POLYTECHNIC UNIVERSITY OF THE PHILIPPINES

Predictive Model for Analyzing Enrollment of Children with Special Needs in Paranaque City

A Thesis

Presented to the Faculty of Undergraduate School

Polytechnic University of the Philippines

Paranaque Campus

In Partial Fulfillment of the Requirements for the Degree

in Bachelor of Science in Information Technology

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BSIT 3-1

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Chapter 1

THE PROBLEM AND ITS SETTING

Introduction

Special needs children require consistent access to education, therapy, and government support services to promote their overall growth. Inefficiencies in data management in tracking and analyzing the enrollment trends among such children, however, have a tendency to create gaps in service delivery, particularly in poor communities. As per Lekha (2025), predictive analytics applies statistical modeling, machine learning, and artificial intelligence (AI) methods to examine past data and predict future health outcomes. In Parañaque City, the absence of an integrated and predictive system limits the ability of local authorities, educational institutions, and therapy centers to assess the actual demand for special education programs and financial assistance, ultimately hindering progress toward Sustainable Development Goal (SDG) 4, which aims to ensure inclusive and equitable quality education for all.

Data-driven decision-making plays a special role in enhancing education accessibility for children with disabilities. Special education predictive analytics helps policymakers predict the rate of enrollment and allocate resources to facilitate better decision-making, as per Brown et al. (2023). One of the fundamental techniques used in predictive analytics is the regression model, which helps establish relationships between different factors affecting enrollment, such as demographic trends, socioeconomic conditions, and availability of services. By leveraging models like linear regression, policymakers can quantify the impact of these variables on enrollment rates and forecast future trends with greater accuracy (Box, Jenkins, & Reinsel, 2015; Johnson & Carter, 2022).

Through the development of a predictive situational analysis system, this research will contribute significantly to evidence-based policymaking, wherein Parañaque City can enhance the accessibility and inclusivity of special education programs. As pointed out by Johnson & Carter (2022), school-level predictive modeling is linked to improved program evaluation, improved fund allocation, and increased enrollment efficiency. This initiative also aligns with SDG 3, which promotes good health and well-being by ensuring that children with special needs receive the necessary therapy and educational support. Through this project, special needs children will gain from a more ordered and fair enrollment procedure.

The system to be proposed will allow stakeholders such as administrators, employees, and authorized staff to manipulate and analyze data according to age, gender, income level, and therapy enrollment. Previous studies point out that the use of predictive analytics in enrollment systems maximizes efficiency and reduces gaps in accessibility (Martinez & Lee, 2021). This aligns with the objective of providing children with disabilities with adequate education and financial support that is tailored to their needs while contributing to the broader global effort to achieve sustainable and inclusive development.

Statement of the Problem

Despite the efforts made to implement inclusive education, different children with special needs in Parañaque City face challenges accessing proper education and therapy interventions. The inefficiencies in the monitoring of enrollments, the allocation of resources, and service deployment are the result of no centralized database, as well as an analytics tool with predictive capacities. Manual or disaggregated data systems existing have no real-time capacities required to address special education gaps.

This study attempts to solve the following major questions:

1. What are the present issues in monitoring and managing the enrollment of children with special needs in Parañaque City?

2. How can predictive analytics enhance the effectiveness of enrollment processes and resource allocation for special education programs?

3. What demographic and socioeconomic determinants affect the enrollment rates of children with disabilities?

4. How can a centralized database system be useful in the identification of underserved areas and ensuring equitable access to education and therapy services?

5. What is the influence of financial accessibility on enrollment and participation of children in special education programs?

6. How can the suggested predictive model aid administrators in decision-making and policy formation in special education?

Through the answers to these questions, this study aims to improve the enrollment process for special needs children using a data-driven strategy that guarantees accessibility, efficiency, and inclusivity.

Theoretical Framework

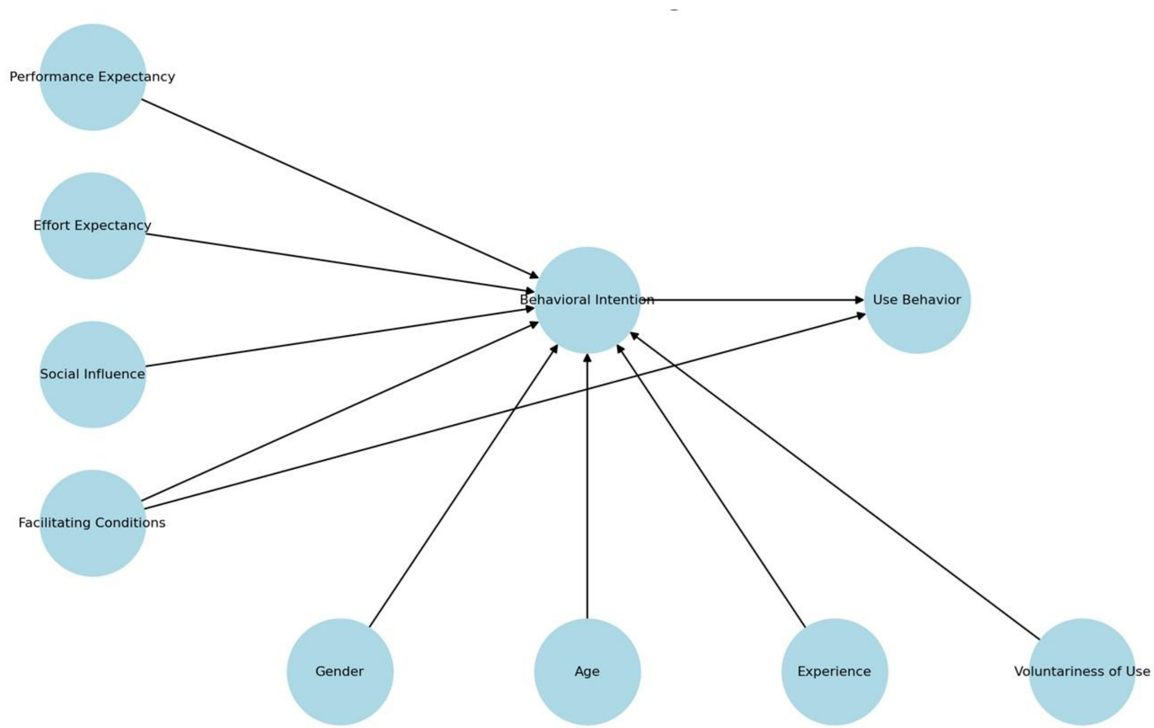


Figure 1. Unified Theory of Acceptance and Use of Technology

This study adopts "The Unified Theory of Acceptance and Use of Technology (UTAUT)", proposed by Venkatesh et al. (2003), which is commonly used to investigate technology adoption. The UTAUT framework identifies four key determinants of technology acceptance, which are highly relevant to the implementation of a Predictive Model for Analyzing Enrollment of Children with Special Needs in Paranaque City

Firstly, Performance Expectancy measures whether parents, educators, and policymakers believe that using the proposed system benefits them, assists in decision-making, and improves the efficiency of enrollment and situational analysis. The system is expected to enhance accessibility, streamline data collection, and contribute to more data-driven interventions for children with special needs.

Secondly, Effort Expectancy refers to how intuitive and easy the system is to use. The user-friendly interface of the system plays a crucial role in ensuring higher adoption rates among stakeholders, including parents, educators, healthcare professionals, and government agencies. By minimizing complexity, the system will encourage more participation and accurate data input.

Thirdly, Social Influence affects adoption, particularly in environments where peer recommendations or institutional policies drive behavior. In the context of this study, the endorsement and encouragement of the local government, CSN centers, and advocacy groups will play a critical role in persuading users to engage with the system. Community acceptance and institutional support will increase trust and participation in the enrollment process.

Lastly, Facilitating Conditions refer to the availability of resources, infrastructure, and technical support that enable users to adopt and effectively use the system. For this study, factors such as internet access, training programs, and government collaboration are essential to ensuring that the system functions effectively and reaches all intended users, including low-income families and underserved communities.

By integrating the UTAUT model, this study ensures that the proposed system is designed to be efficient, user-friendly, widely accepted, and well-supported, ultimately contributing to an inclusive and data-driven approach for addressing the needs of children with special needs in Parañaque.

Conceptual Framework

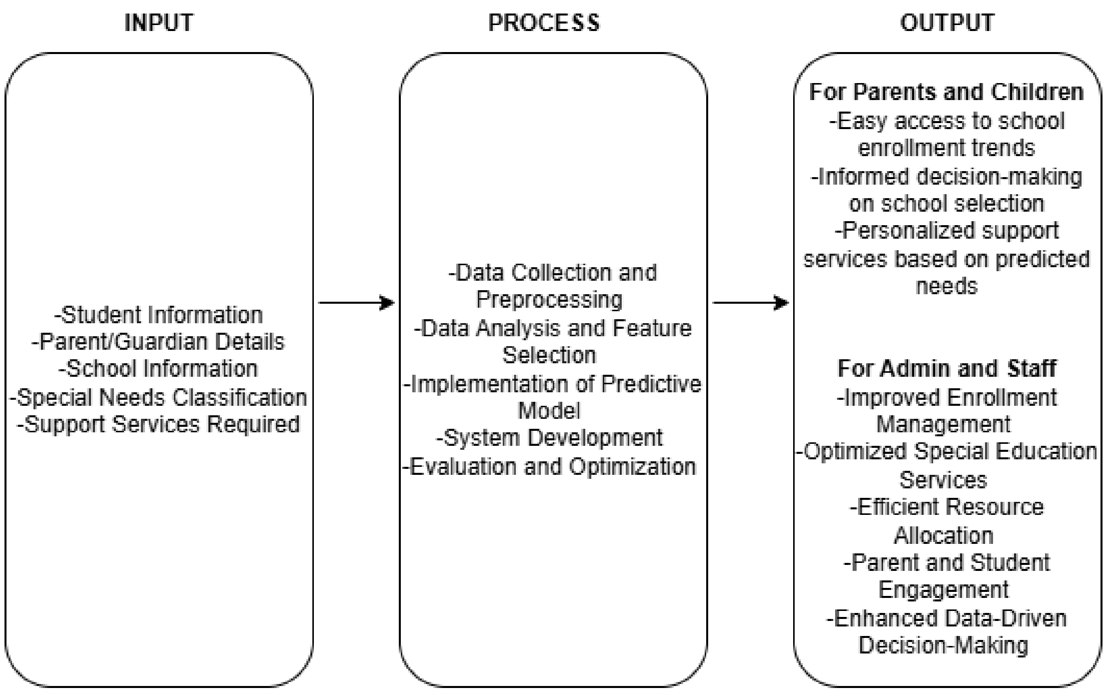


Figure 2. Conceptual Framework

Figure 2 illustrates the Input-Process-Output (IPO) model for the development of a Predictive Model for Analyzing Enrollment of Children with Special Needs in Parañaque City. According to Adobe Experience Cloud Team (2023, July), an IPO diagram helps in analyzing and improving a system by breaking it down into input, process, and output, ensuring all variables and results are systematically considered. This framework provides a structured approach to understanding the flow of information, from data collection to processing and analysis, ultimately generating actionable insights for policymakers, educators, and service providers. The conceptual framework for this study is grounded in the goal of providing a centralized, data-driven solution to analyze and manage enrollment information for Children with Special Needs (CSN) in Parañaque City. It draws upon systems theory and evidence-based policy-making principles to integrate stakeholders, processes, and technology into a single analytical environment.

- **Input:** Demographic data, therapy and education service records, socioeconomic indicators
- **Process:** Data integration, predictive modeling, categorization, and analysis
- **Output:** Centralized dashboard with analytics for policy planning and enrollment monitoring

Objectives of the Study

General Objectives

To develop a centralized and predictive database system for the enrollment of children with special needs in Parañaque City, enabling data-driven decision-making to improve educational access, resource allocation, and policy formulation.

Specific Objectives

- Design a secure and structured database system aligned with ISO/IEC 25010 software quality standards.
- Facilitate accurate data collection through PWD ID verification and manual input options.
- Categorize students based on demographics and disability profiles for actionable analysis.
- Apply predictive modeling techniques to identify trends and gaps in enrollment.
- Support education and health agencies with real-time, accessible data for decision-making.

- Promote equitable access to services by guiding the distribution of support based on actual needs.

Scope and Limitations of the Study

Scope

The goal of this research is to conceptualize an inclusive database system that will manage Parañaque City records of children with disabilities to collect, categorize, enroll, and facilitate access to therapy and special education services. It is meant to provide effective management of records, beneficiary verification, and situational analysis to assist the government in planning and allocation of resources. By establishing the extent of this system, the study will be able to ascertain its purposes, which are the standardization of data collection, enhancing access to special services, and the proper classification of those to be taken care of. These will all, in the long run, lead to better and encompassing programs for children with disabilities.

1. **Data Storage and Collection**

   The system will promote data gathering and storage by compiling, storing, and keeping tabs on records of children with disability. It will enable automatic capturing of data on children with an existing PWD ID, with those who have none to be manually input via a verification mode. The system will capture relevant demographic information such as age, gender, disability category, income level, and barangay district.

