CHAPTER 3

Design and Methodology

Research Design

The researchers employed descriptive and developmental research designs. The descriptive research aspect aimed to understand and characterize the challenges faced by the Negros Occidental Private Schools Sports Cultural Educational Association (NOPSSCEA) in sports management. Data was collected through surveys, interviews, and document analysis from private schools affiliated with NOPSSCEA. This data was analyzed using quantitative and qualitative methods to gain a comprehensive understanding of the existing issues. The application was developed with input and feedback from stakeholders such as schools, NOPSSCEA officials, and athletes, undergoing continuous testing and refinement to ensure effectiveness. A pilot study was conducted to implement the application in a subset of schools, where its functionality, reliability, performance efficiency, usability, security, compatibility, maintainability, and portability were evaluated using ISO standardized questionnaires. Feedback from the pilot study was used to further refine the application, resulting in a tool that enhances efficiency and transparency in sports management within private schools affiliated with NOPSSCEA.

Research Respondents

Table 2

Research Respondents

Respondents	Number of	Percentage
Students-Athletes	10	40%
IT Experts	10	40%
Coaches/sports	5	20%
Total	25	100%

Table 2 shows the twenty-five (25) randomly selected respondents of the study. The selected respondents were ten (10) student-Athletes, ten (10) IT Experts and five (5) Coaches/sports coordinator. The proponents provided questionnaires to the selected respondents.

Sampling Technique

The proponents utilized a purposive sampling to validate the functionalities of the system. Purposive sampling, also known as judgmental, selective, or subjective sampling, is a non- probability sampling technique where the researcher deliberately selects individuals or cases based on specific criteria relevant to the research objectives. Instead of randomly selecting participants from a population, the researchers used their judgment to choose individuals who possess certain characteristics, experiences, or expertise that are deemed essential to the study.

Data Gathering Instrument

The data gathering instrument utilized in this study was based on the ISO/IEC 25010 standard for Software Quality Requirements and Evaluation (SQuaRE). This validated tool assessed software quality by evaluating eight key characteristics: Functional Suitability, Performance Efficiency, Compatibility, Usability, Reliability, Security, Maintainability, and Portability. The researchers employed this ISO-based questionnaire to collect comprehensive information for the development of Sport Event and Athletes Management System. Respondents rated their level of agreement with each statement using a 5-point Likert scale, where 1 indicated "Unsatisfactory" and 5 indicated "Excellent." This quantitative approach enabled precise data collection regarding the software's quality attributes and provided a structured format for reporting usability test findings. It helped assess the current state of Sport Event and Athletes Management System and identify potential Usability requirements for the proposed system.

Data Gathering Procedure

The data gathering procedure was conducted systematically to ensure thorough and accurate collection of information in accordance with ISO standards. The researchers utilized a standardized survey questionnaire based on the ISO usability standard and recruited a diverse sample of 25 participants, including student-athletes, coaches, and

sports coordinator from VMA Global College and IT professionals. An ISO-compliant questionnaire based on the ISO/IEC 25010 standard for Software Quality Requirements and Evaluation (SQuaRE) was then distributed both in paper format and electronically to participants who might be out of reach. Each participant received a brief overview of the study's objectives, the significance of their participation, and detailed instructions for completing the questionnaire. Once the data collection was complete, all responses were compiled and organized for subsequent analysis, adhering to best practices outlined in ISO standards to ensure data integrity and reliability.

Validity of Research Instrument

The researchers did not conduct a separate validity assessment for the instrument, as it is based on the ISO/IEC 25010 standard for Software Quality Requirements and Evaluation (SQuaRE), which has been extensively validated through rigorous testing. This standardization process ensures that the instrument accurately measures the intended constructs, confirming its validity across diverse populations and contexts. By adhering to the established criteria of ISO/IEC 25010, the researchers can confidently rely on the instrument's ability to assess software quality effectively and consistently.

Reliability of the Questionnaire

The reliability of the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) 25010:2011 as the research instrument for the Sports Events and Athletes Management System is well-established due to its standardized nature. Extensive research has demonstrated that the ISO/IEC 25020: 2011 standard is valid and reliable in measuring user's satisfaction and evaluating the system and application software qualities which can help for the system development of the project. Hence, there is no need to conduct validity and reliability test for the system.

Analysis / Statistical Treatment of Data

In this study, data analysis and statistical treatment were conducted using the average mean, based on responses collected through the ISO/IEC 25010:2011 Questionnaire. This questionnaire includes a range of items aimed at assessing user satisfaction in areas such as system usefulness, information quality, and interface quality. After administering the survey to a purposive sample of 25 respondents, the data were analyzed quantitatively by calculating the mean score for each item.

