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Individual Report

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Contents

Introduction

In the rapidly changing landscape of education in Sri Lanka, it has become increasingly apparent that there is a need for a more efficient and accurate approach to monitoring student performance. The current grading and performance assessment methods employed in schools are often manual, time-consuming, and prone to errors. To tackle these challenges head-on, the objective of this system is to introduce a cutting-edge performance monitoring application that is customized to meet the unique needs of schools in Sri Lanka. This application is designed to streamline the grading process, ensure consistency, and provide valuable insights into student performance through software engineering principles and practice.

Aims and Objectives

The primary aim of the Student Performance Monitoring Application is to contribute to the enhancement of educational quality within Sri Lankan schools. It aspires to create an informed and data-driven environment that benefits all educational stakeholders.

The objective of this application is to create a Student Performance Monitoring System that will comprehensively track students' academic performance, offer timely feedback, and manage grades. This system will simplify the school management system and enhance the overall educational experience.

This application aims to create a user-friendly platform for educators to manage student grades, provide students with easy access to their academic progress and gain feedback, and offer administrators valuable insights. It aligns with Sri Lankan educational standards, caters to stakeholders' needs, and enhances educational quality and efficiency.

The Student Performance Monitoring Application addresses Sri Lanka's education challenges by streamlining grading, reducing administrative burdens, and ensuring fair assessments. It empowers students with data-driven insights, serves various stakeholders, and aligns with local educational standards, promising a more efficient and transparent education system. (Abayasekara and Arunatilake, 2018).

Stakeholder Analysis

Stakeholder analysis for the Student Performance Monitoring System is a vital process for identifying and understanding the roles, interests, and influence of all involved parties. This System unites a diverse group of educational stakeholders.
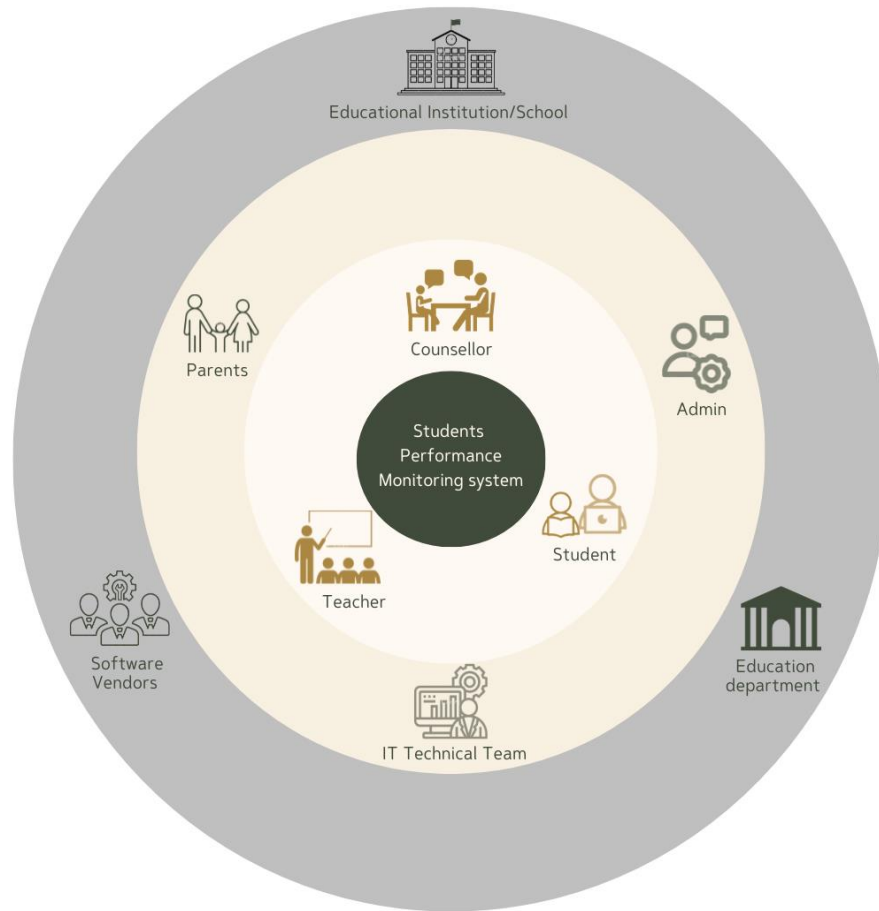

Figure 1: Onion Model for Stakeholder Student Performance Monitoring System

The primary users of the system include students, teachers, and parents, while administrators, counsellors, IT teams, software vendors, and the Education Department each contribute significantly to the system's success.