2. **Categorization and Analysis**

For analysis and classification, the system will organize records according to age, sex, type of disability, and income level in order to provide government agencies a way of knowing the distribution of children with disabilities per barangay. It would also aid in determining underserved areas, mainly barangays having a high density of children with disabilities but which have fewer numbers of accessible therapy centers. Also, a proximity analysis will be performed to assess how close children are to available therapy and special education facilities. The system will also identify gaps in enrollment due to economic factors, highlighting families who might need financial support to gain access to therapy and education services.

3. **Enrollment and Verification Process**

The registration and verification process will be carried out through a PWD ID or a doctor licensed verification number as the main authentication. Manual verification and approval by staff in case an applicant does not have a PWD ID will be required.

4. **User Access and Management**

To ensure data safety and management, there will be three levels of access within the system. Admins will have full control over the records, modifications, and approval processes. Restricted access will be provided for staff on managing records and approvals, and authorized staff will be able to view and examine the data for policy development, reporting, and planning.

5. **Situational Analysis when Developing Policy**

The system will also serve as a situational analysis tool to guide government decision-making. It will provide information on the financial needs, identifying how many children require financial support for therapy and education. It will identify the efficacy of government programs in special education and suggest where new therapy and special education centers must be established. It will identify gaps in admissions based on finances, which can guide policymakers how to surmount financial barriers to access.

Limitations

1. Dependence on PWD ID or License for Verification

The research has a number of limitations that should be taken into account. Confirmation of records will mainly be undertaken on the basis of the availability of a PWD ID, and hence children without a registered PWD ID will need to be confirmed manually, which may cause delays in enrollment.

2. Geographic Coverage Restricted to Parañaque City

The system will only be expanded within Parañaque City but not the other cities and municipalities.

3. Accuracy and Completeness of Data

Reliability of accuracy and comprehensiveness of information will depend on sources of data such as PSA, LGU records, and manual inputs which can be incomplete and outdated at times. This would affect data analysis and decision-making dependability.

4. **Financial Aid Assessment Limitations**

Even though the system will detect children who need money, it does not provide money directly since money availability is subject to government agencies and NGOs.

5. **Limited Real-Time Data Updates**

All of the updates for government policy changes, availability of therapy centers, and PWD registrations will have to be done manually as the system would lack monitoring for online therapy sessions or grant distribution.

6. **Restricted System Access for Security and Privacy**

Access will only be provided for approved users (admin, staff, and authorized personnel), prohibiting unauthorized users from pulling or modifying files.

7. **Exclusion of Persons with Disability**

The system is only for disabled children, and the disabled adults or the other vulnerable population will not be covered. Exclusion of Non-Disability-Related Data The system does not track general education enrollment, employment rates, or other socio-economic measures beyond the scope of children with disabilities.

Significance of the Study

This research is important since it will try to design an integrated database system to enhance record-keeping, classification, and accessibility of the services for disabled children in Parañaque City. By generating a centralized and effective system, this research will be highly advantageous to the stakeholders such as government agencies, policymakers, special schools for disabled children, therapy centers, and disabled children's parents.

- **For Policymakers and Government Agencies**

  The system will present accurate and categorized data on children with disabilities, making it easier for LGUs and policymakers to allocate resources more effectively. It will aid them in determining underserved areas, estimating the need for therapy and special education services, and improving current programs for children with disabilities. Moreover, with the integration of financial support analysis, the system will assist in determining families that require financial support, making government programs addressing economic constraints to education and therapy more accessible.

- **For Therapy Centers and Special Education Institutions**

  This research will assist in supporting special education centers and therapy centers by providing these centers with information regarding the distance of children from potential services. Depending on which of the barangays have more disabled children but lack access to nearby special education or therapy centers, facilities can strategically allocate their services to underserved geographic locations. Children will be provided with equal access to special education and therapy without their families having to undergo long distance travel.

- **For Data Management and Research**

  The database will be a true source of information for social workers, researchers, and advocacy organizations working with disabled children. With a structured set of data on age, gender, nature of disability, income group, and therapy attendance, researchers are able to conduct studies on disability inclusion, accessibility issues, and the effectiveness of government schemes. This will enable more inclusive policies and support systems for special-needs children to be developed.

- **For Effective Data Collection and Protection**

  Through the use of a centralized electronic record system, the study will improve data storage and capture, reducing errors and duplication of records. The system's access control, limited to admins, staff, and authorized personnel, will protect the data and confidentiality from abuse or unauthorized use of sensitive information.

- **For children with disabilities and their families**

  Parents and guardians will appreciate an easier and more organized enrollment process because the system will allow for automatic enrollment through a PWD ID and manual verification for others. Families will also have simpler access to information regarding available special education and therapy, making it easier to enroll their children and monitor government aid programs. Furthermore, by illustrating gaps in enrollment by cost, the system can be used as a basis for calling for increased aid for families in need.

Definition of Terms

Children with Special Needs – Refers to students who require additional educational support due to physical, cognitive, emotional, or learning disabilities.

Data Analytics – The process of analyzing collected data to identify patterns, trends, and insights related to student enrollment.

Decision-Making System – A framework that helps school administrators and policymakers make data-driven choices regarding enrollment and resource distribution.

Educational Institutions – Schools, learning centers, or specialized programs that cater to children with special needs.

Educational Planning – The process of preparing resources, facilities, and staffing based on projected student enrollment data.

Enrollment – The process of registering children with special needs into an educational institution or program.

Historical Enrollment Data – Previous records of student registration used to train predictive models for forecasting future enrollments.

Inclusion Programs – Educational approaches that integrate children with special needs into mainstream or specialized learning environments.

Machine Learning – A type of artificial intelligence (AI) that allows computer systems to learn from data and make predictions based on historical trends.

Parental Involvement – The active participation of parents or guardians in the enrollment, learning, and decision-making process for their child's education.

Model – A statistical or machine learning approach used to analyze historical data and predict future enrollment trends.

Resource Allocation – The distribution of educational materials, teachers, classrooms, and budget based on the predicted number of enrollees.

Student Demographics – Data that includes age, disability type, location, socioeconomic background, and other factors influencing school enrollment.

Support Services – Special education services, therapy, and interventions designed to assist children with special needs in their learning journey.

Chapter 2

REVIEW OF LITERATURE AND STUDIES

This chapter summarizes the existing literature about Predictive Model for Analyzing Enrollment of Children with Special Needs. Researchers have analyzed evidence from a number of different sources to construct an understanding of ideas about the system, understanding its characteristics and possible advantages and disadvantages. This section also discusses the possible benefits of the system.

Technological Background

The integration of technology into education has significantly improved data management, decision-making, and service delivery. Special education programs benefit from advanced data-driven technologies such as predictive analytics, machine learning, and artificial intelligence (AI) to address issues in enrollment, classification, and allocation of resources. In recent years, the Philippine government and educational institutions have recognized the importance of digital transformation in managing records of children with special needs. The development of centralized databases and predictive analytics tools has become essential in ensuring equitable access to education and therapy services.

Another significant technological advancement in predictive analytics in education is Geographic Information System (GIS) utilization. GIS technology facilitates mapping of special schools and therapy clinics with respect to residential areas of disabled children. GIS serves as a data visualization tool for policy-makers to understand where there is less coverage by special education centers and allocate the resources in such areas for maximizing access to special education facilities (Chen & Lee, 2020).

In addition, adaptive learning technology, which employs AI and machine learning, individualizes the learning experience for kids with special needs. These technologies monitor student progress and make data-driven recommendations regarding individualized learning plans through real-time data analysis, thereby creating education that is both more inclusive and more effective (Martinez & Lee, 2021). AI-based recommendation systems assist teachers and special education professionals in customizing interventions to meet the particular learning needs of students.

With these innovations, the implementation of predictive analytics and data-driven decision-making in education will enhance the general efficiency of special education programs. Through the utilization of emerging technologies like AI, cloud computing, and GIS, educational institutions and policymakers can promote equitable access to quality education and therapy services for children with special needs. These innovations provide a strong platform for evidence-based policymaking, allowing institutions to predict enrollment trends, disburse resources in an efficient manner, and improve service delivery for special education-requiring students.

An Overview about Predictive Analytics Model

According to research carried out by Brown et al., (2023), Predictive analytics is a technique of using statistical modeling, machine learning, and artificial intelligence in analyzing past data and making predictions for the future. Predictive models have been widely used in education to monitor the trend of enrollments, students' performance, and resource management within an institution. Predictive analytics gives insights into trends in demographics to allow policymakers to fund and facilitate access for children with disabilities. Predictive analytics works through statistical analysis, data mining, and trend analysis to predict student enrollment and educational demands changes.

Likewise, in a study by Johnson & Carter (2022), predictive analytics has played a key role in the identification of underserved regions, informing educational institutions to streamline their programs and allocation of resources. The implementation of these models has resulted in more evidence-based policy-making, minimizing inefficiencies within the education system.

Smith, T. (2024) said that predictive analytics applied in crisis management for education enhances preparedness, harmonizes planning for resources, and guarantees learning continuity through data-driven projections. The approach addresses the common challenges in education crises, such as disruptions, lack of resources, and ineffective decision-making, and even considers ethical and data protection issues.

A study by Gonzales et al. (2020) discussed that Predictive analytics is now becoming popular among colleges and university, using advanced analytics to develop creative new techniques and tools to progress students' performance. In the Philippines, colleges and universities are now moving to the use of analytics to monitor the student performance to improve learning and to make the students more competitive

Challenges in Predictive Enrollment Models

A major challenge to predictive enrollment models is the availability, consistency, and validity of the data. As quoted by Anderson et al. (2018), predictive models rely on historical records of enrollments, demographic patterns, and socioeconomic level. Most schools lack comprehensive datasets of children with special needs, however. For developing countries like the Philippines, there are gaps in documentation in special education, which makes projections unreliable (Santos & Garcia, 2020. There are some children who may be underreported since they are not diagnosed, and there are others who are misclassified, thus creating biased predictions. In Parañaque City, where public and private schools have a different reporting system, inconsistency is a critical factor in achieving an accurate predictive model.

One challenge that confronts predictive modeling in this instance is the inconsistent data capture and reporting standard. Williams et al. (2020) directed focus towards a research study that emphasized that education entities across different geographies implement various standards in the screening of special needs children. The diversity brought about inconsistencies to the data being recorded, providing a challenge whose prediction could not be realized with models. In addition, parents may not report their child's status because of stigma or lack of services. This leads to underrepresentation in official records, which diminishes the efficacy of predictive analytics. Standardizing the evaluation and data collection process through government-mandated reporting procedures can help improve the accuracy of predictive models (Kim et al., 2022).

Predictive modeling in special education has also triggered ethical and privacy issues, particularly concerning sensitive information of students. Smith and Johnson (2019) noted that legislations on data security and privacy should be ensured at all costs to prevent disclosure of confidential details to unauthorized recipients. As predictive models are founded on information that comprise medical history, cognitive tests, and socioeconomic status, mishandling can result in privacy violations or misuse of student records. In Parañaque City, where public and private schools have disparate data protection practices, adherence to privacy laws like the Data Privacy Act of 2012 (RA 10173) is necessary. Schools should utilize secure storage, anonymization, and access limitations to ensure ethical use of data.

Studies and Literature about Predictive Analytics Model

According to Fajardo et al. (2024), research was carried out to create a machine learning model to improve the effectiveness of scholarship grant awarding for a Philippine local government unit. The system applied several algorithms, such as Logistic Regression, Naïve Bayes, Support Vector Machine (SVM), Random Forest, and Multilayer Perceptron, to forecast the best-fit scholarship for applicants. Of these models, Logistic Regression showed the most accuracy and best precision-recall balance and so was the most successful in indicating scholarship eligibility.

Simlilarly, Babaran and Esquivel (2025) presented a study on the design, development, and evaluation of a Data Analytics-based Decision Support System (DSS) for St. Paul University Philippines' ICT services. The DSS combined descriptive, diagnostic, predictive, and prescriptive analytics to improve decision-making, automate service efficiency, and resolve issues like equipment maintenance, service request management, and system performance monitoring. Applying a descriptive and developmental research design, the system was assessed in accordance with ISO/IEC 25010 software quality standards and the Technology Acceptance Model. Results showed that the DSS enabled decision-making through actionable insights, enhanced service response times, and enabled proactive maintenance approaches, eventually optimizing ICT services within the university.

Based on Maglapuz and Lacatan (2023), their study aimed to create predictive models evaluating the quality assurance performance of the local higher education institutions (LHEIs) using statistical and data mining methods. Through correlating student perception and institutional assessment data in ten quality assurance areas, the research named the most important indicators—entrepreneurship, research, laboratory, and physical plant—that strongly predict institutional compliance. The models, developed with linear regression, showed high performance and posed a viable decision-support system in terms of improving institutional quality and service delivery.

In a related study, Espiritu et al. (2024) made an effort to enhance the management of scholarship programs by incorporating data mining techniques with an internet-based system. The research involved the BRO-Ed Scholarship Program in Isabela province, which experienced difficulty in effectively processing more and more scholarship applications. Through the use of data mining methods like systematic data integration, preprocessing, deployment of decision trees, and clustering algorithms, the researchers automated the scholarship application process, solving issues of operational inefficiencies. Further, an open online platform was created to make it more accessible to users. Preliminary findings showed a high rate of success improvement, reflecting the potential of data-driven scholarship distribution. The research placed emphasis on simplicity of implementation, evidence-based decision-making, and cost minimization, which fits with Sustainable Development Goal 4, ensuring inclusivity and equality in education.

