Dhaka University Swimming Pool Management System

Submitted As
Software Requirements Specification and Analysis
Document of SPL-2 **[SE-505]**

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Introduction

Welcome to the Software Requirements Specification (SRS) for the Dhaka University Swimming Pool Management System. This document encapsulates the comprehensive details of our team's endeavor to develop an innovative and efficient software solution tailored for the management of Dhaka University's swimming pool facility. With a commitment to enhancing user experience, operational efficiency, and overall facility management, this SRS outlines the core functionalities and requirements that our software aims to fulfill.

Purpose

The primary purpose of this software is to streamline the diverse operations involved in managing Dhaka University's swimming pool facility. From user registrations and event planning to financial transactions and supplier management, our software aspires to integrate and optimize every aspect of swimming pool administration. By harnessing the power of technology, we aim to enhance user satisfaction, improve staff productivity, and ensure the seamless operation of the swimming pool facility.

Intended Audience

This SRS is designed for a varied audience, including software developers, system architects, project managers, quality assurance professionals, and stakeholders involved in the planning and execution of the Swimming Pool Management System. Additionally, it serves as a comprehensive reference for potential end-users, providing insights into the features and functionalities that the software will offer.

Conclusion

In concluding this SRS, we look forward to embarking on this journey to develop a cutting-edge Dhaka University Swimming Pool Management System. By aligning technological solutions with the specific needs of the swimming pool administrators, staff, and users, we aim to create a software platform that not only meets but exceeds expectations. We anticipate that this SRS will serve as a foundational guide throughout the development process, fostering a shared understanding and vision for the successful realization of our software.

1. Inception Report

1.1 Introduction

The Dhaka University Swimming Pool Management System represents a digital solution aimed at streamlining the multifaceted tasks involved in efficiently administering Dhaka University's swimming pool facility. Inspired by the commitment to elevate user experience and operational efficiency, this document serves as a foundational guide for our project. Within these pages, we articulate the project's vision, outline its objectives, and identify the critical stakeholders, laying the groundwork for a successful development phase.

1.2 Working Towards Collaboration

Our team places a strong emphasis on fostering collaboration and teamwork. Recognizing that successful project outcomes rely on effective communication, shared goals, and a harmonious working environment, we prioritize building a collaborative culture. Through regular team meetings both in online and offline, open communication channels like messenger groups, and collaborative tools like google drive, we create an inclusive space where each team member's strengths contribute to the collective success of the project. Emphasizing a cooperative

mindset, this phase establishes the groundwork for efficient workflows, constructive problem-solving, and a unified approach as we embark on the development journey together.

1.3 Identifying The Stakeholders

In this crucial phase of project inception, we diligently identify and analyze the stakeholders who hold a vested interest in the success and outcomes of the Dhaka University Swimming Pool Management System. We were able to identify the stakeholders of our project, who are:

1. Varsity Students
2. Non-varsity Individuals
3. Teachers
4. Officers
5. Family Members of Teachers and Officers
6. Staff
7. Associate Members
8. Suppliers
9. Temporary Mechanics
10. Trainer
11. Head of Swimming Pool
12. Planning Operator
13. Counter Officer

2. Elicitation of Dhaka University Swimming Pool management System

The elicitation process for the Dhaka University Swimming Pool Management System involves systematically gathering requirements from stakeholders. Through interviews, surveys, observations, and collaborative sessions, we aim to understand

user needs, identify pain points, and envision improvements. This comprehensive approach ensures that the final system is tailored to address the diverse requirements of pool administrators, staff, users, suppliers, and regulatory entities. The elicitation process is iterative, allowing for continuous refinement based on feedback and evolving insights, ultimately contributing to the successful development and implementation of an efficient and user-friendly pool management solution.

2.1 Quality Function Deployment (QFD)

Quality Function Deployment (QFD) is a structured approach to defining customer needs or requirements and translating them into specific plans to produce products to meet those needs. The "voice of the customer" is the term to describe these stated and unstated customer needs or requirements.

We visited central Swimming Pool of University of Dhaka and talked to the Director, Assistant Director of Physical Education Center of the university, Planned Operator, Counter Operator of the Swimming Pool, different swimmers and other employees and got the following requirements for our automated system:

2.1.1 Normal Requirements

- **Online Form:** The system shall provide an online form for users to submit information and requests to register and admit in any courses of the swimming pool.

- **Online Admission:** Users, particularly students and participants, should be able to complete the admission process online, including selecting classes or programs and making necessary payments.

- **Online Transaction:** The system will facilitate online transactions, allowing users to make payments for various pool-related services and activities through a secure online portal.

- **Per Person Login Account:** Every user will have the ability to create and manage an individual login account, providing personalized access to the swimming pool management system.

- **Notice to All:** The system should enable administrators to send notifications, announcements, and important information to all pool users through a centralized notice system.

- **Online Review:** Users will have the capability to submit and view reviews or feedback on their pool experiences through an online review platform.

- **Database (to store information of all):** A comprehensive database will be implemented to securely store and manage information related to users, schedules, and other relevant data.

- **Swimming Pool Profit/Loss:** The system will include a feature to calculate and display the financial performance of the swimming pool, providing insights into profit and loss to administrative accounts.

2.1.2 Expected Requirements

- **Schedule Management:** Schedule management is a crucial aspect that will ensure smooth operations and optimal utilization of pool resources. This functionality will allow administrators to create and manage schedules for various activities such as swim lessons, training sessions and maintenance periods. Users will get access to the schedule to view available time slots, register for activities or courses, and plan their visits accordingly.
- **Student Entry Database:** The system will maintain a student entry database, capturing and storing relevant information about students participating in swimming classes and programs.

- **Staff Managemen t:** A dedicated staff management module will be incorporated to oversee and manage information related to pool staff, including lifeguards, trainers, and administrative personnel.

2.1.3 Exciting Requirements

- **Event Management:** The system will feature an event management module, allowing for the seamless planning, organization, and execution of various exciting events within the swimming pool facility.

- **Lesson Management (video/guidelines):** A comprehensive lesson management system will be implemented, incorporating video content and guidelines to enhance the learning experience for participants in swimming classes and programs

- **Course Management:** This feature enables administrators to efficiently organize and manage swimming courses, classes, and training programs within the facility.
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2.2 Usage Scenario

2.2.1 Registration Module

In the Dhaka University Swimming Pool Management System, pool access registration is available based on the user's category. Separate registration forms and payment structures would be provided for varsity students, non-varsity individuals, teachers, officers, family members of teachers and officers,staff, associate members, suppliers, temporary mechanics, trainer, head of swimming pool, planning operator, and counter officer.

Swimmer Registration Form

Regular Swimmer Registration Form :

Name:
Email:
Phone Number:
Gender:
Date of Birth:
Occupation:
Are you a student of (Optional) ● BUET ● Dhaka Medical College ● Others
Student ID of Selected Institute(BUET / DMC) :[Dependant on whether previous options are selected]
Parent's Name:
Parent's Phone Number:
Any Illness : ● Asthma ● High Blood Pressure ● Epilepsy ● Skin-disease

University's Student Form:

Name:
Email:

Phone Number:
Gender:
Date of Birth:
Department:
Session:
Registration Number:
Occupation:
Parent's Name:
Parent's Phone Number:

Member of the Central Swimming Team?
   ● YES
   ● NO

Any Illness :
   ● Asthma
   ● High Blood Pressure
   ● Epilepsy
   ● Skin-disease

Teacher and officers' form:

Name:
Email:
Phone Number:
Gender:
Date of Birth:
Department/Office:

Profession/Position:
Current Address:
Emergency Family Member's Name:
Emergency Family Member's Phone Number:

Any Illness :
   ● Asthma
   ● High Blood Pressure
   ● Epilepsy
   ● Skin-disease

Form for Family members of teachers and officers:

Name:
Email:
Phone Number:
Gender:
Date of Birth:
Occupation:
Referred Guardian's Name:
Referred Guardian's Occupation:
Referred Guardian's Department/Office:

Any Illness :
   ● Asthma
   ● High Blood Pressure
   ● Epilepsy
   ● Skin-disease

Associate members Form:

Name:
Email:
Phone Number:
Gender:
Date of Birth:
Department/Office:
Profession/Position:
Emergency Contact's Name:
Emergency Contact's Phone No:

Any Illness :
    ● Asthma
    ● High Blood Pressure
    ● Epilepsy
    ● Skin-disease

All swimmer registration data except regular swimmer registration are verified through the central database record of the university.

(Non Swimmer) System user Registration Form

Form for head of the swimming pool, planning operator, and counter officer:

Name:
Email:

Phone Number:	
Professional Position:	

A verification request with details of registered information will then be sent to the central authority of the university. If the central authority approves, the head of the swimming pool, planning operator, and counter officer registrations are granted and role based access is given.

After filling out the registration information, every user will be prompted to set their password.

2.2.2 Scheduling Module

Training Schedule for Swimmers

	8.00 AM-9.00 AM	9.00 AM-10.00 AM	10.00 AM -11.00 AM	11.30 AM-12.30 PM	12.30 PM-1.30 PM	1.30 PM-2.30 PM	5.00 PM-6.00 PM	6.00 PM-7.00PM	7.00 PM-8.00 PM	8.00 PM-9.00 PM
Friday	Any Swimmer (Female)	Any Swimmer (Female)	Any Swimmer (Female)	Any Swimmer (Male)	Any Swimmer (Male)	Any Swimmer (Male)	Teacher/ Officer	Teacher/ Officer	Associate Members	Associate Members
Saturday	Any Swimmer (Female)	Any Swimmer (Female)	Any Swimmer (Female)	Any Swimmer (Male)	Any Swimmer (Male)	Any Swimmer (Male)	Teacher/ Officer	Teacher/ Officer	Associate Members	Associate Members

	10.00 AM-11.00 AM	11.00 AM-12.00 PM	12.00 PM -1.00 PM	1.00 PM -2.00 PM	2.00 PM-3.00 PM	5.00 PM-6.00 PM	6.00 PM-7.00PM	7.00 PM-8.00 PM	8.00 PM-9.00 PM
Sunday	Any Swimmer (Female)	Any Swimmer (Female)	Central swimming team members and regular swimmers (Female)	Central swimming team members (Female)	Central swimming team members and regular swimmers (Female)	Teacher/ Officer	Teacher/ Officer	Associate Members	Associate Members
Monday	Any Swimmer (Male)	Any Swimmer (Male)	Central swimming team members and regular swimmers (Male)	Central swimming team members (Male)	Central swimming team members and regular swimmers (Male)	Teacher/ Officer	Teacher/ Officer	Associate Members	Associate Members
Tuesday	Any Swimmer (Female)	Any Swimmer (Female)	Central swimming team members and regular swimmers (Female)	Central swimming team members (Female)	Central swimming team members and regular swimmers (Female)	Teacher/ Officer	Teacher/ Officer	Associate Members	Associate Members
Wednesday	Any Swimmer (Male)	Any Swimmer (Male)	Central swimming team members and regular swimmers (Male)	Central swimming team members (Male)	Central swimming team members and regular swimmers (Male)	Female Teacher And Female Family members of Teachers/ Officers	Female Teacher And Female Family members of Teachers/ Officers	Female Teacher And Female Family members of Teachers/ Officers	Female Teacher And Female Family members of Teachers/ Officers

Swimmer entities are notified about their respective schedule. Schedules can be updated anytime by the Planning Operator.

2.2.3 Lesson Management Module

The system maintains a comprehensive log of all training sessions. All training sessions are followed by descriptive guidelines and a video lesson recorded by trainers. These videos and lessons are uploaded and managed by trainers and the planning operator.

Trainer can update the training log by requesting access to log editing from the planning operator.

Following is the default lesson log:

Stage - 1

- *Breath control and overcoming the fear of water*
- *Exhaling into water: Face only.*
- *Exhaling into water: Head underwater*
- *Exhaling into water: Bobbing*
- *Float introduction: Holding the wall*
- *Floating. Starfish*
- *Floating. Cannonball*
- *Floating and sinking*
- *Floating. Streamline*
- *Kicking introduction. Sitting on deck*
- *Kicking. Hands on the wall, no breath*
- *Kicking. Hands on the wall with breath*
- *Kicking. One hand on the wall, side breath*
- *Kicking. Streamline kicking*
- *Kicking with the board*
- *Kicking. One arm on the board*

- *Streamline kicking with breath. No board*
- *Kicking one arm up. Side breath*

Stage - 2

- *Introduction. Warm-Up*
- *Pulling overview. One arm pull, stationary*
- *Pulling. One arm holding the wall*
- *Pulling. One arm with the board*
- *Pulling. Catch-Up Drill with the board*
- *Pulling. Catch-Up Drill*
- *Swimming. Freestyle stationary*
- *Swimming. Freestyle swim*

Stage - 3

- *Timing Introduction. Warm-Up*
- *Timing. Kicking One Arm Up. Stomach to Side Rotation*
- *Timing. Kicking. Side Glide*
- *Timing. Stationary Switch Drill*
- *Timing. Six Kicks-Switch Drill*
- *Timing. Freestyle stationary*
- *Timing. Freestyle Swim*
- *Flip-Turns Introduction. Flip-Turn. Standing*
- *Flip-Turn. Jumping Flip-Turn*

Stage - 4

- *Introduction. Warm-Up*
- *Swimming Set. Breathing Patterns*
- *Flip-Turns. Revising.*
- *Flip-turns. Kicking into the flip*
- *Flip-turns. Holding the wall*
- *Flip-turns. Wall flip-turn, rotation to the stomach*
- *Flip-turns. Wall flip-turn and swim*
- *Flip-turns. Swim and flip-turn*

- *Flip-Turns. Swimming freestyle with flip-turn*
- *Dives introduction. Dive. Sitting*
- *Diving. Kneeling dive*
- *Diving. Standing dive*
- *Diving. Dive off the block*
- *Diving. Track position*
- *Diving. Dive and freestyle swim*

***Final* :**

- *Test. 100 Freestyle*

Every swimmer has their personal lesson tracking log where they can mark down the lesson they've completed. The swimmers can also give feedback on how much they've learnt and where they lack. These feedbacks are notified to the trainer and the planning operator.

2.2.4 Payment Module

The system is integrated with all the online banking services in Bangladesh, including mobile banking services like Bkash, Nagad, and Rocket. All of the registered staff and swimmers can set their transacting account with credit and banking details.
The swimming pool has an admin banking account which is set by the central authority. This admin banking account is where all the fees and centrally allocated budget is kept. The bills for suppliers and mechanical helps and the salaries of the temporary staff are paid through the admin banking account.

The payment module has following segments:

Admissions Fees and Monthly fees for Swimmers: The system allocates designated admissions fees for registered varsity students, regular individuals, teachers and officers, family members of teachers and officers,staff, associate members who make these payments through the integrated mobile or online banking services.

The designated fees can be updated by the planning operator and the upgradation in fees are approved and monitored by the university central authority.

Swimmer Category	Admission Fee (BDT)	Monthly Fee (BDT)	Annual Fee (If paid at once)
University Student	100	100	(Not Applicable)
Teachers and officers	340	300	1. 1300(For 12 months) 2. 900(For 6 months)
Family members of teachers and officers	340	300	(Not Applicable)
Regular Swimmer (Except BUET/DMC student)	2600	1300	(Not Applicable)
Regular Swimmer (BUET/DMC student)	1300	650	(Not Applicable)
Associate Members	2600	1300	1. 15,600(For 12 months)

Swimmer Category	Admission Fee (BDT)	Monthly Fee (BDT)	Annual Fee (If paid at once)
University Student	100	100	(Not Applicable)
Teachers and officers	340	300	1. 1300(For 12 months) 2. 900(For 6 months)
			2. 10,400(For 6 months)

2.2.5 Event Management Module

The planning operator can create and manage any event in following steps:

- **Create Event :**

The event creation form:

Event ID:	[Auto filled by system]
Event Name:	[Enter a descriptive and unique name for the event]
Event Date and Time:	[Choose the date and time when the event will occur]
Event Description:	[Compose a detailed description of the event, including its purpose, agenda, and any special highlights]
Define Roles:	[Create a list of roles required for the event (e.g., Event Coordinator,

	Lifeguard, Ticket Sales, First Aid, Resource allocator)]
Budget :	[Allocate an estimated budget]
Ticket price(Optional):	[Assign a ticket price]

- **Client Notifications**

  Notification Preferences: Configure how and when clients will receive event notifications. Options include email, SMS, and push notifications.

  Customize Messages: Personalize the messages for each notification channel to ensure engagement.

- **Publish and Notify**

  Publish Event: Once satisfied with the event details, the planning operator can make the event live.

  Automatic Notifications: The system will automatically send event notifications to clients and assign staff members, ensuring everyone is informed and ready.

3. Scenario Based Modeling

The success of a computer-based system or product is measured in many ways but user satisfaction resides at the top of the list. Understanding how actors want to interact with a system will lead the software team to properly characterize requirements and build meaningful analysis and design models. Hence, requirements modeling begins with the creation of scenarios in the form of use cases, activity diagrams, and swimlane diagrams.

3.1 What is a Use Case Diagram?

A use case is a written description of how users will perform tasks on this website. It outlines, from a user's point of view, a system's behavior as it responds to a request. Each use case is represented as a sequence of simple steps, beginning with a user's goal and ending when that goal is fulfilled. Use cases specify the expected behavior (what), and not the exact method of making it happen (how). Use cases once specified can be denoted both textual and visual representation (i.e. use case diagram). A key concept of use case modeling is that it helps us design a system from the end user's perspective. It is an effective technique for communicating system behavior in the user's terms by specifying all externally visible system behavior.

Primary Actor
Primary actors interact to achieve required system function and derive the intended benefit from the system. They work directly and frequently with the software.

Secondary Actor
Secondary actors support the system so that primary actors can do their work. They either produce or consume information.

3.2 The Purpose of Use Case Diagram

The reasons why an organization would want to use case diagrams include:
- Represent the goals of systems and users.
- Specify the context a system should be viewed in.
- Specify system requirements.
- Provide a model for the flow of events when it comes to user interactions.
- Provide an outside view of a system.
- Shows external and internal influences on a system.

3.3 Use Case Diagram : Dhaka University Swimming Pool Management System

3.3.1 Level 0:

Name: Dhaka University Swimming pool management system
Primary Actor: Varsity students, regular individuals, teachers, officers, family members of teachers, family members of officers, associate members, staff, head of the swimming pool, planning operator, and counter officer.
Secondary Actor: SSLCommerz, Mail system, SMS, Central Database, System, University authority

Figure-1 : Level 0(Swimming pool management system)

3.3.2 Level 1:

Name: Swimming pool Management System details

Primary Actor: varsity students, regular individuals, teachers, officers, family members of teachers, family members of officers, associate members, staff, suppliers, temporary mechanics, trainer, head of the swimming pool, planning operator, and counter officer.