The average mean scores from the ISO/IEC 25010:2011 provided essential insights into user perceptions regarding

the usability of the Sports Events and Athletes Management System. Higher mean scores indicated a greater level of satisfaction among respondents. For example, a score surpassing 3.41 on a 5-point Likert scale would suggest that users viewed the system as highly effective and useful. Moreover, the overall mean score calculated across all dimensions offered a comprehensive assessment of the system's general usability. This statistical analysis enabled the identification of both strengths and weaknesses within the system, guiding future enhancements to ensure that the Sports Events and Athletes Management System effectively meets user expectations and requirements. By utilizing average means, the analysis facilitated a clear understanding of usability data, ultimately reinforcing the reliability and, validity of the research findings.

Overall, the use of average means as a statistical measure allowed for a clear and concise interpretation of usability data, ultimately contributing to the reliability and validity of the research findings.

The formula for computing the mean is.

$X = \sum Xi$

N

Where: X = mean

Xi = sum of all individual score

N = number of respondents

Table 3. Likert Scale

Code	Interpretation	Description
5	Excellent	4.51 – 5.00. The system is complete and fully functional.
4	Very Good	3.51 – 4.50. The system is complete and functional.
3	Good	2.51 – 3.50 The system is somewhat complete and functional.
2	Poor	1.51 – 2.50. The system is incomplete and somewhat functional.
1	Very Poor	1.50 - below. The system is incomplete and non-functional.

System Development Life Cycle

The proponents used Modified Waterfall Model of Life Cycle Development due to its ability to go back to a prior stage of the cycle and verify whether any errors were made in the current proposal's creation. In contrast to the other Life Cycle Development model, this one was useful for evaluating the planned study's progress by looking at it from the beginning to the current stage. It enabled the developer to produce and maintain a fantastic feature before to the actual creation of the system. The system's flow and procedure were shown in this model. It is possible to stabilize the system's entire development process and alter the system cycle. It is the proponent's guide for modifying the entire process and deployment of the system in order to provide the administrator, private schools, coaches, and athletes with

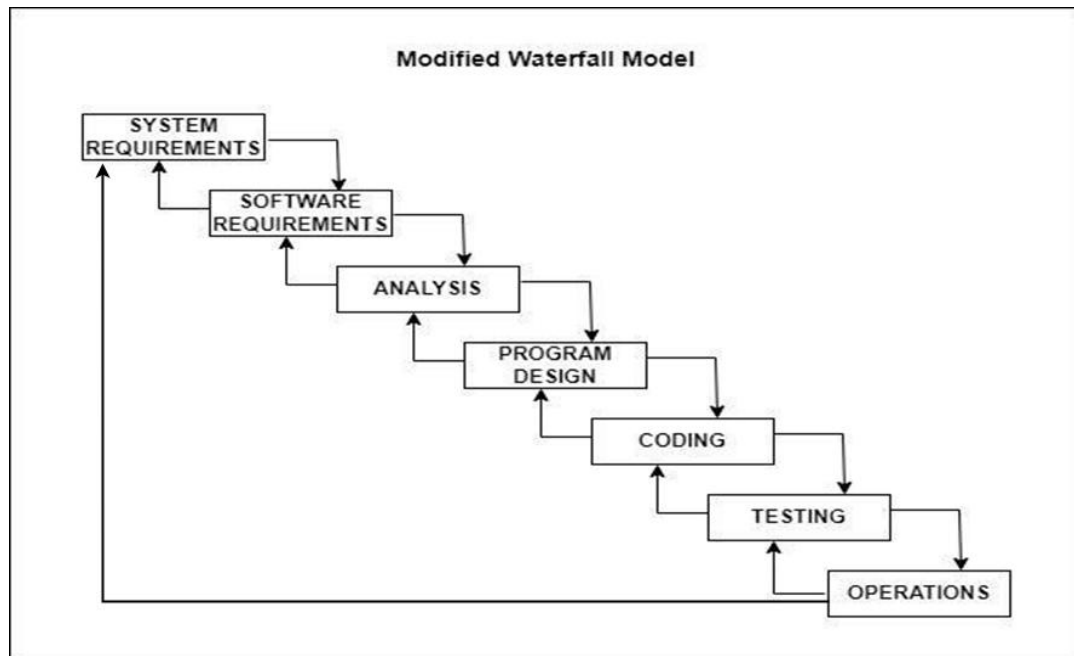a good presentation and knowledge of the system and its functionalities.

Modified Waterfall Model

Figure 1. Modified Waterfall Model

The following are the phases of the Waterfall Method that the proponents utilized in this study:

Phase 1: Requirements Gathering

During this phase, information and data about the sports events and athlete management system were gathered, and requirements were collected by the admin, sports coordinator, coaches, and student-athletes of the system.

Phase 2: Software Requirements

In this phase, the proponents studied the software requirements in developing the web application to provide a satisfying functionality for the organization.