Based on Campado et al. (2023), research was done to examine the incorporation of assistive technology (AT) in teaching learners with special educational needs (LSENs) in selected schools in the Philippines. The study aimed to determine the assistive technologies utilized and to examine the perceptions, challenges, and support mechanisms faced by special education (SPED) teachers. Using in-depth interviews with 12 SPED teachers during the COVID-19 pandemic, the research discovered that interactive multimedia, conventional tools, and few high-tech devices were used. Although assistive technology was seen as an effective and engaging teaching tool, issues like resource limitations, student misbehavior, technical problems, and poor teacher training were realized. The study suggested institutional support and special training to improve AT integration and respond more effectively to the needs of students with disabilities.

Finally, Williams et al. (2023) carried out a study of predictive analytics adoption in the United States and Europe to predict trends in student enrollments. Through their research, they proved that machine learning techniques have been largely adopted to anticipate shifts in enrollment, allowing for the effective resource allocation in schools. Through forecasting of enrollment bulges, policymakers were in a position to make appropriate budgeting decisions and allocations of teachers so that educational resources were distributed in an efficient manner.

Synthesis

The literature reviewed in this chapter offers important insights into the application of predictive analytics in education, special education enrollment, and data-driven decision-making. Fifteen local and 15 foreign related literature sources were examined, which emphasized the key contributions of predictive models in predicting enrollment patterns, maximizing resource allocation, and solving data management and accessibility challenges.

Local studies highlight the increasing implementation of machine learning and predictive analytics in schools and institutions nationwide. Fajardo et al. (2024) and Gonzales et al. (2020) illustrated how Philippine institutions and government use predictive models to improve scholarship management and student performance tracking. Likewise, Babaran & Esquivel (2025) and Espiritu et al. (2024) analyzed the efficiency of data analytics-based decision support systems in ICT services management and scholarship application automation. These results reiterate the viability of predictive analytics in automating administrative tasks and facilitating effective distribution of educational resources.

Foreign literature further supports the impact of predictive analytics on enrollment forecasting and institutional planning. According to Williams et al. (2023) and Johnson & Carter (2022), machine learning-based predictive models are widely used in the United States and Europe to anticipate enrollment fluctuations, allowing schools to allocate budgets and teaching personnel efficiently. Likewise, Smith (2024) focused on the position of predictive analytics in crisis management for education so that institutions are able to foretell disruptions, maximize resource planning, and sustain learning continuity.

The common element in both foreign and local research is the relevance of data standardization and quality in predictive modeling. Local studies, like Santos & Garcia (2020) and Campado et al. (2023), reported issues of missing datasets, unreliable data collection, and underreporting of special needs children due to stigma and lack of diagnosis. This was in line with reports by Williams et al. (2020) and Kim et al. (2022), which discussed global inconsistencies in special education data reporting, making it difficult to create accurate predictive models. Both sets of studies suggest that standardizing data collection processes and government-mandated reporting procedures could significantly improve predictive accuracy.

Another major impact observed in both local and foreign literature is the use of Geographic Information Systems (GIS) and artificial intelligence (AI) in predictive analytics. Studies by Chen & Lee (2020) and Martinez & Lee (2021) demonstrated how GIS technology maps special education facilities and identifies underserved regions, ensuring better resource allocation. Similarly, local initiatives in the Philippines, as mentioned by Gonzales et al. (2020), are beginning to adopt AI-based adaptive learning to personalize educational interventions for special needs students. These studies highlight how technology-driven solutions can help improve access to special education services, optimize transportation planning, and enhance policy-making.

Finally, ethical and privacy concerns are a major challenge identified in predictive analytics applications. Research from both local sources (Smith & Johnson, 2019; Santos & Garcia, 2020) and foreign sources (Kim et al., 2022; Anderson et al., 2018) emphasized the need for strong data security measures and compliance with privacy laws such as the Data Privacy Act of 2012 (RA 10173) in the Philippines and General Data Protection Regulation (GDPR) in Europe. These findings suggest that institutions utilizing predictive models must implement secure storage, data anonymization, and access control mechanisms to protect sensitive student information.

In summary, the literature review attests those predictive analytics is a useful tool for enhancing special education enrollment planning, resource allocation, and institutional decision-making. Nevertheless, issues of data inconsistency, non-standardization, and privacy need to be resolved to ensure its maximum effectiveness. The current research advances these findings by creating a predictive model specifically for the enrollment of special needs children in Parañaque City, combining machine learning methods, real-time data integration, and policy-informed decision support to maximize educational accessibility and equity.

Chapter 3

Research Methodology

Research Design

This study adopts a mixed research design combining qualitative and quantitative data to explore the underlying factors and real-world experiences surrounding the enrollment of children with special needs in Parañaque City. The focus is on gathering in-depth insights from key stakeholders, including parents, educators and healthcare providers. Data will be collected through semi-structured interviews, focus group discussions, and document analysis to capture narratives, challenges, and contextual factors that influence enrollment patterns. This design allows the researchers to interpret human behavior, motivations, and systemic barriers from the participants' perspectives.

By focusing on qualitative and quantitative methods, the study aims to generate rich, contextualized data that can inform the development of more inclusive and effective enrollment systems and support services tailored to the needs of children with special needs in the local setting.

Research Respondents

The respondents for this study are key stakeholders involved in the enrollment and assessment of children with special needs in Parañaque City. These include personnel from the CSN Center Parañaque such as the Center Administrator, Licensed Social Workers, and Enrollment Officers who handle data recording, intake reviews, and situational analysis. Their insights are essential in identifying the challenges in the current enrollment process and evaluating the potential effectiveness of a predictive model. Additionally, parents or guardians of enrolled children will be included to gain a user perspective on system accessibility and enrollment experience. These respondents were selected through purposive sampling based on their direct involvement in the enrollment workflow.

Sources of Data

Primary data sources include:

- Interviews with key stakeholders involved in special education and child welfare:
    - Administrative officers and staff from the CSN Parañaque
    - Educators and coordinators from local public special education units within Parañaque.
- Survey responses from parents or guardians of children with special needs, which were used to assess barriers to enrollment and perceptions of accessibility.

Secondary data sources include:

- Scholarly literature on inclusive education, predictive analytics in public health and education, and enrollment trends for children with special needs in urban settings.
- Official reports and statistical data from local government offices, such as:
    - Enrollment and demographic statistics provided by the Parañaque City Government

Research Instrument

In this study, researchers used the following primary research instruments to analyze the enrollment of children with special needs in Paranaque City:

1. **Quantitative Survey**:

   Researchers employed a structured questionnaire to assess the factors influencing the enrollment of children with special needs. The survey incorporated elements of the Unified Theory of Acceptance and Use of Technology (UTAUT) to evaluate how different stakeholders (e.g., parents, school administrators, and local authorities) accept and engage with enrollment processes. Additionally, the survey included questions based on ISO/IEC 25010, a framework for assessing the quality of services. This approach helped measure satisfaction, accessibility, and usability of the enrollment process. According to the standards set by Britton (2021), the survey is designed to evaluate the effectiveness and efficiency of systems implemented for the enrollment of special needs children.

2. **Qualitative Interview**:

   In addition to the quantitative survey, researchers conducted both semi-structured and unstructured interviews with key stakeholders, including parents of children with special needs, special education teachers, and local government representatives. Semi-structured interviews included a set of pre-determined questions, but allowed room for follow-up questions based on the responses. Unstructured interviews provided a more flexible, open-ended conversation, giving interviewees the opportunity to share personal experiences and insights. This approach provided a richer understanding of the issues faced by children with special needs and their families in Paranaque City.

Data gathering Procedure

The researchers initially conducted a series of orientations and community visits to introduce the study to the respondents, including parents of children with special needs, school administrators, and representatives from local government units. Participants were given an overview of the current enrollment procedures and policies in place within Parañaque City.

Following this, a structured survey was administered to assess the respondents' experiences, challenges, and satisfaction levels with the existing enrollment process. This survey provided quantifiable data regarding accessibility, availability of support services, and overall satisfaction with the system.

In parallel, the researchers conducted both semi-structured and unstructured interviews to gather in-depth qualitative data. These interviews allowed respondents to share personal insights and elaborate on the barriers and facilitators to enrollment that are not easily captured in a survey format. The data gathered offered valuable insights into the inclusivity, efficiency, and responsiveness of the current enrollment system, as well as areas in need of improvement to better serve children with special needs in the city.

Samples and Sampling Technique

The sampling technique employed in this study is purposive sampling, a non-probability sampling method suitable for qualitative research. This technique was chosen to intentionally select participants who are knowledgeable about the enrollment process and the challenges faced by families of children with special needs. The purposive sampling strategy ensures that the data gathered are rich, relevant, and specific to the research objectives.

The sample size is determined based on data saturation and the need to capture a variety of perspectives across different socioeconomic backgrounds and geographic locations within Parañaque. This approach will help generate comprehensive insights into the factors influencing enrollment patterns and will support the development of an effective predictive model for improving special needs education services in the city.

Data Analysis

The study utilized the Unified Theory of Acceptance and Use of Technology (UTAUT) and the ISO/IEC 25010:2011 Software Quality Model as analytical frameworks to evaluate the effectiveness and acceptability of the proposed system for analyzing the enrollment of children with special needs in Parañaque City. These models provided a comprehensive structure for assessing both user acceptance and software quality attributes relevant to the system's intended function and usability.

A structured survey instrument was administered to key stakeholders, including local government personnel, SPED coordinators, and IT evaluators. The survey incorporated a five-point Likert scale (5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 =

Disagree, 1 = Strongly Disagree), designed to capture quantitative perceptions on various dimensions of system quality and user experience. In parallel, the system was evaluated using the ISO/IEC 25010:2011 quality characteristics to ensure the robustness and suitability of the system. The following key product quality attributes were examined:

1. **Functional Suitability**
   - Completeness
   - Correctness
   - Appropriateness
2. **Performance Efficiency**
   - Time Behavior
   - Resource Utilization
3. **Reliability**
   - Fault Tolerance
   - Recoverability
   - Availability
4. **Usability**
   - Learnability
   - Operability
   - User Interface Aesthetics
   - User Error Protection
5. **Security**
   - Confidentiality
   - Integrity
   - Accountability
   - Authenticity
6. **Maintainability**
   - Modularity
   - Reusability
   - Modifiability
   - Testability
7. **Portability** (if applicable)
   - Adaptability
   - Installability
   - Replaceability

Descriptive statistics, including means and standard deviations, were computed to summarize user responses under both frameworks. These metrics facilitated the interpretation of respondents' overall satisfaction, perceived usefulness, and system performance. The quantitative results, supported by qualitative interview insights, offered a comprehensive analysis of the proposed system's effectiveness in supporting the enrollment process and its alignment with the quality standards set by international models.

Ethical Consideration

Several ethical strategies were taken into account during the implementation of the study Analyzing Enrollment of Children with Special Needs in Parañaque City to uphold the rights, privacy, and welfare of the participants. The researchers prioritized informed consent from all respondents, particularly the parents or guardians of the children involved. Before collecting any personal or demographic information, the participants were thoroughly informed of the study's objectives, procedures, and how the data would be used to enhance enrollment systems and services for children with special needs.

In accordance with ethical research practices, participants were assured of their right to decline or withdraw from the study at any point without consequences. Explicit consent was secured for all forms of data collection, including interviews and surveys. For the protection of sensitive information, letters were submitted to relevant city offices seeking permission to conduct interviews and consultations with authorized personnel. The researchers acknowledged the participants' right to privacy and made sure to explain how their contributions would influence the system's development.

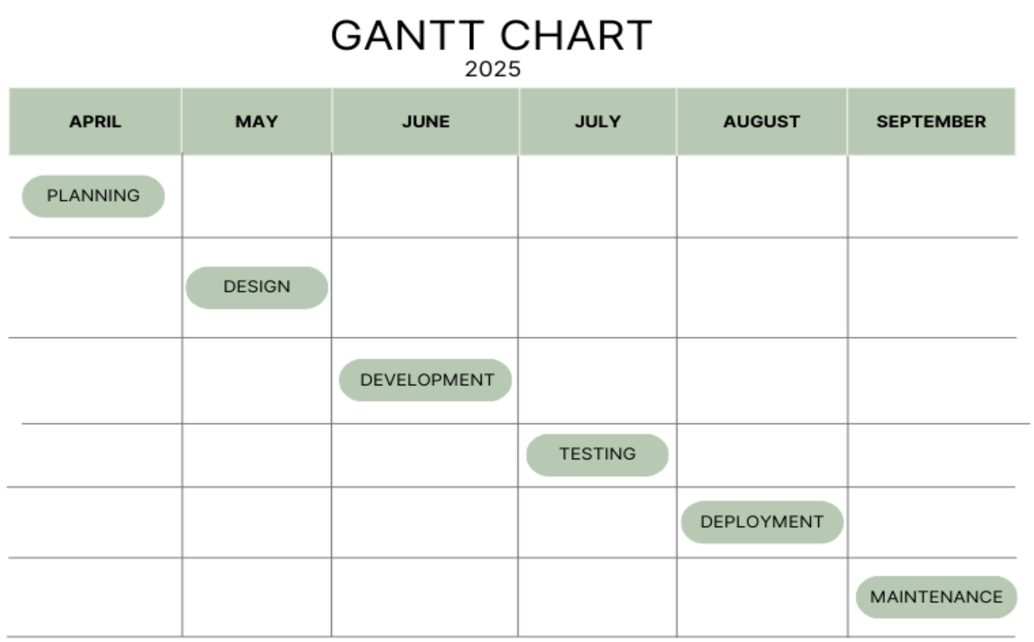
Data security and confidentiality were also core priorities. The proposed system was designed with security features to ensure that personal data of children and their families would be protected from unauthorized access. Information collected is encrypted and securely stored, and access is limited to authorized personnel only. Furthermore, no data will be disclosed or repurposed beyond the scope of the study. The entire research process adhered strictly to the standards set by the Data Privacy Act of 2012 (Republic Act No. 10173), ensuring that all data management and storage procedures complied with national privacy and ethical regulations.