Together, they collectively shape the educational landscape through this dynamic system.

1. **Educational Institution/School** –

Educational institutions/Schools require Student Performance Monitoring System to improve education quality, student outcomes, and reputation while ensuring compliance with educational standards and regulations.
They bear the financial responsibility for project funding, which involves budget allocation, acquisition of funds or grant, and diligent financial resource management. This undertaking is bound by a multitude of legal obligations and regulatory requirements.

2. **Student** –

Students are the prime stakeholders in the Student Performance Monitoring System as they are directly impacted by the system's enhancements. This platform significantly improves their academic experience by providing feedback, monitoring their progress, setting goals, and actively engaging in their education, thereby significantly improving their academic journey.

3. **Parents** –

Parents, as existing users, have a direct impact on potential changes in the Student Performance Monitoring System. These changes may grant parents real-time access to their child's academic data, enhancing their involvement in monitoring progress and offering required support for their child.

4. **Teachers** –

Teachers, being integral members of the school community, play a central role in the Student Performance Monitoring System. System. The change to the Student Performance system from the conventional student management system may require adaptation to new grading procedures with potential training needed to utilize and maximize the potential of this platform. This system enables teachers to monitor student progress in real time, enabling personalized guidance and fostering collaboration among other primary stakeholders for improved learning outcomes.

5. **Administrators** –

Administrators play a key role within the system, as they possess the authority to approve or discontinue the Student Performance Monitoring System based on project progress and the alignment with organizational goals. This includes managing user access and permissions, ultimately leading to more informed decision-making for enhanced resource allocation and the formulation of educational policies.

6. **Counsellor** –

Counselors play a pivotal role in the Student Performance Monitoring System. System adjustments may enable counselors to provide more tailored support to students, involving data analysis and personalized action plans for those in need of extra assistance. This individualized approach can contribute to improved academic outcomes for students.

7. **IT Technical Team** –

The IT maintainers are responsible for ensuring the seamless operation of the Student Performance Monitoring System. They maintain hardware, software, and data security while collaborating with vendors for alignment. Their expertise resolves technical issues faced by the other stakeholder to smooth use of the platform.

8. **Software Vendors -**

Software vendors, working in conjunction with the school's system administrators, are essential to maintain the Student Performance Monitoring System. This collaboration may necessitate third-party service providers, including software maintenance and development teams, to align with the system's technical requirements and offer maintenance and support services as required. This change brings significant benefits, as service providers can enhance the system's reliability and functionality, contributing to its overall success.

9. **Department of Education** –

The Department of Education has a significant interest and influence over the Student Monitoring System as it is the central governmental body that is responsible for ensuring the compliance of the system with its educational standards and policies.

This is the central government department responsible for overseeing and regulating education. They have a significant interest and influence in ensuring the system's compliance with educational standards and policies.
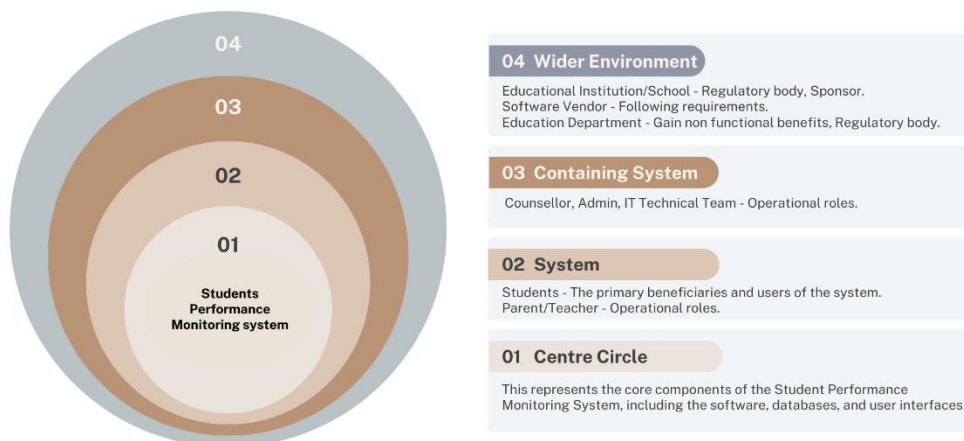

Figure 2: Stakeholder priority diagram.