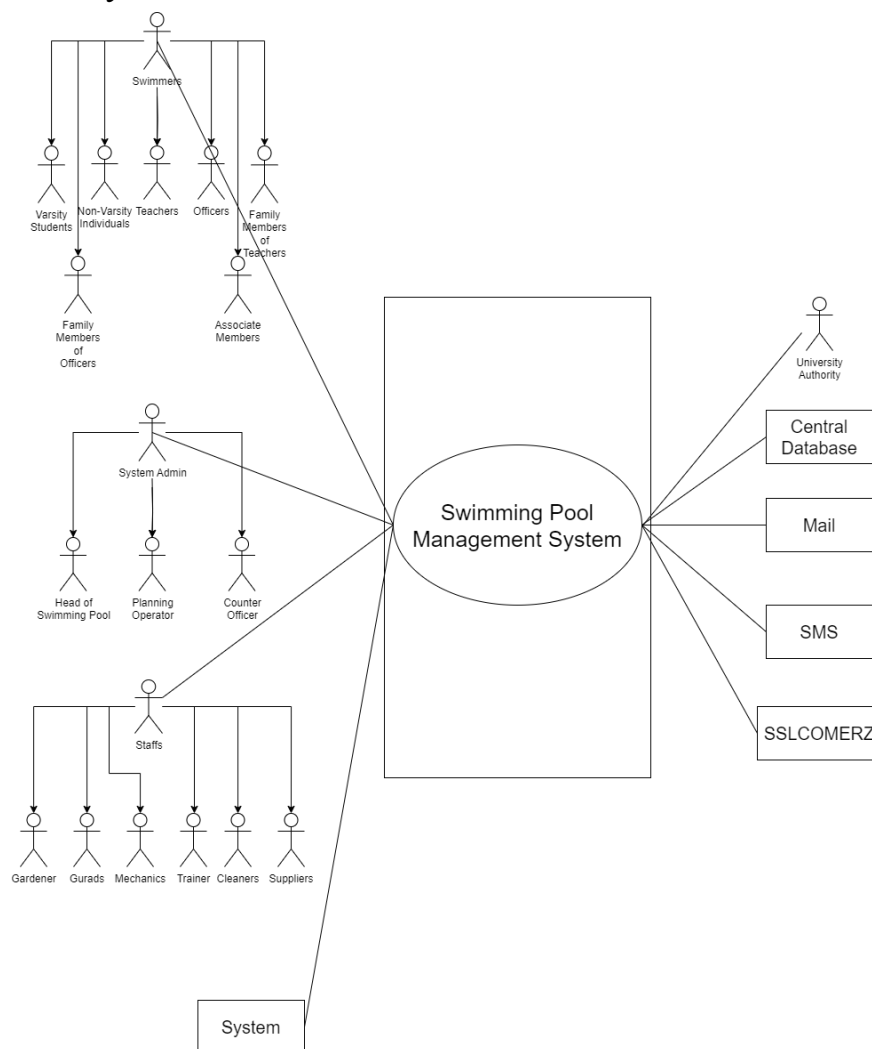**Secondary Actor:** SSLCommerz, SMS, Central Database, System, University authority
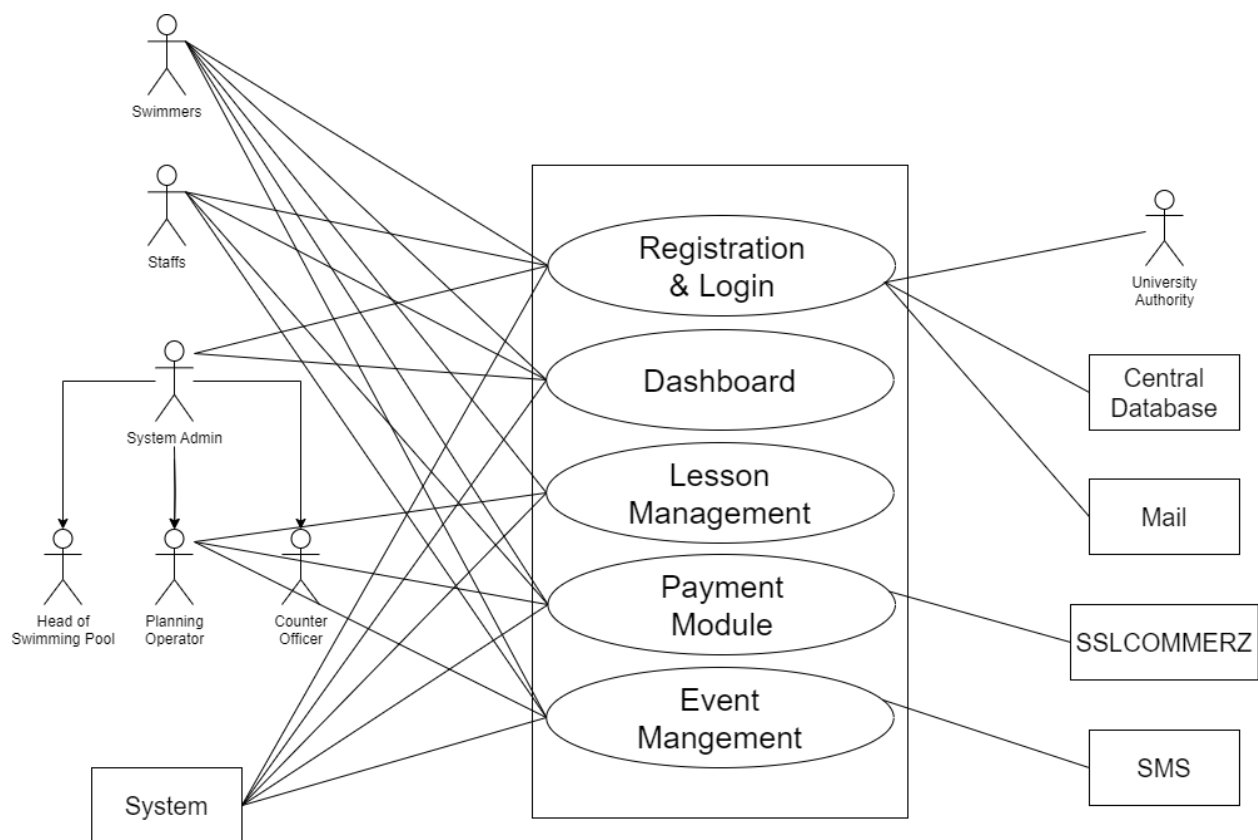

Figure-2 : Level 1(Swimming pool Management System details)

Descriptions:

Registration & login

Manages user registration with distinct forms for varsity students, regular individuals, teachers, family members, associate members, suppliers, temporary mechanics, and staff. Verification through the central database ensures data accuracy.

Dashboard

Provides a user-friendly interface for swimmers, staff, and administrators to view personal schedules, attendance, lesson progress, supply status, and payment details.

Lesson Management

Maintains a comprehensive log of training sessions with descriptive guidelines and video lessons. Swimmers have personal lesson tracking logs with progress feedback.

Payment module

Integrated with online banking services. Manages admissions and monthly fees, disburses salaries, and pays bills for suppliers and mechanical help.

Event Management

Enables planning, creation, and management of events. Configures event details, assigns roles, and automates notifications. Auto-calculates costs and blocks extra expenses beyond allocated budgets.

Action & Response:

Registration & login

- *Action:* User fills out the relevant registration form.
- *Reply:* Users data will be stored in the database

Dashboard

- *Action:* User logs in and selects the dashboard section.
- *Reply:* Personalized dashboard displaying relevant information based on the user's role and preferences.

Lesson Management Subsystem

- *Action:* Trainer updates the training log.
- *Reply:* Swimmers receive notifications about updated training logs and provide feedback.

Payment

- *Action:* User initiates a payment.
- *Reply:* Confirmation of successful payment; updates in user and system records.

Event Management

- *Action:* Planning Operator creates a new event.
- *Reply:* Automatic notifications sent to clients and staff; system tracks and updates event costs.

3.3.3 Level 1.1:

Name: Registration & login

Primary actor: Varsity students,regular individuals, teachers, officers, family members of teachers,family members of officers, associate members, staffs, suppliers, temporary mechanics, trainer, head of the swimming pool, planning operator, and counter officer.

Secondary actor: Mail system,central database, SSLCOMMERZ
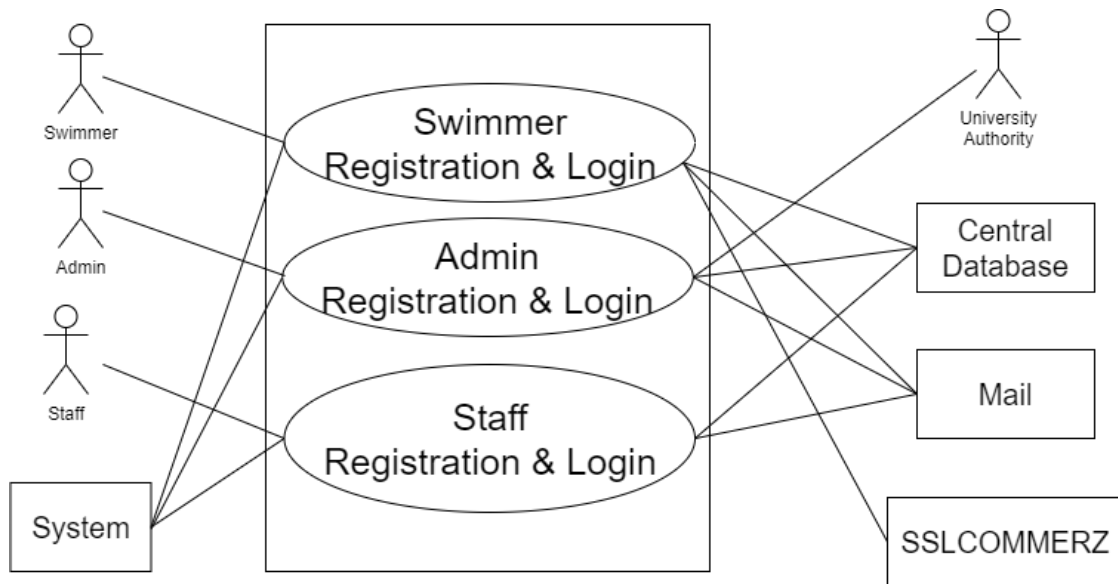
Figure-3 : Level 1.1 (Registration Subsystem)

Description

Swimmer Registration

Manages distinct registration forms for various user categories, including varsity students, regular individuals, teachers, family members, and associate members. The central database verifies registration data, ensuring accuracy.

Staff Registration

Handles the registration of staff members, including head of the swimming pool, planning operator, counter officer, and trainers. Central database verification is employed for data accuracy.

System User/Admin Registration

Enables the registration of system administrators or users with administrative roles.

The central authority reviews and approves registrations based on specific criteria.

Action & Response:

Swimmer Registration

- *Action:* User fills out the relevant swimmer registration form.
- *Reply:* Verification request sent to the central database; approval grants access to the swimming pool.

Staff Registration

- *Action:* Staff members complete the respective registration forms.
- *Reply:* Verification request sent to the central database or central authority; approval grants role-based access.

System User/Admin Registration

- *Action:* System users or administrators register with required details.
- *Reply:* Registration details reviewed by the central authority; access granted based on approval.

3.3.4 Level 1.1.1

Name: Swimmer registration
Primary actor: Swimmer, system
Secondary actor: central database,mail , SSLCOMMERZ
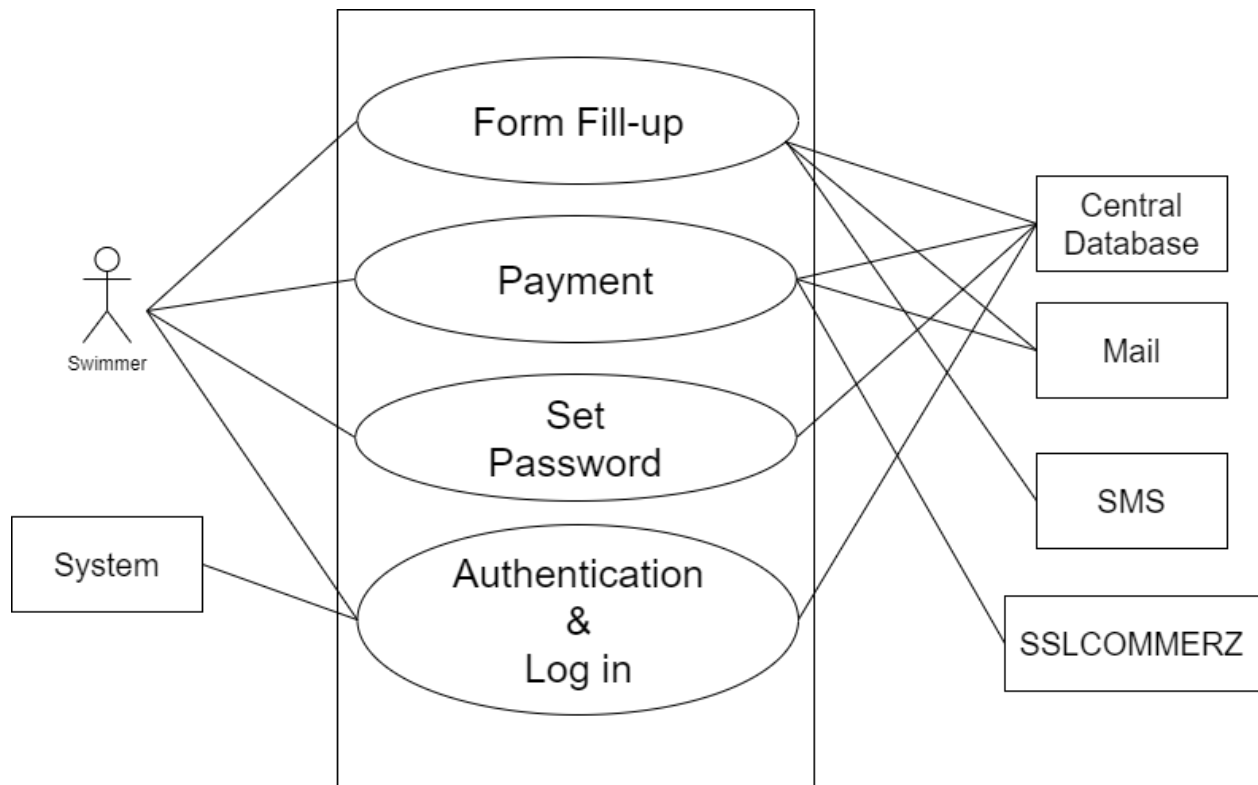
Figure-4 : Level 1.1.1 (Swimmer Registration)

Description:

Form Fill-Up

Swimmers, including regular swimmers, university students, teachers, officers, family members, associate members, and temporary staff, provide personal and professional details through a comprehensive registration form. The form collects essential information such as name, email, phone number, gender, date of birth, occupation, and additional details based on the user category.

Payment

Swimmers make payments for admission and monthly fees through integrated online banking services. The fees vary based on the swimmer category, and the system validates and verifies the payment information.

Set Password

After successful registration, swimmers are prompted to set a password for their account, ensuring secure access to the system.

Authentication

Upon subsequent logins, swimmers authenticate using their username, password, and registered fingerprint for secure access to the system.

Actions & Response:

Successful Registration

- *Action:* Registration data processed and saved.
- *Reply:* Confirmation message displayed; email sent to the user.

Unsuccessful Registration

- *Action:* System detects errors or missing information.
- *Reply:* Error message guides user to correct and resubmit.

Payment Verification

- *Action:* System verifies payment details.
- *Reply:* Payment confirmation message displayed.

Password Set Successfully

- *Action:* Swimmer successfully sets a password.
- *Reply:* Confirmation message displayed; secure password set.

Authentication & log in

- *Action:* System validates username and password.
- *Reply:* User granted access; system displays authenticated user interface.

3.3.5 Level 1.1.2

Name: Staff registration
Primary actor: Staff, System
**Secondary actor:** Central database, Mail
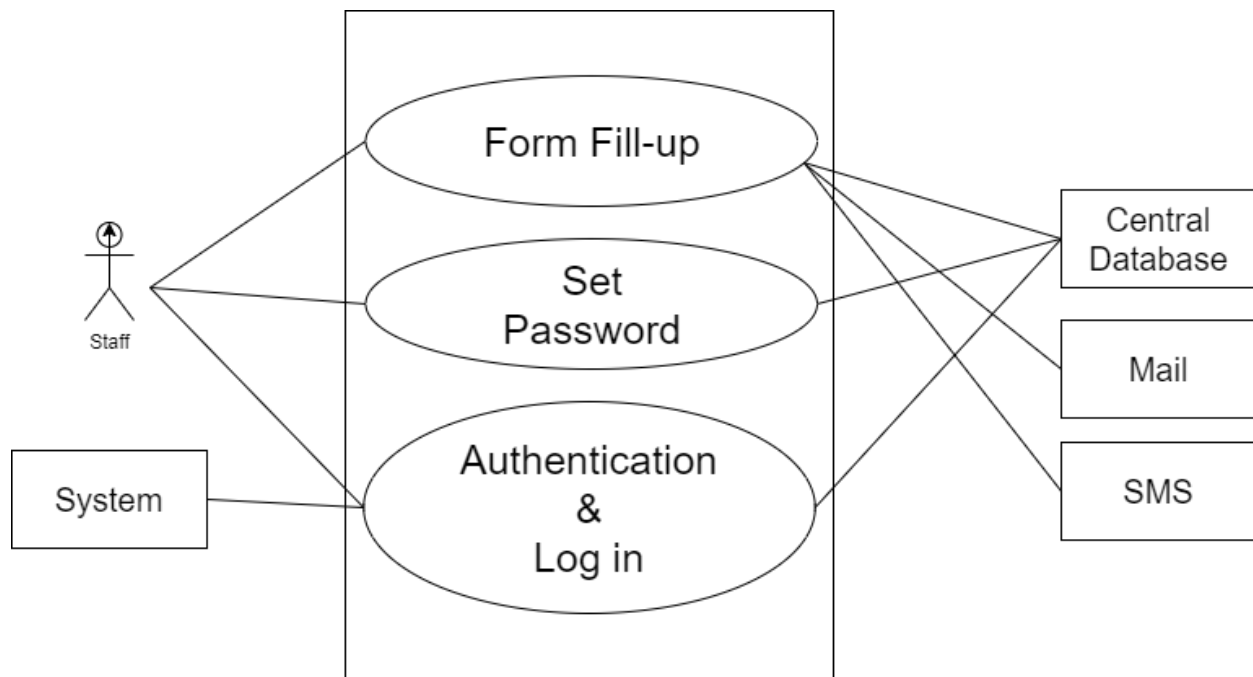
Figure-5 : Level 1.1.2 (Staff Registration)

Description
Form Fill-Up

Staff members provide relevant personal and professional details through a dedicated registration form. The form captures information such as name, email, phone number, gender, occupation, department/office, and additional details based on the specific staff category.

Set Password

After successful completion of the form, staff members are prompted to set a password for their account to ensure secure access to the system.

Authentication & login

Upon subsequent logins, staff members authenticate using their username, password, and registered fingerprint to securely access the system.\

Actions & Response:

Successful Registration

- *Action:* Registration data processed and saved.
- *Reply:* Confirmation message displayed; email sent to the staff member.

Unsuccessful Registration

- *Action:* System detects errors or missing information.
- *Reply:* Error message guides staff member to correct and resubmit.

Password Set Successfully

- *Action:* Staff member successfully sets a password.
- *Reply:* Confirmation message displayed; secure password set.

Authentication & login

- *Action:* System validates username and password.
- *Reply:* Staff member granted access; system displays authenticated user interface.

3.3.6 Level 1.1.3

Name: Admin registration
Primary actor: Admin, System
**Secondary actor:** Central Database, Mail
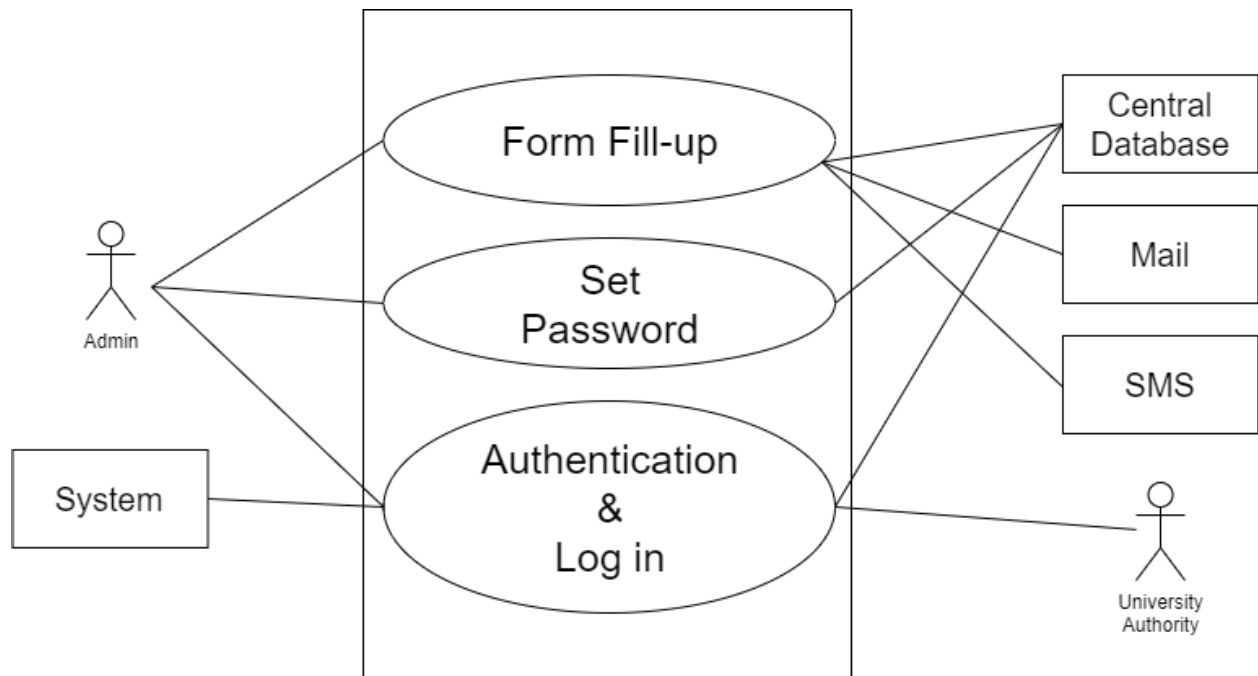
Figure-6 : Level 1.1.3 (Admin Registration)

Description:

Form Fill-Up

Administrative users, including head of the swimming pool, planning operator, and counter officer, provide essential personal and professional details through a specialized registration form. The form captures information such as name, email, phone number, and professional position.

Set Password

After successful completion of the form, administrative users are prompted to set a password for their account to ensure secure access to the system.

Fingerprint Registration:

Administrative users register their fingerprints for authentication, choosing either their own device (e.g., smartphone) or using a device available at the counter.

Authentication

Upon subsequent logins, administrative users authenticate using their username, password, and registered fingerprint to securely access the system.