This ethical commitment reinforces the researchers' responsibility in promoting transparency, trust, and respect for the rights of the participants, particularly those from vulnerable populations.

Software Methodology

I. Planning

Table 1. Gantt Chart



II. Analysis

A. Functional Requirements

1. Admin

- The Admin reviews and approves submitted enrollment data.
- The Admin adds, edits, or removes enrollment data.
- The Admin views, audits, and tracks data submissions and modifications.
- The Admin generates statistical reports.
- The Admin views data visualization settings (e.g., graphs, maps).
- The Admin views system-wide analytics and dashboards.
- The Admin customizes dropdown lists (e.g., disability types, service categories).
- The Admin generates charts and comparative analytics between schools/barangays.

2. CSN Staff

- The CSN Staff filters enrollee data by age group, disability, or gender.
- The CSN Staff monitors trends in enrollment within their school or barangay.
- The CSN Staff views summary statistics relevant to their jurisdiction (e.g., most common disabilities).

- The CSN Staff generates localized school-level reports (for internal planning or submission).
- The CSN Staff classifies enrollees according to disability and educational needs.

3. Guardian/Parent

- The Guardian registers to submit information about their child.
- The Guardian uploads supporting documents (PWD ID).

B. Non-Functional Requirements

1**. Operational Requirements**

- The system must be fully responsive and accessible on desktop, tablet, and mobile devices.
- All interfaces should load in under 5 seconds to ensure user efficiency.

2. Performance Requirements

- The platform should support at least 20 simultaneous users without compromising system performance.

3. Security Requirements

- Role-Based Access Control (RBAC) must be implemented to limit system features per user type.
- All student data, especially personal and diagnostic information, must be encrypted.

4. Usability Requirements

- The interface should be simple and intuitive to accommodate users with varying technical proficiency, such as parents and school personnel.

5. Compliance Requirements

- The system must maintain detailed audit trails for any data updates, user activities, and enrollment transactions.

6. Interoperability Requirements

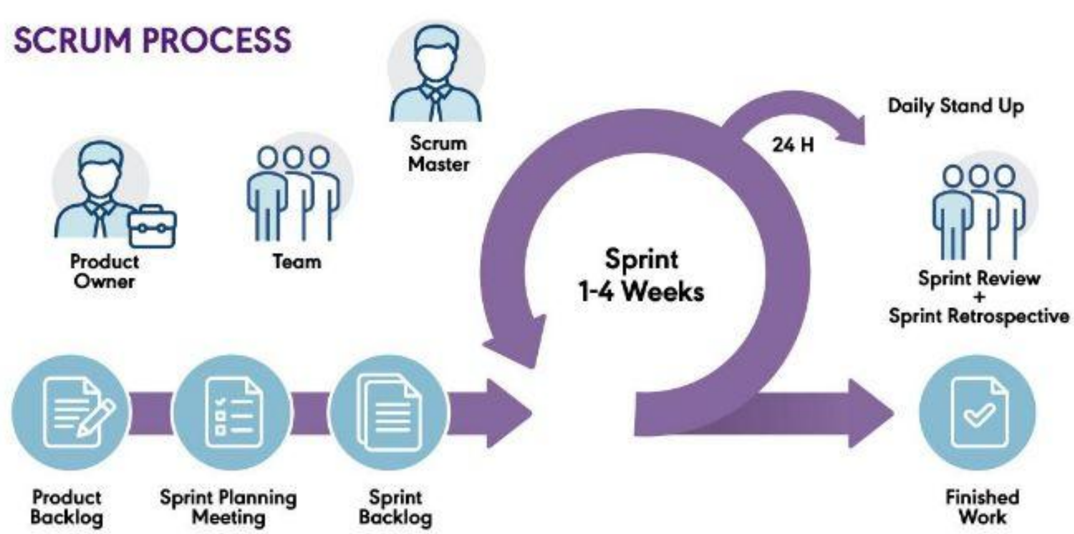
- The platform must allow file uploads and exports in commonly used formats such as JPEG, PNG, PDF, and Excel.

7. Environmental Requirements

- The system should be deployed on a secure and redundant cloud platform with high availability.
- It must be compatible across multiple browsers (e.g., Chrome, Firefox, Edge) to accommodate different user environments.

Software Development Methodology

Figure 3. Agile Methodology



The development of a web-based enrollment monitoring system for children with special needs in Parañaque City utilized the Scrum framework within the broader scope of Agile methodology. This approach guided the project through a systematic, adaptive, and collaborative development process. Agile methodology, as discussed in the study of Daraojimba et al. (2024), offers a significantly higher success rate compared to traditional project management strategies due to its iterative nature. This iterative process enables the development team to respond effectively to changing needs, fosters continuous learning and collaboration, and ultimately results in improved client satisfaction and better-aligned system features.

Scrum, as a specific framework under Agile, defines distinct roles and breaks down work into manageable sprints or iterations. Each sprint allows the development team to concentrate on specific goals within a fixed timeframe, ensuring focused work and high-quality outputs. Through this structure, the system could be continuously refined based on the evolving requirements and feedback from key stakeholders such as parents, educators, and local government officials. This iterative model ensures that the final system is responsive to real-world challenges and needs, thereby enhancing its relevance and effectiveness.

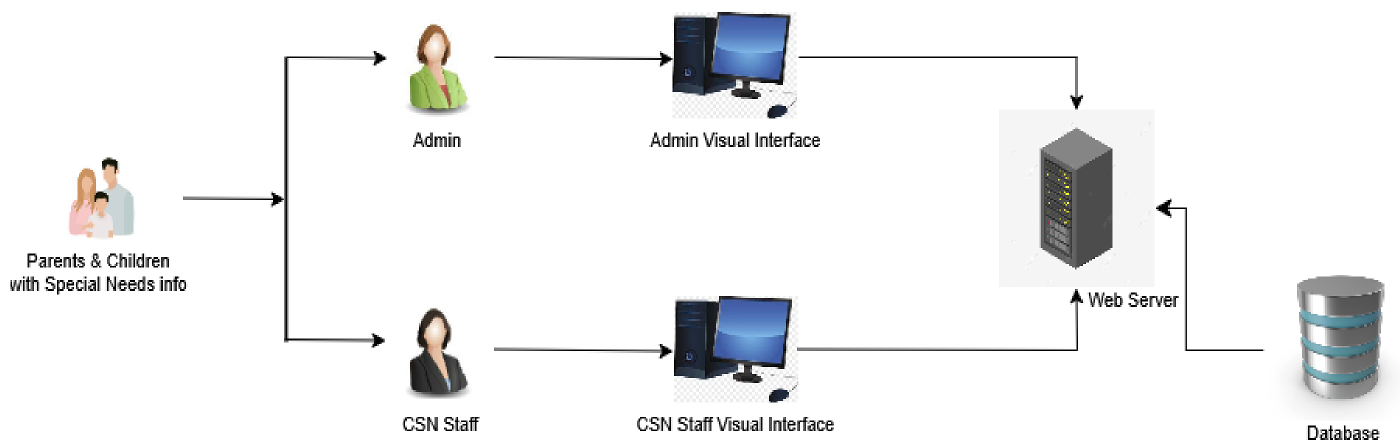
Moreover, Scrum is widely regarded as an effective framework for managing complex and evolving projects (Kalyani & Mehta, 2019), which makes it particularly suitable for this initiative. Given the sensitive nature of data involved—such as the personal and educational profiles of children with special needs—a systematic and adaptable framework like Scrum is crucial. It ensures the system’s security, reliability, and integrity, while also providing the flexibility needed for continuous improvement in response to community feedback and policy developments.

In essence, the application of the Scrum framework in this project served as a foundation for creating a high-quality, user-centered enrollment system for children with special needs in Parañaque City. The framework promoted productivity, collaboration, and responsiveness, all of which were vital in addressing the unique challenges associated with inclusive education.

System Architecture

The system includes several key user roles: the Admin, who oversees the entire platform and manages user permissions and data security; the School Administrator, who is responsible for managing enrollment records, verifying student applications, and coordinating with both parents and local authorities; and the Parents or Guardians, who can submit applications, upload necessary documents, and track the progress of their child's enrollment. To support the functionality of the system, essential hardware components are integrated, including a server that hosts the centralized database for secure storage of personal and enrollment data, user access devices such as computers, tablets, and smartphones to allow interaction from various users, and a reliable network infrastructure that ensures continuous data flow and system accessibility. This system architecture provides a structured and secure environment that facilitates a streamlined enrollment process, promoting inclusive education for children with special needs in Parañaque City.

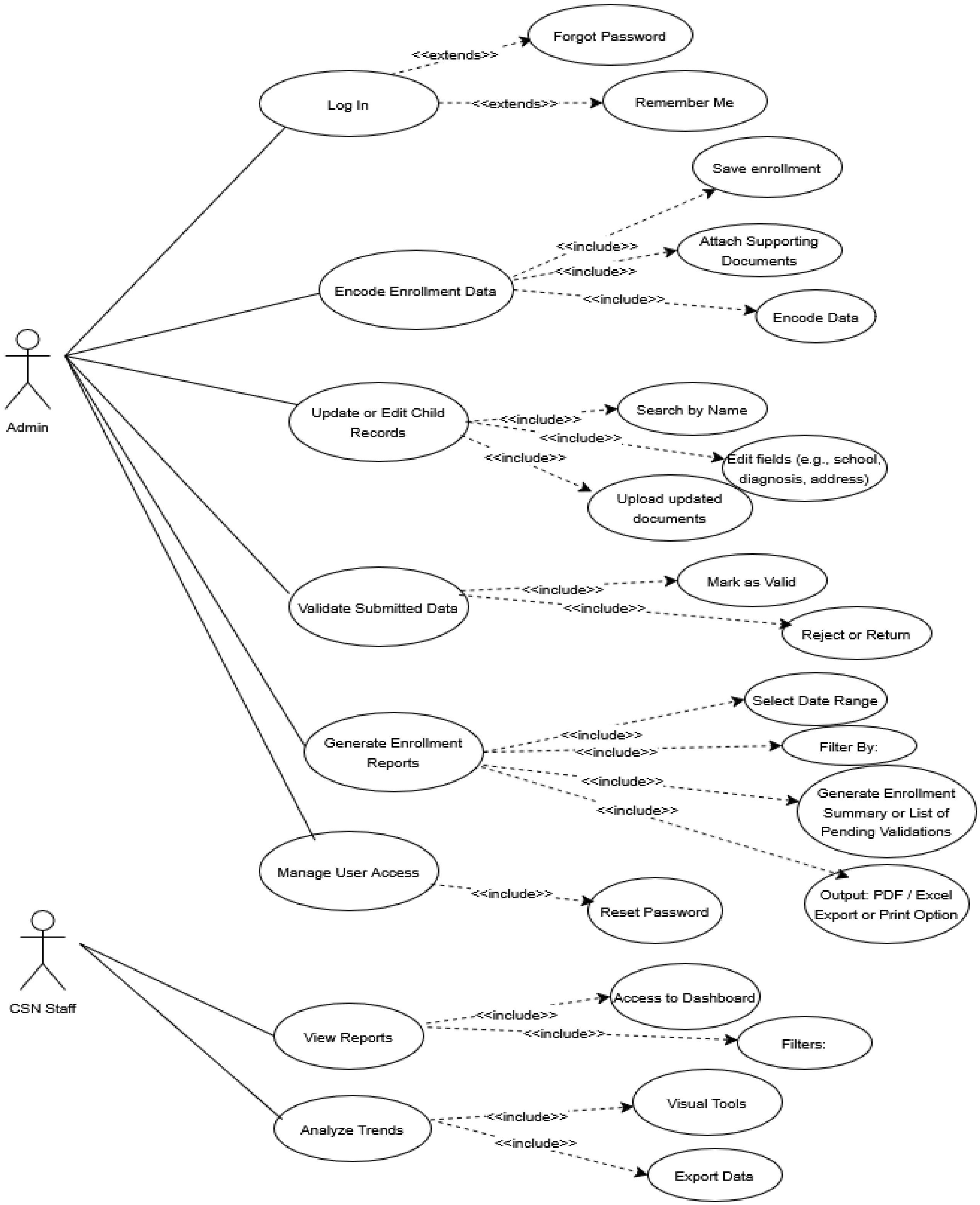
Figure 4. System Architecture



Use Case Diagram

A use case diagram visually represents the interactions between users (actors) and the system, highlighting its functionalities from the user's perspective. This diagram aids in identifying the system's core operations and how various users interact with it, helping define the system's scope and functional requirements.

