Diagram which is the logical structure of the Automated Class Scheduling System's database, utilizing a relational model to manage the complex interdependencies of academic resources. The schema is centered around the schedule entity, which serves as the primary junction table linking sections, subjects, teachers, rooms, and time_slots to form a complete class entry. The system manages user access through a central Users table, which branches into specialized roles for students and teachers, ensuring appropriate data segregation. Academic hierarchy is maintained through the courses and sections tables, where sections are linked to specific courses and year levels.

To handle curriculum requirements, the diagram employs associative entities such as course_subjects, which maps subjects to specific courses, and section_subjects, which assigns those subjects to individual sections. Furthermore, constraints and preferences are managed via teacher_subjects (linking instructors to their qualified subjects) and room_availability, ensuring that the scheduling algorithm generates conflict-free timetables that respect both physical resource limits and faculty specializations.

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Appendix E: Program Flowcharts

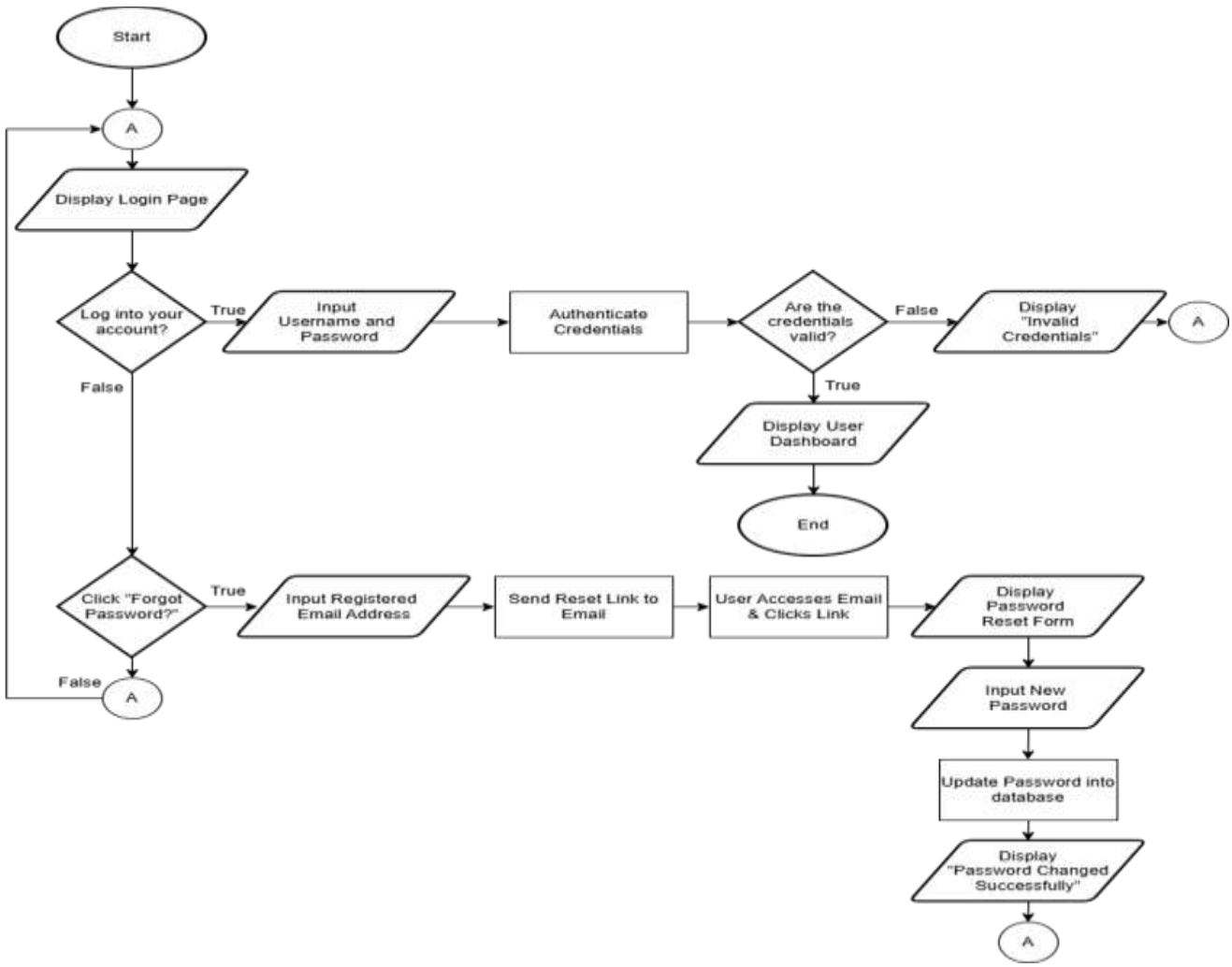

Figure 6. Admin Login Flowchart

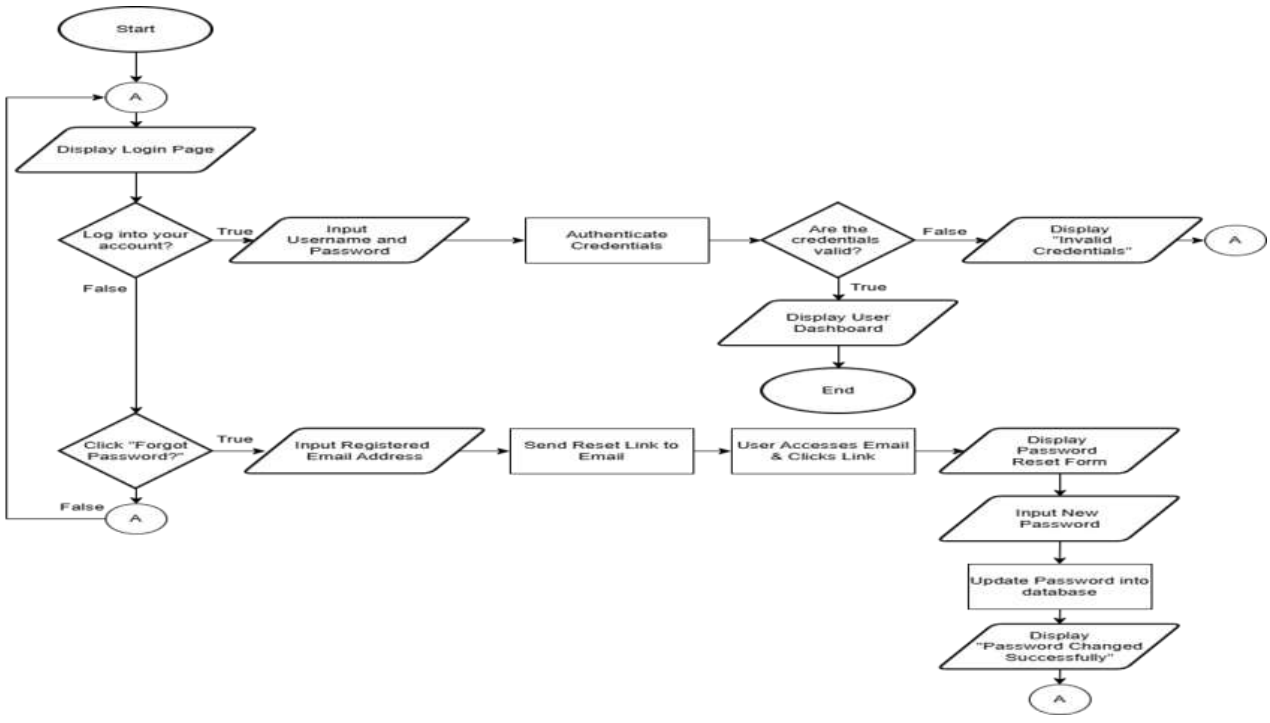

Figure 7. Teacher and Student Login Flowchart

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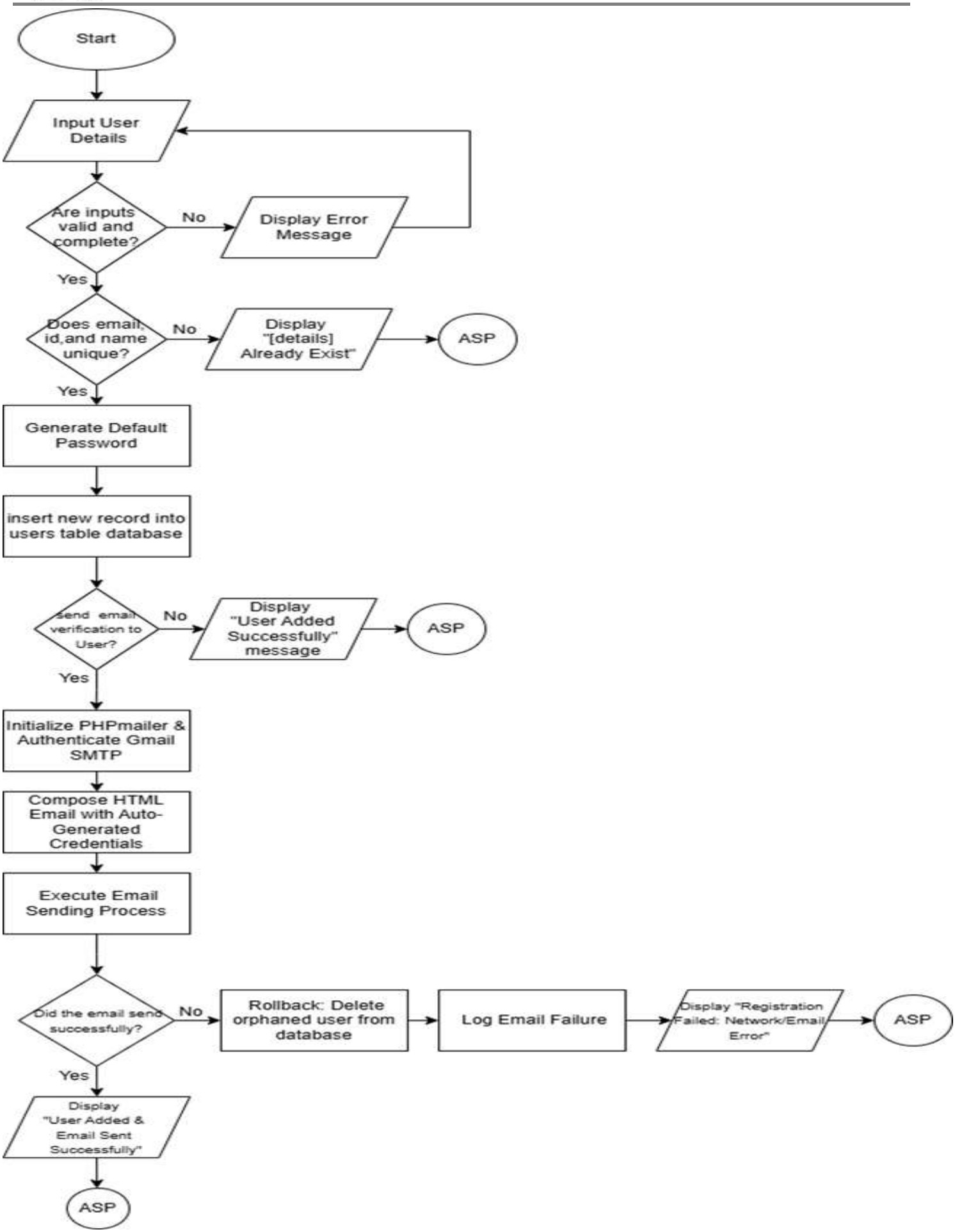