The Student Performance Monitoring System is a critical element in education, uniting diverse stakeholders. This collaborative effort enhances academic excellence, highlighting the system's significance in fostering educational quality.

Requirement Analysis

Requirements are high level conceptual formulation that represents detailed description of precisely articulated specification.

Requirement for an induction is one of the critical steps in requirements engineering. This involves complex process of learning and understanding the needs of users and project sponsors with the ultimate purpose of conveying it to the software developers to fulfil their requirements in a user-friendly platform which provides seamless transition into the system. (Aurum and Wohlin, 2006).

This process was done using "technique interviews" with the main stakeholders to understand the requirements for the system. This was a semi-structured interview that focused on the main aspects of this application.

The main questions raised during this interview are as follows:

1. "What specific features or functionalities do you believe are crucial for enhancing student performance monitoring and support within the application, based on your experience and expertise in education?"

   This question was primarily designed for teachers and counselors,
   Who are the crucial stakeholders of the system and the professionals in the field?

2. "In your role as a parent, what are the key success criteria or performance indicators you would use to evaluate the effectiveness of this application in supporting students and educators? What measurable outcomes are most important to you?"

   This question was raised for parents since they play a vital role in a student's education and well-being. Involving them in the assessment of applications effectiveness having a sense of accountability and transparency.

3. "Are there specific challenges you face in tracking your performance that the system could address?"

   This system revolves around students to have a better impact on them. This question addresses key problems and enhancement they seek in their educational journey.

All requirements elicited were validated by the stakeholders as well.

User Requirements

Requirement prioritization is important in filtering essential requirements. Complex decision making isn't a new aspect for software engineering. The quality of a product is often determined by the ability to satisfy the needs of the customers and users, in this case students, parents, and teachers.

The stakeholder characterized prioritization is the technique followed here since each of these stakeholders provide vital information that the other two neglect. (Aurum and Wohlin, 2006).

Functional requirements are specific tasks or actions that they must perform to meet the needs of users. Fundamentally what the system must do! They shape the blueprint of a software system, outlining the specific functionalities and features that must be built to fulfill user needs and tasks.

Non-functional requirements are qualities of how the system must perform. Essentially, how well the system should be doing. These requirements limit the design space and space that's available for exploration. (Altexsoft, 2023).

This section discusses the system requirements to solve the earlier identified problems, involving all stakeholders.

The following list reflects the student performance monitoring system's user and system requirements:

1. Student will be able to request IEPs (Individualized education plans).
   1.1 The System shall provide logged-in users with to access a web-based portal to request IEPs from their counselor. (Functional)
   1.2 The System shall validate student requests to ensure that they are complete and accurate. (Functional)
   1.3 The System shall send a notification to the student's counselor when an IEP request is submitted. (Functional)
   1.4 The System shall send a notification to the student when their IEP request has been completed. (Functional)
   1.5 User interface of the system should be easy to handle. (Non-Functional)

2. Student will be able to receive notifications.
   2.1 The System shall provide logged-in users (Student) to access received notifications. (Functional)
   2.2 The System shall display notifications when their IEP request has been completed. (Functional)
   2.3 The System shall display warning notifications when their attendance is low. (Functional)
   2.4 The System shall display warning notifications when their result is low. (Functional)
   2.5 The System should be faster in receiving notifications. (Non-Functional)

3. Student will be able to view results.
   3.1 The system shall provide logged-in users (Student) to view displayed student results in a clear and easy-to-understand format. (Non-Functional)
   3.2 The system shall display the final results that have been updated and published by the admin. (Functional)
   3.3 The system shall allow students to download their results in a variety of formats, such as PDF or CSV. (Functional)

4. Student will be able to view feedback.
   4.1 The system shall display the logged-in user's (Student) the student's feedback in a clear and easy-to-understand format. (Non-Functional)
   4.2 The system shall allow students to filter their feedback by date, subject, or teacher name. (Functional)

5. Teacher will be able to mark attendance.
   5.1 The system shall display logged-in users (Teacher) with a secure and convenient way to mark attendance for their students. (Non-Functional)
   5.2 The system shall allow teachers to mark attendance by manually entering student names or scanning student ID cards. (Functional)