Figure 5. Use Case Diagram



Use Case Description

The use case description refers to a structured narrative that outlines a specific interaction between a user (or actor) and a system to accomplish a goal. This type of description is commonly found in research related to software engineering, systems analysis, human-computer interaction, and information systems. It is used to support system design, requirement gathering, or theoretical analysis.

Table 2. Use Case Description: Log in and Manage System

Use Case Name	Predictive Model Admin Use Case Diagram	
Scenario	Login and manage system as staff	
Triggering Event	Staff needs access to monitor the enrollees and the approval of request	
Brief Description	Staff logs in to approve the request from enrollees and make reports after prompting the predictive model	
Actors	Staff	
Stakeholders	Staff, Students, Parents	
Preconditions	Staffs must access the system by putting their credentials	
Flow of Activities:	Actor	System
	1. Staff inputs credentials in order to login 2. Staffs can access list of enrollees, statistics and approval of request 3. Staffs can see the flow of the analytics 4. Staffs can prompt the predictive model	1.1 System validates login credentials 1.2 System restores the data that come from enrollment 1.3 System shows the upward and downward of the data in analytics 1.4 System prompts and shows the accurate activities based on the analysis

	5. Staffs must make a report for school record 6. Staffs can see the history of results	1.5 System reports prompt 1.6 System shows all of the history of results and reports
Exception Condition	1.1 If credentials are incorrect, system will deny the login	

Table 3. Use Case Description: Registration

Use Case Name	Parent Registration Use Case Diagram	
Scenario	Register and create an account in the system as a parent	
Triggering Event	A parent needs to register to gain access to their child's enrollment status and reports	
Brief Description	Parent signs up in the system to create an account and link it to their child's record	
Actors	Parent	
Stakeholders	Parents, Students, Staff	
Preconditions	Parent must access the registration page and input valid personal and child-related information	
Postconditions	Parent account is created and linked to the appropriate child record; parent can now log in	
Flow of Activities:	Actor	System
	1. Parent accesses the registration page 2. Parent fills in personal information (name, email, contact number, etc.) 3. Parent provides information to link to child (e.g., student ID or verification code) 4. Parent submits the registration form	1.1 System displays registration form 1.2 System validates the provided data 1.3 System checks for existing child record and matches the input 1.4 System saves the parent's information and creates the account

	5. Parent receives confirmation of successful registration	1.5 System confirms successful registration and sends a notification
Exception Condition	If data is incomplete or invalid, the system will show an error and prompt for correction	

Table 4. Use Case Description: Analyze Enrollment Trends

Use Case Name:	Analyze Enrollment Trends Use Case Diagram	
Scenario:	Staff wants to view and analyze the enrollment trends of children with or without disabilities.	
Triggering Event:	Staff accesses the system's analytics dashboard to review enrollment patterns.	
Brief Description:	Staff reviews graphical representations of enrollment trends over time to support decision-making and planning.	
Actors:	Staff	
Stakeholders:	Staff, Admin	
Preconditions:	Staff must be logged in and have access to the analytics dashboard.	
Postconditions:	System displays graphs showing enrollment trends based on chosen filters (e.g., time period, age group, disability type).	
Flow of Activities:	Actor	System
	1. Staff logs into the system 2. Staff navigates to the analytics dashboard 3. Staff selects filters (e.g., year range, type of disability) 4. Staff reviews visual graphs showing trends	1.1 System verifies staff access to analytics tools 1.2 System loads enrollment data 1.3 System applies selected filters

		1.4 System displays visual trends (e.g., bar graph, line chart)
Exception Condition:	If the system lacks sufficient data or encounters an error, it alerts the staff and halts graph generation.	

Table 5. Use Case Description: Generate Enrollment Reports

Use Case Name:	Generate Enrollment Reports Use Case Diagram	
Scenario:	Staff wants to generate enrollment reports for children with or without disabilities.	
Triggering Event:	Staff clicks on the “Generate Report” button in the reporting section of the system.	
Brief Description:	Staff uses the system to create reports summarizing enrollment data by filters like age, disability type, and school year.	
Actors:	Staff	
Stakeholders:	Staff, Admin	
Preconditions:	Staff must be logged in and have reporting access permissions.	
Postconditions:	System generates a report in a printable and/or downloadable format (e.g., PDF or Excel).	
Flow of Activities:	Actor	System
	1.Staff logs into the system 2.Staff navigates to the report generation module 3.Staff selects filters (e.g., date range,age) 4.Staff clicks “Generate Report” 5. Staff reviews or downloads the report	1.1 System verifies access rights 1.2 System fetches and filters data 1.3 System compiles report into a presentable format

		1.4 System displays report or provides download
Exception Condition:	If filters are invalid or data is missing, the system notifies the staff and prevents report generation.	

Table 6. Use Case Description: Validate or Approve Submitted Documents

Use Case Name:	Document Validation and Approval Use Case Diagram	
Scenario:	Staff needs to validate and approve the documents submitted by parents during enrollment.	
Triggering Event:	New documents are submitted by parents and marked as pending review.	
Brief Description:	Staff accesses the submitted documents, checks their validity, and either approves or rejects them with feedback.	
Actors:	Admin	
Stakeholders:	Staff,Parents	
Preconditions:	Parents must have submitted the required documents. Staff must be logged in and have document validation access.	
Postconditions:	Documents are either approved or marked for resubmission with feedback.	
Flow of Activities:	Actor	System
	1.Staff logs into the system 2.Staff navigates to the pending documents section 3.Staff views each document submission	1.1 System lists newly submitted documents 1.2 System loads document for preview 1.3 System updates status after review

	4.Staff approves or rejects with feedback 5.System updates the document status	(approved or needs revision) 1.4 System notifies the parent of the outcome
Exception Condition:	If a document is unreadable or the system fails to load it, an error message is displayed and review is paused.	

Table 7. Use Case Description: Update Student Records

Use Case Name:	Update Student Records Use Case Diagram	
Scenario:	Staff wants to update or correct student information in the system (e.g., name, age, disability status, contact details).	
Triggering Event:	A request for correction is submitted by a parent, or staff identifies outdated/incomplete data.	
Brief Description:	Staff accesses the child's profile, makes the necessary updates, and saves the revised information in the database.	
Actors:	Staff	
Stakeholders:	Staff,Parents. Admin	
Preconditions:	Staff must be logged in and authorized to access and edit student records.	
Postconditions:	The system saves the updated information and logs the change for auditing.	
Flow of Activities:	Actor	System
	1. Staff logs into the system 2. Staff searches for and selects the student record 3. Staff clicks “Edit” and updates the required fields 4.Staff saves the changes 5.Staff confirms the update was successful	1.1 System authenticates staff permissions 1.2 System retrieves and displays the student’s record 1.3 System validates the input data

		1.4 System saves the updated data and logs the change 1.5 System confirms successful update
Exception Condition:	If input data is invalid or a saving error occurs, the system alerts the staff and does not apply the changes.	

Table 8. Use Case Description: Remember Me

Use Case Name	Admin Login with "Remember Me"	
Scenario	Admin logs in to manage system with option to remember credentials	
Triggering Event	Admin needs to access system functions and prefers to save login credentials for future sessions	
Brief Description	Admin accesses the website, inputs credentials, and may choose the "Remember Me" option to securely store login information	
Actors	Admin	
Stakeholders	Admin, System Administrator	
Preconditions	Admin must go to the website and input valid login credentials	
Postconditions	Admin is successfully logged into the system. If “Remember Me” is selected, login credentials/token are securely saved in local storage.	
Flow of Activities:	Actor	System
	1. Admin accesses the login page via website	5.1 System sends credentials to the authentication server
	2. Admin selects "Admin" section	5.2 System validates login credentials
	3. Admin selects “Admin” and inputs credentials	5.3 If “Remember Me” is selected, system securely stores token locally
	4. Admin optionally checks the “Remember Me” box	5.4 If not selected, system skips storage and logs in user normally
	5.Admin clicks the Log In button	

Exception Condition	If credentials are incorrect, system denies login and prompts retry	

Table 9. Use Case Description: Forgot Password

Use Case Name	Forgot Password	
Scenario	Admin forgets password and requests reset through the system	
Triggering Event	Admin is unable to log in due to a forgotten password	
Brief Description	Admin selects "Forgot Password", inputs credentials, receives an email with a reset link, and sets a new password through the system	
Actors	Admin	
Stakeholders	Admin, System Administrator	
Preconditions	Admin account must exist in the system	
Postconditions	Admin's password is updated successfully. Admin is redirected to the login screen and can log in using the new password.	
Flow of Activities:	Actor	System
	1. Admin accesses the login page via website	
	2. Admin selects "Admin" section	
	3. Admin clicks "Forgot Password"	3.1 System displays reset form
	4. Admin inputs account credentials	
	5. Admin submits reset request	5.1 System validates credentials
		5.2 If valid, system sends a password reset email with a secure link
	6. Admin receives the email and follows the reset link	
	7. Admin inputs and confirms a new password on the reset page	7.1 System updates the password in the database
		7.2 System shows confirmation message: "Password reset successful."

		7.3 System redirects Admin to the login screen
Exception Condition	5.1 If credentials are invalid, the system shows an error message	
	6. If the user does not receive or click the reset link, the password cannot be updated	

Activity Diagram

The Activity Diagram illustrates the workflow of the predictive enrollment process from data input to enrollment decision-making. It visualizes the step-by-step flow of activities carried out by different actors within the system, helping to clarify how tasks are connected and where decisions occur