Phase 3: Analysis

In this phase, the proponents analyzed the problem of the Sports Events and Athletes Management System by gathering the data and start the whole study and system design and development.

Phase 4: Program Design

In this phase, the proponents recognized the features and design to be used and the processes and functionalities needed to finish the system so that the system design can be understood by the users.

Phase 5: Coding

After the requirements and design phase, the proponents constructed the system based on the gathered data and information. All the processes, functionalities, and flows of the system were tested to see if the system would be an efficient tool for the company that would use the said system. The proponent uses Html, Tailwindcss, Python (Django framework), and Javascript(Jquery) for the programming languages.

Phase 6: Testing

In this phase, the proponents chose IT experts, Admin, Sports Coordinator, Coaches and Student Athletes of VMA Global College and Training Centers, Incorporated in user testing to identify the lacks of the System. The proponents tested the admin panel of the managing and saving the data in order to make sure that these essential functions were accurate and error-free.

Phase 7: Operation

In this phase, the might operation of the system requires ongoing maintenance to address bugs, fix security vulnerabilities, and potentially incorporate new features based on user feedback.
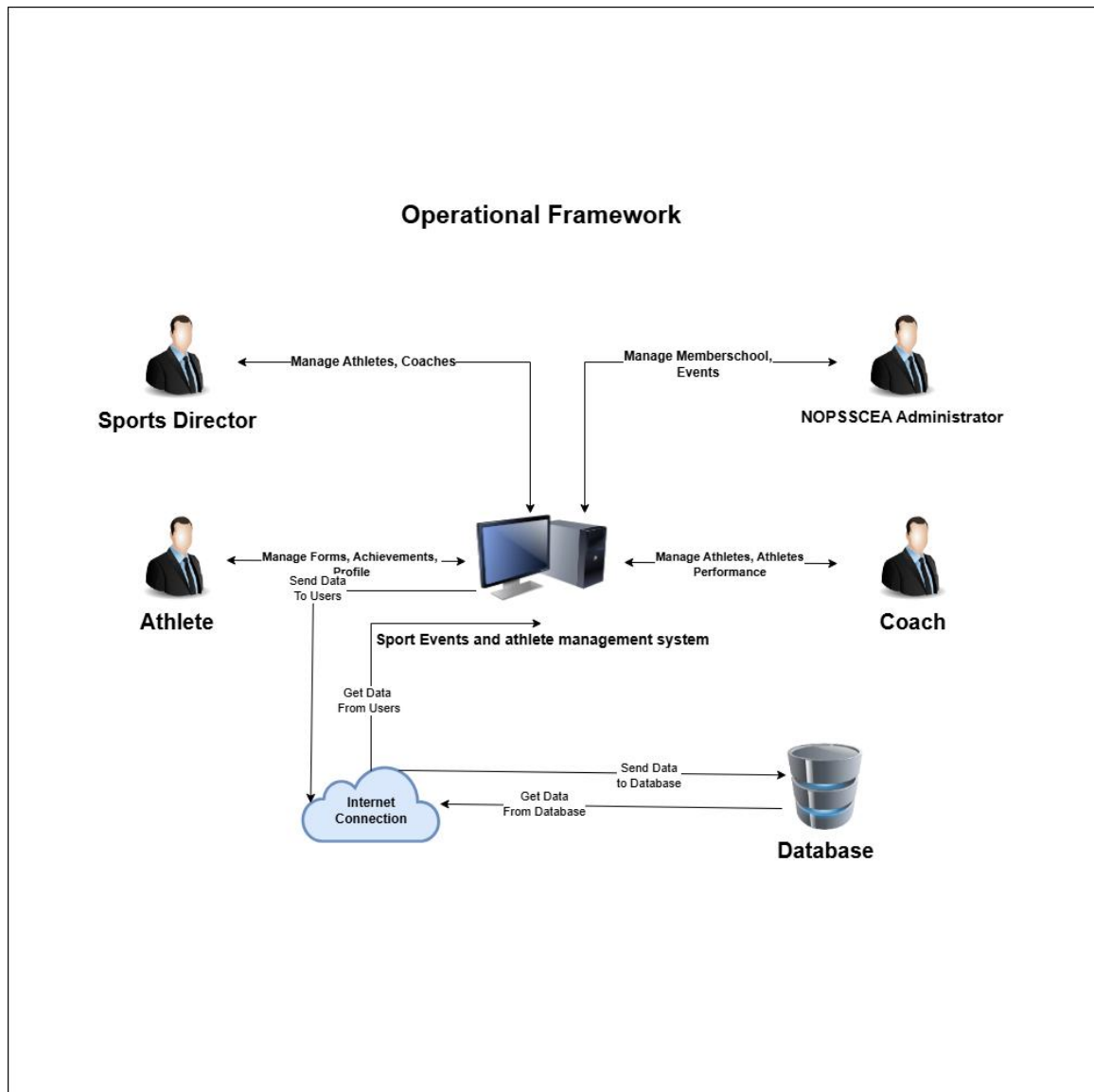
Operational Framework