Actions & Response:

Successful Registration
- *Action:* Registration data processed and saved.
- *Reply:* Confirmation message displayed; email sent to the administrative user.

Unsuccessful Registration
- *Action:* System detects errors or missing information.
- *Reply:* Error message guides administrative user to correct and resubmit.

Password Set Successfully
- *Action:* Administrative user successfully sets a password.
- *Reply:* Confirmation message displayed; secure password set.

Authentication
- *Action:* System validates username, password, and fingerprint.
- *Reply:* Administrative user granted access; system displays authenticated user interface.

3.3.7 Level 1.2

Name: Dashboard
Primary actor: Swimmer, admin, staff, system
Secondary actor: Central Database
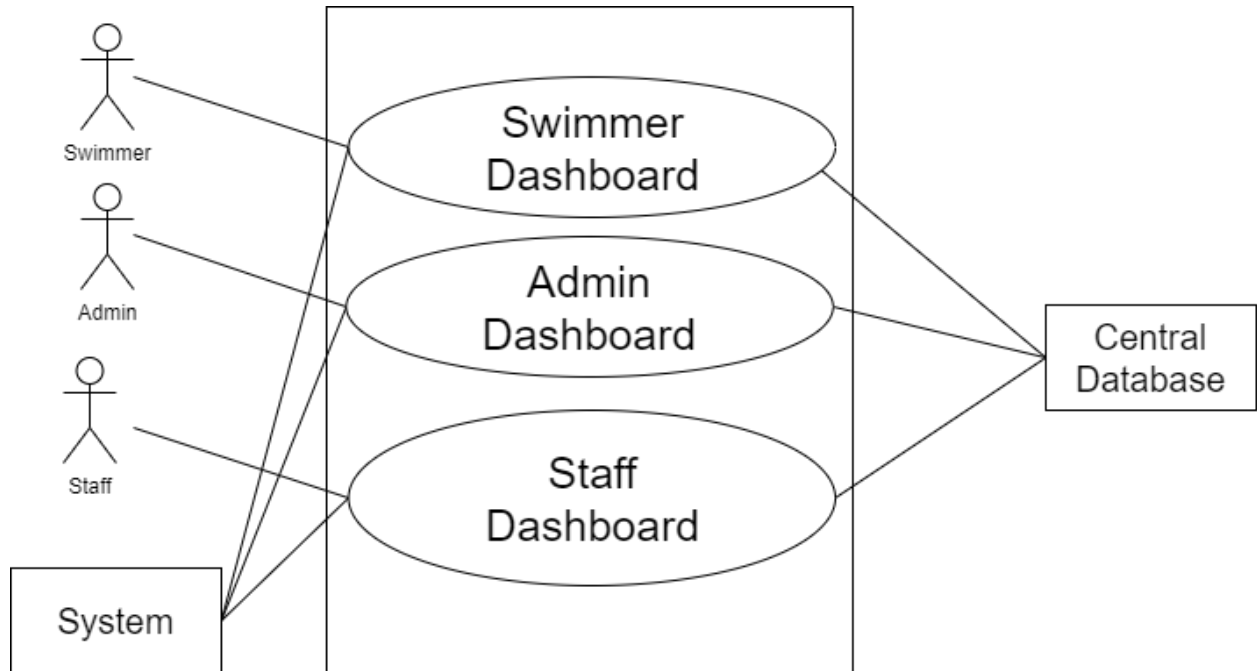
Figure-10 : Level 1.2 (Dashboard)

Description:

Swimmer Dashboard

Personalized view for swimmers displaying training schedules, lesson progress, and notifications.

Staff Dashboard

Comprehensive dashboard offering insights into schedules, attendance, and notifications for staff members.

Admin Dashboard (Head of the Swimming Pool, Planning Operator, Counter Officer)

useful interface for administrative users to oversee attendance, manage events, and handle system operations.

Action & Response:

Swimmer Dashboard

Updated Schedule Notification:

- *Action:* Planning Operator updates the schedule.
- *Reply:* Swimmer receives a notification about the updated schedule.

Lesson Completion Feedback:

- *Action:* Swimmer marks a lesson as completed.
- *Reply:* Trainer and Planning Operator receive feedback; progress index updated.

Staff Dashboard

Updated Schedule Notification:

- *Action:* Planning Operator updates the staff schedule.
- *Reply:* Staff member receives a notification about the updated schedule.

Event Participation Notification:

- *Action:* Planning Operator assigns a role for an event.
- *Reply:* Staff member receives a notification about the assigned role.

Admin Dashboard (Head of the Swimming Pool, Planning Operator, Counter Officer)

Event Management:

- *Action:* Planning Operator creates a new event.
- *Reply:* System sends notifications to staff and updates the event log.

User Authentication Monitoring:

- *Action:* Head of the Swimming Pool reviews authentication logs.
- *Reply:* System displays a detailed authentication report.

3.3.8 Level 1.2.1

Name: Swimmers Dashboard
Primary actor: Swimmer, system
Secondary actor: Central database,mail, SSLCOMMERZ

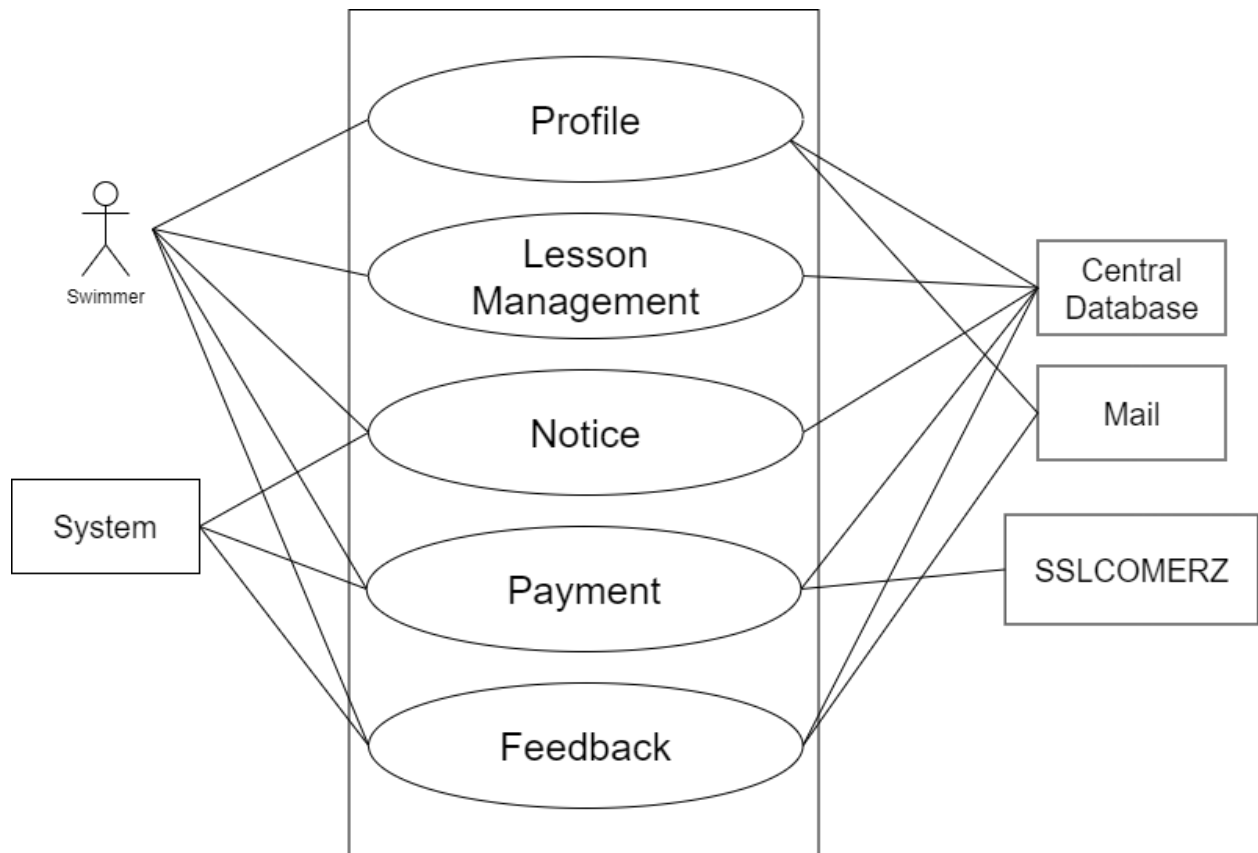Figure-11 : Level 1.2.1 (Swimmers Dashboard)

Description:

The Swimmer Dashboard is a personalized and comprehensive interface designed to enhance the swimming experience for individual swimmers. It offers a range of features that cater to the swimmers' training progress, communication needs, and administrative tasks.

Profile

The Profile section allows swimmers to view and manage their personal information. Swimmers can update details such as their name, contact information, and emergency contact details to ensure accurate records.

Lesson Progress

In the Lesson Progress section, swimmers can view their training journey. This includes marking completed lessons, accessing instructional videos and guidelines provided by trainers, and monitoring their progress index.

Notice Board

The Notice Board feature keeps swimmers informed about important announcements, schedule changes, or any other relevant updates. Notices are prominently displayed for easy access to critical information.

Payment

The Payment Information section displays details related to admissions fees, monthly fees, and any other financial transactions associated with the swimming program. Swimmers can view payment history and upcoming payments.

Feedback

Swimmers have the ability to provide feedback on lessons, training sessions, or any other aspects of their swimming experience. This two-way communication channel allows swimmers to share their thoughts and receive responses from trainers and the planning operator.

Action & Response:

Profile

- *Action:* Swimmer updates personal information.
- *Reply:* System displays a confirmation message; updated profile details reflected in the dashboard.

Lesson Progress

Mark Lesson as Completed:

- *Action:* Swimmer marks a lesson as completed.
- *Reply:* System updates the progress index; confirms lesson completion.

View Instructional Videos:

- *Action:* Swimmer accesses instructional videos.
- *Reply:* System displays available videos for the selected lesson.

Notice Board

Read Notices:

- *Action:* Swimmer clicks on a notice to read.
- *Reply:* System displays the notice content; acknowledgment or additional actions as required.

Payment

View Payment Details:

- *Action:* Swimmer checks payment information.
- *Reply:* System displays details related to admissions fees, monthly fees, and payment history.

Feedback

Provide Feedback:

- *Action:* Swimmer submits feedback.
- *Reply:* System acknowledges the feedback submission; notifies trainers and planning operators.

3.3.9 Level 1.2.2

Name: Staffs Dashboard
Primary actor: Staff, system
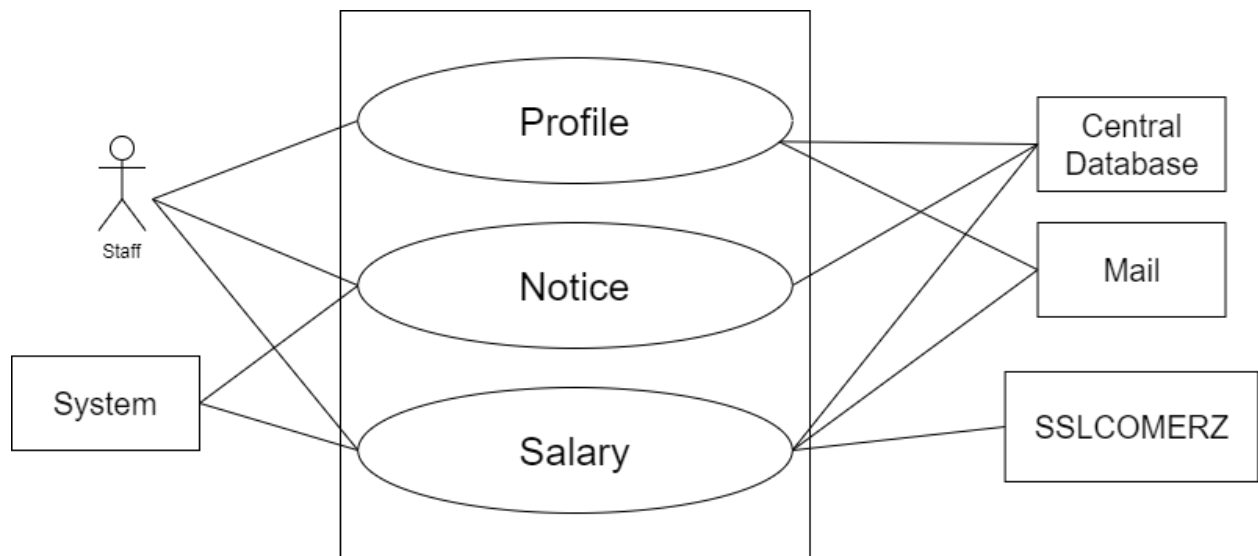**Secondary actor:** Central database, mail, SSLCOMMERZ

Figure-12 : Level 1.2.2 (Staffs Dashboard)

Description:

The Staff Dashboard provides a comprehensive and user-friendly interface for staff members, offering features tailored to their roles and responsibilities within the swimming pool management system.

Profile

The Profile section allows staff members (Teachers, Officers, Family Members, and Associate Members) to view and manage their personal information. Staff members can update their profiles, ensuring accurate and up-to-date details.

Notice Board

The Notice Board feature keeps staff members informed about important announcements, schedule changes, or any other relevant updates. Notices are displayed prominently, ensuring staff members stay up-to-date with the latest information.

Salary

The Salary section provides staff members with insights into their designated salaries, payment history, and upcoming payments. This module allows staff members to track their financial transactions related to their roles in the swimming pool management system.

Action & Response:

Profile

Profile Update:

- *Action:* Staff member updates personal information.
- *Reply:* System displays a confirmation message; updated profile details reflected in the dashboard.

Notice Board

Read Notices:

- *Action:* Staff member clicks on a notice to read.
- *Reply:* System displays the notice content; acknowledgment or additional actions as required.

Salary

View Salary Details:

- *Action:* Staff member checks salary and compensation details.
- *Reply:* System presents salary information, including payment history and upcoming payments.

3.3.10 Level 1.2.3

Name: Admin Dashboard
Primary actor: Admin
Secondary actor: Central database, mail,SSLCOMMERZ
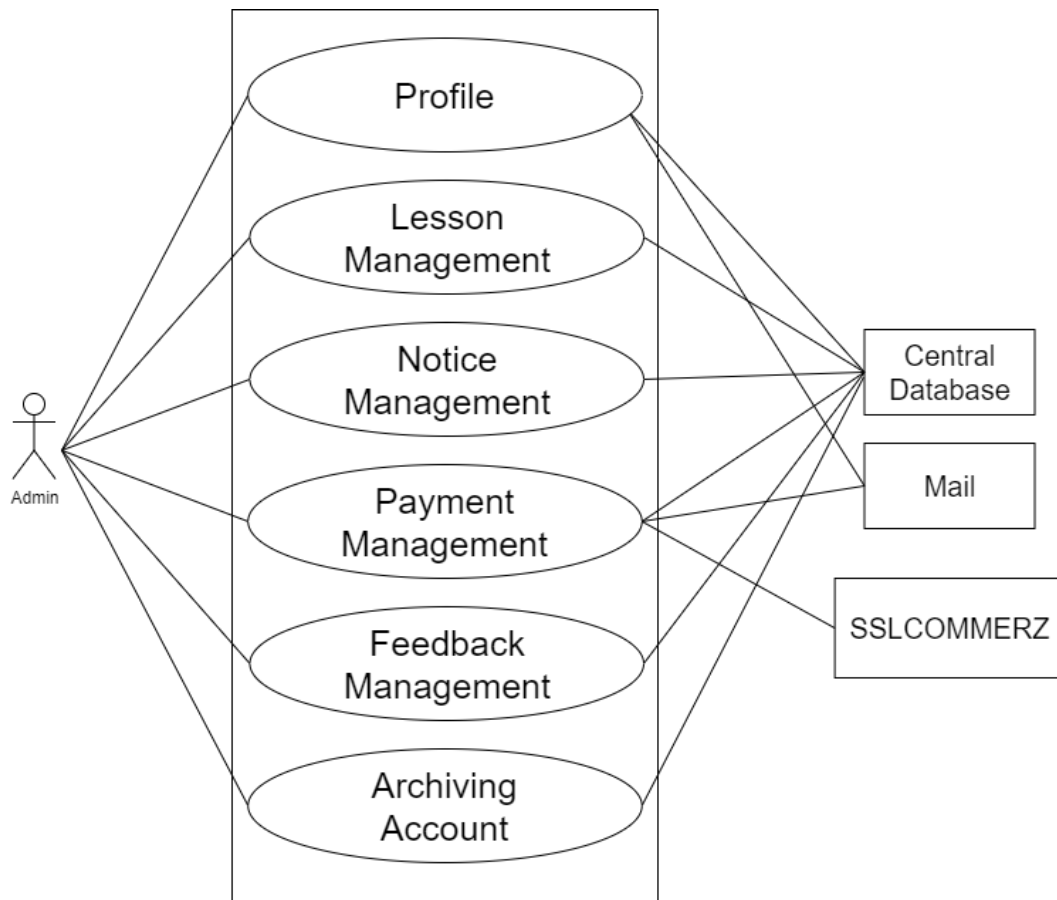

Figure-13 : Level 1.2.3 (Admin Dashboard)

Description

The Admin Dashboard serves as the central control hub for the swimming pool management system, offering a range of features that empower administrators to oversee, manage, and optimize various aspects of the system.

Profile

The Profile section allows the administrator to view and manage their personal information. Admins can update details such as their name, contact information, and other relevant details.

Payment Management

The Payment Management feature enables the administrator to monitor and manage financial transactions within the system. Admins can view payment histories, track outstanding payments, and ensure the smooth financial operation of the swimming program.

Event Management

The Event Management section provides tools for creating, managing, and overseeing events. Admins can create new events, allocate budgets, assign roles, and ensure the successful execution of various activities associated with events.

Notice Management

The Notice Management feature allows administrators to create, edit, and publish notices. Admins can communicate important information, schedule changes, and updates to all system users through a centralized notice system.

Feedback management

The Feedback management module enables admins to receive feedback from swimmers, respond to inquiries, and communicate with the trainer. Two-way communication fosters collaboration and ensures effective information exchange.

Archiving Account

The Archiving Account feature enables the administrator to archive or deactivate user accounts based on specific criteria. Admins can maintain a clean and organized user database by archiving accounts that are no longer active or relevant.

Action & Response:

Profile

Profile Update:

- *Action:* Admin updates personal information.
- *Reply:* System displays a confirmation message; updated profile details reflected in the dashboard.

Payment Management

View Financial Overview:

- *Action:* Admin checks the financial overview of the swimming program.
- *Reply:* System displays a summary of financial transactions, outstanding payments, and overall financial health.

Event Management

Create New Event:

- *Action:* Admin creates a new event.
- *Reply:* System prompts the admin to input event details, allocate budgets, and assign roles.

Monitor Event Status:

- *Action:* Admin checks the status of ongoing and upcoming events.
- *Reply:* System displays a list of events with their respective statuses.

Feedback

Receive Swimmer Feedback:

- *Action:* admins receive feedback from a swimmer.
- *Reply:* System notifies admin of new feedback; provides options to respond or take necessary actions.

Notice Management

Create and Publish Notice:

- *Action:* Admin creates and publishes a notice.
- *Reply:* System confirms the successful creation and publication of the notice; notifies relevant users.

Edit Notice:

- *Action:* Admin edits an existing notice.
- *Reply:* System displays the updated notice; notifies users of the changes.

Archiving Account

Archive User Account:

- *Action:* Admin archives or deactivates a user account.
- *Reply:* System archives the account, updating user status; notifies the admin of the successful action.