Figure 6. ***Admin Login***

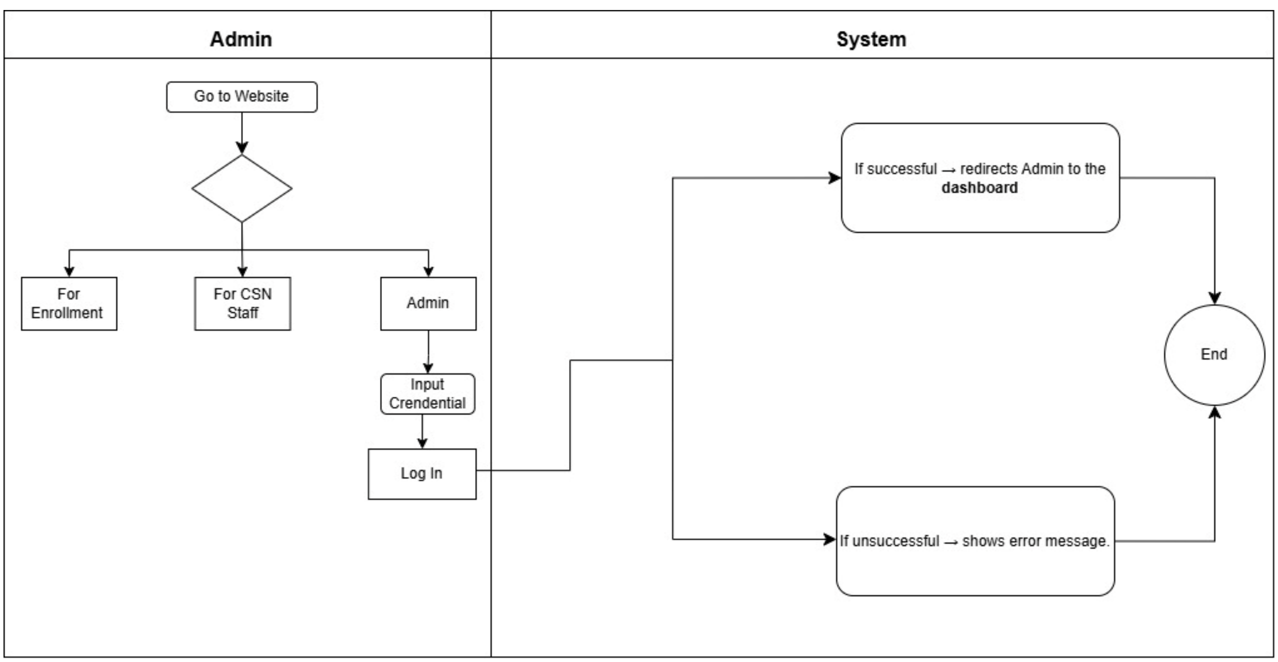


Figure 6.1 ***Admin Login (Remember Me)***

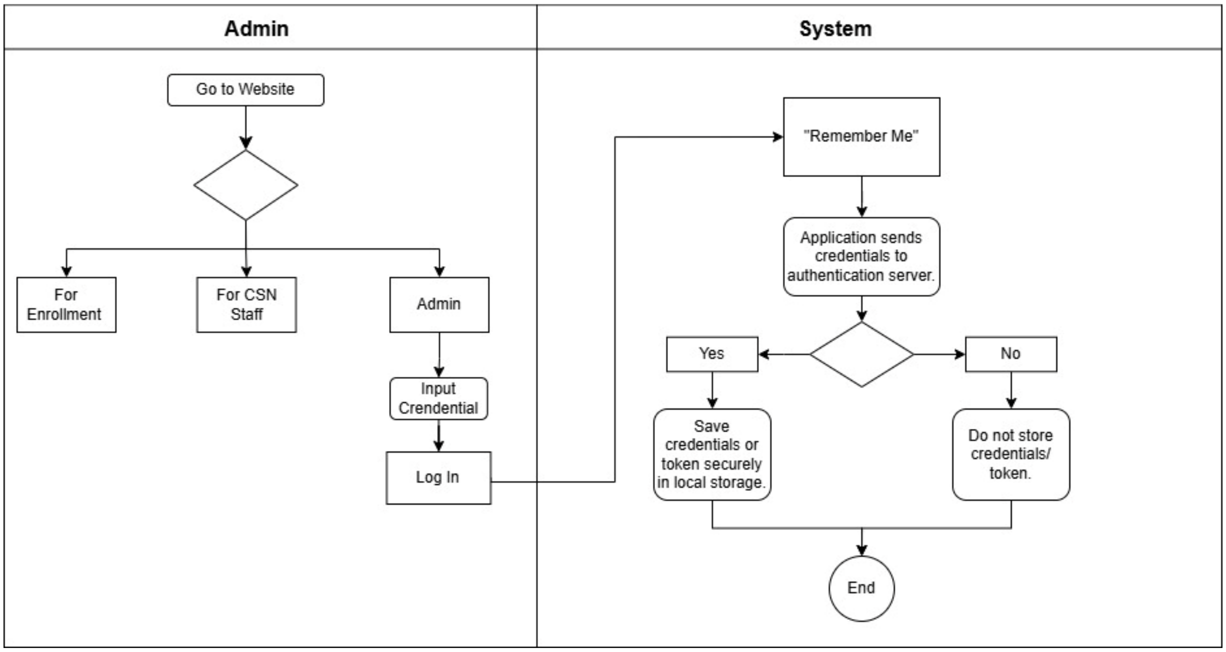


Figure 6.2 ***Admin (Edit and Delete)***

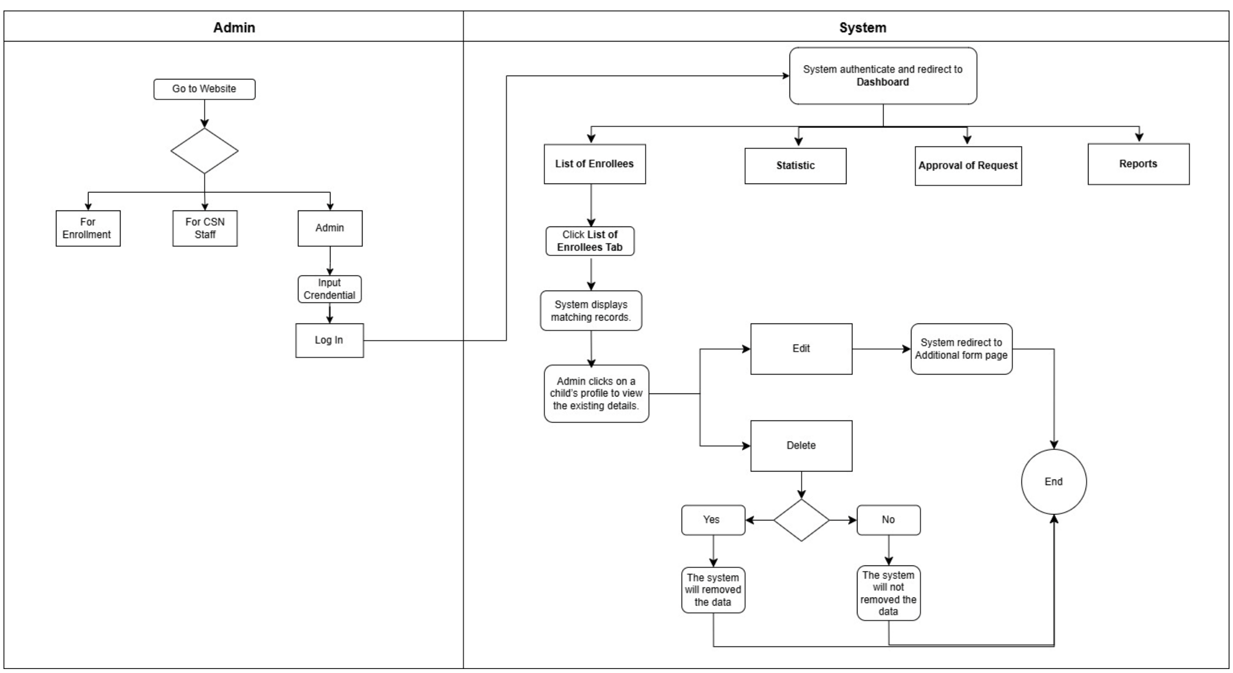


Figure 6.3 ***Admin Login (Forgot Password)***

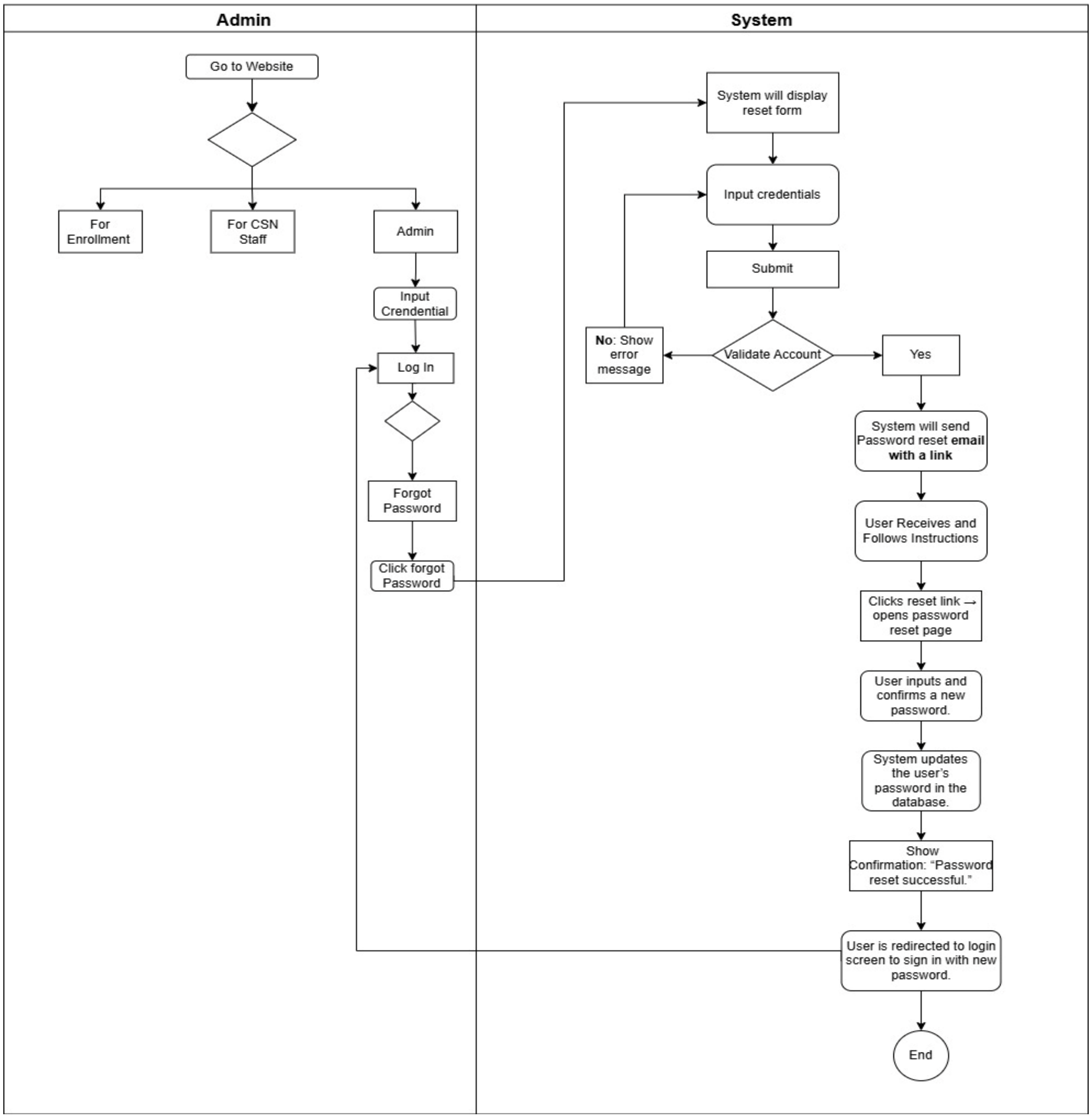


Figure 6.4 ***Admin (Statistics)***

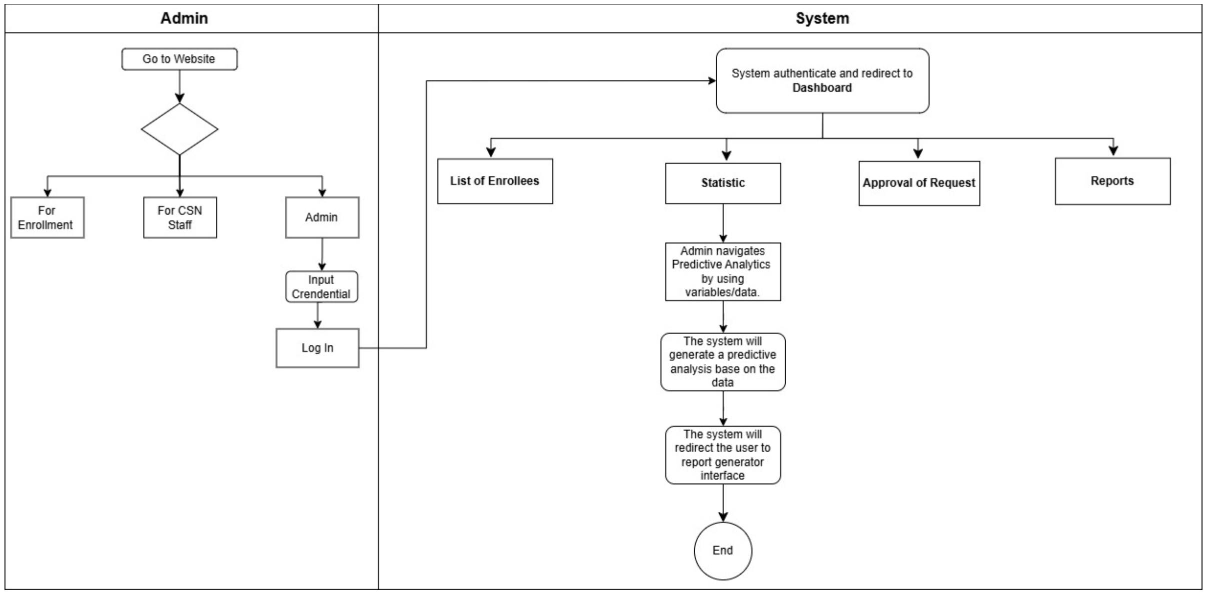


Figure 6.5 ***Admin (View Reports)***

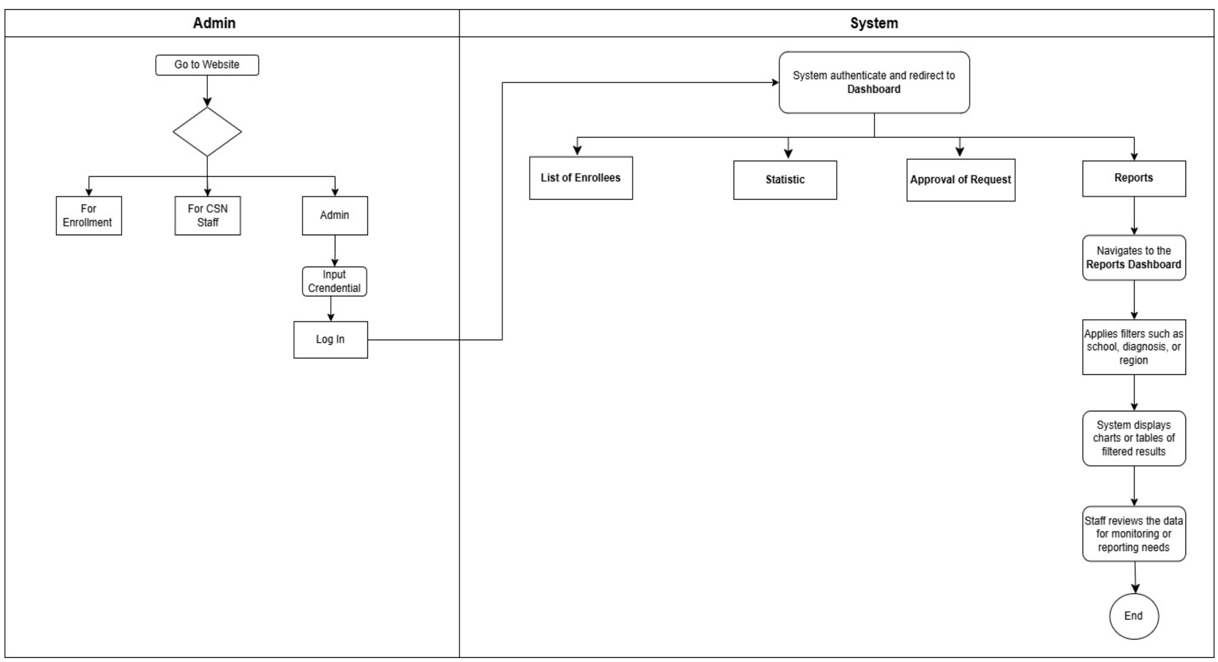


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Figure 6.6 ***Admin (Approval of Request)***