Figure 2. Operational Framework

Figure 2 shows the Operational Framework of the Sports Events and Athletes Management System on how the how member school, NOSSCEA, Coach, Athlete relate their duties in interact with the System.
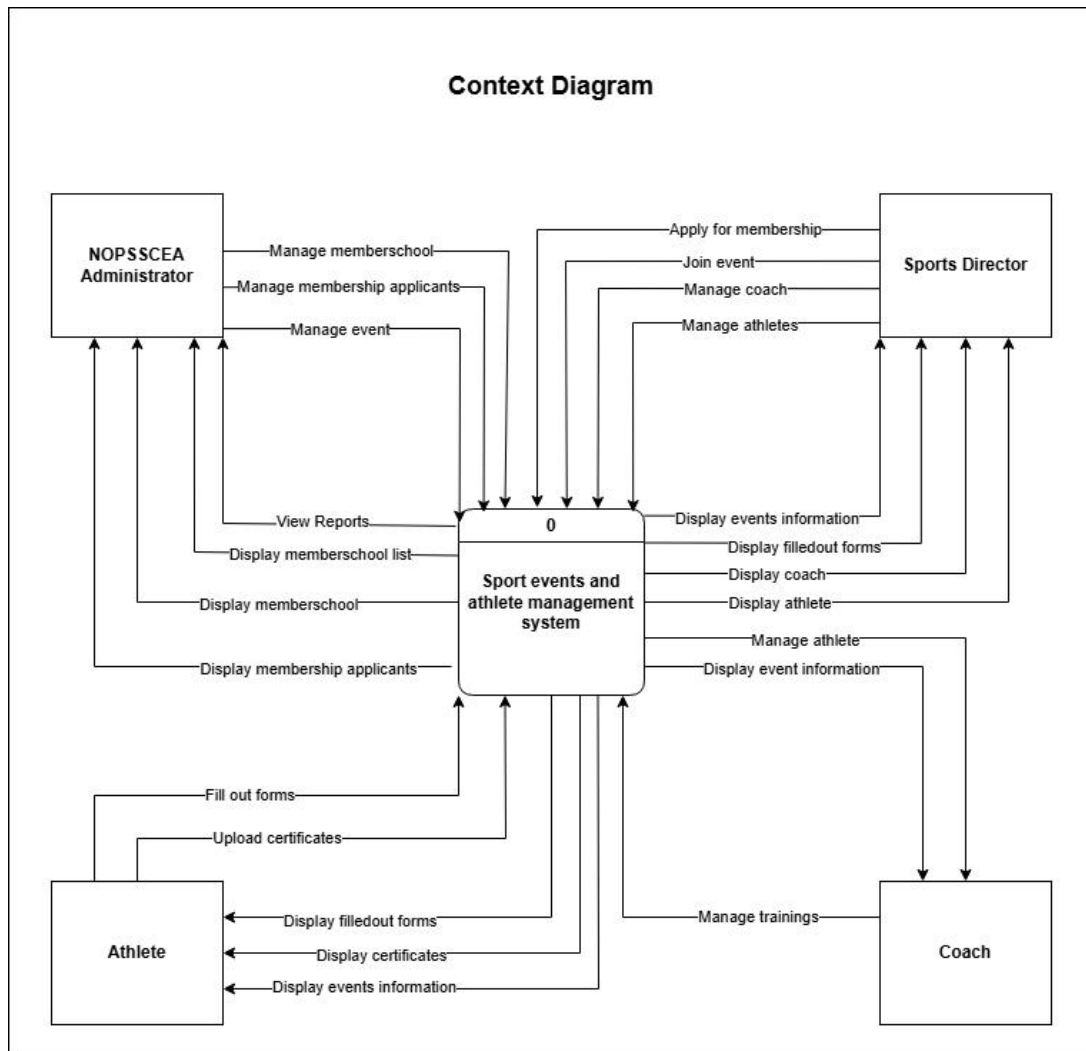
Figure 3. Context Data Flow Diagram