Figure 8. Register User Flowchart

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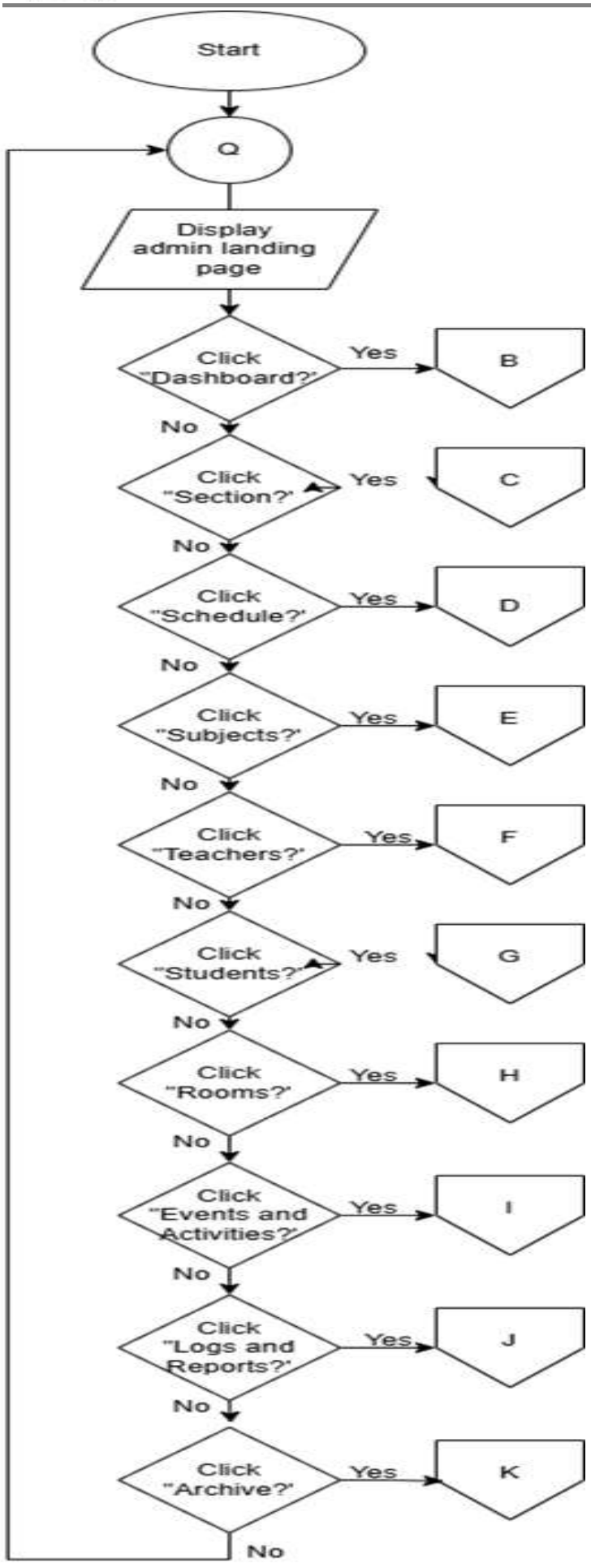

Figure 9. Admin Landing Page Navigation Flowchart

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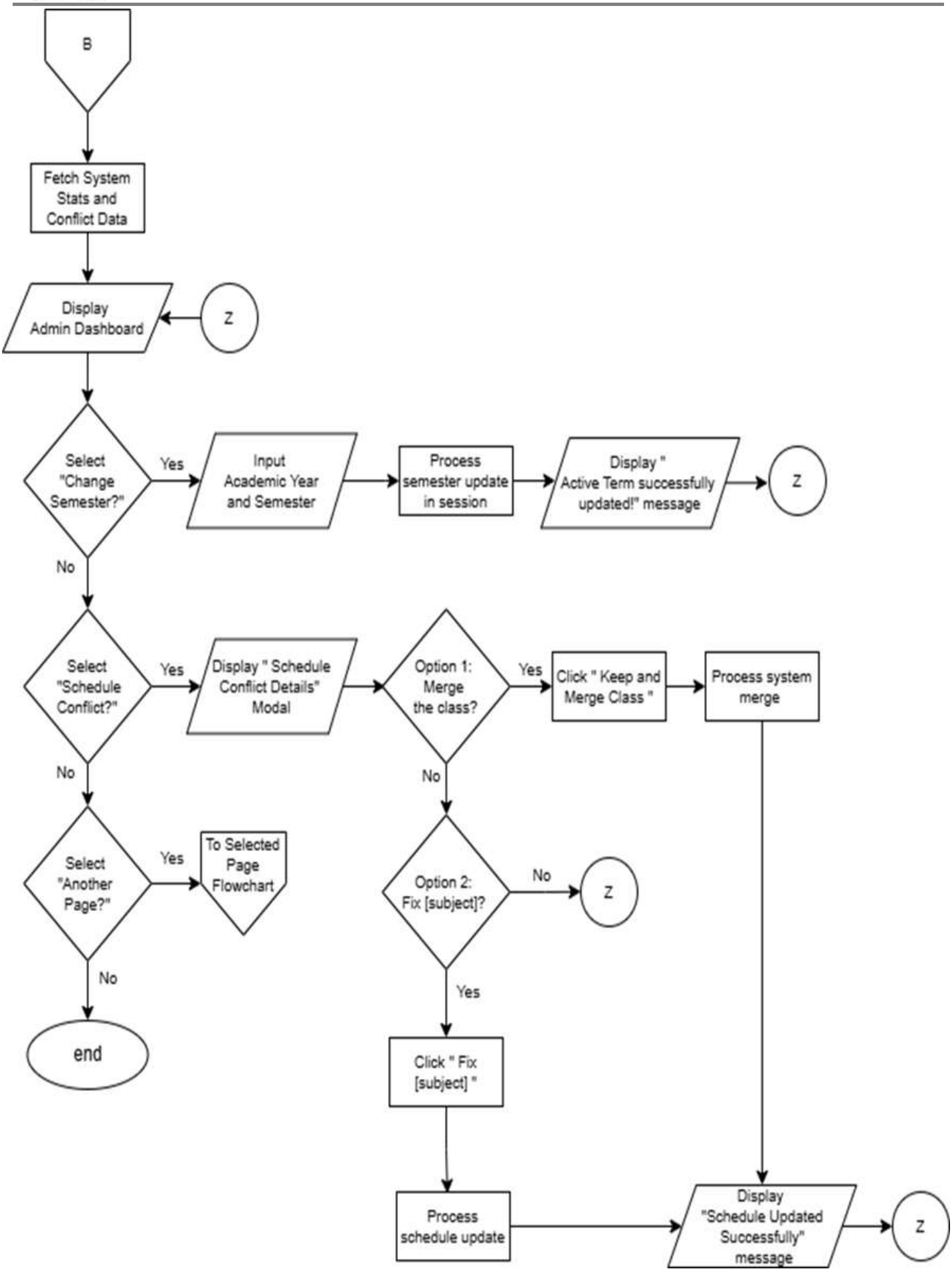

Figure 10. Admin Dashboard Page Flowchart

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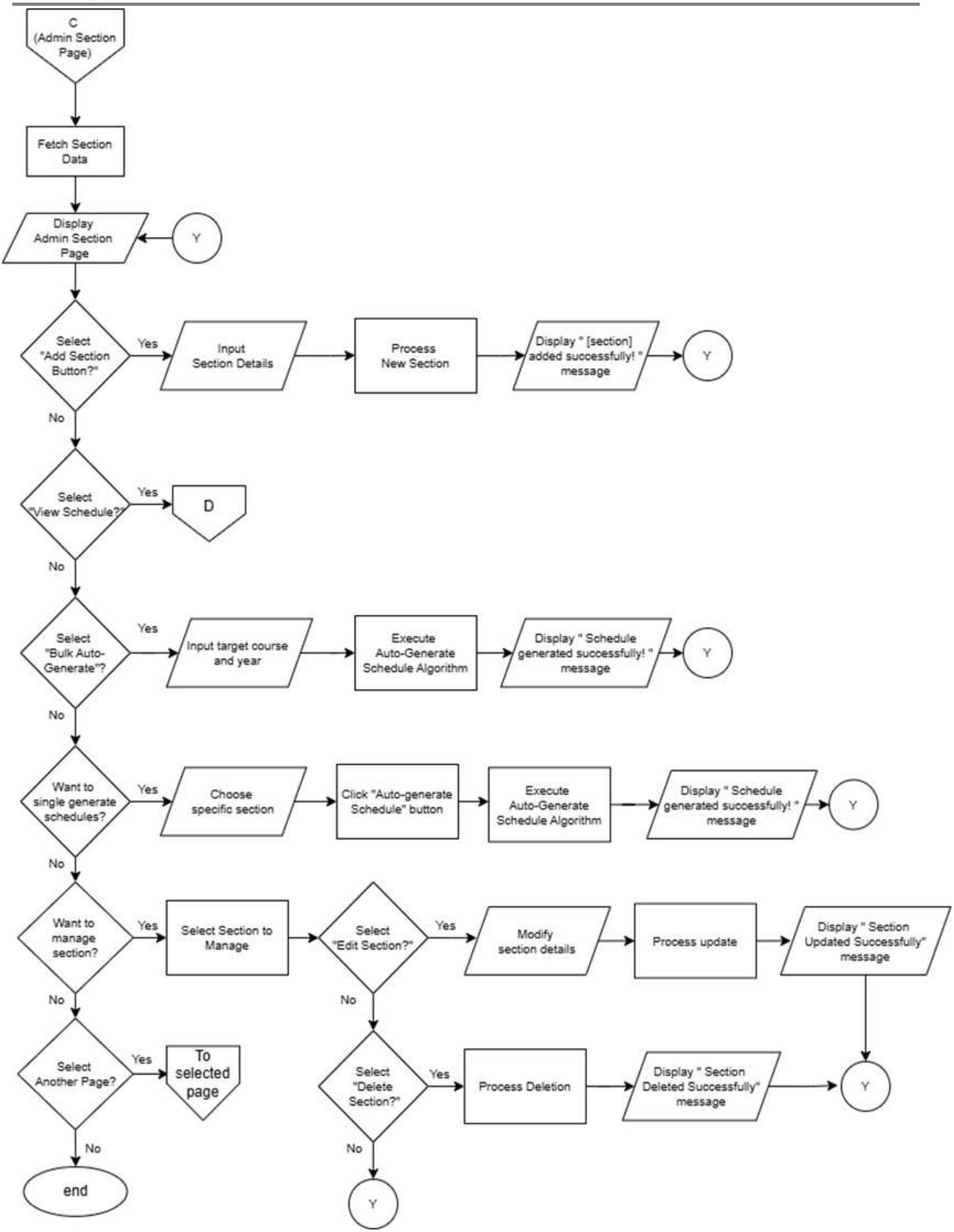

Figure 11. Admin Section Page Flowchart

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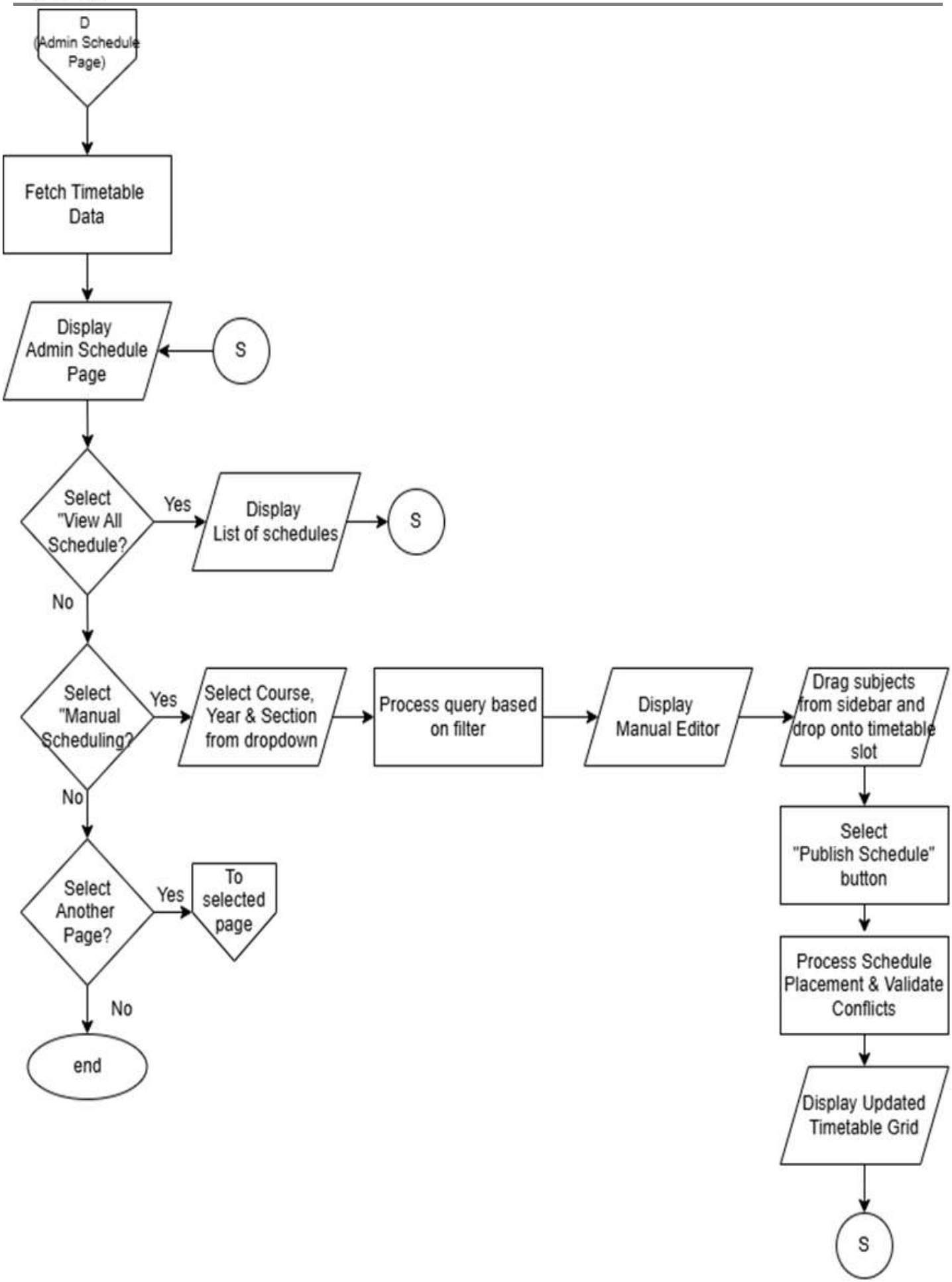