3.3.11 Level 1.3

Name: Lesson Management System
Primary actor: Swimmer, Planning/Counter officer, system
Secondary actor: central database
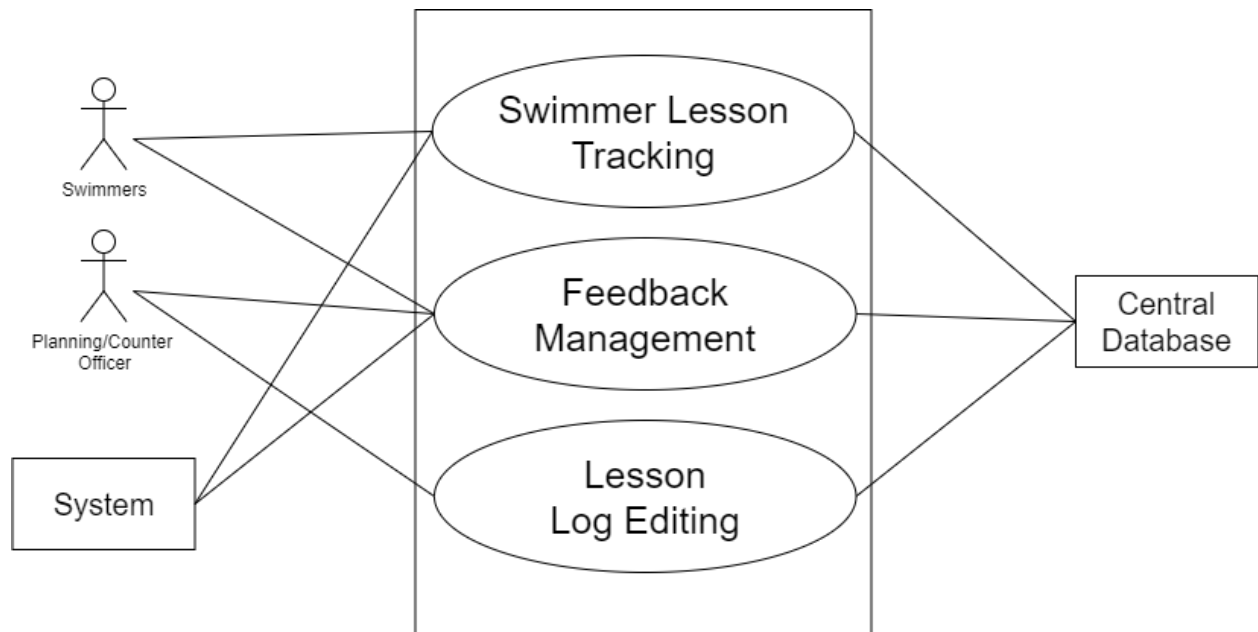
Figure-18 : Level 1.4 (Lesson management System)

Description:

The Lesson Management System is a comprehensive subsystem within the swimming pool management system, focusing on the planning, tracking, and improvement of training sessions for swimmers. This system incorporates video lessons and guidelines to enhance the learning experience, fostering effective communication and feedback loops between swimmers, counter operators and trainers.

Swimmer Lesson Tracking

Swimmers have access to a personalized lesson tracking log, which includes both video lessons and detailed guidelines. The log outlines the stages of their training, encompassing breath control, strokes, and advanced techniques. Swimmers mark completed lessons, provide feedback, and track their progress over time.

Feedback Management

Planning operator plays a crucial role in managing and collecting feedback from swimmers, including insights on both video lessons and guidelines. They address immediate concerns and log feedback including editing if necessary.

Lesson Log Editing

Planning/Counter officers have the ability to update the comprehensive training log, incorporating video lessons and written guidelines collaborating with trainers. They can add new lessons, revise existing ones, and upload instructional videos, creating a dynamic and informative lesson database.

Action & Response:

Swimmer Lesson Tracking

Mark Lesson as Completed:

- *Action:* Swimmer marks a lesson as completed, including video lessons and guidelines.
- *Reply:* System updates the lesson log, providing immediate feedback to the swimmer and storing the completion status.

Provide Feedback

- *Action:* Swimmer provides feedback on a completed lesson, including video content and guidelines.
- *Reply:* System records the feedback and notifies the planning operator for further action.

Counter Operator Feedback Management

Receive Swimmer Feedback:

- *Action:* Counter operator receives feedback from a swimmer, covering video lessons and guidelines.

- *Reply:* System displays the feedback for the counter operator to review and address. If necessary, the feedback is forwarded to the trainer.

Lesson Log Editing

Edit Lesson Log:

- *Action:* Planning/Counter officer edits the training log, including video lessons and guidelines.
- *Reply:* Updated lessons, added new content, or uploaded videos.

3.3.12 Level 1.4

Name: Payment
Primary actor: Swimmers, planning operator, system
Secondary actor: University authority ,supplier, mechanics, staffs, central database, mail
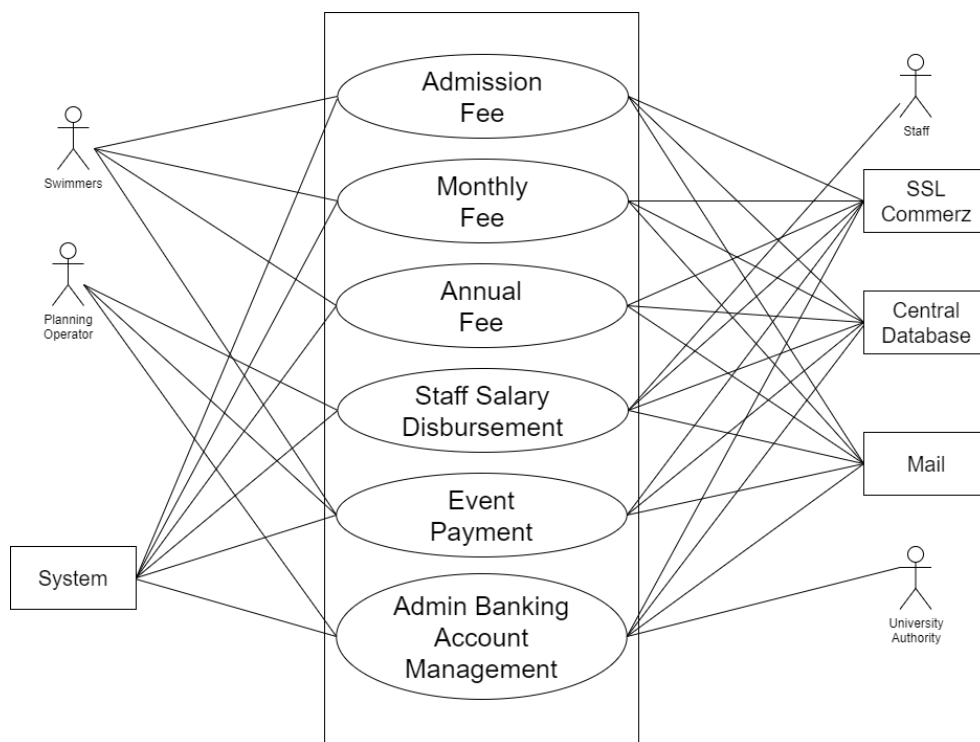

Figure-20 : Level 1.6 (Payment)

Description:

Admissions and Monthly Fees

This submodule handles the payment of admission and monthly fees for various user categories, such as university students, teachers and officers, regular swimmers, and associate members. Users can navigate to the Payment section, select their appropriate fee category, provide payment details, and complete the transaction. The system updates the user's payment record and sends a confirmation notification.

Annual Fee Payment

This submodule allows users to pay the annual fee upfront. Users choose the "Annual Fee" option in the Payment section, enter payment details, and complete the transaction. The system records the payment, updating the user's status as paid for the entire year.

Staff Salary Disbursement

The Staff Salary Disbursement submodule is managed by the planning operator. The planning operator initiates the process, confirms designated salaries, generates payroll records for each staff member, disburses salaries through the chosen transaction method, updates payroll records, and sends notifications to staff, ensuring timely and accurate salary payments.

Event-related Payments

Users can make payments related to events, such as purchasing tickets. The planning operator creates an event, specifies the ticket price (if applicable), and users access the event details to purchase tickets. The system deducts the ticket price from their registered account, and event-related costs are calculated using supply and mechanical help logs.

Admin Banking Account Management

This submodule involves overseeing and managing the central admin banking account by the central authority. The central authority ensures there are sufficient funds for salary disbursement, supplier payments, and other financial obligations. They also approve fund transfers or budget allocations requested by the planning operator, maintaining control and oversight of financial transactions.

Action & Response:

Admissions and Monthly Fees

- *Action:* User pays admission or monthly fees.
- *Response: system shows* "Payment processed successfully. Thank you for enrolling!"

Annual Fee Payment

- *Action:* User pays the annual fee upfront.
- *Response:* system received Annual fee and replied with " You're confirmed for the year!"

Staff Salary Disbursement

- *Action:* Planning operator disburses staff salaries.
- *Response:* system gives confirmation message.

Event-related Payments

- *Action:* User buys event tickets.
- *Response:* "Ticket purchase successful. Enjoy the event!"

Admin Banking Account Management

- *Action:* Central authority manages the admin account.
- *Response:* "Admin account managed. Funds allocated as needed."

3.3.13 Level 1.5

Name: Event management
Primary actor: Planning operator,system
Secondary actor: Central database,mail,SMS
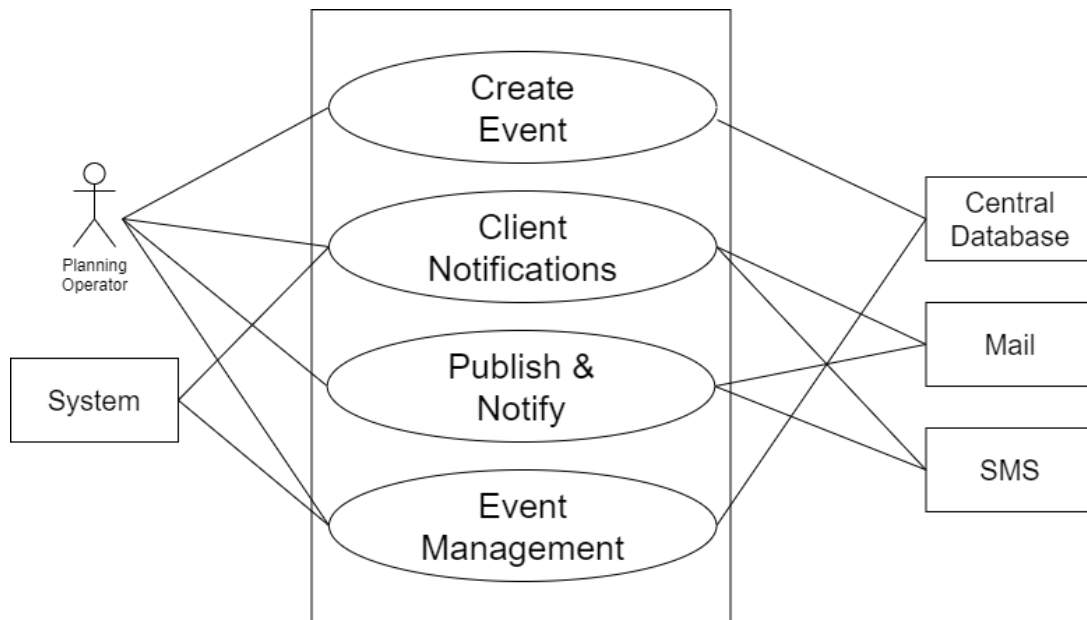
Figure-21 : Level 1.7 (Event Management)

Description:

Create Event

The planning operator initiates event creation, specifying details such as event name, date, description, roles, and budget.

Client Notifications

Users configure notification preferences for event updates, choosing channels like email, SMS, in-app alerts, and push notifications.

Publish and Notify

Once satisfied with event details, the planning operator publishes the event, triggering automatic notifications to clients and staff.The system automatically

sends event notifications to clients and assigns staff members, ensuring everyone is informed and ready.

Event Management

Costs related to event management are auto-calculated using supply and mechanical help request logs. The system blocks any extra expenses exceeding the allocated budget.

Action & Response:

Create Event

- *Action:* Planning operator initiates event creation, specifies details.
- *Reply:* system replied with "Event created successfully! Details saved for [Event Name] on [Date]."

Client Notifications

- *Action:* Users configure notification preferences.
- *Reply:* users notified

Publish and Notify

- *Action:* Planning operator publishes the event.
- *Reply: System gives notification as needed and shows* "Event published! Notifications sent to clients and staff. Everyone is now informed and ready."

Event Management

- *Action:* System auto-calculates costs using supply and mechanical help logs.
- *Reply:* system notify the planning operator

3.4 What is an Activity Diagram?

An activity diagram is a type of diagram used in software engineering and requirements engineering to model the flow of activities and actions within a system or a business process. It provides a visual representation of the dynamic aspects of a system, showing how different activities interact and the sequence in which they occur.

3.5 The Purpose of Activity Diagram

An activity diagram can prove to be useful to a software engineer for various reasons, such as:

- Drawing the activity flow of a system.
- Describing the sequence from one activity to another.
- Describing the parallel, branched and concurrent flow of the system.

3.6 Activity Diagram: Dhaka University Swimming Pool Management System

To understand each of the processes involved in every module of the Dhaka University Swimming Pool Management System, we have taken the help of activity diagrams. We have created the activity diagrams for the Management System based on the Use Case Diagrams and the information we obtained.

3.6.1 Level 1.1

Name: Registration and login
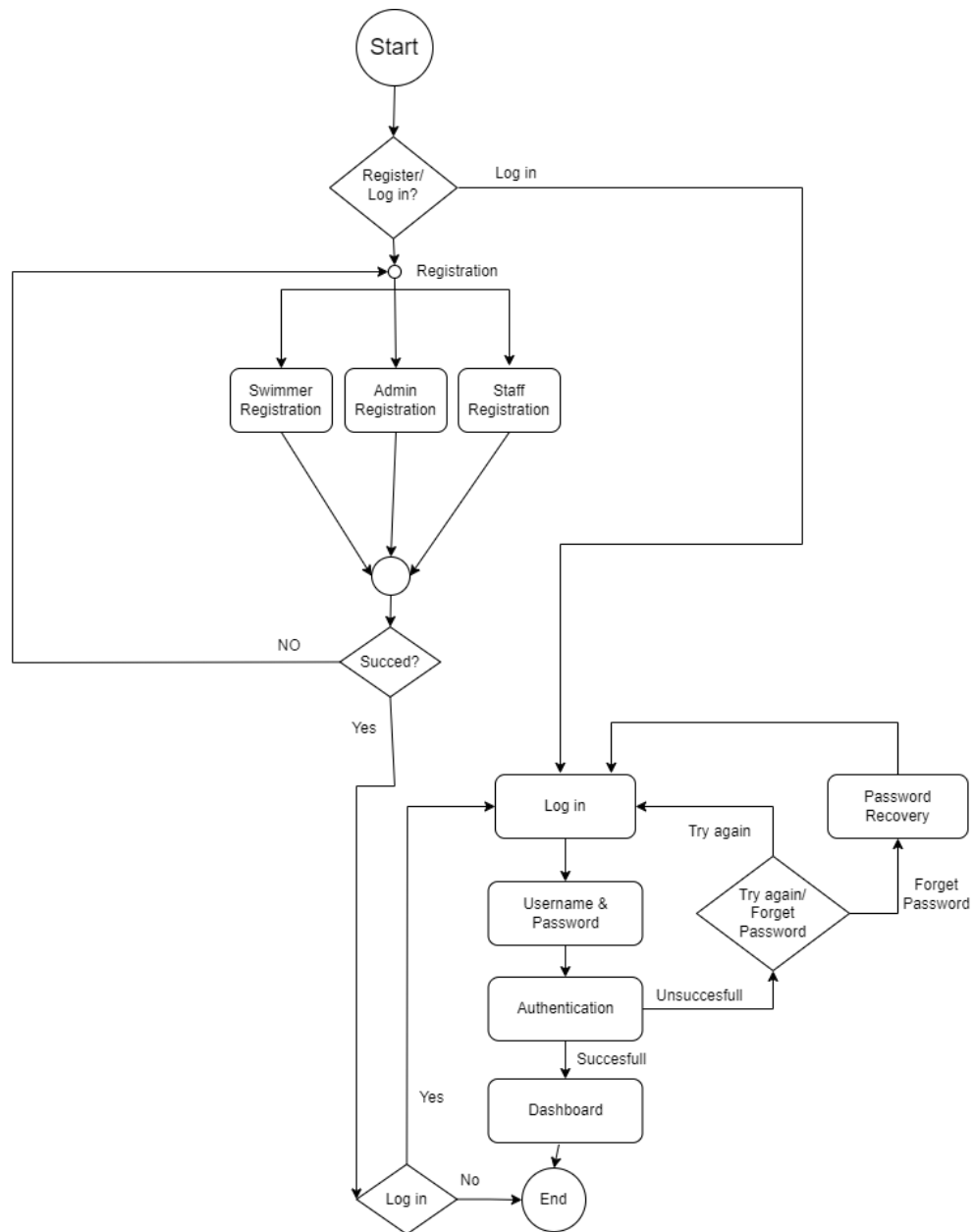
Fig 22 : Registration and login

Description of activity diagram level 1.1

Manages user registration with distinct forms for varsity students, regular individuals, teachers, family members, associate members, and staff. Verification through the central database ensures data accuracy.

3.6.2 Level 1.1.1

Name: Registration details
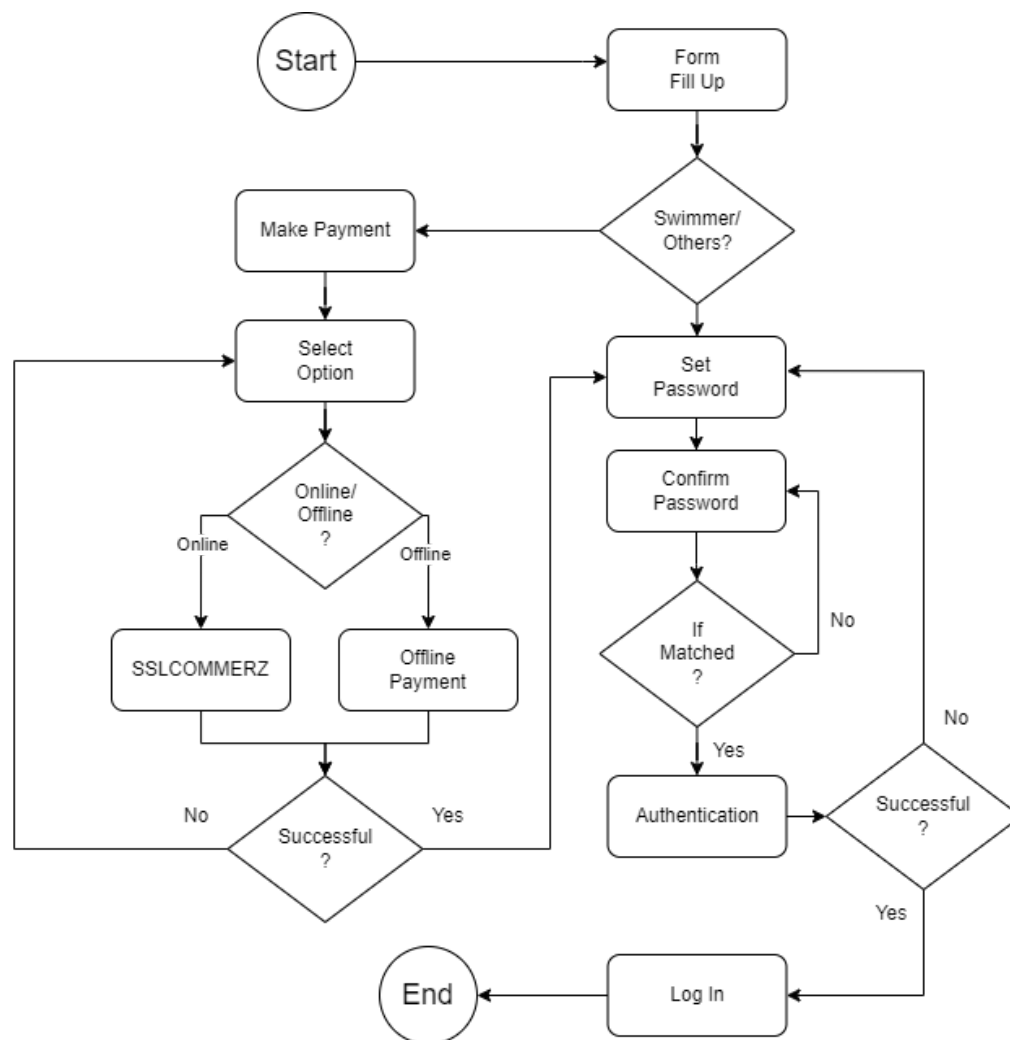
Fig 23 : Registration details

3.6.3 Level 1.2

Name: Dashboard
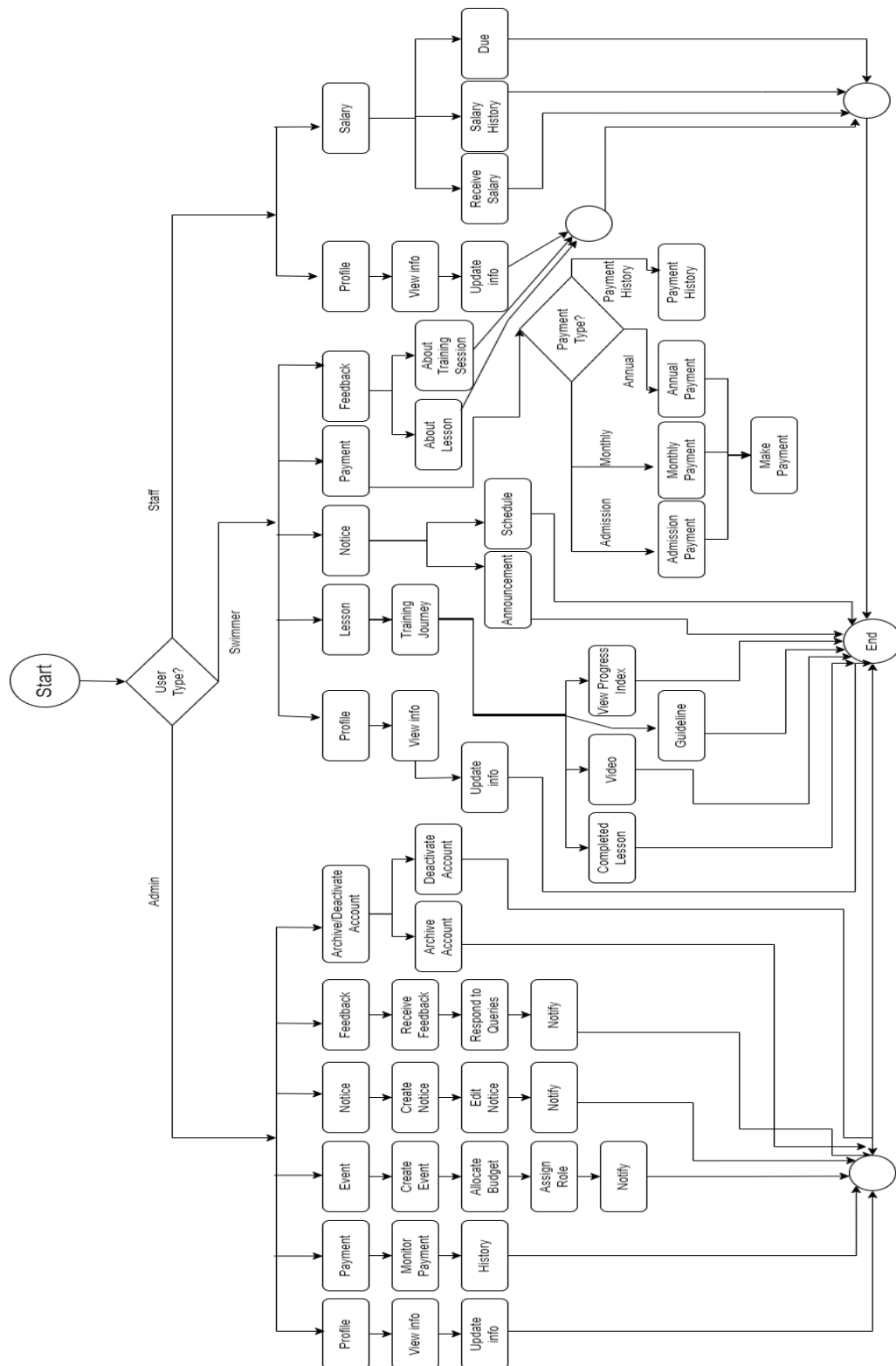
Fig 24 : Dashboard (activity diagram)

Description of Dashboard activity diagram

Provides a user-friendly interface for swimmers, staff, and administrators to view personal schedules, attendance, lesson progress, supply status, and payment details.