Figure 3 shows the Context Data Flow Diagram of sports event and athlete management system facilitates member school management, including coaches and athletes. Athletes can submit forms and achievements, which the system tracks along with their performance. The system offers functionalities to view lists of member schools, applications, coaches, athletes, performance reports, submitted forms, and uploaded achievements.
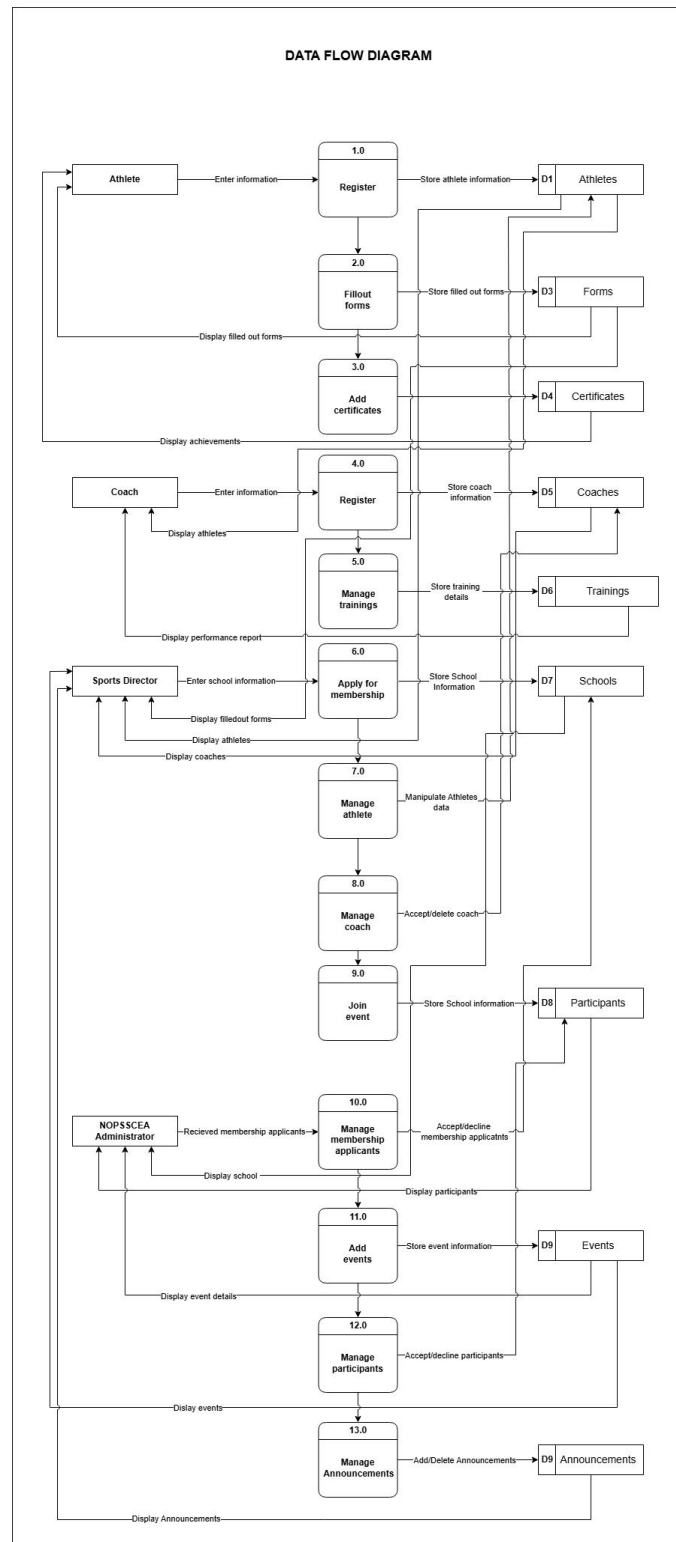
Figure 4. Data Flow Diagram

Figure 4 shows the data flow diagram of the Sports Events
and Athletes Management System coaches can then enter their
information and view/manage athletes. Schools apply for