6. Teacher will be able to update mark.
   6.1 The system shall display logged-in users (Teacher) with a secure and convenient way to update student marks for assessments and assignments. (Non-Functional)
   6.2 The system shall allow teachers to update marks for individual students or for multiple students at once. (Functional)
   6.3 The system shall allow teachers to track changes to student marks over time. (Functional)
   6.4 The system shall allow the admin to access marks to generate report card for each student. (Functional)

7. The teacher will be able to update feedback.
   7.1 The system shall display logged-in users (Teacher) with a secure and convenient way to update feedback for students on assessments and assignments. (Non-Functional)
   7.2 The system shall allow teachers to add, edit, and delete feedback at any time. (Functional)
   7.3 The system shall allow teachers to format their feedback using a variety of formatting options, such as text styles, font sizes, and bullet points. (Functional)
   7.4 The system shall allow teachers to attach files to their feedback, such as images, videos, or audio files. (Functional)
   7.5 The system shall allow teachers to notify students and parents when they have updated their feedback. (Functional)

8. Parent will be able to receive notifications.
   8.1 The System shall provide logged-in users (Parent) to access received notifications. (Functional)
   8.2 The System shall display notifications when their IEP request has been published. (Functional)
   8.3 The System shall display warning notifications when their attendance is low. (Functional)
   8.4 The System shall display warning notifications when their result is low. (Functional)
   8.5 System should be faster and accurate in sending notifications. (Non-Functional)

9. Parent will be able to view results.
   9.1 The system shall provide logged-in users (Parent) to display the student's results in a clear and easy-to-understand format. (Non-Functional)
   9.2 The system shall display the final results that have been updated and published by the admin. (Functional)
   9.3 The system shall allow students to download their results in a variety of formats, such as PDF or CSV. (Functional)

10. Parent will be able to view feedback.
   10.1 The system shall display logged-in users (Parent) the student's feedback in a clear and easy-to-understand format. (Non-Functional)
   10.2 The system shall allow students to filter their feedback by date, subject, or teacher name. (Functional)

11. Counselor will be able to view student record.
   11.1 The system shall display logged-in users (Counselor) with a secure and convenient way to view student records and generate IEPs menu. (Non-Functional)
   11.2 The system shall allow counselors to view a student's complete record, including their demographic information, academic history, IEP, and assessment results. (Functional)
   11.3 The system shall allow counselors to filter and sort student records by a variety of criteria, such as student name, grade level, or IEP status. (Functional)
   11.4 The system shall allow counselors to generate IEPs from student records, such as progress reports or past IEP progress reports. (Functional)

12. The counselor will be able to receive an IEP request (Individualized education plans).
   12.1 The system shall send a notification to logged-in users (Counselor) to their email address when a student submits an IEP request. (Functional)
   12.2 The notification shall include the student's name, contact information, problem description, and academic goals. (Functional)

13. Admin will be able to maintain the system.
   13.1 The system shall provide logged-in users (Admin) with a secure and convenient way to manage the system. (Non-Functional)
   13.2 The system shall provide tools for the IT technical team to monitor system performance and identify potential problems. (Functional)

14. The admin will be able to assign a teacher.
   14.1 The system shall allow logged-in users (Admin) to assign a teacher. (Functional)
   14.2 The system shall allow admins to add, edit, and delete teacher records. (Functional)

15. Admin will be able to add class.
   15.1 The system shall allow logged-in users (Admin) to add a class. (Functional)
   15.2 The system shall allow admins to add, edit, and delete class records. (Functional)

16. Admin will be able to add new students.
   16.1 The system shall allow logged-in users (Admin) to add a student. (Functional)
   16.2 The system shall allow admins to add, edit, and delete student records. (Functional)

17. Admin will be able to update attendance.
    17.1   The system shall provide logged-in users (Admin) with a secure and convenient way to update student attendance records. (Non-Functional)
    17.2   The system shall allow admins to update attendance records for individual students or for multiple students at once. (Functional)

18. Admin will be able to generate report cards.
    18.1   The system shall provide logged-in users (Admin) with a secure and convenient way to generate report cards for students. (Non-Functional)
    18.2   The system shall allow admins to customize the report card template to include the desired information, such as student demographics, academic grades, attendance records, and teacher comments. (Functional)
    18.3   The system shall allow admins to generate report cards for individual students or for multiple students at once. (Functional)

19. The IT Technical team will be able to maintain the system.
    19.1   The system shall provide logged-in users (Admin) with a secure and convenient way to manage the system. (Non-Functional)
    19.2   The system shall provide tools for the IT technical team to monitor system performance and identify potential problems. (Functional)

In conclusion, the correct derivation of system requirements from user requirements is an important aspect of requirement engineering.