3.6.4 Level 1.3

Name: Lesson management
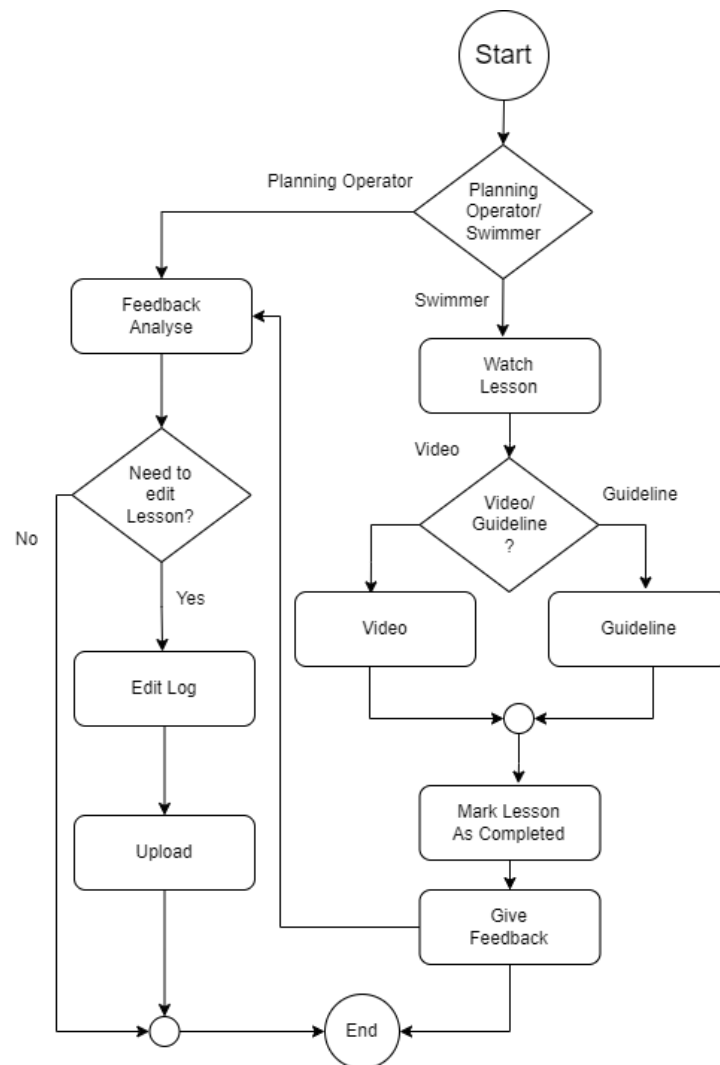
Fig 27 : Lesson management

Description of Lesson Management

Maintains a comprehensive log of training sessions with descriptive guidelines and video lessons. Swimmers have personal lesson tracking logs with progress

3.6.5 Level 1.4

Name: Payment
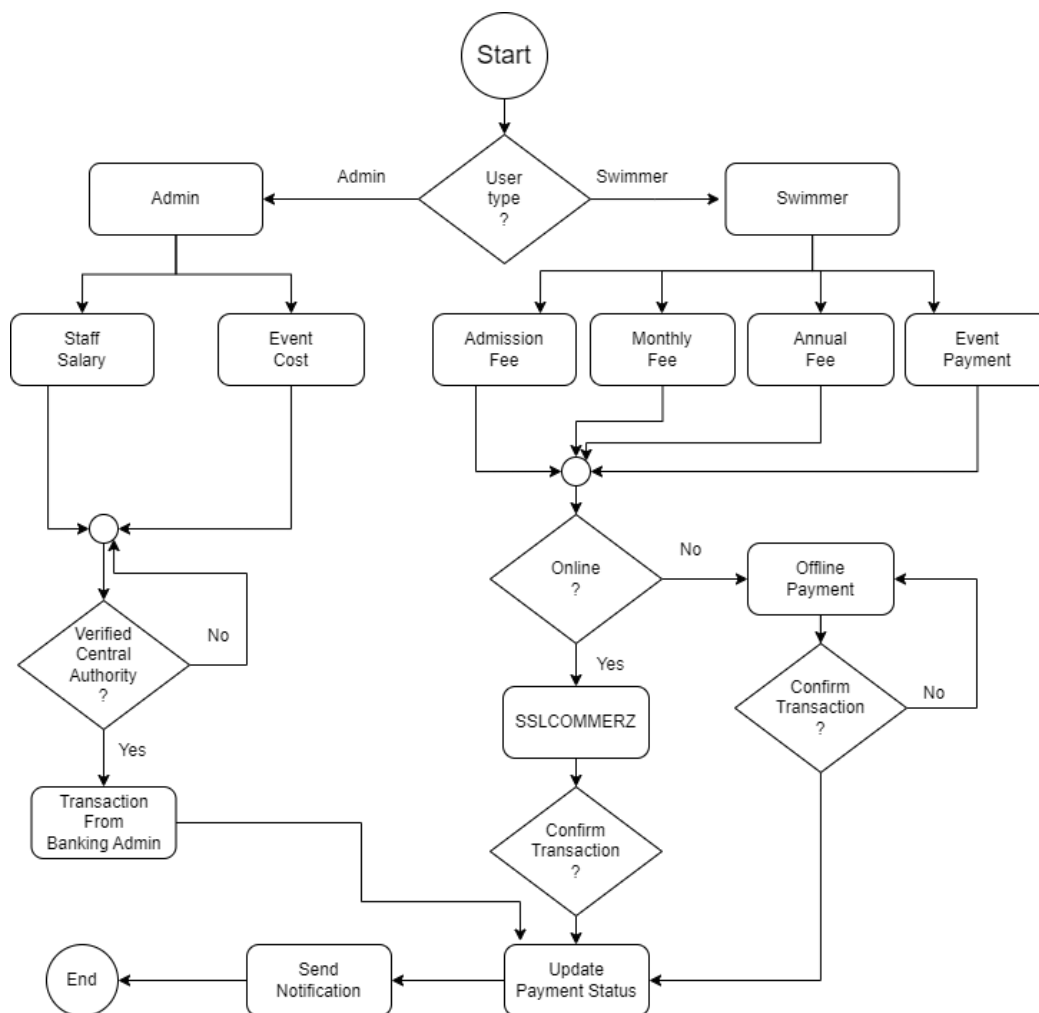
Fig 28 : Payment module

Description of Payment module

Integrated with online banking services. Manages admissions and monthly fees, disburses salaries, and pays bills for suppliers and mechanical help.

3.6.6 Level 1.5

Name: Event management
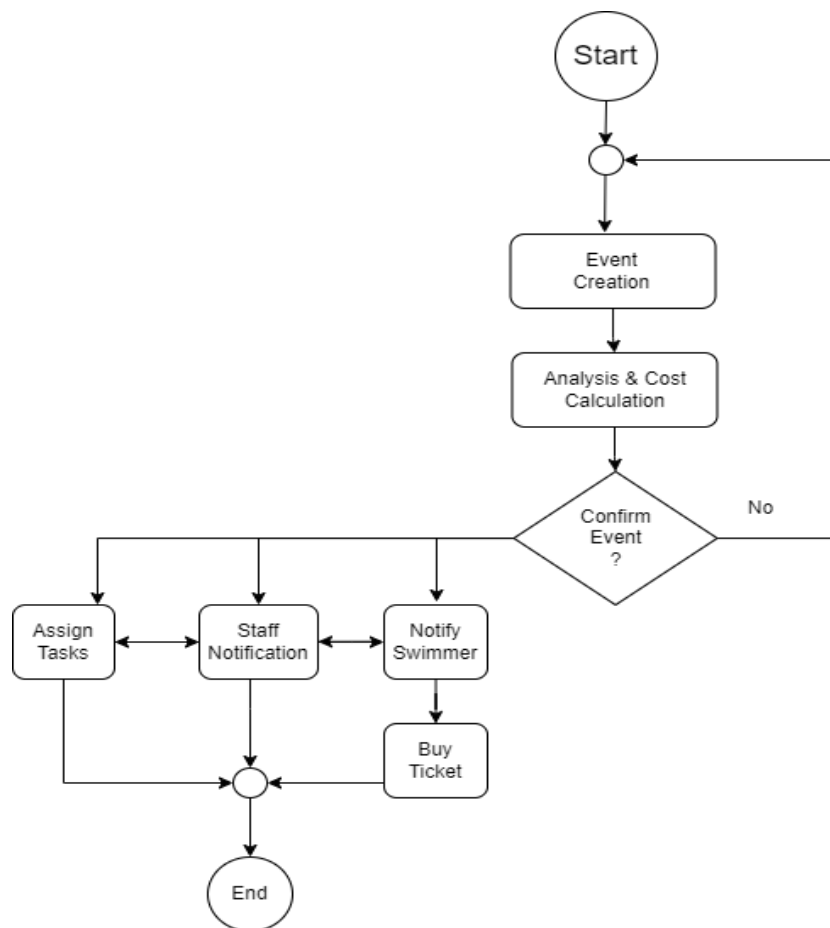
Fig 29 : Event management

Description of Event Management

Enables planning, creation, and management of events. Configures event details, assigns roles, and automates notifications.

3.7 What is a Swimlane Diagram?

A swimlane diagram is a type of flowchart, which diagrams a process from start to finish, but it also divides these steps into categories to help distinguish which departments or employees are responsible for each set of actions. It is based on the analogy of lanes in a pool, as it places process steps within the horizontal or vertical "swimlanes" of a particular department, work group or employee, thus ensuring clarity and accountability.

3.8 The Purpose of Swimlane Diagram

A swimlane diagram provides various facilities to a software engineer, such as

- The separate lanes of the diagram make it easy to delineate responsibilities belonging to certain actors. This helps to clarify complex processes within the software.
- Visualizing processes in this way provides a more thorough overview of an actor's roles within an organization and helps to reduce bottlenecks, redundancies, and extraneous steps.
- Ensures that everyone knows their specific role and avoids collisions.
- Helps to standardize work processes and record them in highly shareable formats that people within the organization can quickly refer to if needed.

3.9 Swimlane Diagram: Dhaka University Swimming Pool Management System

3.9.1 Level 1.1

Name: Registration and login
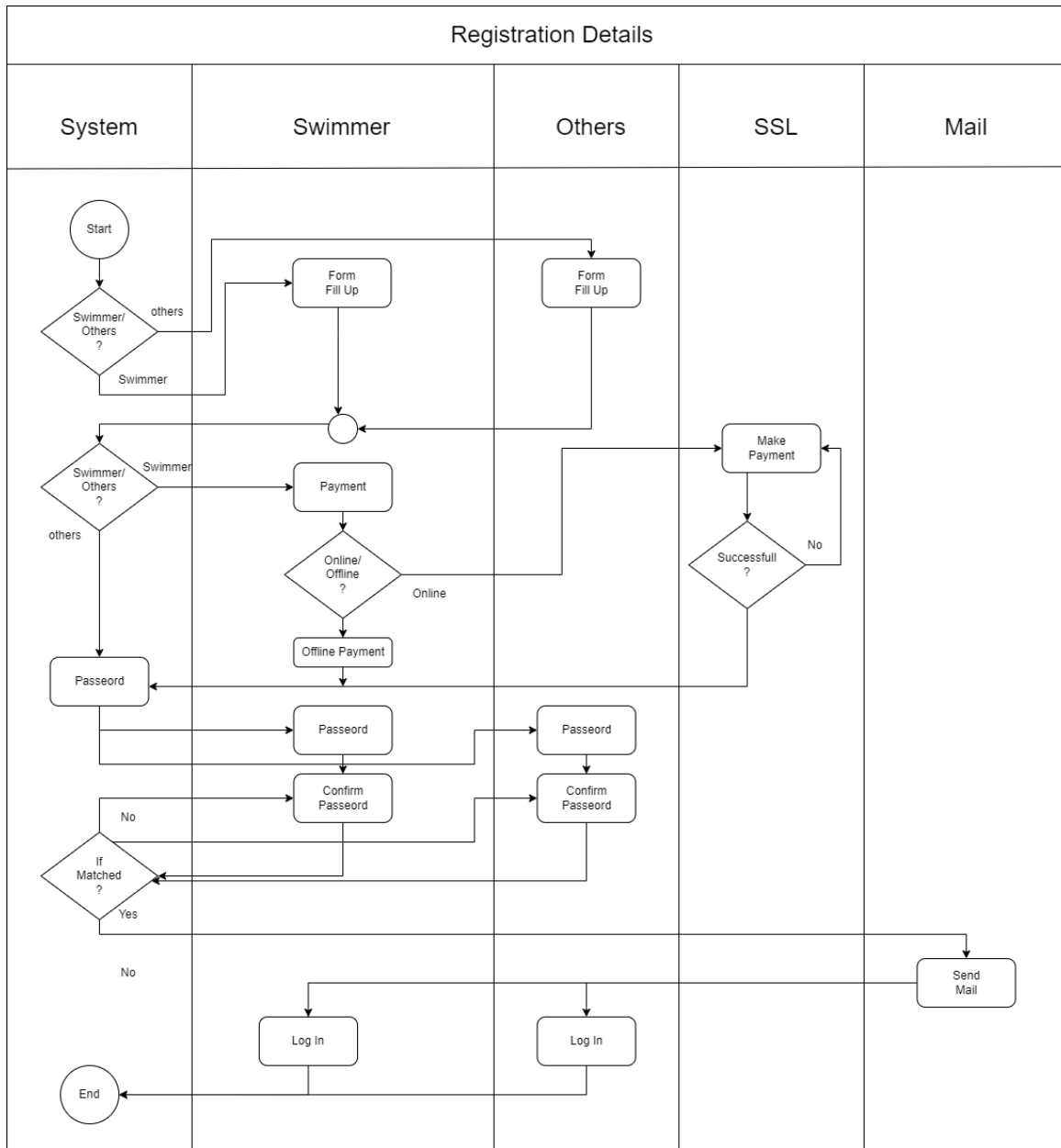
Fig 30 : Registration and login