Figure 12. Admin Schedule Page Flowchart

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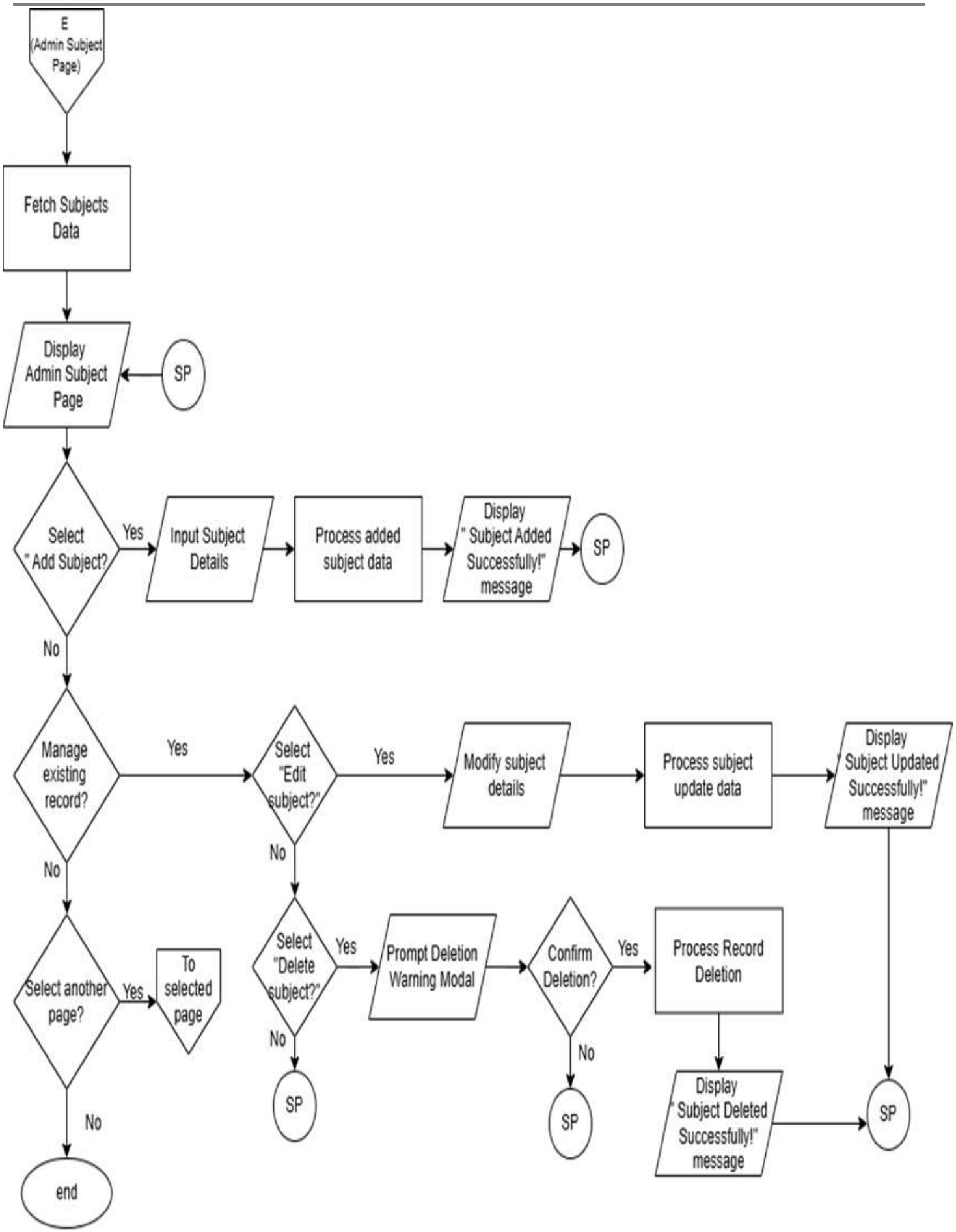

Figure 13. Admin Subject Page Flowchart

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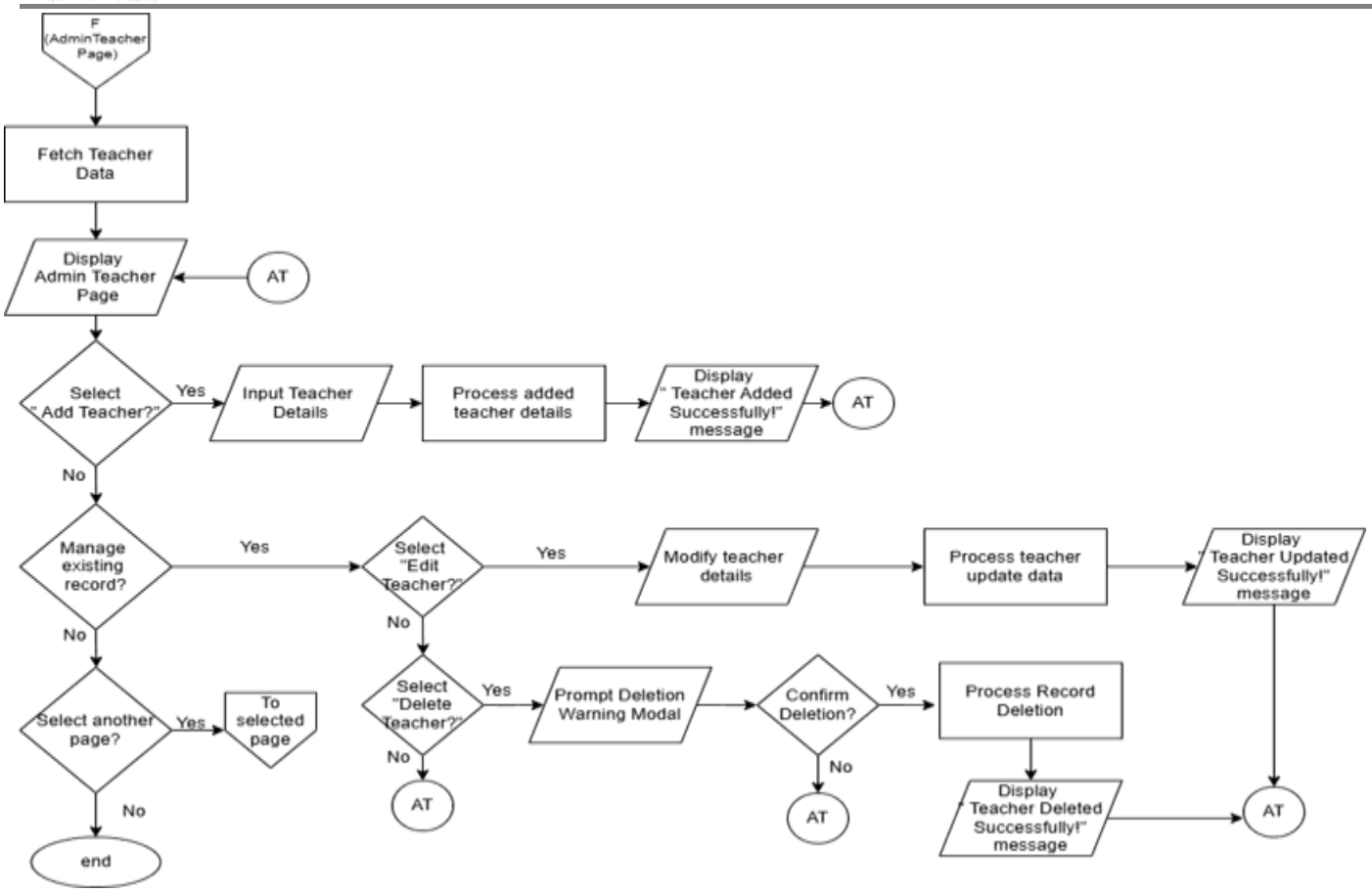