membership and upon approval, manage coaches, athletes, and event participation. The system stores athlete achievements, school membership information, and event participants.
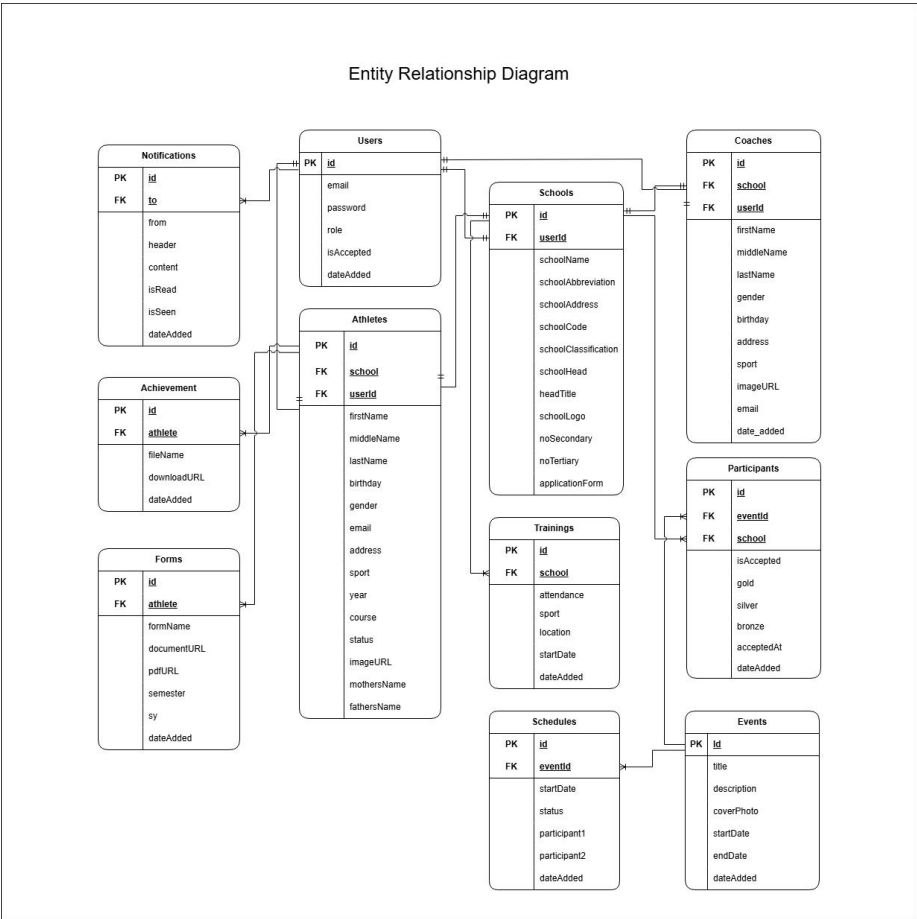
Figure 5. Entity Relationship Diagram

Figure 5 shows the entity relationship diagram of the sports and athletes management system. One school can have many coaches (one-to-many), and many athletes can be linked to one coach (many-to-one). Athletes and events have a many-to-many relationship, an athlete can participate in many events, and conversely, an event can have many athletes participating. This structure allows the system to

efficiently track athletes, their achievements, coaches, schools, events, and athlete participation in those events.