3.9.2 Level 1.2

Name: Dashboard
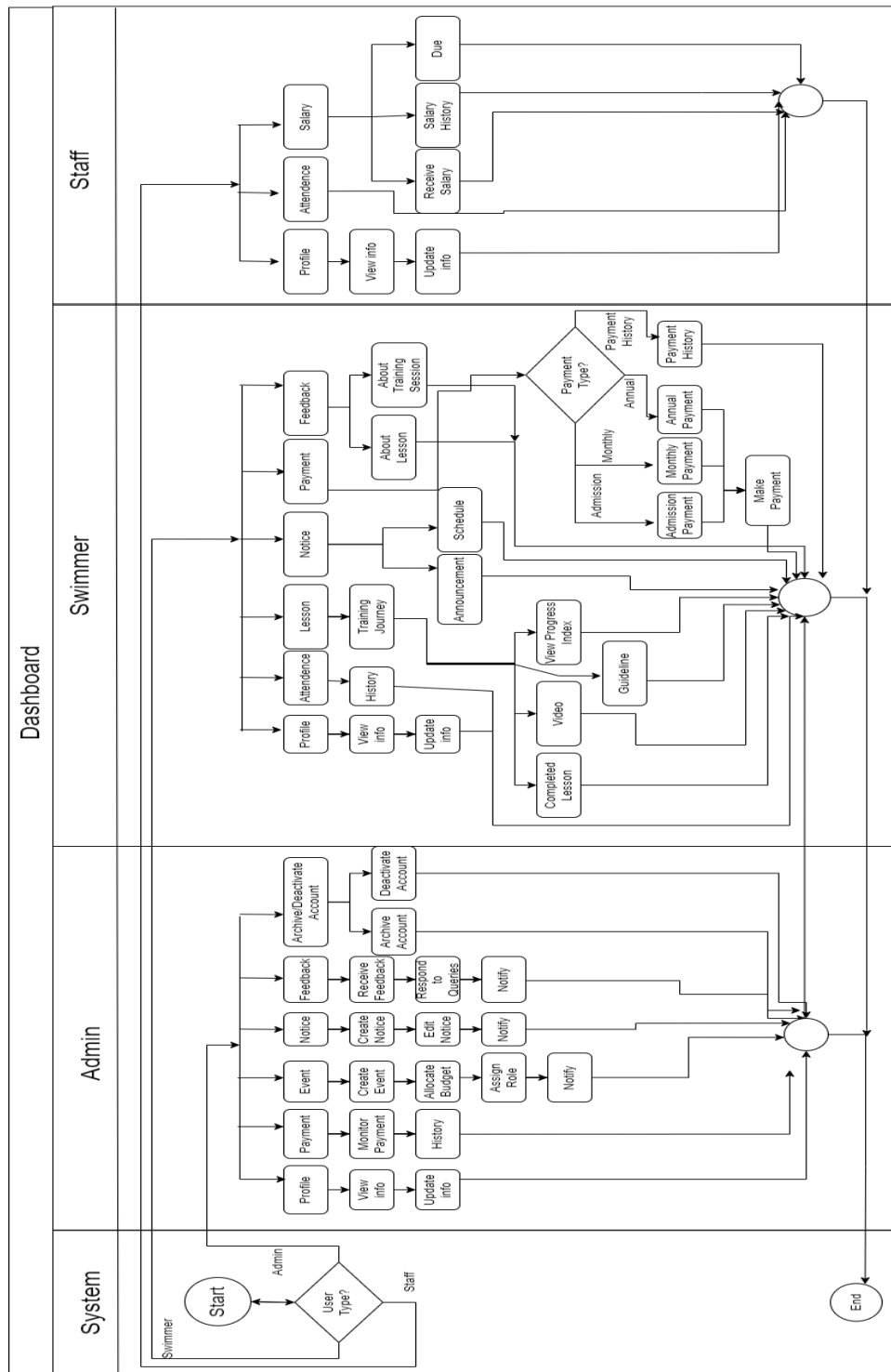
Fig 31 : Dashboard

3.9.3 Level 1.3

Name: Lesson management
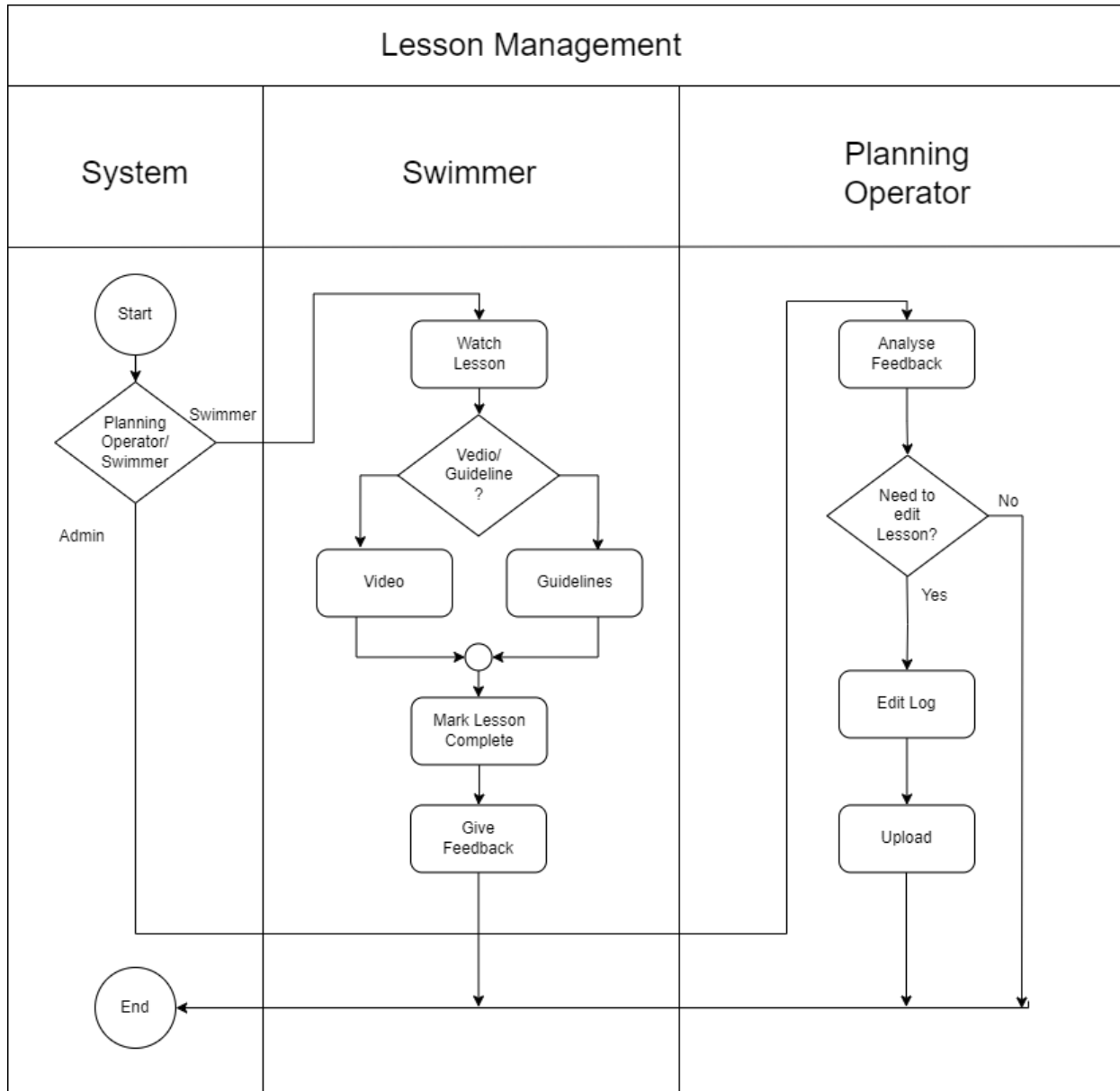
Fig 34 : Lesson management

3.9.4 Level 1.4

Name: Payment
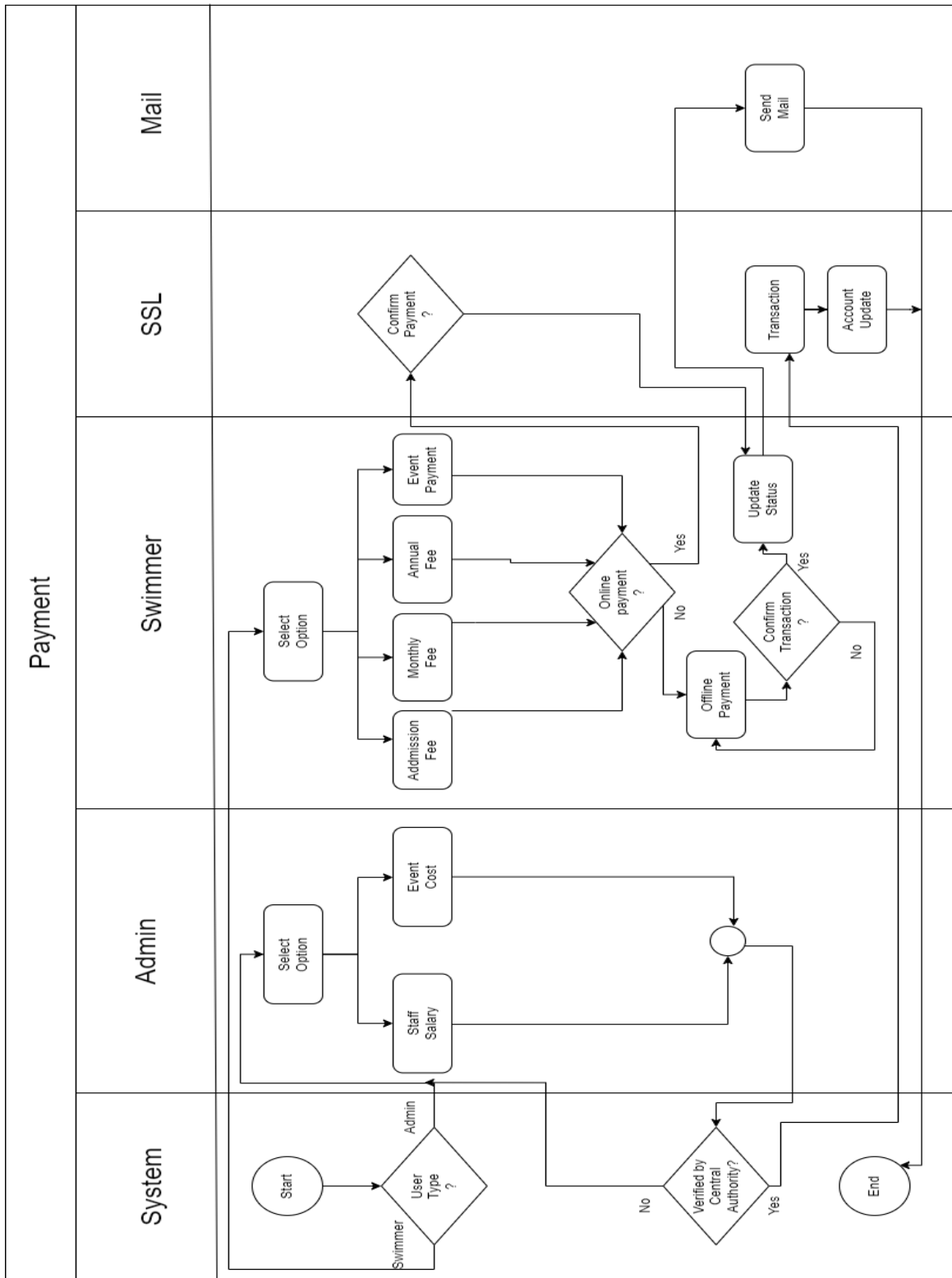
Fig 35 : Payment module

3.9.5 Level 1.5

Name: Event management
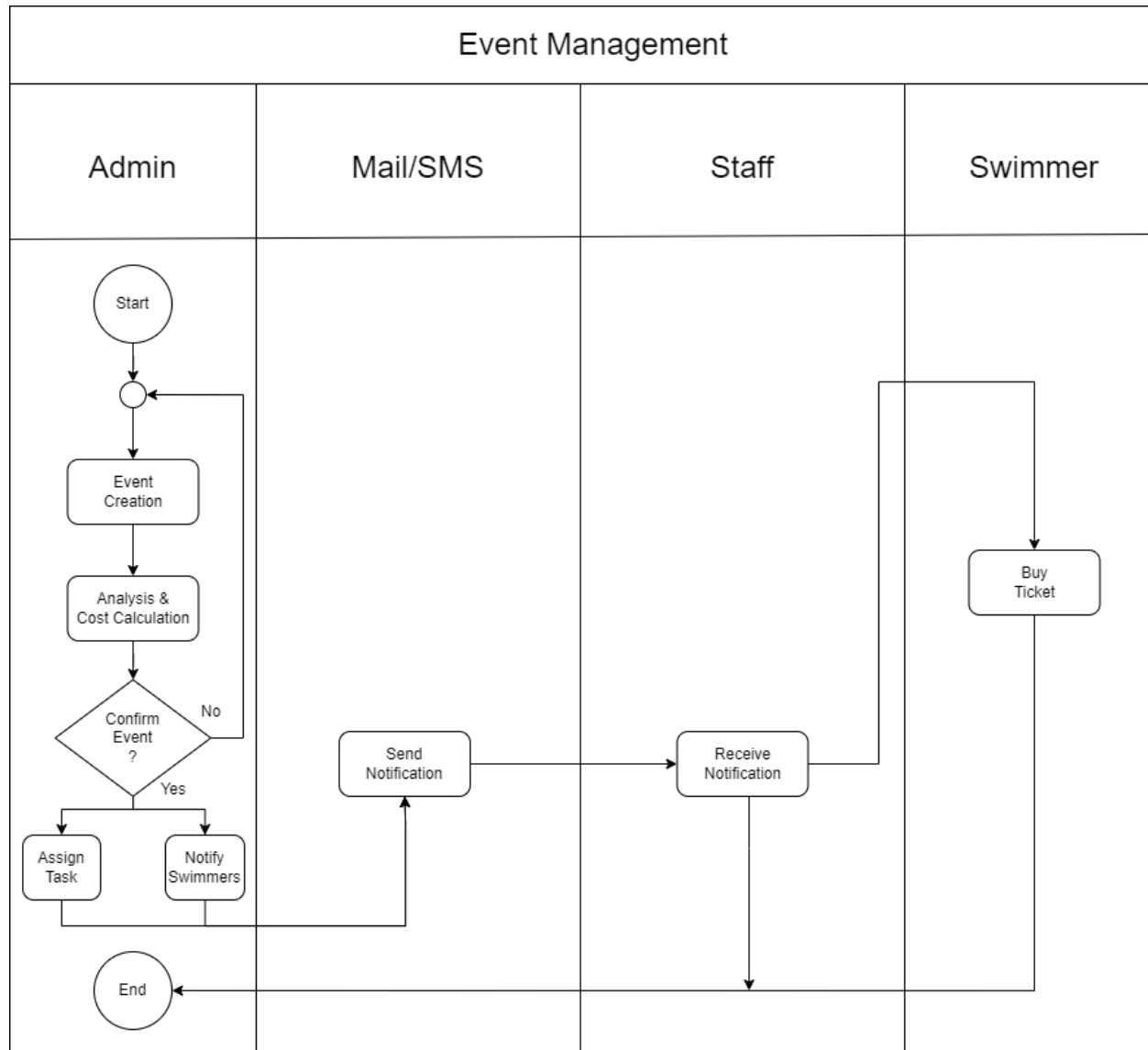
Fig 36 : Event management

4. Database Modeling

4.1 What is Database Modeling?

Database modeling is the process of creating a detailed representation of a database structure. It involves defining the structure of the database, including tables, fields, relationships, and constraints. The goal of database modeling is to organize and structure data in a way that supports efficient storage, retrieval, and management of information. It serves as a blueprint for database development, helping developers design databases that meet the specific needs of an application or system. Database modeling can be visualized through diagrams such as Entity-Relationship Diagrams (ERD) that illustrate the entities, attributes, and relationships within the database.

4.2 ThePurpose of Database Modeling

The purpose of data modeling can be summarized in several key points:

- Data modeling aids communication by visually representing how data is organized and related in a system.
- It serves as a design guide for developing databases, defining the structure and relationships among data elements.
- Data modeling clarifies business requirements, ensuring the database aligns with organizational needs.
- Ensures data integrity by setting constraints and rules for maintaining accurate and consistent information.

4.3 Database Modeling: Dhaka University Swimming Pool Management System

4.3.1 Noun Listing

No	Nouns	Attributes	P / S
1.	Swimming Pool Management System (SPMS)	11, 13, 14, 15, 16,17, 18	S
2.	Registration		S
3.	User	7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 162, 163	S
4.	Category		P
5.	Swimmers Registration form	21, 22, 23, 24, 25,31, 32, 33, 34, 35	S
6.	Payment		S
7.	Varsity Student	21, 22, 23, 24, 25, 37, 38, 39	P
8.	Teacher-Officer	21, 22, 23, 24, 25, 37, 42, 43, 44, 45	P
9.	System User		P
10.	Family member	21, 22, 23, 24, 25, 26, 47, 48, 49	P
11.	Temporary Staff	21, 22, 23, 57, 58, 59, 60	S
12.	Associate members	21, 22, 23, 24, 25, 37, 42, 43, 44, 45	S
13.	Trainer	21, 22, 23	S

14.	Head of the Swimming Pool	21, 22, 23, 42	S
15.	Planning Operator	21, 22, 23, 42	S
16.	Counter Operator	21, 22, 23, 42	S
17.	Regular swimmer	21, 22, 23, 24, 25, 26	S
18.	Regular Swimmer registration form	21, 22, 23, 24, 25, 26, 27,29, 30, 31, 32, 33, 34, 35	S
19.	Name		S
20.	Email		S
21.	Phone Number		S
22.	Gender		S
23.	Date of Birth		S
24.	Occupation		S
25.	Parent's Name		S
26.	Parent's Phone Number		S
27.	University's Student Form	21, 22, 23, 24, 25, 37, 38, 39, 29, 30, 31, 32, 33, 34, 35	S
28.	Department		P
29.	Session		P
30.	Registration Number		P
31.	Swimmer	21, 22, 23, 24, 25	P
32.	Teachers and Officers Form	21, 22, 23, 24, 25, 37, 42, 43, 44, 45, 31, 32, 33, 34, 35	S

33.	Position		P
34.	Current Address		P
35.	Emergency Family Member's Name		P
36.	Emergency Family Member's Phone Number		P
37.	Family Members Form of Teachers and Officers	21, 22, 23, 24, 25, 26, 47, 48, 49	P
38.	Referred Guardian's Name		P
39.	Referred Guardian's Occupation		P
40.	Referred Guardian's Department		P
41.	Associate Member's Form	21, 22, 23, 24, 25, 37, 42, 44, 45, 31, 32, 33, 34, 35	S
42.	Central Database Record		S
43.	University		P
44.	Admin Registration Form		S
45.	Verification Request		S
46.	Central Authority		S
47.	Cleaner		S
48.	Lifeguard		S
49.	Security Guard		S

50.	Gardener		S
51.	Business Name		P
52.	Registration Information		S
53.	Password		S
54.	Confirmation message		S
55.	Scheduling Module		S
56.	Training schedule		S
57.	Verification Request		P
58.	Saturday		P
59.	Sunday		P
60.	Monday		P
61.	Tuesday		P
62.	Wednesday		P
63.	Pool Area		P
64.	Lesson Management Module		S
65.	Log		S
66.	Descriptive Guidelines		S
67.	Video Lesson		S
68.	Training log	102, 103, 107	S
69.	Log editing		S
70.	Lesson Tracking Log	109, 108, 110, 111	S
71.	Lesson		S

72.	Feedback		S
73.	Lesson completion		S
74.	Progress index		S
75.	Request initiation		S
76.	Request		S
77.	Costumes		P
78.	review		S
79.	Event id		S
80.	Request confirmation		S
81.	Request status		S
82.	Service charge		S
83.	Transaction		S
84.	Banking Methods		S
85.	Equipment		S
86.	Admin account id		S
87.	Individuals		S
88.	Payment module		S
89.	Banking services	168, 169, 170	S
90.	Bangladesh		P
91.	Bkash		S
92.	Nagad		S
93.	Rocket		S
94.	Admin Banking Account	162, 176, 175	S

95.	credit		S
96.	Banking Details		S
97.	Bills		S
98.	Budget		S
99.	Fees	178, 179, 182	S
100.	Salaries		S
101.	Admin user		S
102.	Admission fees		S
103.	Monthly fees		S
104.	Mobile		P
105.	Upgradation		S
106.	Annual Fee		S
107.	Disbursement		P
108.	Event management module		S
109.	Event	128, 188, 189, 190, 198, 175	P
110.	Steps		P
111.	Event creation form		S
112.	Event name		S
113.	Event date		S
114.	Event time		S
115.	Agenda		P
116.	Highlights		P
117.	Roles		P

118.	Ticket sales		P
119.	First Aid		P
120.	Resource Allocator		P
121.	Staff Directory		S
122.	Ticket price		S
123.	Client notification		S
124.	Preferences		S
125.	Event Notification		S
126.	Option		P
127.	clients		P
128.	email		S
129.	Phone alerts		S
130.	Engagement		P
131.	Notification channel		S
132.	Publish Event		S
133.	Costs		P

4.3.2 List of data Object

Data Object	Attributes
User	- User_ID (Primary Key) - Name - Email - Phone_Number - Gender

	- Date_of_Birth - Bank_Account_ID - Bank_Name - Bank_Brach_Routing_No
Swimmer (is a User)	- Swimmer_ID (Primary Key) - Type (Regular, University_Student, Teacher_Officer, Family_Member, Associate) - Name - Email - Phone_Number - Gender - Date_of_Birth - Occupation - Department - Session - Registration_Number - Student_Status - Institute - Student_ID - Parent_Name - Parent_Phone_Number - Referred_Guardian_Occupation -Referred_Guardian_Department - Member_Central_Swimming_Team - Training_Schedule - AdmissionFee - MonthlyFee - AnnualFee
PoolAdmin (is a User)	- Admin_ID (Primary Key, Auto-increment) - Professional_Position(HeadOfPool , PlanningOperator , CounterOfficer)
TemporaryStaff (is a User)	- Staff_ID (Primary Key, Auto-increment) - Professional_Position

	- Cleaner - Lifeguard_Male - Lifeguard_Female - Security_Guard - Trainer - Gardener
Lesson	- Lesson_ID (Primary Key, Auto-increment) - Stage - Description - Video_Lesson_Link
Event	- Event_ID (Primary Key, Auto-increment) - Event_Name - Event_Date_Time - Event_Description - Budget - Ticket_Price (Optional)
Course	-Course ID(Primary key,Auto-increment) -Course_Name -Course_Type -Course_Fee -Enrolled_Student -payment

Analysis:

In our system we have multiple types of swimmers , each having distinct
registration forms . The information on swimmer forms are mostly the same with
little differences . Hence we merge all those form information in a single data
object , Swimmer. The admin roles(head , planning operator , counter officer) can
be merged into a single data object, PoolAdmin . We can introduce a user data
object which can simplify the data objects by inheritance.

The following are the final data objects :

1. **User:**
   - **Purpose:** Captures general user information including name, contact details, birthdate, and banking-related information.
2. **Swimmer (User subtype):**
   - **Purpose:** Consolidates diverse swimmer types into a unified structure, storing registration form attributes like occupation, institute details, health conditions, and membership affiliations.
3. **PoolAdmin (User subtype):**
   - **Purpose:** Merges administrative roles (Head of Pool, Planning Operator, Counter Officer) into a single data entity, simplifying administrative data management.
4. **Staff (User subtype):**
   - **Purpose:** Records temporary staff roles and responsibilities within the swimming pool, categorizing roles such as cleaner, lifeguard, security guard, trainer, and gardener.
5. **Course:**
   - **Purpose:** Manages courses available in the swimming pool. Stores Course name,type,id and enrolled student in that course.
6. **Lesson:**
   - **Purpose:** Stores detailed swimming lesson information including lesson stages, descriptions, and links to video lessons for effective training tracking.
7. **Event:**
   - **Purpose:** Manages data pertinent to events held within the swimming pool environment. Stores event names, dates, descriptions, budget allocations, and optional ticket prices.