Figure 14. Admin Teacher Page Flowchart

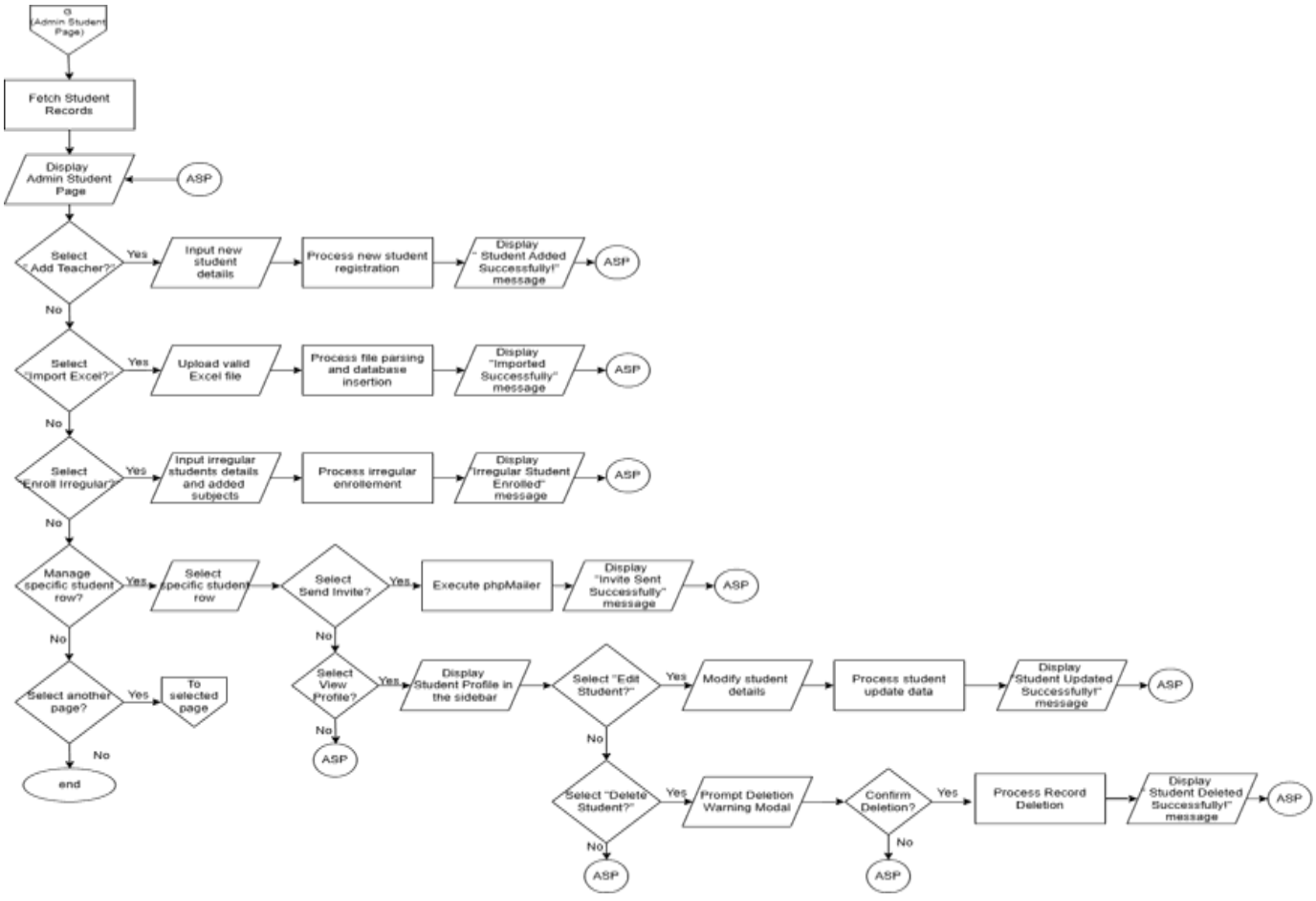

Figure 15. Admin Student Page Flowchart

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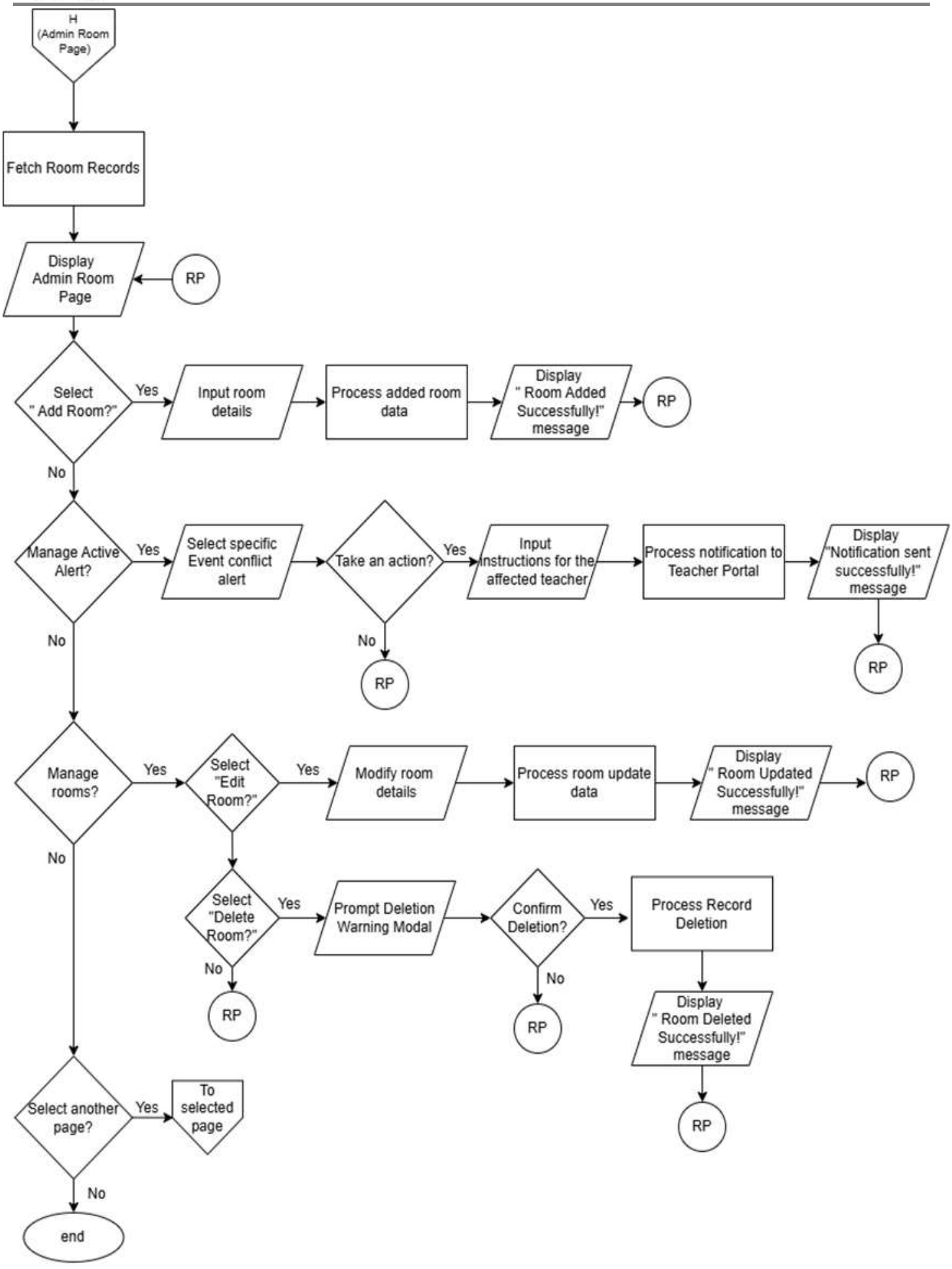

Figure 16. Admin Room Page Flowchart

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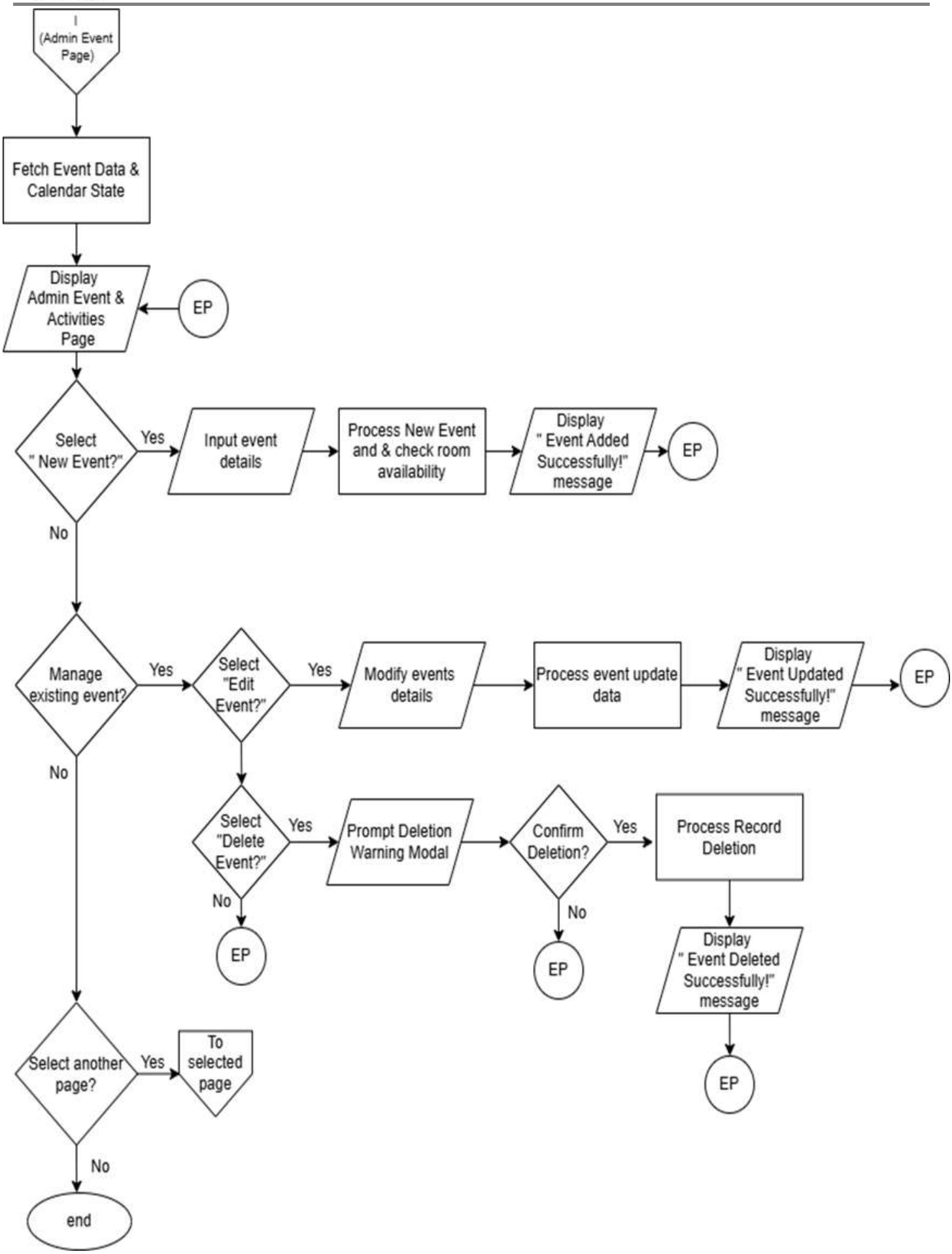

Figure 17. Admin Events and Activities Page Flowchart

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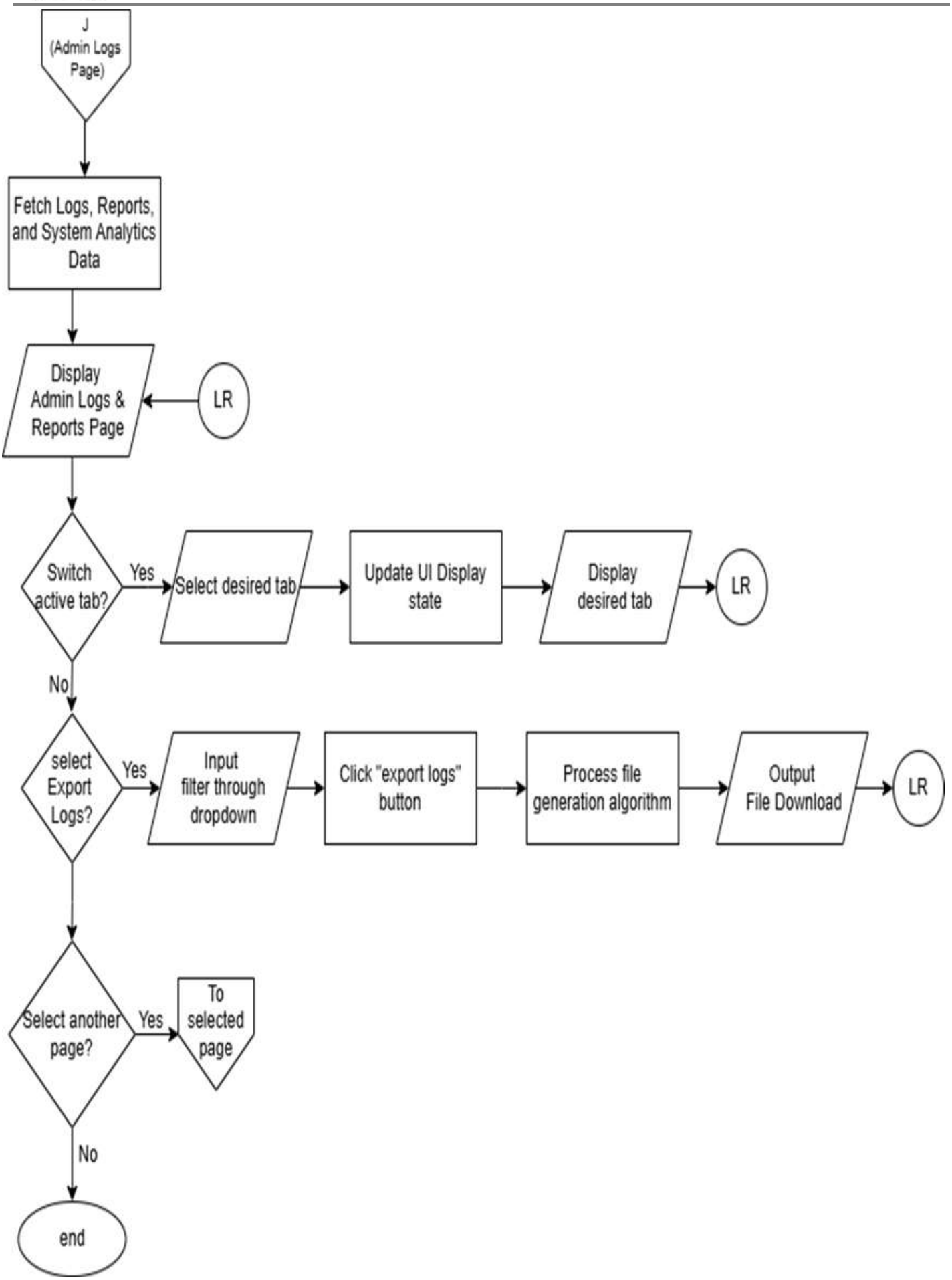