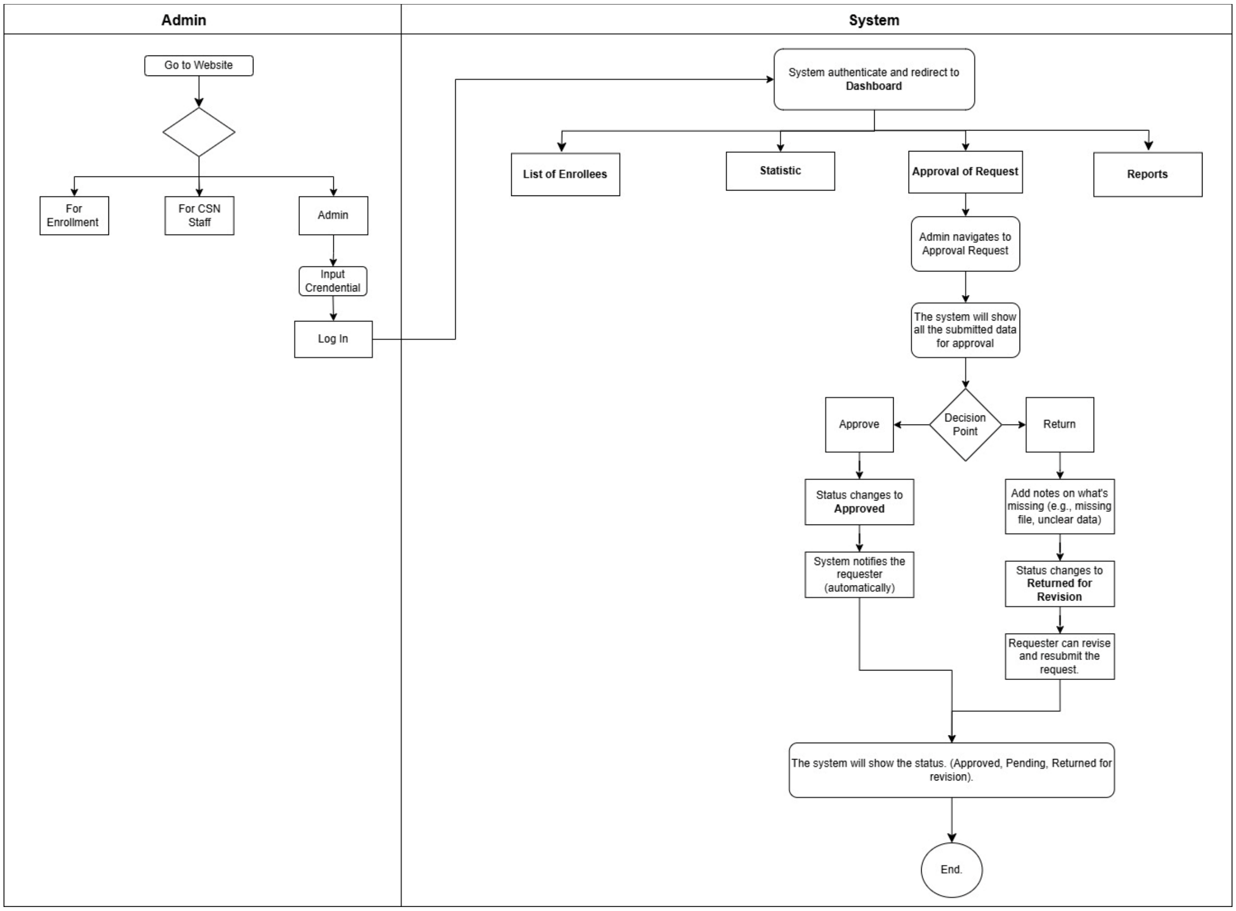


Figure 6.7 ***CSN Staff Login***

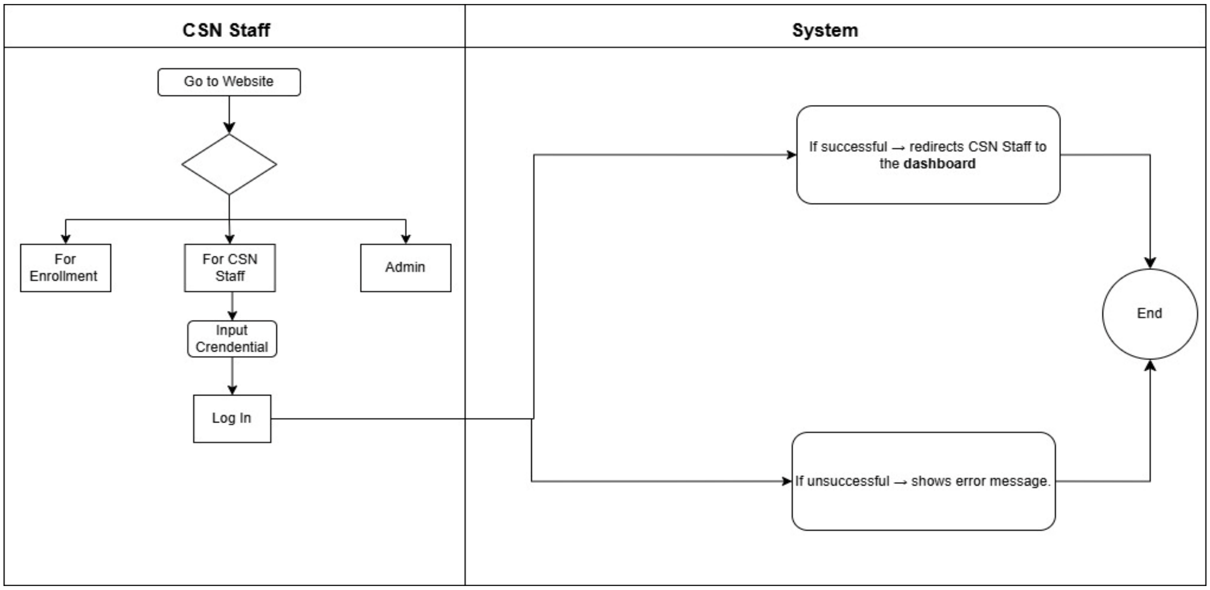


Figure 6.8 ***CSN Staff (Statistic)***

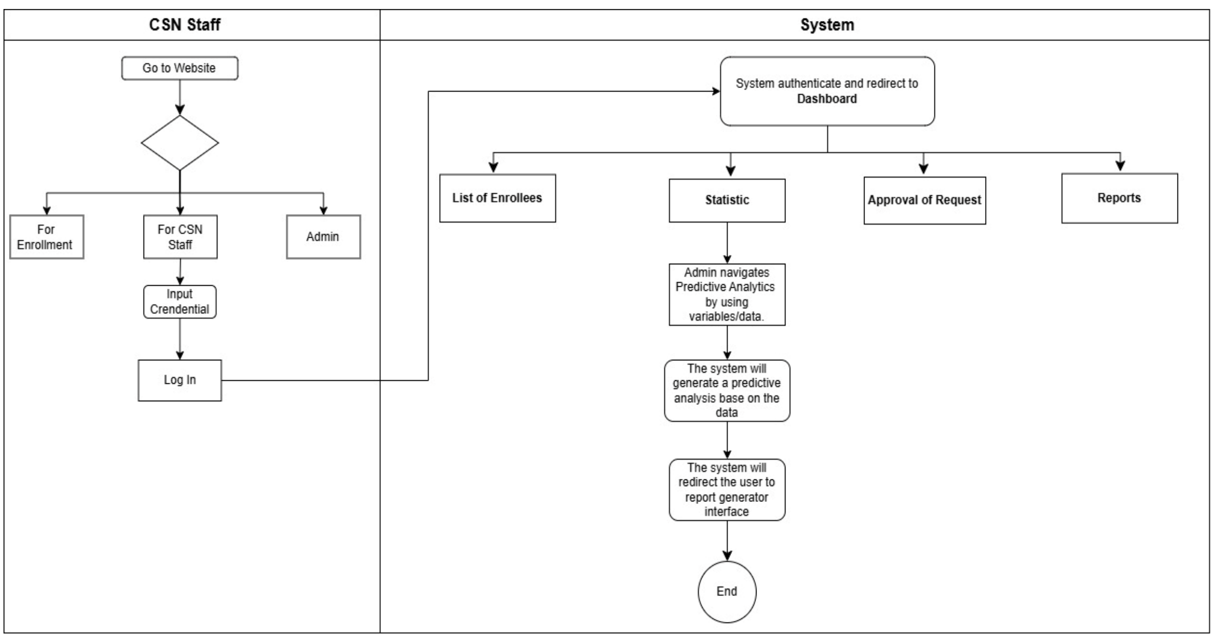


Figure 6.9 ***CSN Staff (Report)***

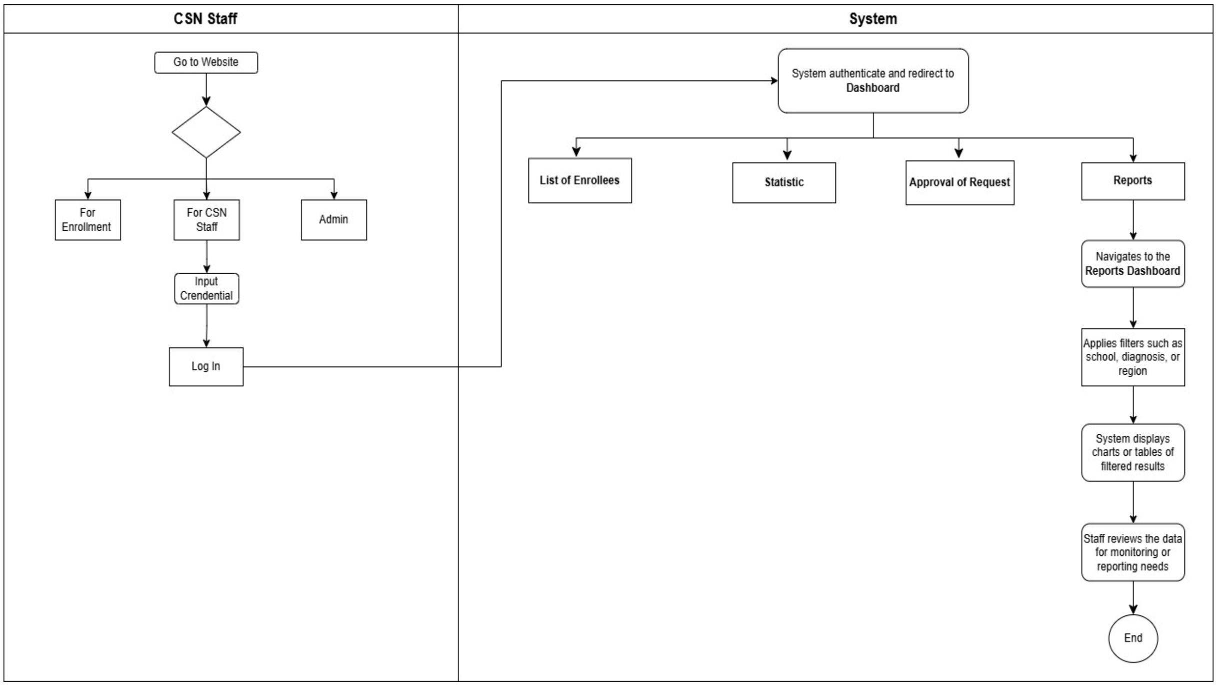
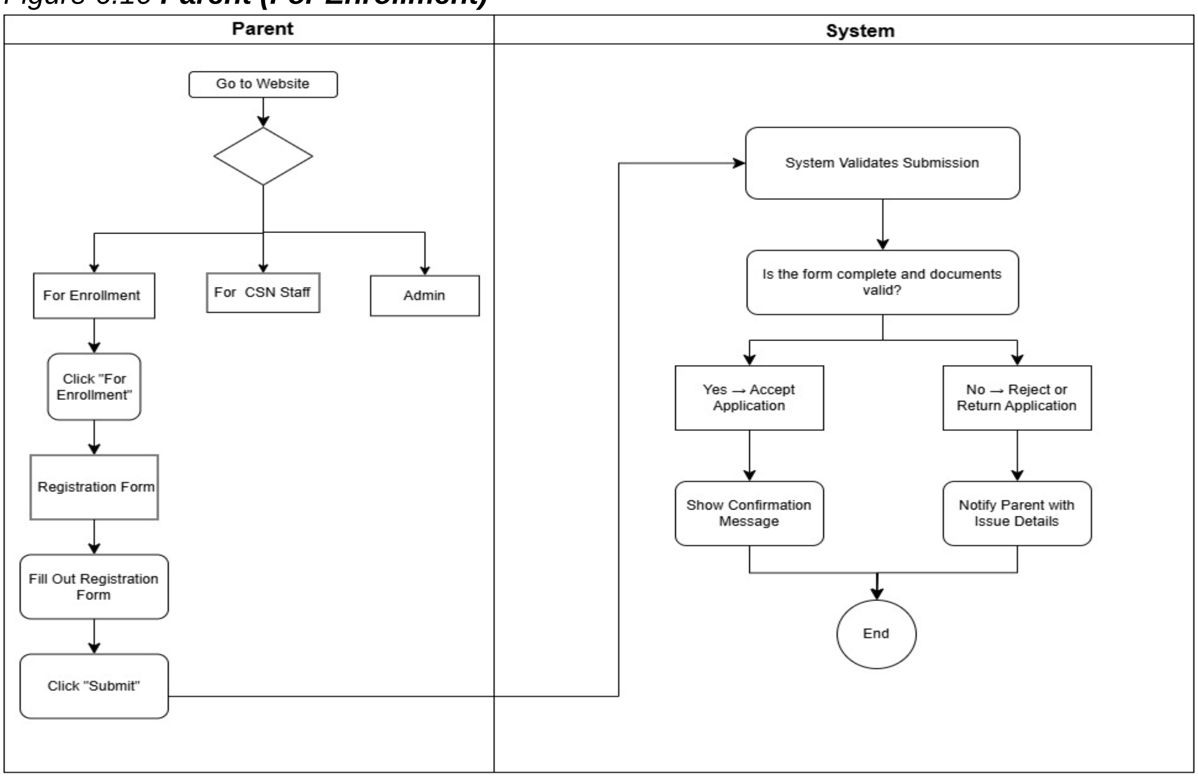
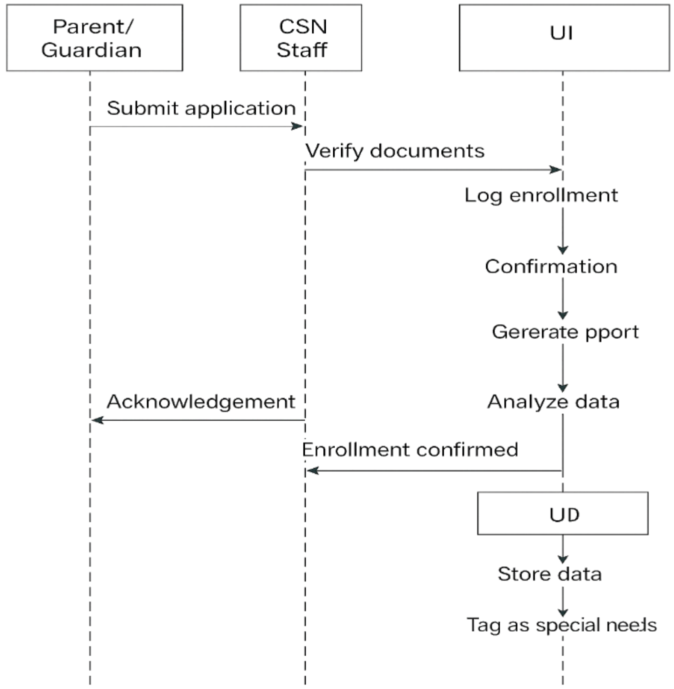