4.3.3 Relational Diagram

| Swimmer | —— Buy —— | Course |

| Swimmer | —— learn —— | Lessons |

| Swimmer | —— Participate —— | Event |

| Admin | —— create —— | Event |

| Admin | —— upload —— | Lesson |

| Admin | —— allocate rules —— | Stafff |

| Staff | —— arrange —— | Event |

| Course | —— suggest —— | Lesson |
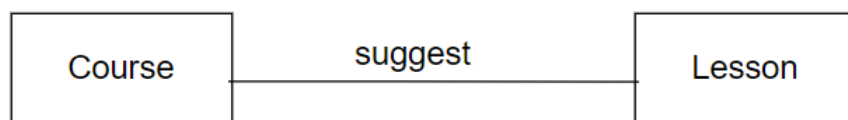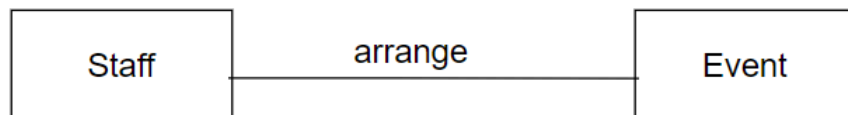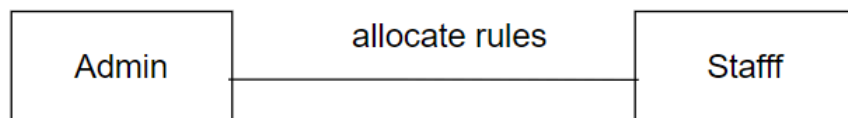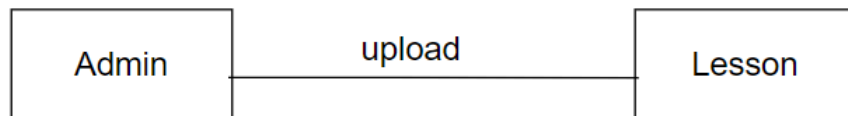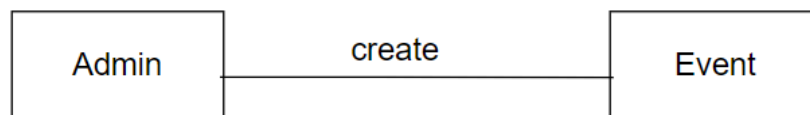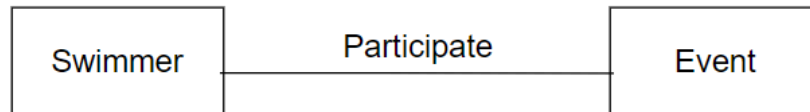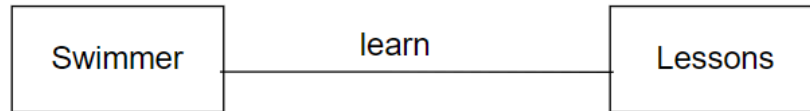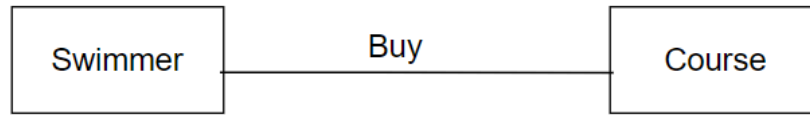
4.3.4 ER Diagram
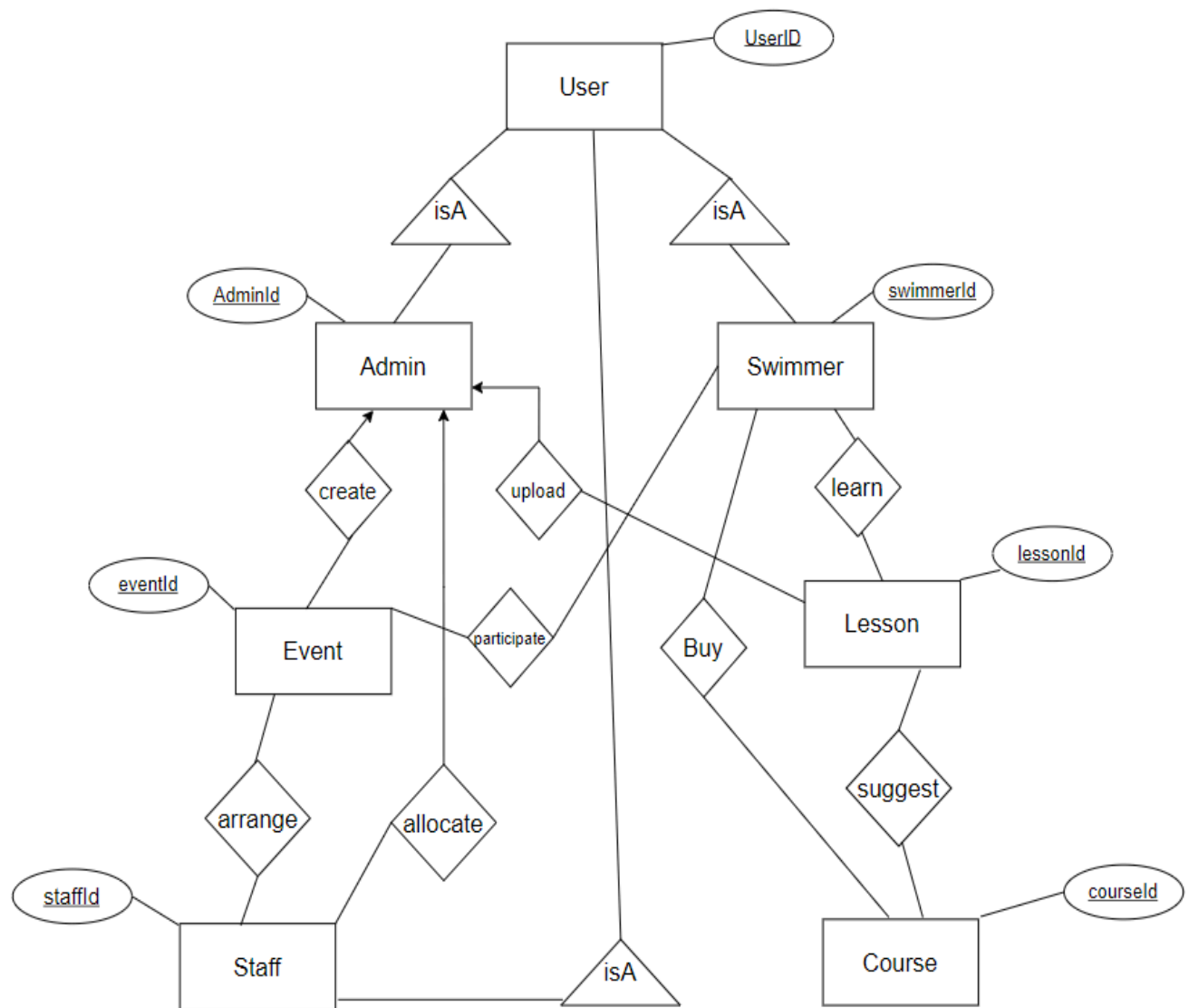
5. Class Based Modeling

5.1 What is Class Based Modeling?

Class-based modeling identifies classes, attributes, and relationships that the system will use. It represents the object. The system manipulates the operations. The elements of the class-based model consist of classes and objects, attributes, operations, and class – responsibility - collaborator (CRC) models. Classes are determined using underlining each noun or noun clause and entering it into the simple table. Attributes are the set of data objects that are defining a complete class within the context of the problem. The operations define the behavior of an object.

5.2 Class Based Modeling: Swimming Pool Management System

5.2.1 List of Nouns and Related Verbs

Nouns	Verbs
Swimming Pool Management System	Provides,uses,guides,creates,is equipped,generate,send, Manages,is integrated, allocates,personalize,calculates
Registration	Provides,
User	Sends,is prompted,registers,chooses, authenticates,receives,

	initiates,sets
Registration form	Is provided,
Payment	
Swimmer	Are notified,mark,gives,
Staff	sends,initiates,request,marks
Associate members	sends,initiates,marks
Trainer	sends,uploads,update
Head of the Swimming Pool	
Planning Operator	Approves,ensures,generates,uploads,reviews,verifies, Confirms,inserts,designates, Approves,creates,manages, makes,updates,changes
Counter Operator	sends,manages,ensures
Swimmer Registration form	Is provided
Regular Swimmer registration form	Is filled
Name	
Email	
Phone Number	
Gender	
Date of Birth	
Occupation	
Parent's Name	

Parent's Phone Number	
University's Student Form	Is filled
Teachers and Officers Form	Is filled
Associate Member's Form	Is filled
Central Database Record	Is ensured
System User Registration Form	Is filled
Verification	
Central Authority	provides,gives,grants,approves, monitors,verifies
Temporary Staff Form	Is filled
Cleaner	
Lifeguard	
Security Guard	
Gerdener	
Supplier's Form	Is filled
Pool chemicals and water treatment	
Cleaning Equipment	
Accessories and Lifeguard Gear	
Outdoor Furniture	
Food and Snacks	
Plumber	

Structural Mechanic	
Registration Information	
Password	
Username	
Authentication	
Enrollment	
Confirmation message	
Scheduling Module	
Training schedule	
Reports	
Notification	
Lesson Management Module	
Log	
Descriptive Guidelines	
Video Lesson	
Training log	
Log editing	
Tracking Log	
Lesson	
Feedback	
mechanism	
Lesson completion	
Progress index	Is created

Request initiation	
Staff member	
Request	
review	
Supplier notification	
Request log	
Tender log	
Quantities	
Item request log	
Request Id	
Unique identifier	
Requestor Details	
Date	
Item name	
Event id	
Request confirmation	
Tender	
Tender log	
Tender date	
Entity	
Tender number	
Documents	
Allocation	

Amount	
Temporary Field Workers	
Confirmation	
Completion	
Automation	
Request status	
invoice	
Invoice id	
Invoice date	
Unit price	
Subtotal	
Service charge	
Transaction	Are made
Banking Methods	
Pool equipment mechanic	
Electrician	
Plumber	
Structural mechanic	
Payment module	
Banking services	
Bkash	
Nagad	
Rocket	

account	
credit	
Banking Details	
Bills	Are paid
Budget	
fees	
Salaries	
Admin	compares,ensures,
Admission fees	
Monthly fees	
Upgradation	
Annual Fee	
Event management module	
Event creation form	
Event name	
Event date	
Event time	
Staff Directory	
Ticket price	
Client notification	
Preferences	
Event Notification	
email	

Phone alerts	
Massage	
Notification channel	
Publish Event	
changes	
Electrician	

5.2.2 General Classifications

Candidate classes are categorized based on the seven general classification. The analysis classes manifest themselves in one of the following ways:

1. External entities
2. Things
3. Events
4. Roles
5. Organizational units
6. Places
7. Structures

A candidate class is selected for special classification if it fulfills three or more characteristics.

Index	Noun	General Classification
1.	Swimming Pool Management System	1,5,7
2.	Registration	3

3.	User	4
4.	Registration form	7
5.	Payment	2
6.	Swimmer	1,4,7
7.	Staff	1,4,5,7
8.	Associate members	4,5
9.	Trainer	1,4,5,7
10.	Head	4,5
11.	Planning Operator	1,4,5,7
12.	Counter Operator	1,4,5,7
13.	Swimmer Registration form	1,2,7
14.	Regular Swimmer registration form	1,2,7
15.	Name	2
16.	Email	2
17.	Phone Number	2
18.	Gender	2
19.	Date of Birth	2
20.	Occupation	2
21.	Parent's Name	2
22.	Parent's Phone Number	2
23.	University's Student Form	7
24.	Teachers and Officers Form	7
25.	Associate Member's Form	7
26.	Central Database Record	7
27.	System User Registration Form	7
28.	Verification	3

29.	Central Authority	1,4,5,7
30.	Temporary Staff Form	7
31.	Cleaner	4
32.	Lifeguard	4
33.	Security Guard	4
34.	Gardener	4
35.	Supplier's Form	1,2,7
36.	Pool chemicals and water treatment	2
37.	Cleaning Equipment	2
38.	Accessories and Lifeguard Gear	2
39.	Outdoor Furniture	2
40.	Food and Snacks	2
41.	Office Supplies	2
42.	Registration Information	7
43.	Password	2
44.	Username	2
45.	Authentication	3
46.	Enrollment	3
47.	Confirmation message	3
48.	Scheduling Module	7
49.	Training schedule	2
50.	Reports	2
51.	Notification	2,3
52.	Lesson Management Module	7
53.	Log	7
54.	Descriptive Guidelines	7

55.	Video Lesson	2
56.	Training log	7
57.	Log editing	3
58.	Tracking Log	3
59.	Lesson	1,2,7
60.	Feedback	1,2,7
61.	Lesson completion	3
62.	Progress index	2
63.	Request initiation	3
64.	Staff member	4
65.	FieldWorkerRequestForm	1,2,7
66.	Tender log	2
67.	Quantities	2
68.	Item request log	2
69.	Request Id	2
70.	Central Admin	1,4,5,7
71.	Requestor Details	7
72.	Date	2
73.	Item name	2
74.	Event id	2
75.	Request confirmation	3
76.	Tender	1,2,7
77.	Tender log	7
78.	Tender date	2
79.	Entity	2
80.	Tender number	2

81.	Documents	7
82.	Allocation	3
83.	Amount	2
84.	Temporary Field Workers	4
85.	Completion Automation	3
86.	Request status	2
87.	Invoice	1,2,7
88.	Invoice id	2
89.	Invoice date	2
90.	Unit price	2
91.	Subtotal	2
92.	Service charge	2
93.	Transaction	3
94.	Banking Methods	1,3,7
95.	Pool equipment mechanic	4
96.	Electrician	4
97.	Plumber	4
98.	Structural mechanic	4
99.	Payment module	3
100.	Banking services	1,3,7
101.	Bkash	2
102.	Nagad	2
103.	Rocket	2
104.	Account credit	2
105.	Banking Details	7
106.	Bills	2
107.	Budget	2

108.	Fees	2
109.	Salaries	2
110.	Admin	1
111.	Admission fees	2
112.	Monthly fees	2
113.	Upgradation	3
114.	Annual Fee	2
115.	Event	1,3,7
116.	Event creation form	7
117.	Event name	2
118.	Event date	2
119.	Event time	2
120.	Staff Directory	2
121.	Ticket price	2
122.	Client notification	3
123.	Preferences	2
124.	Event Notification	3
125.	Email	2
126.	Phone alerts	3
127.	Massage	3
128.	Notification channel	2
129.	Publish Event	3
130.	Changes	2
131.	Electrician	4

5.2.3 Selection Criteria

The candidate classes are then selected as classes by six Selection Criteria:

1. Retain information
2. Needed services
3. Multiple attributes
4. Common attributes
5. Common operations
6. Essential requirements

A candidate class generally becomes a class when it fulfills around three characteristics.

No.	Potential Class	Selection Criteria
1.	SwimmingPoolManagementSystem	1,2,3,6
2.	Swimmer	1,2,3,6,4,5
3.	PlanningOperator	1,2,3,6
4.	CounterOfficer	1,2,3,6
5.	SwimmerRegistrationForm	1,4,3
6.	Event	1,3
7.	Central Admin	1,2,3,6
8.	Banking Method	1,2,3,6
9.	Lesson	1,3,2,6
10.	LessonLog	1,3
11.	FieldWorkerRequestForm	1,3,4
12.	Trainer	1,2,3,6,4,5
13.	Feedback	1,2
14.	TemporaryStaffForm	1,3

5.2.4 Selected Classes

There are 10 classes in this system:

- User (base class)
- Admin
- Swimmer
- PlanningOperator
- Event
- Lesson
- Staff
- BankingAdmin
- UniversityCentralAdmin

5.3 Class-Card

User	
Attributes	**Methods**
Name (String)	Register(); SetPassword(); Authenticate(); updatePersonalInformation();
Email (String)	
Phone Number (String)	
Gender (String)	
Date of Birth (Structure)	
Responsibility	**Collaboration**
Register Individual Information [Register()]	Admin
Set Password for Registered Account [SetPassword()]	Admin
Authenticate Whenever Logged In [Authenticate()]	Admin
Update personal data	Admin

Swimmer *(Inherits from User)*

Attributes	Methods

Category (String)	setCategory();
	fillUpCategoryBasedForm();
	payment();
	markLessonDone();
	giveLessonFeedback();
	viewTrainingSchedule();
	getEventTicket();

Schedule (Structure)	
CategoryInfo Form (Structure)	
Admission Fee(Double)	
MonthlyFee (Double)	
lessonLog (List of lessons)	

Responsibility	Collaboration
Fill up category based information [fillUpCategoryBasedForm()]	Admin
Pay required Fees [payment()]	Admin , BankingAdmin
Access lesson materials [accessTrainingMaterials()]	Lesson
Marks completed lessons as done from personal lesson log [markLessonDone()]	Lesson
Give Feedback on lessons [giveLessonFeedback()]	Lesson
Buy event ticket [getEventTicket()]	Event , Admin , BankingAdmin

PlanningOperator *(Inherits from User)*

Attributes	Methods

FinancialAccount (Structure)	getVerified();
	setFinancialAccount();
	managePoolBankingAccount();
	setSwimmerSchedule();

	manageTrainingSessionLogs();
	approveStaffRegistraion();
	setStaffSalary();
	createEvent();
	updateEventDetail();
	setEventTicket();
	setEventNotification();

Responsibility	**Collaboration**
Get verified by university central administration before getting access [getVerified()]	Admin , UniversityCentralAdmin
Manage Pool's transacting bank account [managePoolBankingAccount()]	Admin , UniversityCentralAdmin , BankingAdmin
Set or Update schedules for training sessions according to swimmer category [setSwimmerSchedule()]	Swimmer
Update and manage session details [manageTrainingSessionLogs]	Lesson
Upload Lesson Material [uploadMaterial()]	Lesson
Verify and approve temporary staff registration [approveStaffRegistraion()]	Staff , Admin
Set or Update staff salaries [setTemporaryStaffSalary()]	Admin , Staff , UniversityCentralAdmin
Create and publish event with event details [createEvent()]	Event
Generate customized event ticket [setEvent Ticket()]	Event

Event	
Attributes	**Methods**
eventId (INT) eventName (String)	getInitialized(); updateStatus();

eventDateTime (Structure) eventDescription (String) rolesRequired (Structure) assignedStaffs (Structure) ticket(Structure) ticketPrice (Double) status (String) notification (Structure)	generateTicket(); notifyMembers();
Responsibility	**Collaboration**
Get initialized and published with required event details [getInitialized()]	PlanningOperator
Update status in each step completion [updateStatus()]	PlanningOperator
Generate ticket for swimmer entities [generateTicket()]	Swimmer
Notify swimmers about the event	Swimmer

Lesson	
Attributes	**Methods**

LessonList (List of Lessons)
LessonMaterial (Structure)
Feedback (Structure)
	updateLessonList();
	addFeedback();
	notifyTrainer();

Responsibility	**Collaboration**
Get updated on lesson log by Trainer when Trainer is permitted by PlanningOperator [updateLessonList()]	PlanningOperator , Staff
Get feedback on specified lesson from Swimmer [addFeedback()]	Swimmer
Notify Trainer on feedbacks [notifyTrainer()]	Staff

Staff

Attributes	Methods

staffID
staffRole
	askLessonLogAccess();
	uploadMaterial();
	getFeedBack();

Responsibility	Collaboration
Ask PlanningOperator for Lesson Access [askLessonLogAccess()]	PlanningOperator
Upload Lesson Material [uploadMaterial()]	Lesson
Get Feedback on lessons from Swimmers [getFeedBack()]	Swimmer

Admin

Attributes	Methods

poolFinanceAccount (Structure)
PlannigOperator (Structure)
ScheduleLog (Structure)
TransactionInfoLog
	approveUserRegistration();
	allowPasswordSetting();
	allowUserDataUpdate();
	verifyAndAllowPayment();
	updateTransactionLog();
	allocateTrainingSchedule();
	setPoolFinanceAccount();
	allocateSalaryToStaffFinanceAccount();

Responsibility	Collaboration
Approves new user registrations within the system [approveUserRegistration()]	User
Enables setting passwords for registered accounts [allowPasswrdSetting()]	User
Verifies and authenticates user credentials	User

during login [userAuthentication()]	
Grants permission for users to update their personal information [allowUserDataUpdate()]	User
Verifies and enables payment processing [verifyAndAllowPayment()]	BankingAdmin , Swimmer ,
Records and updates transactional logs [updateTransactionLog()]	BankingAdmin
Assigns and manages training schedules set up by PlanningOperator for swimmer entities [allocateTrainingSchedule()]	PlanningOperator , Swimmer
Manages and sets up finance accounts related to the pool [setPoolFinanceAccount()]	PlanningOperator

BankingAdmin	
Attributes	**Methods**
APIEndpoint (Structure) APIToken (Structure) Request Parameters (Structure)	setUpAndConnectAccount(); processTransactionRequest();
Responsibility	**Collaboration**
Configure and establish connection with a bank account within the system [setUpAndConnectAccount()]	PlanningOperator , Swimmer
Handle and execute transaction requests within the banking system. [processTransactionRequest()]	PlanningOperator , Swimmer,

UniversityCentralAdmin	
Attributes	**Methods**
APIEndpoint (Structure) APIToken (Structure) Request Parameters (Structure)	recordAdministrativeFinancialAccount(); verifyAdministrativeControl();

Responsibility	Collaboration
Records and approves administrative financial account details within the system for organizational purposes [recordAdministrativeFinancialAccount()]	PlanningOperator , Swimmer, Staff
Validates and confirms administrative control rights or permissions within the system. [verifyAdministrativeControl()]	PlanningOperator
Authorizes and approves the recorded salary records for temporary staff within the system [approveTemporaryStaffSalaryRecord()]	PlanningOperator , Staff
Allocates or assigns fees related to swimmers' activities or services within the system [allocateSwimmerFees()]	Swimmer

5.4 CRC Modeling
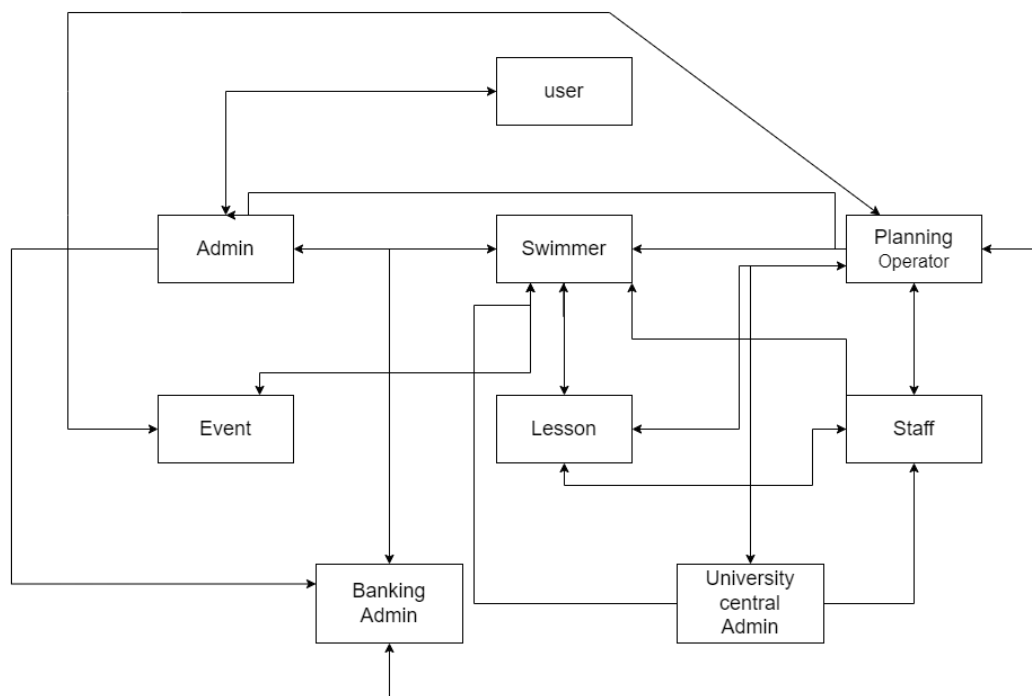
Fig : CRC Modeling

6. Behavioral Modeling

The behavioral model indicates how the software will respond to external events or stimuli. In the context of behavioral modeling, two different characterizations of states must be considered: (1) the state of each class as the system performs its function and (2) the state of the system as observed from the outside as the system performs its function.