Figure 18. Admin Logs and Reports Page Flowchart

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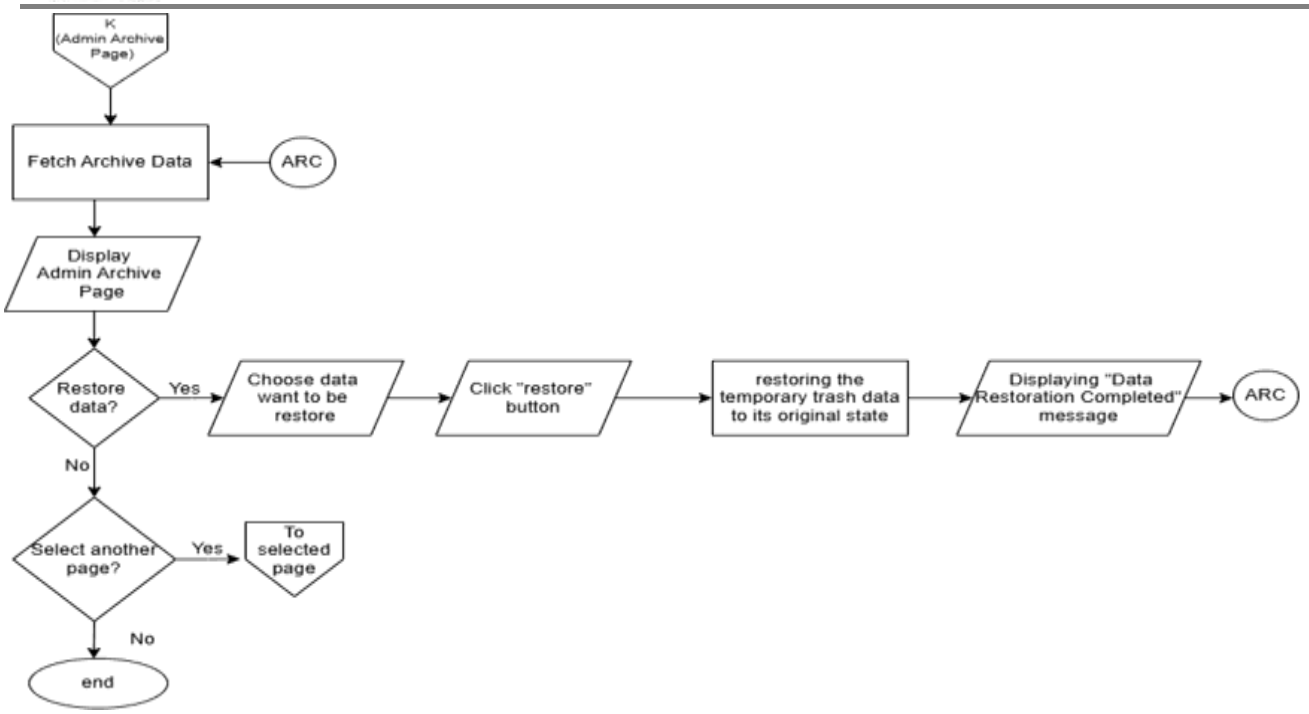

Figure 19. Admin Archive Page Flowchart

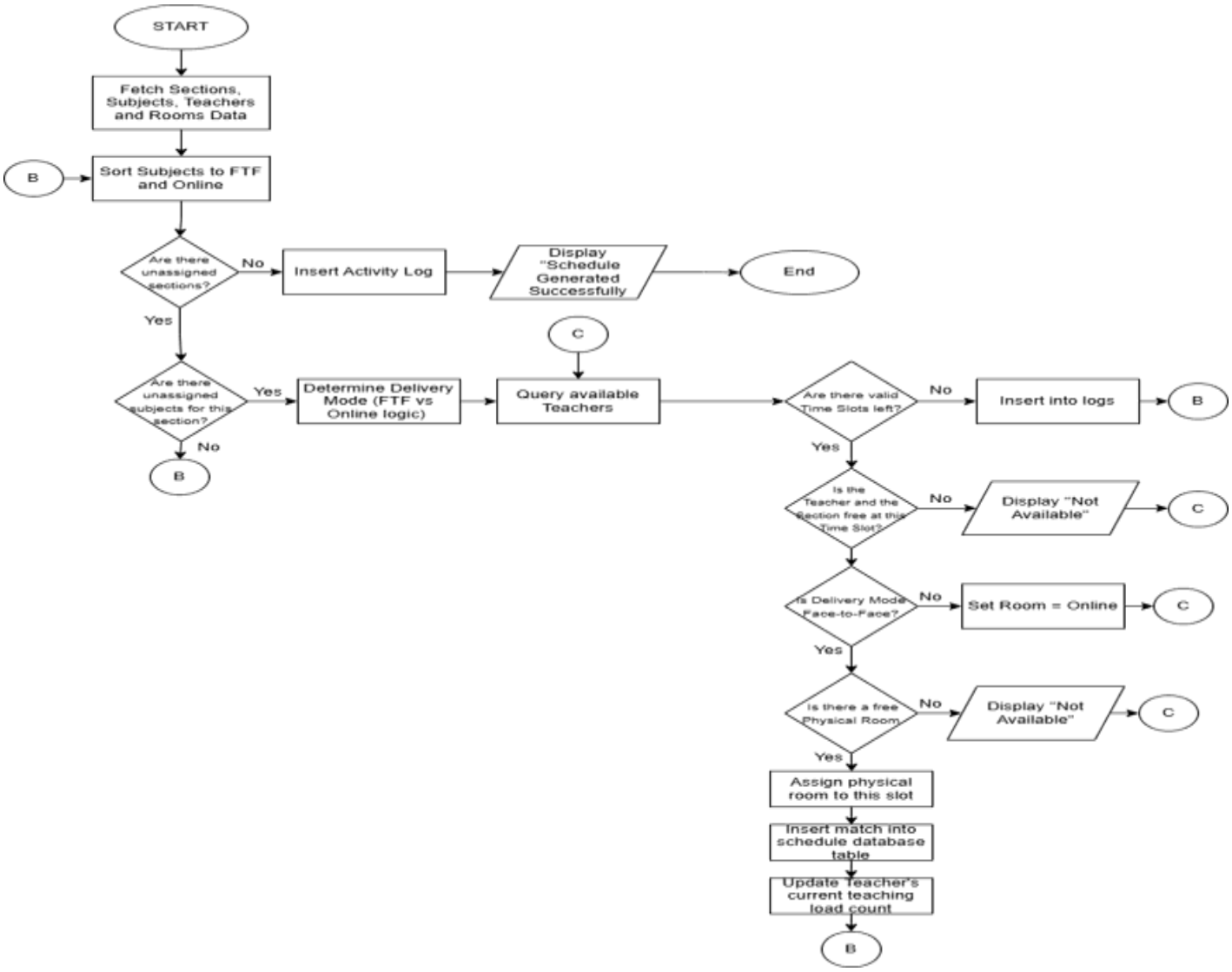

Figure 20. Admin Auto Scheduling Algorithm Flowchart

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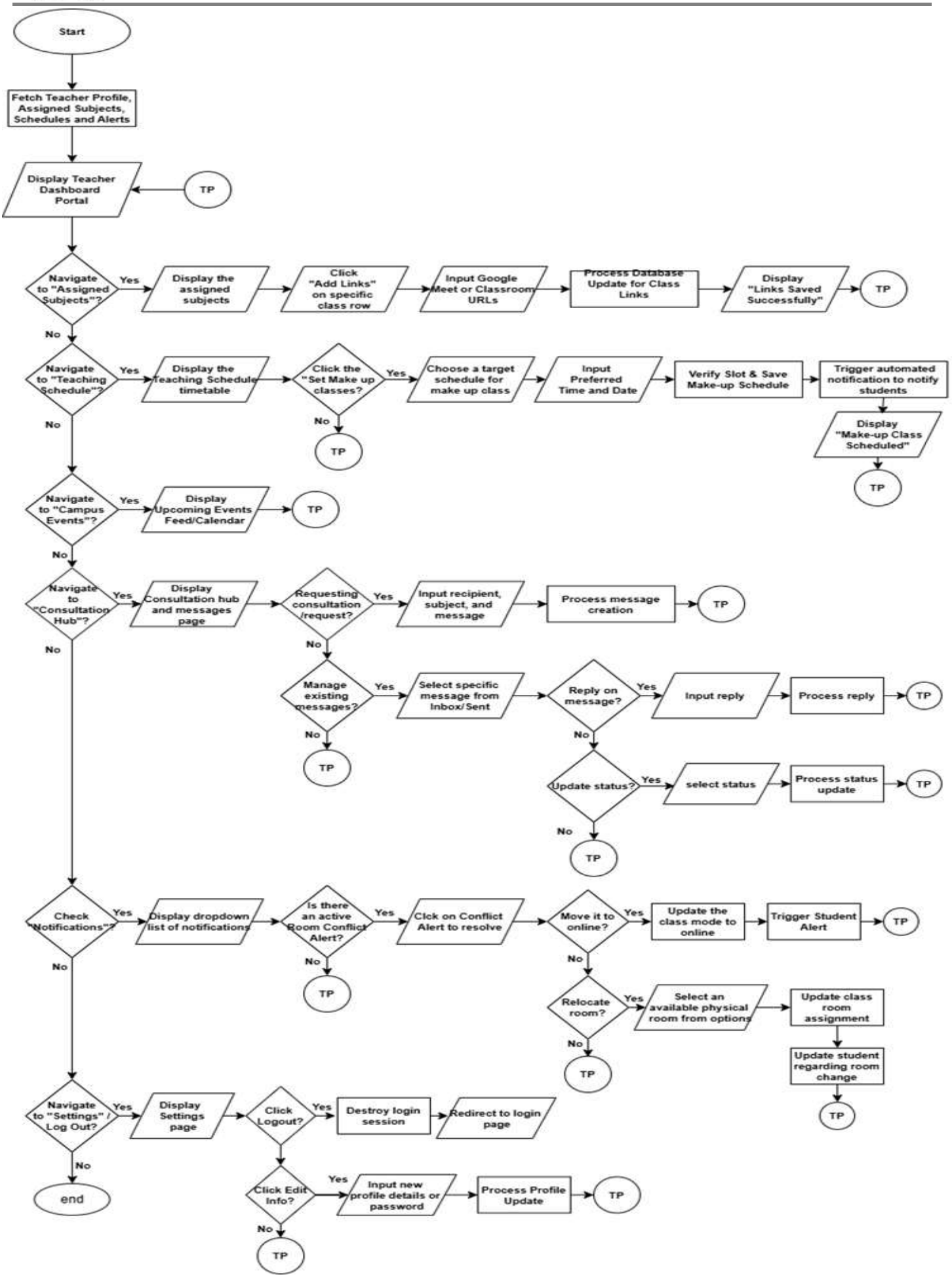