Use-case Analysis

The identification of the system components requires a model to capture the system functionalities offered to its users reflecting the user's view. Use-case diagrams are one of the most suitable widely used techniques for this purpose.
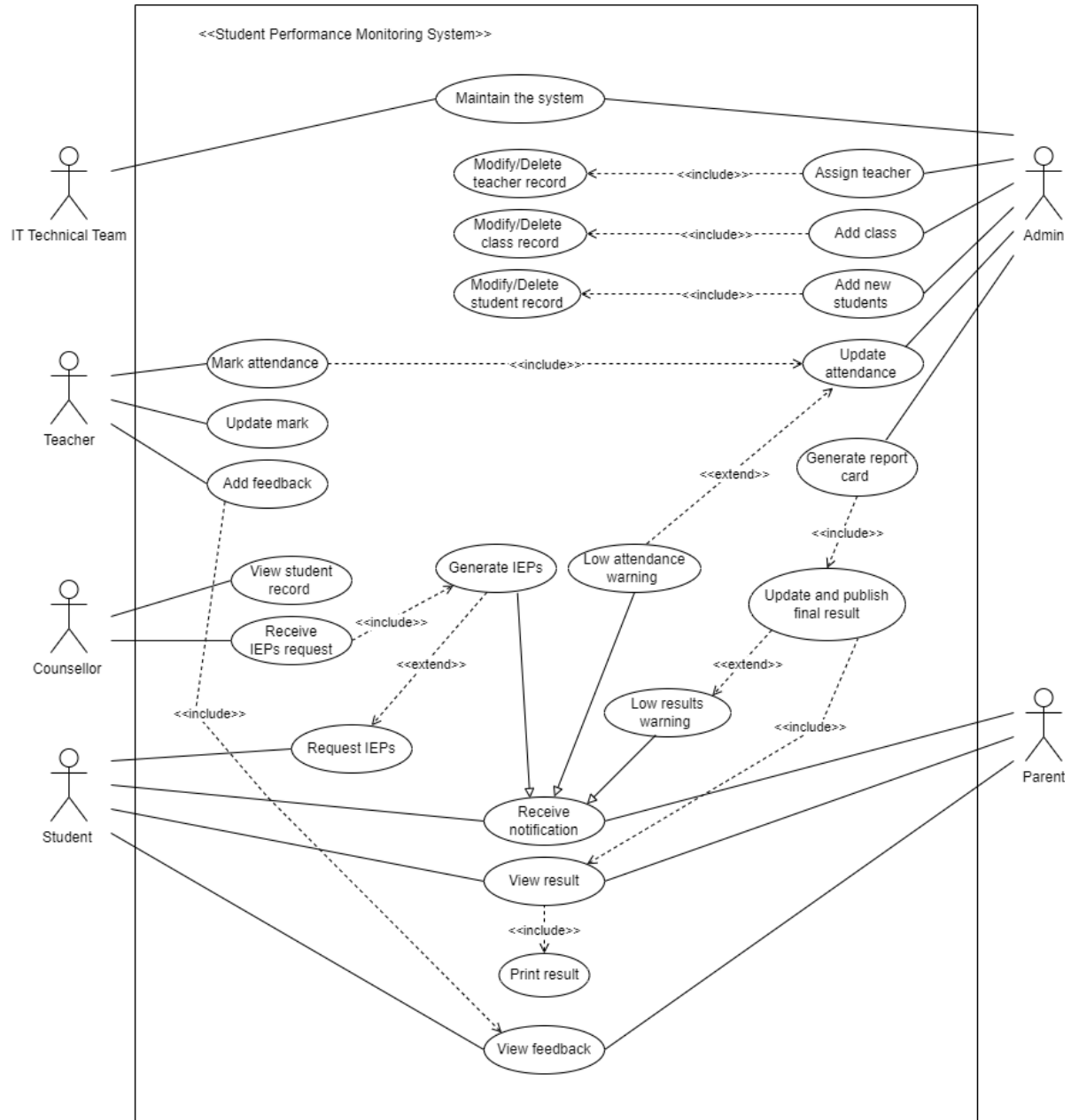

Figure 3: Use-Case Diagram of student performance monitoring application.