Use Case Diagram

Sports Event and Athlete Management System

MANAGE ATHLETE

MANAGE ATHLETE PERFORMANCE

JOIN EVENT

MANAGE COACH

REGISTER/LOGIN

MANAGE EVENT

MANAGE ACHIEVEMENT

MANAGE SCHOOL

FILLOUT FORMS

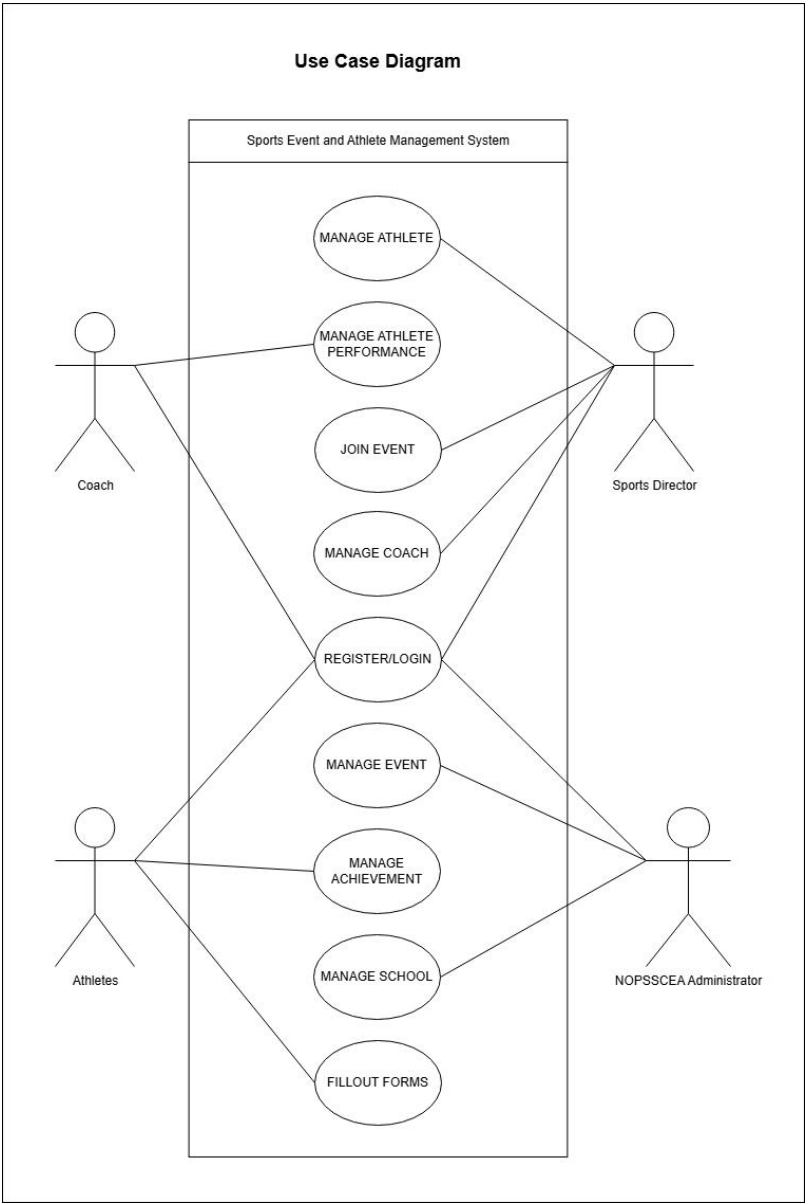Coach

Sports Director

Athletes

NOPSSCEA Administrator

Figure 6. Use Case Diagram

Figure 6 shows the four users – the athletes, coaches, schools, and NOPSSCEA administrators. Athletes can register, fill out forms, and join events. Coaches can register, and schools can manage coaches and athletes, even creating or managing events.

Data Dictionary

This section of the study contains the list of all tables present in the database of the application. This provides comprehensive details on the description, datatype, and size of each entity.

TABLE 4

User Table

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
user_id	int	11	Primary key of tbl_user
username	varchar	255	Name of user
password	varchar	255	User password
email	varchar	255	User email Address
role	varchar	255	Role of the User
Is_accepted	varchar	255	Indicator if the school Accepted
last_login	varchar	255	User last log In
date_added	date		User date added

Table 4 is used to record user information and verify login.

TABLE 5

Athlete Table

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
athlete_id	Int	11	Primary key of tbl_Athletes
school_id	Int	11	Foreign key of tbl_schools
user_id	Int	11	Foreign key of tbl_users
athlete_fname	varchar	255	First name of the athlete
athlete_mname	varchar	255	Middle name of the athlete
athlete_lname	varchar	255	Last name of the athlete
athlete_grade_year	varchar	255	grade/year of the athlete
athlete_course	varchar	255	Course of the athlete
athlete_sport	varchar	255	Sports of the athlete
athlete_gender	varchar	255	Gender of the athlete
profile_pic	Date		profile picture of the Athlete
date_added	varchar	255	Athlete date added

Table 5 stores athletes' personal details, academic information, and sport involvement, linking them to specific schools and users through foreign keys.

TABLE 6

School Table

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
school_id	Int	11	Primary key of tbl_schools
user_id	Int	11	Primary key of tbl_users
school_name	varchar	255	Name of School
school_abbrevation	varchar	255	Abbrevation of the school
school_address	varchar	255	School Address
school_code	varchar	255	School code
date_added	Date		School date added

Table 6 the School Table stores schools details.

TABLE 7

Coaches Table

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
coach_id	int	11	Primary key of tbl_coach
school_id	int	11	Foreign key of tbl_schools

user_id	int	11	Foreign key of tbl_users
coach_fname	varchar	255	First name of the Coach
coach_mname	varchar	255	Middle name of the Coach
coach_lname	varchar	255	Last name of the Coach
coach_gender	varchar	255	Gender of Coach
coach_bday	varchar	255	Birthdate of the Coach
coach_address	varchar	255	Coach Address
coach_sport	varchar	255	Coach Sports
Date_added			Coach date added

Table 7 the Coaches Table, stores information about coaches, including their names, gender, birthdate, address, and the sports they handle.

TABLE 8

Participants Table

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
participant_id	int	11	Primary key of tbl_participant
event_id	int	11	Foreign key of tbl_events
school_id	int	11	Foreign key of tbl_schools

date_added	date		Participant date added

Table 8, the Participants Table, stores information about participants, including their unique identifier, the event they are associated with, the school they represent, and the date they were added to the database.

TABLE 9

Events Table

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
event_id	Int	11	Primary key of tbl_event
event_name	varchar	255	Name of the Event
start_date	Date		Starting date of the event
end_date	Date		End date of the Event

cover_photo	Long-blob		Cover photo of the event
date_added	Date		Event date added

Table 9, the Events Table, stores detailed information about events, including the unique event ID, the name of the event, the starting and ending dates, and the cover photo associated with the event.

TABLE 10

Achievements Table

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
achievement_id	int	11	Primary key of tbl_Achievement
athlete_id	int	11	Foreign key of tbl_ Athlete
images	Long-blob		Athlete achievement Image
date_added	date		Athlete Achievement date added

Table 10, the Achievements Table, stores information about athlete achievements, including the unique achievement ID, a reference to the athlete's ID, and images showcasing the athlete's achievement. Additionally, it records the date when the achievement entry was added to the database.

TABLE 11

Athlete Personal Information Table

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
pinfo_id	varchar	1	Primary key of tbl_Pinfo
athlete_id	int	1	Foreign key of tbl_Athlete
athlete_bday	varchar	2	Birthdate of the Athlete
athlete_addre ss	varchar	2	Address of the Athlete
athletes_moth ersname	varchar	2	Athlete mother's name
athletes_fath ersname	varchar	2	Athlete father's name

date_added	date	5	Athlete date added

Table 11 stores athletes' personal details, including their ID, birthdate, address, and parent's names.