Figure 21. Teacher Portal Flowchart

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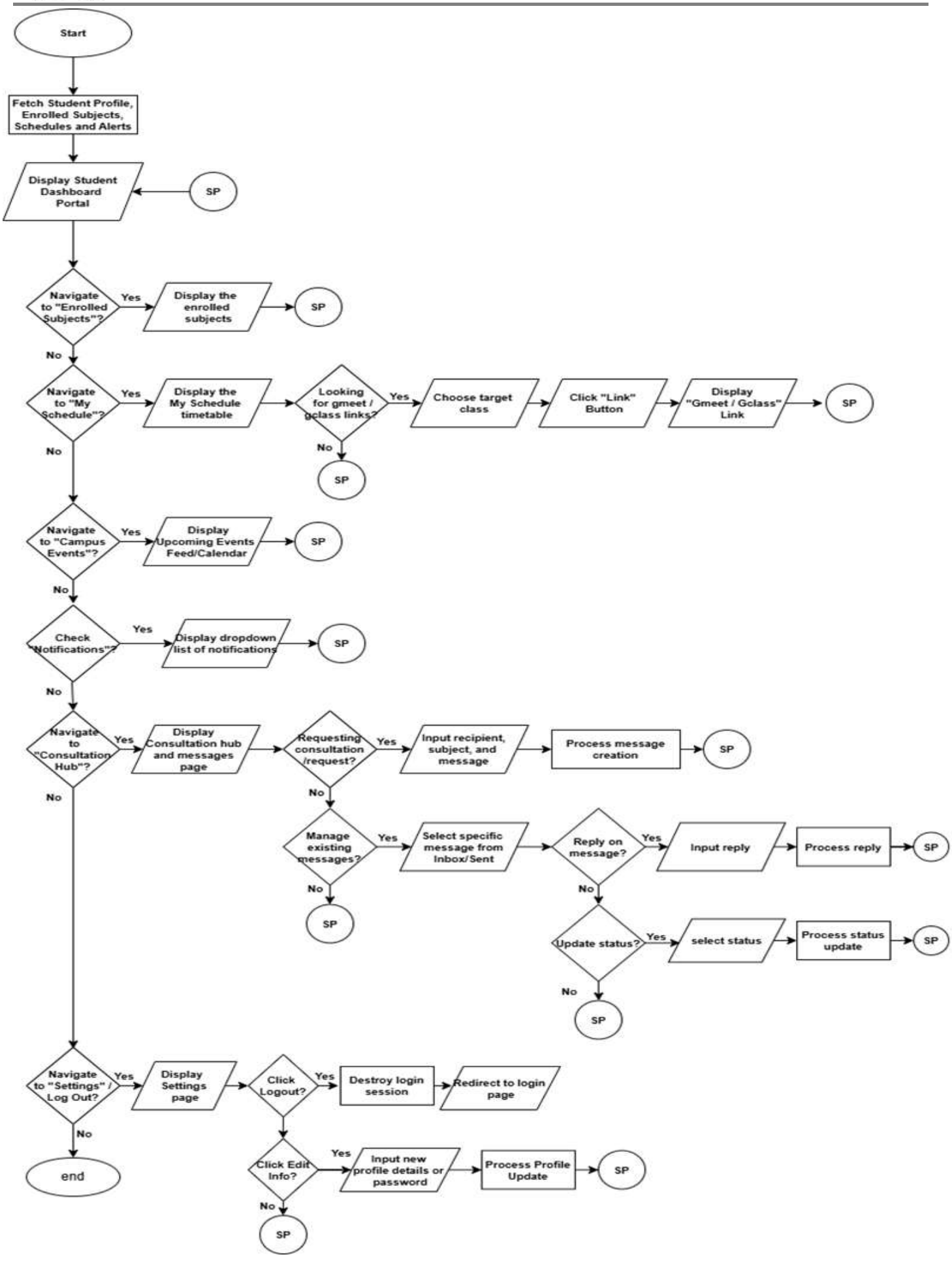

Figure 22. Student Portal Flowchart

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Appendix F: Sample Screen Output

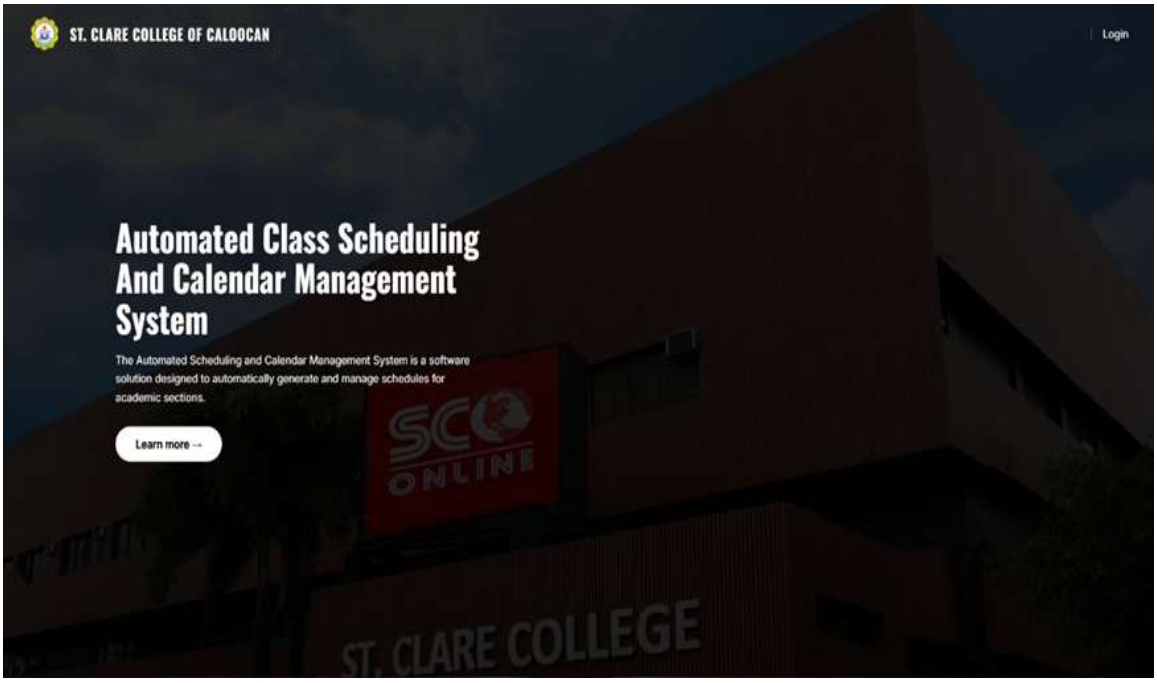

Figure 23. Landing Page

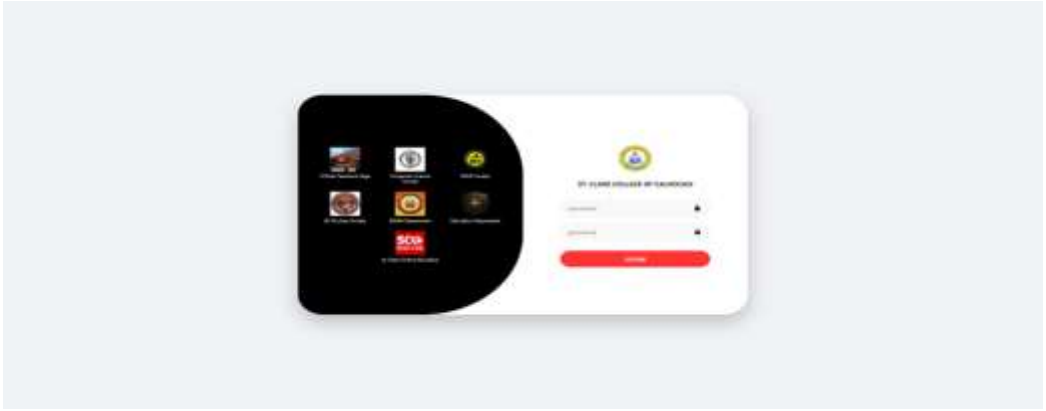

Figure 24. Login Page

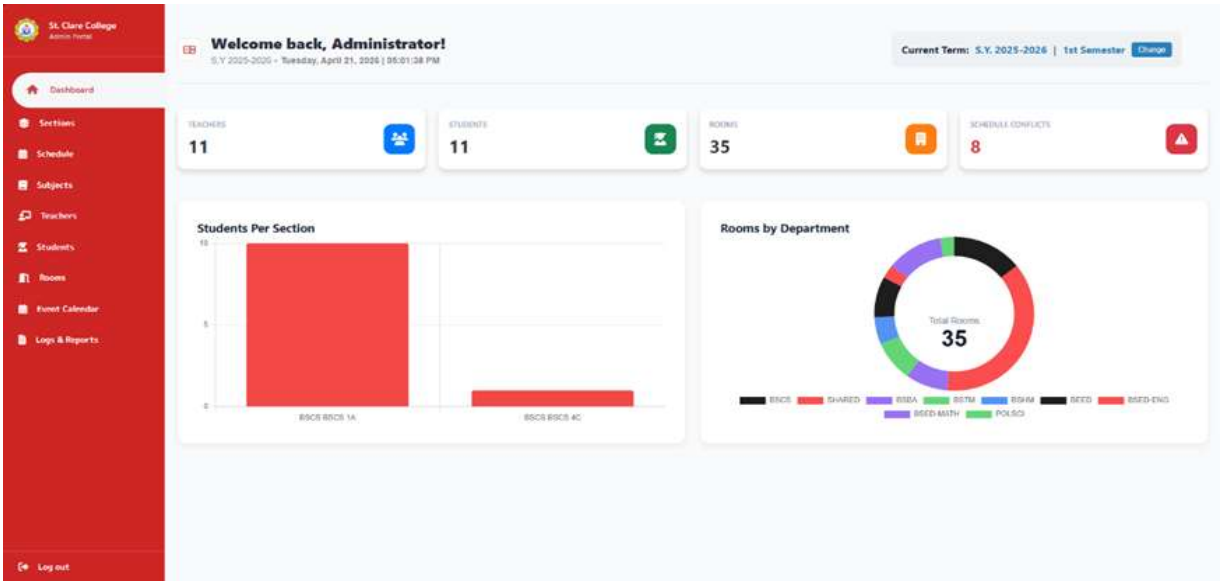

Figure 25. Admin Dashboard Page

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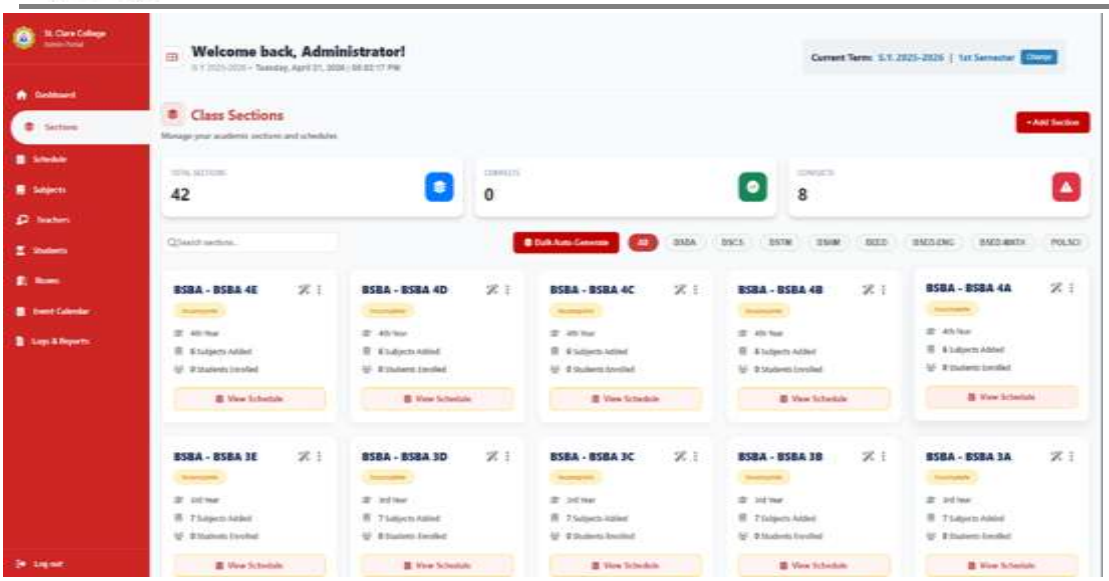