This use case diagram shows how students, teachers, counselors, and administrators can use the student performance monitoring application to view and manage student performance data.

Use case Description.

This use case provided bellow describes the process through which a student can request an Individualized Education Plan (IEP) to address their special educational needs. It involves interactions between the student and their assigned counselor and the admin.

<table>
<tr><td colspan="2" align="center">Student requests an IEP (Individualized education plan)</td></tr>
<tr><td>Actors:</td><td>Students
Counselor, Administrator</td></tr>
<tr><td>Preconditions:</td><td>The student must be logged into the system.
The student must have a complete and accurate student record.
The student must have an assigned counselor.</td></tr>
<tr><td>Postconditions:</td><td>The student's IEP request is sent to their respective counselor's email address.
The student receives a notification that their IEP request has been submitted.</td></tr>
<tr><td>Flow:</td><td>The student logs into the system.
The student navigates to the IEP request section.
Student enters their information academic goals and problem description.
Student reviews and submits.
The system sends a notification to the student's assigned counselor.
The counselor reviews the IEP request.
The counselor contacts the student to schedule a meeting for further assessment and planning to generate the IEP.</td></tr>
<tr><td>Alternative Flow:</td><td>If a student's IEP request is incomplete or inaccurate (Step 5), the system will display an error message and prompt (returning to Step 3) the students to correct the request.
If the student counselor is unavailable the system will send a message to the student to request to contact admin to assign a new counselor.</td></tr>
<tr><td>Exceptions:</td><td>The student is not logged into the system.
The student does not have a complete and accurate student record.
The student does not qualify to request an IEP.</td></tr>
</table>

Student requests an IEP (Individualized education plan) - (Continued)	
Requirement:	• The system must provide secure login authentication for students. • The student accounts must include maintained up-to-date student account information, Such as student demographics, academic grades, attendance records, and teacher comments. • The system must validate IEP requests for completeness and accuracy. • The system must have a notification mechanism to inform the counsellor about IEP requests from students. • The counsellor must have a means to access and review IEP requests from students.

This outlines the entire use case description of students for Individualised Educational Plans (IEPs) including potential exceptional scenarios and requirements that must be met for successful execution.

UML Activity Diagram

An activity diagram in UML visually shows how different tasks or processes happen in a system, by showing the order of activities and how they relate within a system. (Khan, 2023).
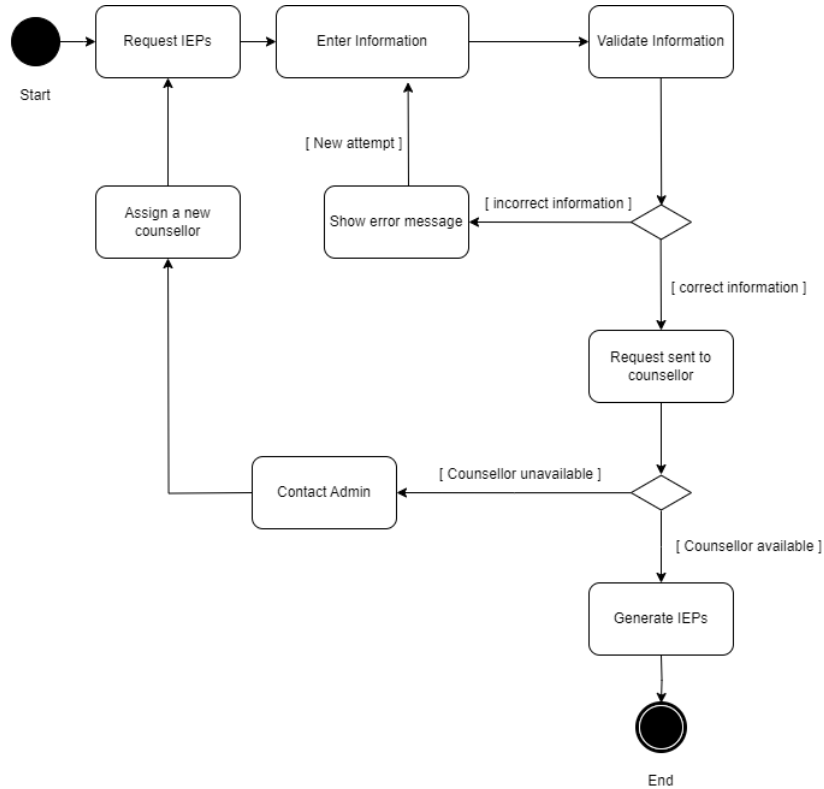

Figure 4: Activity Diagram for Student IEP request process

This activity diagram provides a high-level overview of the student IEP request process. It shows the steps that the student and counselor need to take, as well as the alternative flows and exceptions that can occur. The diagram also lists the requirements for the system that supports the process.