Figure 6.10 ***Parent (For Enrollment)***



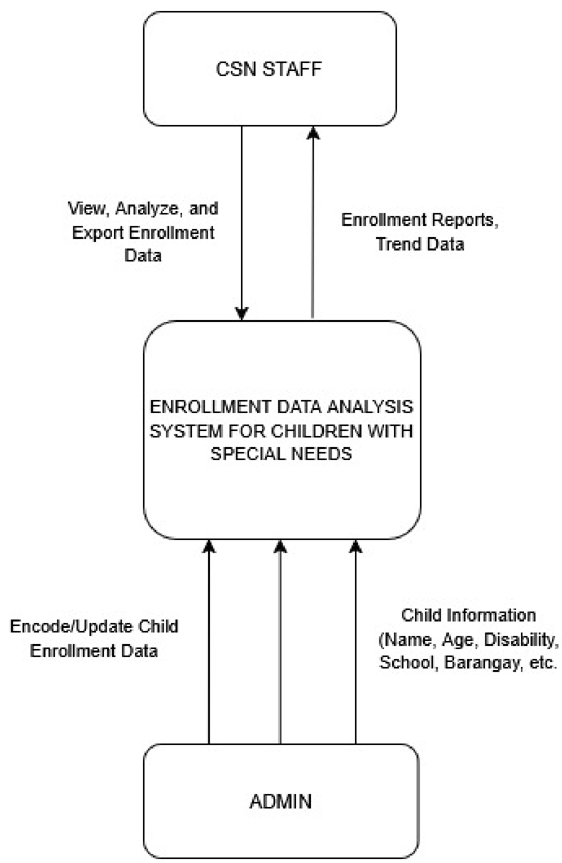
Sequence Diagram

Figure 7. Login



Context Flow Diagram

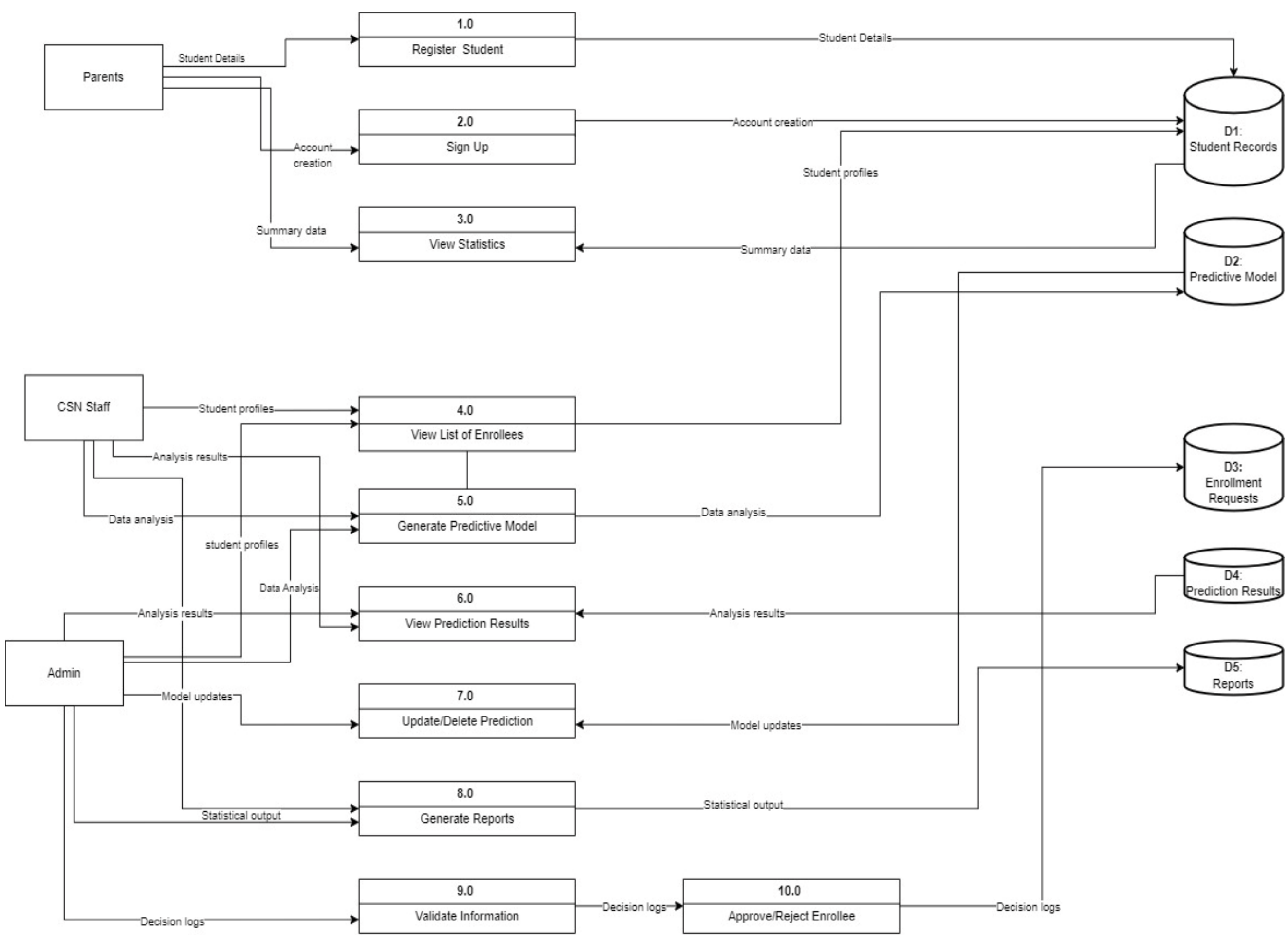
Figure 8. Level 0 Context Flow Diagram



The diagram shows above illustrates the system's interaction with its key external entities and highlights the major data exchanges. The Admin serves as a primary user responsible for encoding, updating, and validating enrollment records. They manage user access and generate reports, which form the basis of data analysis. The CSN Staff utilizes the system to view reports, analyze enrollment trends, and export data for educational planning and resource allocation. The system's core input is data about Children with Special Needs, including personal, demographic, and educational information. This data flows into the system for processing and is transformed into reports and visualizations for strategic use. The diagram highlights the system's role in providing accurate and secure analysis of enrollment patterns, supporting effective decision-making for inclusive education in Parañaque City.

Data Flow Diagram

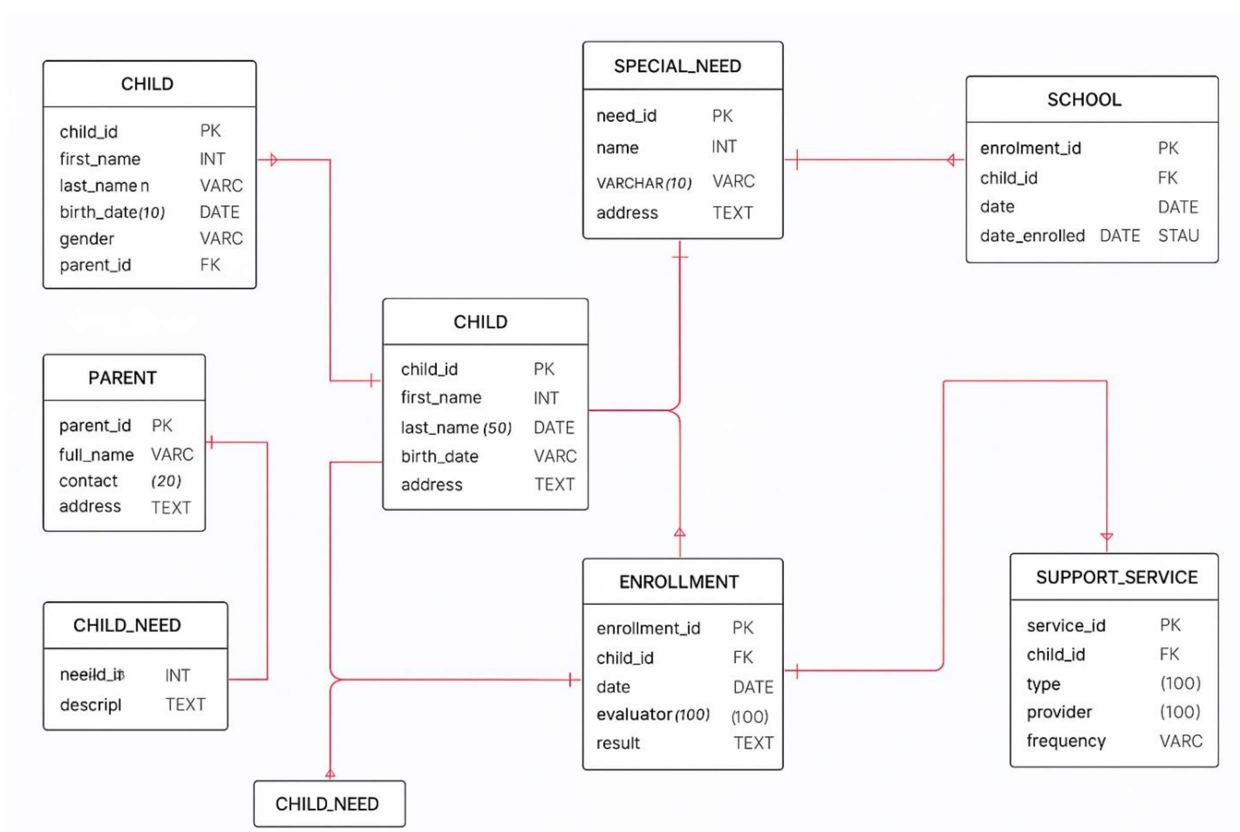
Figure 9. ***Level 1 Data Flow Diagram***



This Data Flow Diagram outlines the flow of data and key processes within a web-based predictive enrollment system for children with special needs in Parañaque City. The system involves three primary user roles: Parents/Guardians, CSN Staff, and Admin. Parents or guardians begin at the Home Page, where they can register their children. The CSN staff has access to several administrative and data management features. They can view statistics, generate the predictive model, and view results. In addition, they can generate reports. The Admin oversees enrollment requests. They can view enrollee requests, validate information, and choose to approve or reject applications. They also manage records by accessing the list of enrollees, and they can update or delete these records as necessary. The diagram visually represents how data and responsibilities are distributed across user roles and how predictive modeling is integrated to support decision-making for student enrollment and activity planning.

Entity Relationship Diagram

Figure 10. Entity Relationship Diagram



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