Figure 26. Admin Section Management Page

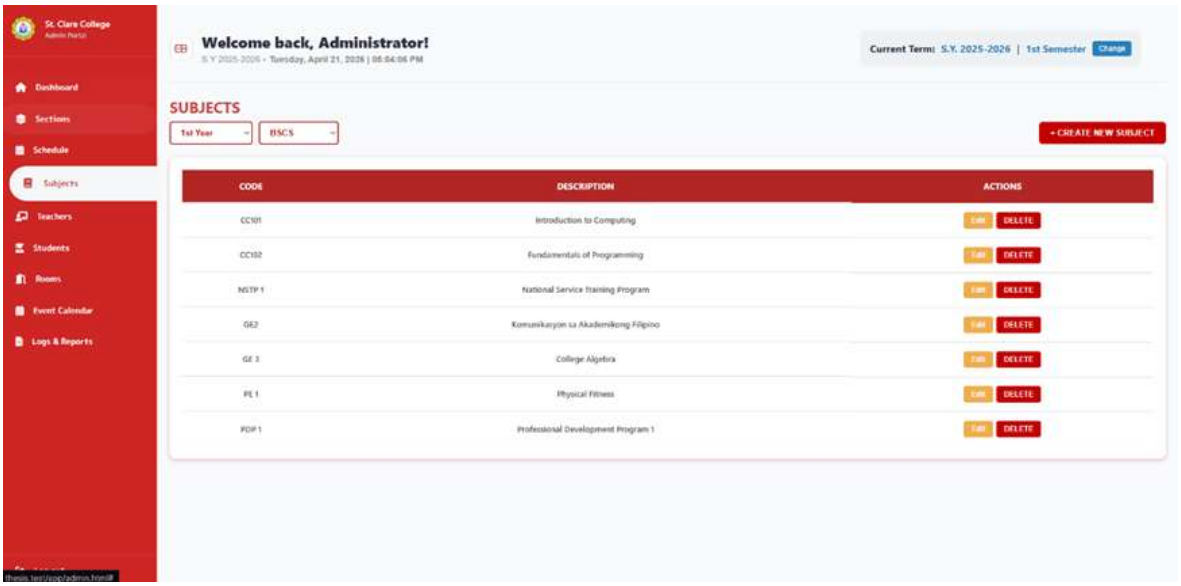

Figure 27. Admin Subject Management Page

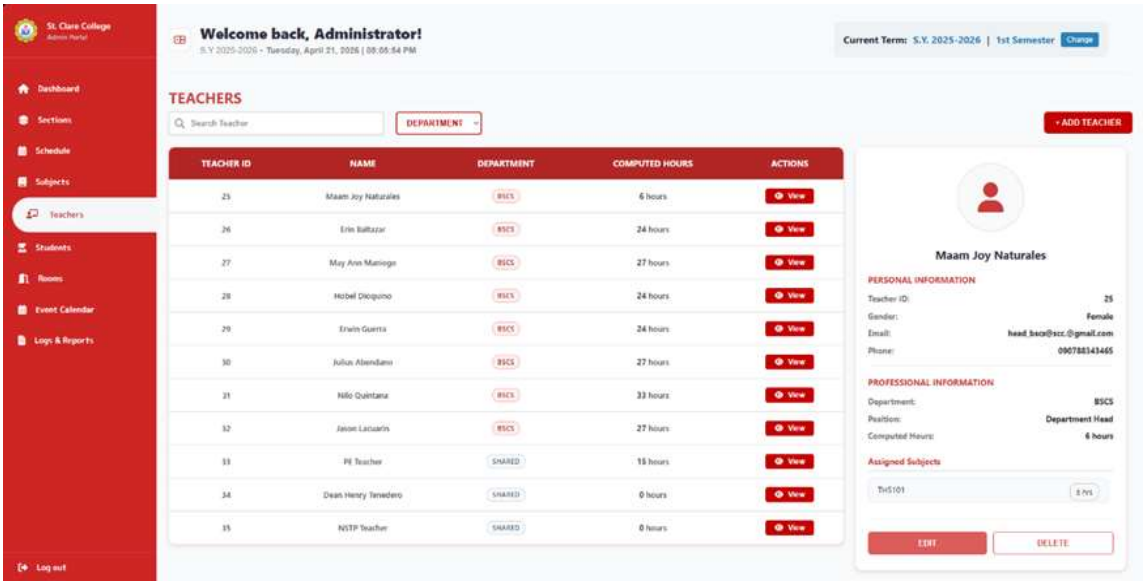

Figure 28. Admin Teacher Management Page

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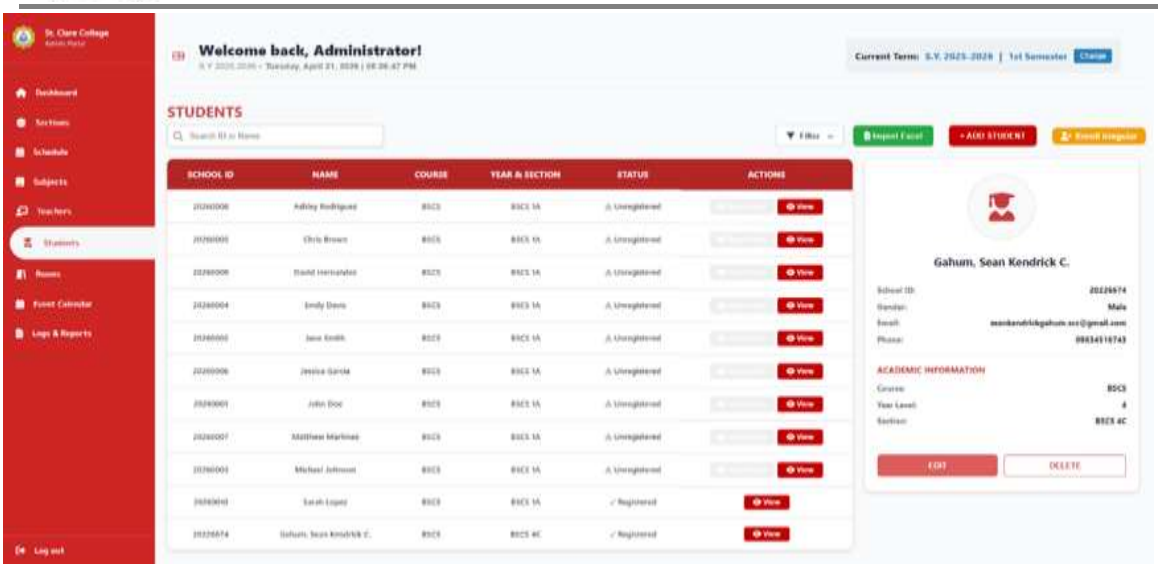

Figure 29. Admin's Student Management Page

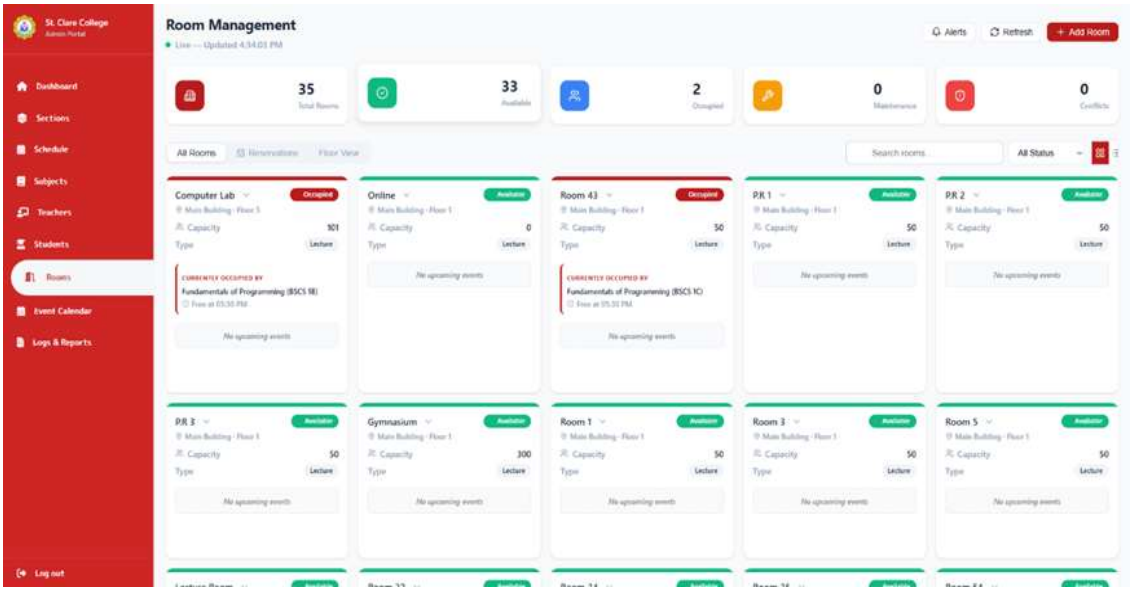

Figure 30. Admin's Room Management Page

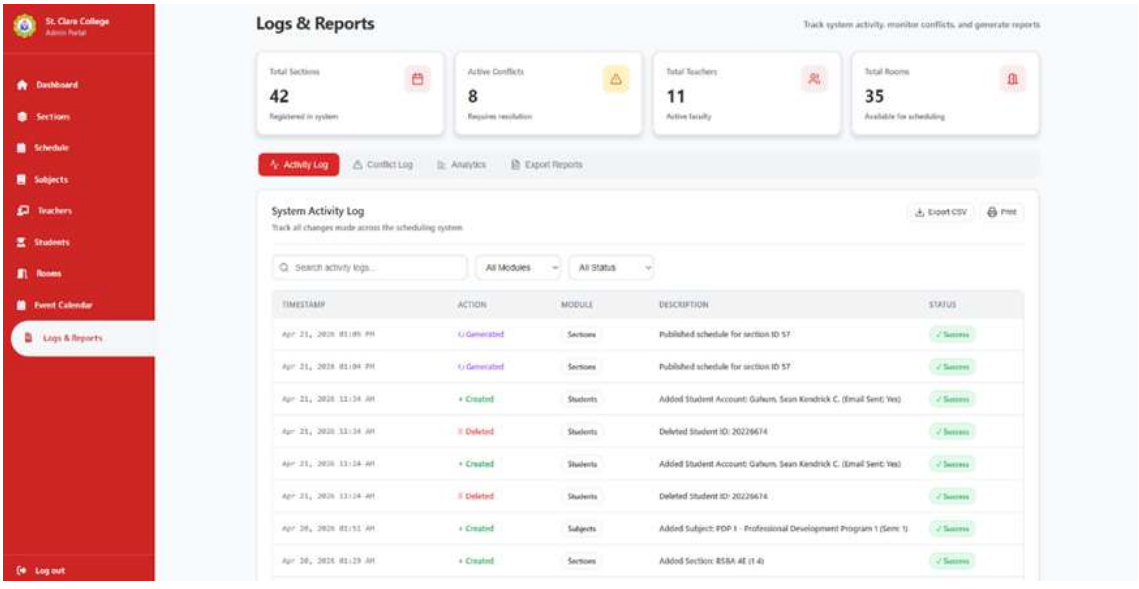

Figure 31. Admin's Log and Report Page

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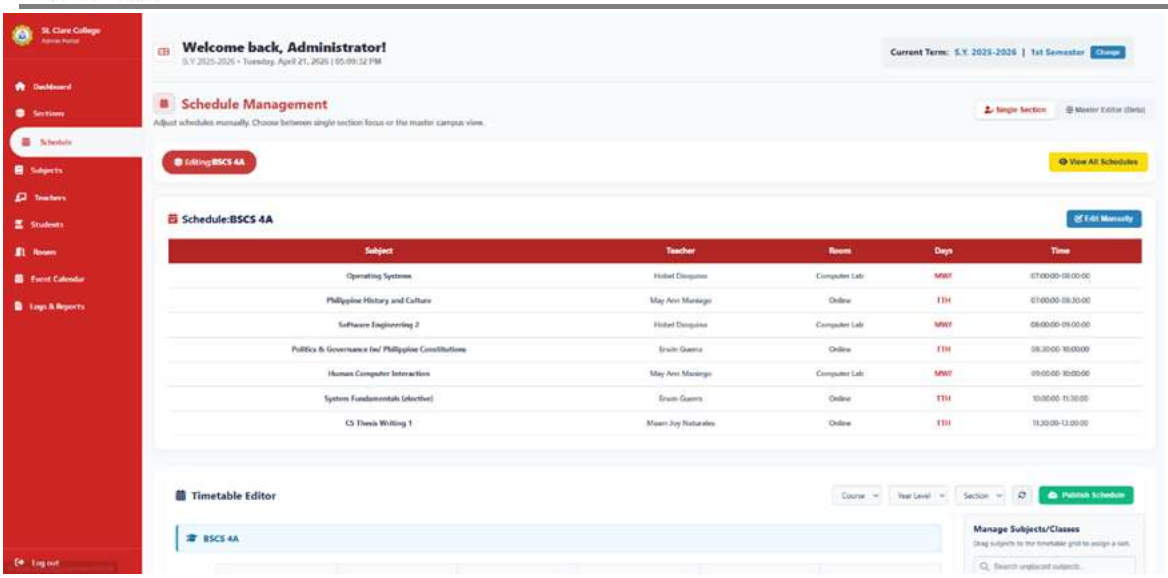