Let's consider Student requests for an IEP,

A student facing a learning challenge is seeking to request an Individualized Education Plan (IEP). They access the system through the IEP request portal. In the portal, they input their information academic goals, and problem descriptions. After reviewing their request, they proceed to submit it.

The IEP request is then forwarded to the student's counselor via email. Simultaneously, the student receives a notification confirming the successful submission of their IEP request. The counselor is promptly informed of the incoming request.

The counselor takes the time to review the submitted IEP request and proceeds to schedule a meeting with the student. During this meeting, both the student and the counselor work together to formulate an IEP tailored to the student's unique needs. This IEP will specify the detailed services and support that the student will require to thrive academically.

This use case is a crucial step in ensuring that students who are academically challenged have access to the necessary support to excel in their educational journey. Offering a concise description of the IEP request process, helps students and their parents understand their rights and navigate the system effectively.

Software development is a creative activity, an informal approach is contrary to good software engineering practices. The application of concept rigor in software engineering principles While considering mathematical techniques and formality to enhance precision and reliability in software systems, they aren't always directly employed in all aspects of software development, including use case descriptions.

In the context of the use case, "Student requests an IEP," the relationship between the principle of rigor and the realization of functional requirements can be explained as follows:

1. Precision and functional requirements: Rigor in software engineering requires precise expression of functional requirements, particularly in IEP request scenarios. This precision can be achieved through detailed use case descriptions, ensuring developers have a comprehensive understanding of the implementation needs.

   The student accesses the IEP request portal within the system and provides their personal information, academic goals, and a description of their challenges. After carefully reviewing their request, the student submits it.

   In summary, this process achieves precision by following the exact data requirements, leaving no room for errors in user input and ensuring clarity and accuracy in collecting necessary information.

2. Verification and validation: Software engineering involves rigorous validation and verification processes to ensure software meets requirements. In the case of "Student requests an IEP," validation includes creating test cases, acceptance criteria, and aligning the use case with functional requirements.

   Upon submission, the system sends a confirmation notification to the student, assuring them that their IEP request was successfully received. Simultaneously, the request is forwarded to the student's counselor via email, ensuring prompt awareness.

   In summary, this part of the process verifies the successful receipt of the student's request and validates that the counselor is promptly informed, thus aligning with the principles of "Verification and Validation" in software engineering.

3. Formality as an option: Mathematical formality in software development is crucial, but it may not always be practical or necessary. A balance must be struck between desired rigor and available resources and project constraints. Use cases, like "Student requests an IEP," provide user-focused documentation, requiring a balance between precision and clarity. The use case bridges user needs and software design, ensuring software meets functional requirements.

   The counselor reviews the submitted IEP request, acknowledging its importance. Subsequently, they schedule a meeting with the student to collaboratively create a tailored IEP. This plan outlines the specific services and support required to enhance the student's academic success.

   -

   In summary, this process highlights that a user-centered, collaborative approach is prioritized, allowing the IEP to be tailored to the student's unique needs for academic success. It underscores that not all software development aspects require strict formality for effective results.

In conclusion, balancing precision, clarity, and user-focused practicality is key to attaining software rigor. Use cases bridge user needs and software design, ensuring functional requirements are met. While not as formal as mathematical methods, they are crucial for software engineering rigor.
(Laplante, 2007).

Conclusion

The development of a performance monitoring application for Sri Lankan schools is a significant breakthrough towards improving grading and assessment processes to understand and ensure every child's maximized learning experience, through personalized educational care based on each child's learning capabilities.

This application will streamline grading, enhance accuracy, and provide actionable insights, potentially revolutionizing the educational landscape. It will empower educators, support students, aid administrators, promote transparency in the educational system, and help to identify students who need additional support to reach the required educational standards.

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