Hardware and Software Requirements

Hardware Requirements

To ensure smooth operations and efficient data handling the Sports Events and Athletes Management System this are the following minimum hardware requirement the proponents use in the study:

Table 12. Hardware Requirements

Hardware Requirements	Description
	At least 128 and up gigabits of storage to store data.
1. Personal Computer	A database server to store all the system's data, like customer information, bookings, and cleaning staff details. This could be run on the same server as the web application or on a separate server for better performance.
2. Laptop	An operating system to support the process of developing.

At least 128 gigabits and up of storage
for backups.

Used for emergency purposes.

Software Requirements

The Software Requirements of Sports Events and Athletes
Management System are the following:

- Internet Browsers (Chrome, Crytotab Browser, Microsoft Edge, Firefox, Safari)
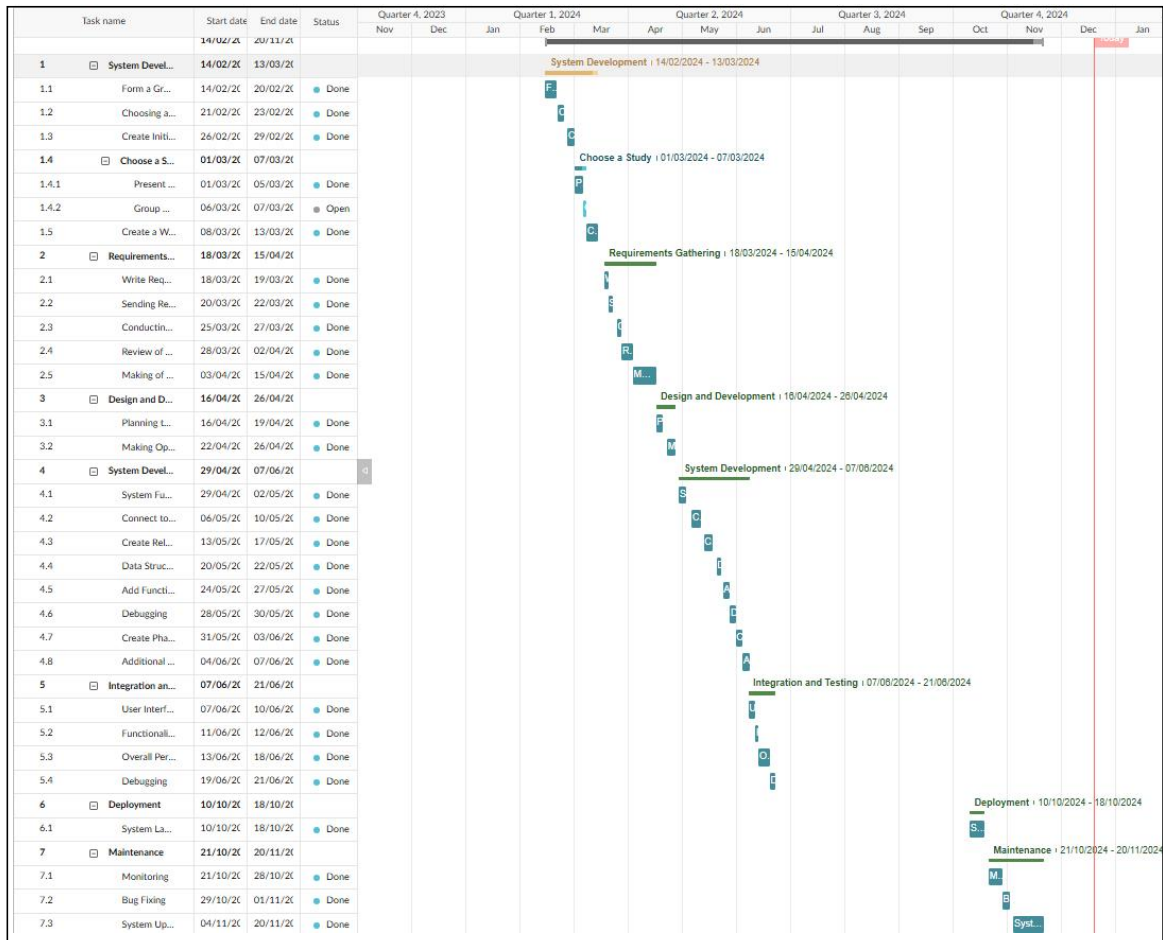- OS(Operating System)
- Xampp
- Visual Studio Code

Gantt Chart

Figure 7: Gantt Chart

Figure 7 shows the Gantt chart of the Sports Events and Athletes Management System.