Figure 32. Admin's Generated Schedules Page

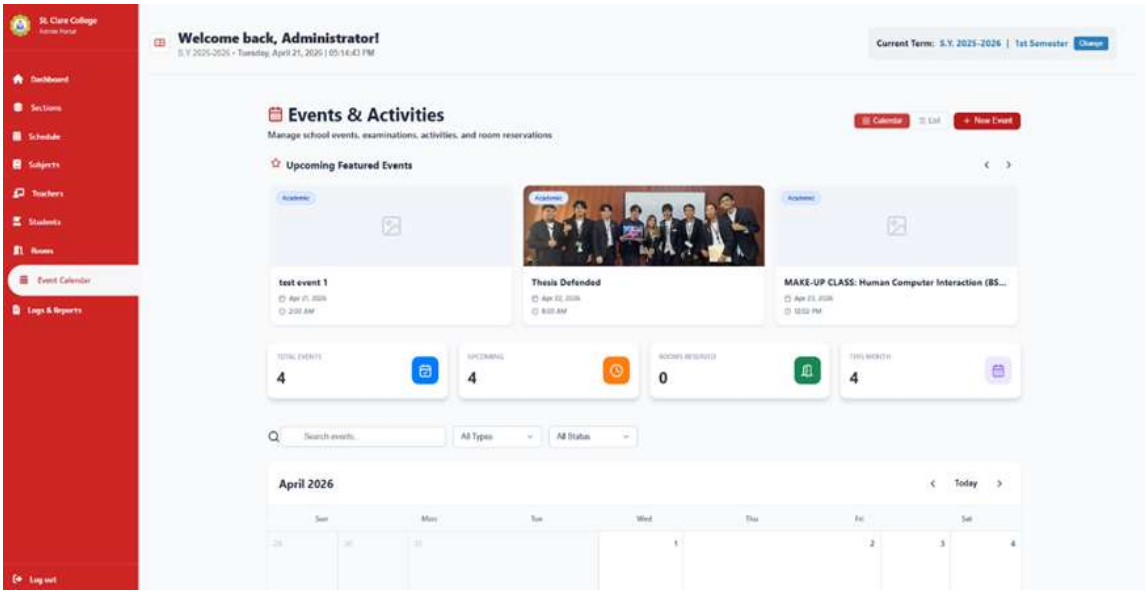

Figure 33. Event Page

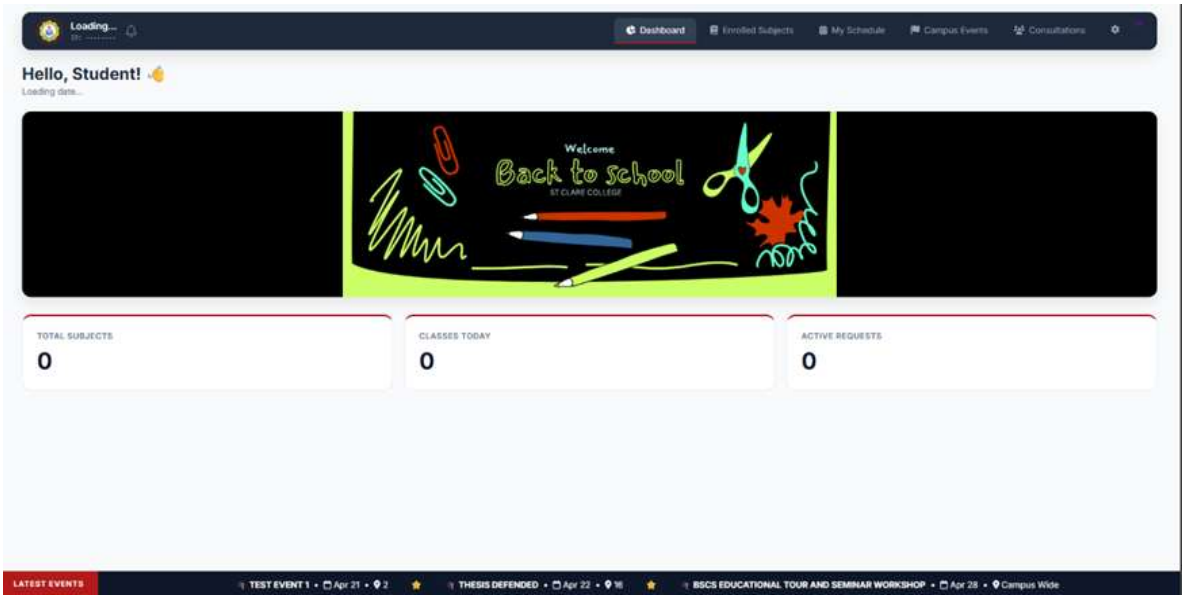

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Figure 34. Student and Teacher Dashboard

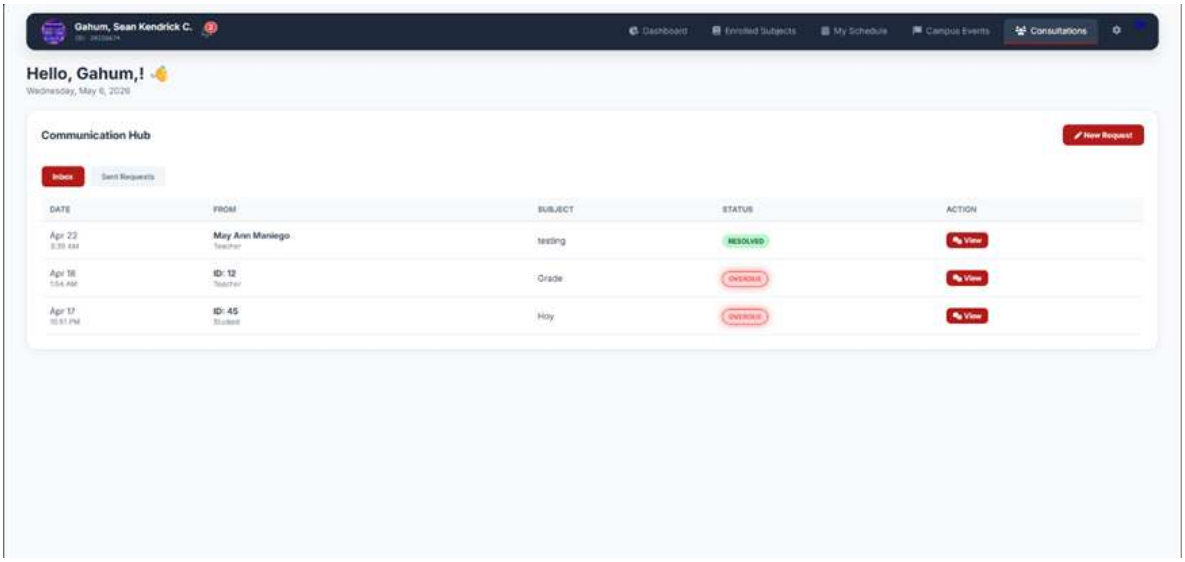

Figure 35. Consultation Hub

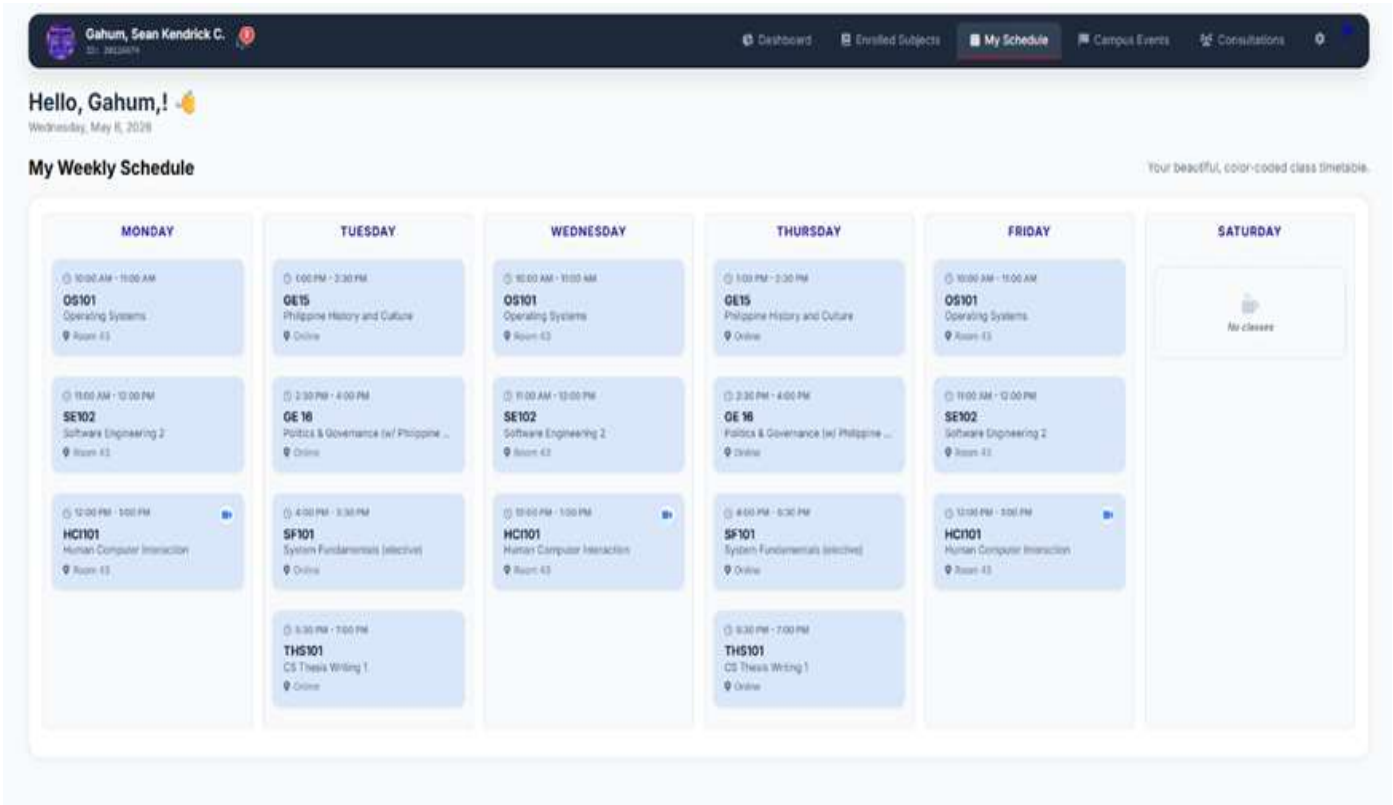

Figure 36. My Schedule Timetable

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Appendix G: Algorithm Discussion

Algorithm	Description	Strength	Weakness
Heuristic-based Greedy Algorithm	A constructive approach that builds the schedule step-by-step. It assigns the first available time slot and room to each subject (Greedy) while applying logical rules like teacher load balancing and MWF/TTH grouping (Heuristics) to guide the decisions. Time complexity: $O(n^2)$ or $O(n^3)$. It is fast for small schools but slows down significantly as the data grows.	1. Speed & Efficiency: Generates conflict-free schedules in milliseconds, making it ideal for web applications. 2. Constraint Handling: rigorous checks ensure 0% double-booking for rooms or teachers. 3. Fairness: The "Least-Loaded" heuristic distributes teaching hours evenly among faculty.	Local Optimization: It makes the best decision for the current subject without looking ahead, which may block better options for later subjects.

Table 9. Algorithm Discussion

Appendix G: Cost Benefit Analysis

Aspect	Estimated Costs (₱)	Estimated Benefits (₱)
Development & Setup	₱0 (Absorbed as thesis project)	Avoids ~₱100,000+ in outsourced IT development fees
Operational & Labor	~₱1,500 – ₱3,000 / month (Hosting)	Repurposes ~₱5,000 – ₱8,500 of admin labor hours / semester
Efficiency & Overhead	Minimal time for staff training	Maximizes facility usage and eliminates costly scheduling errors

Table 9. Cost Benefit Analysis