6.1 State Transition Diagram: Dhaka University Swimming Pool Management System

One component of a behavioral model is a UML state diagram that represents active states for each class and the events (triggers) that cause changes between these active states. State Transition Diagram represents active states for each class of events (triggers). For this we identified all the events, their initiators and collaborators. In the State Transition Diagram the states are shown in boxed texts, and the transition is represented by arrows. It is also called State Chart or Graph. It is useful in identifying valid transitions.

6.1.1 List of Events

Initiator class	Events	Collaborator class
user	Register in system	admin
Banking admin	Provides payment structure	User,Counter officer,Swimmer,Planning operator,Trainer
University central admin	Verifies registration data through Central database record	User,Counter officer,Swimmer,Planning operator,Trainer

Admin	Notifies feedback	Trainer,planning operator
Banking Admin	Operate transactions	User,Counter officer,Swimmer,Planning operator,Trainer
Counting officer	Set financial account	Admin,Banking admin
User,Counter officer,Swimmer,Planning operator,Temporar	Set transaction account with credit and banking details	Banking admin

y staff, supplier,Trainer		
Admin	Allocates admission fees and monthly fees	User,swimmer,Temporary staff
Swimmer,Planning operator	Pays through online or mobile banking	Banking admin
Planning operator	Updates designated fees	
University Central admin	Monitors and Approves update done on fees	
Admin	Records salaries in the employers accounts	Counter officer,Planning operator, Trainer
Planning Operator	Create and manage event	Swimmer
Planning operator	Provides notification about events	User,Counter officer,Swimmer,Planning operator,Trainer
Planning operator	Set event ticket	
Planning operator	Can update cost of event	

6.1.2 State Transition Diagram

6.1.2.1 ID: 1

Name: User
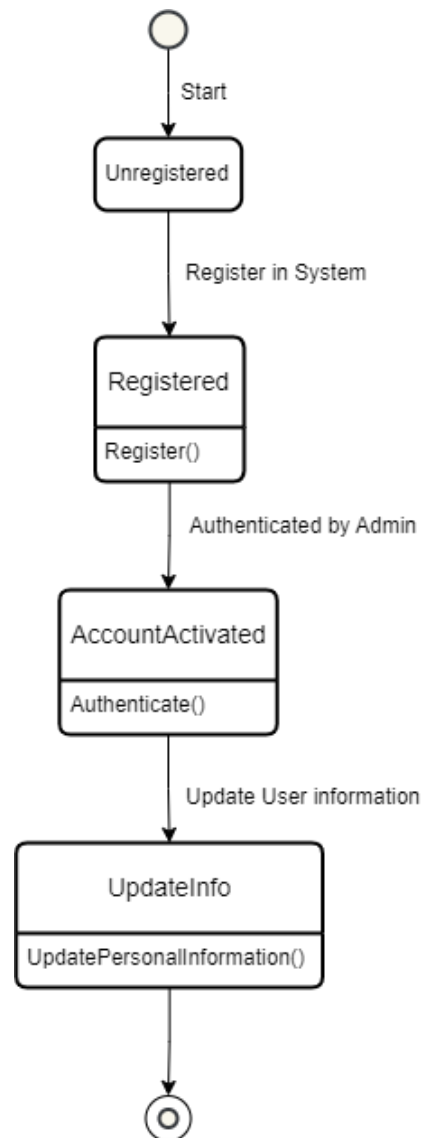
Figure 1 : User state transition diagram

6.1.2.2 ID: 2

Name: Swimmer
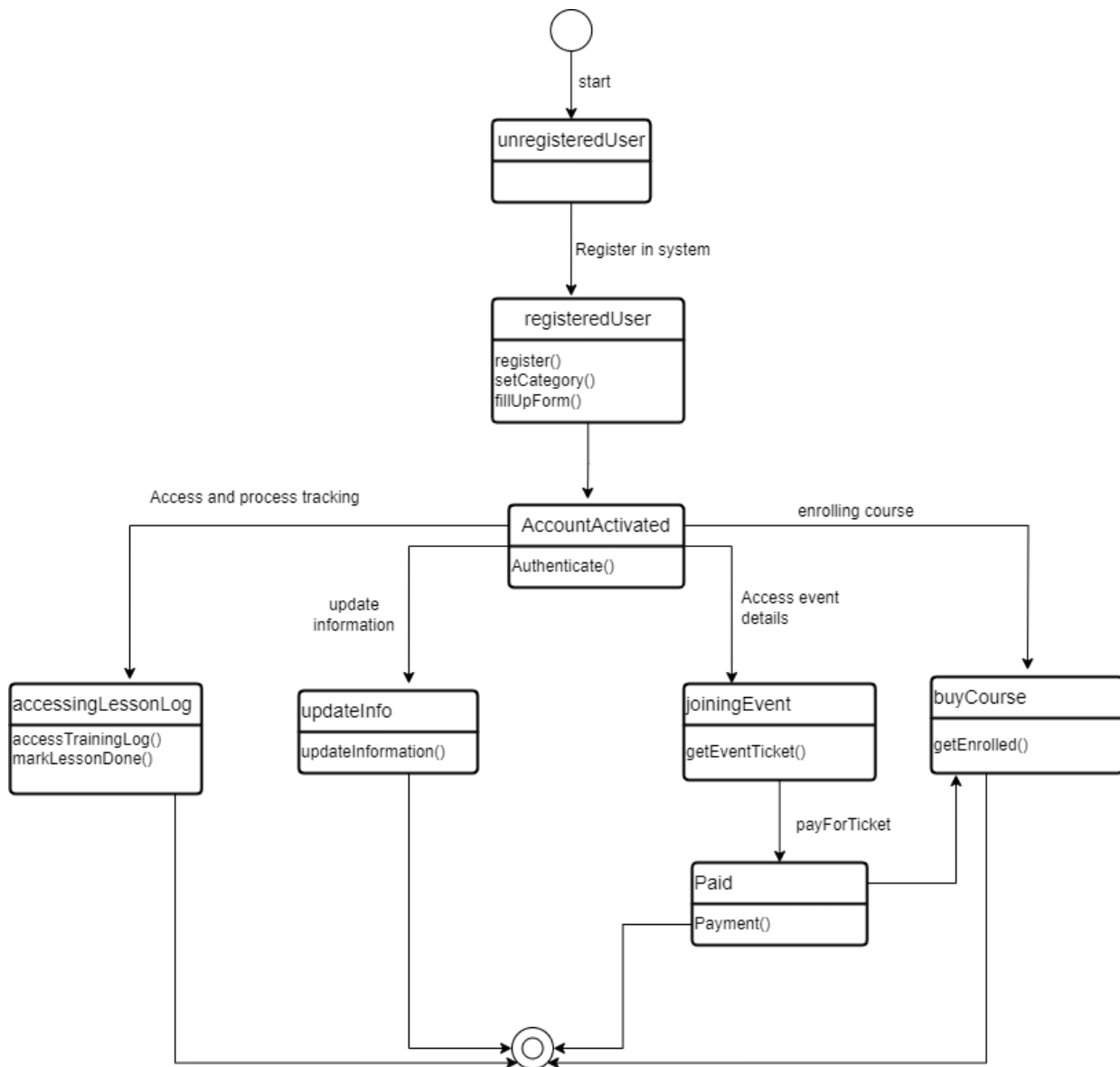
Figure 2 : Swimmer state transition diagram

6.1.2.3 ID: 3

Name: Counting officer
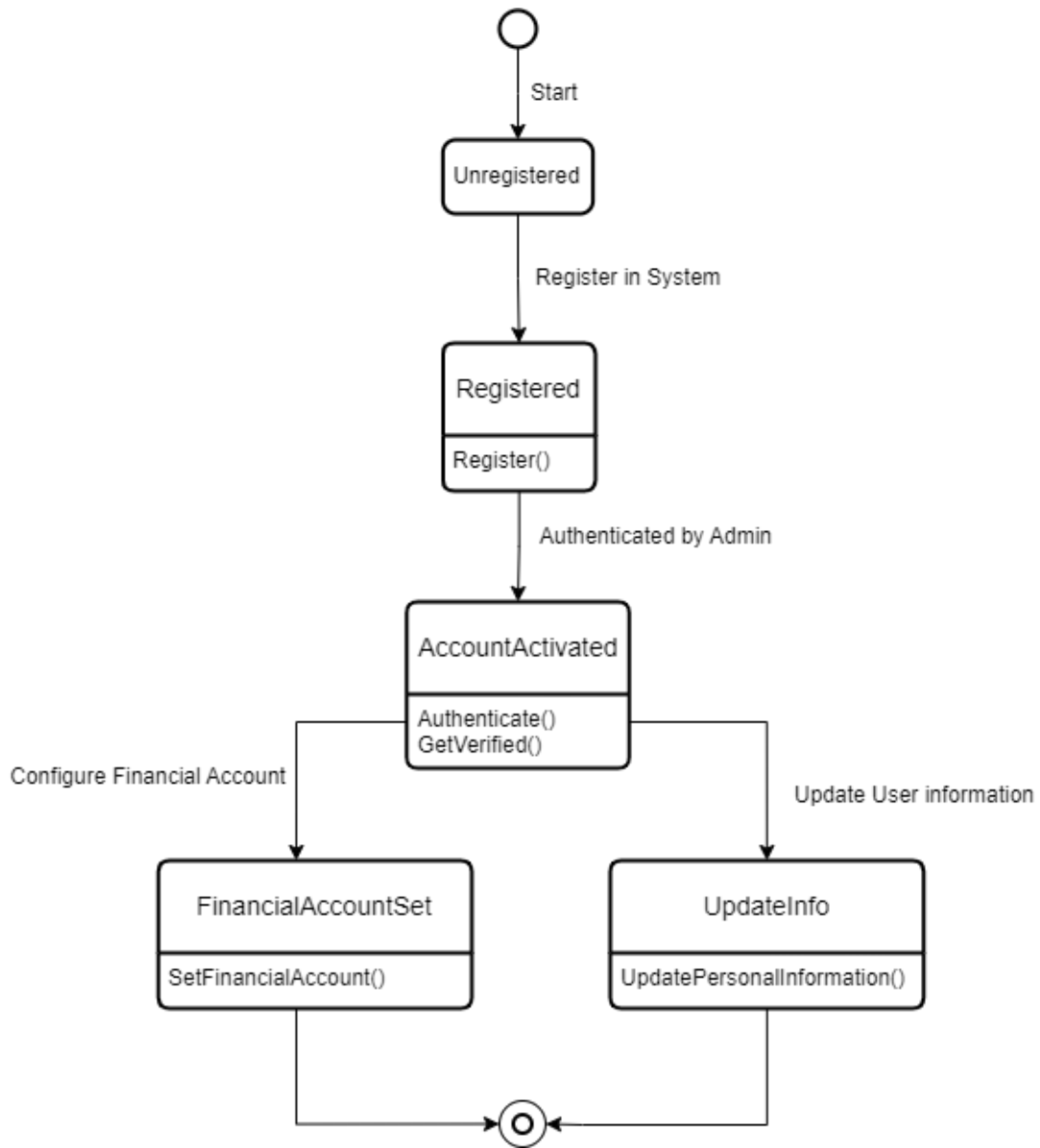
Figure 3 : Counting officer state transition diagram

6.1.2.4 ID: 4

Name: Planning Operator
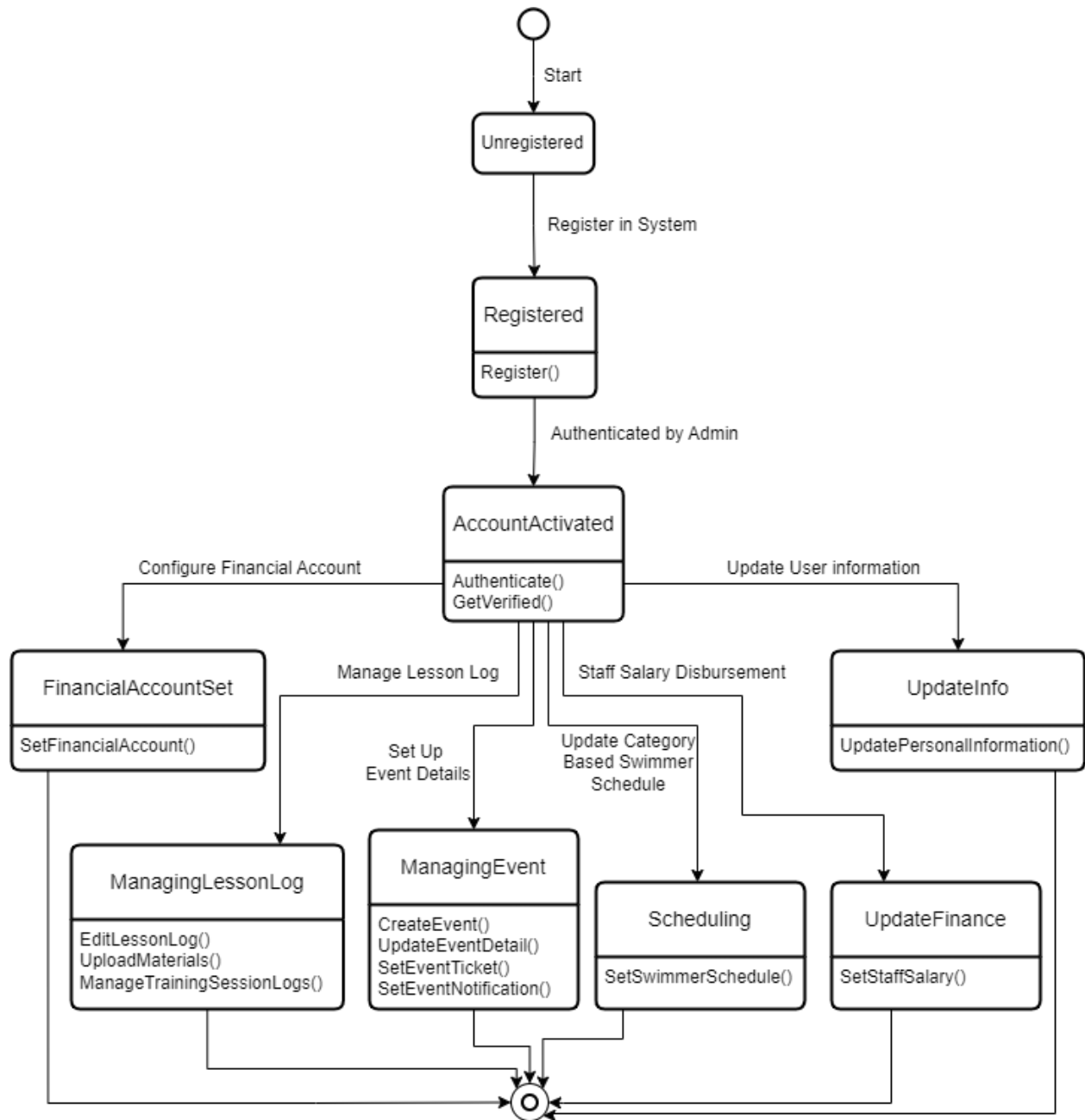
Figure 4 : Planning officer state transition diagram

6.1.2.5 ID: 5

Name: Staff
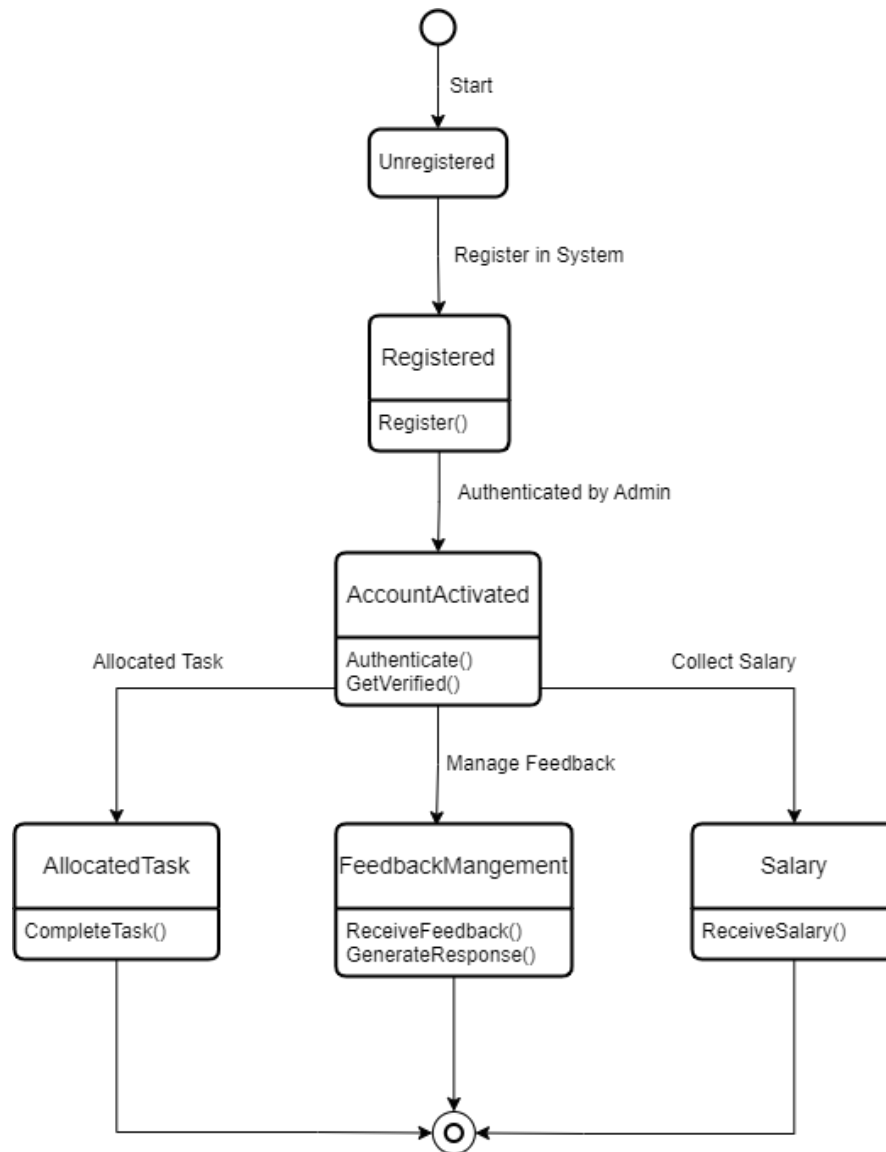
Figure 10 : Event state transition diagram

6.1.2.6 ID: 6

Name: Event
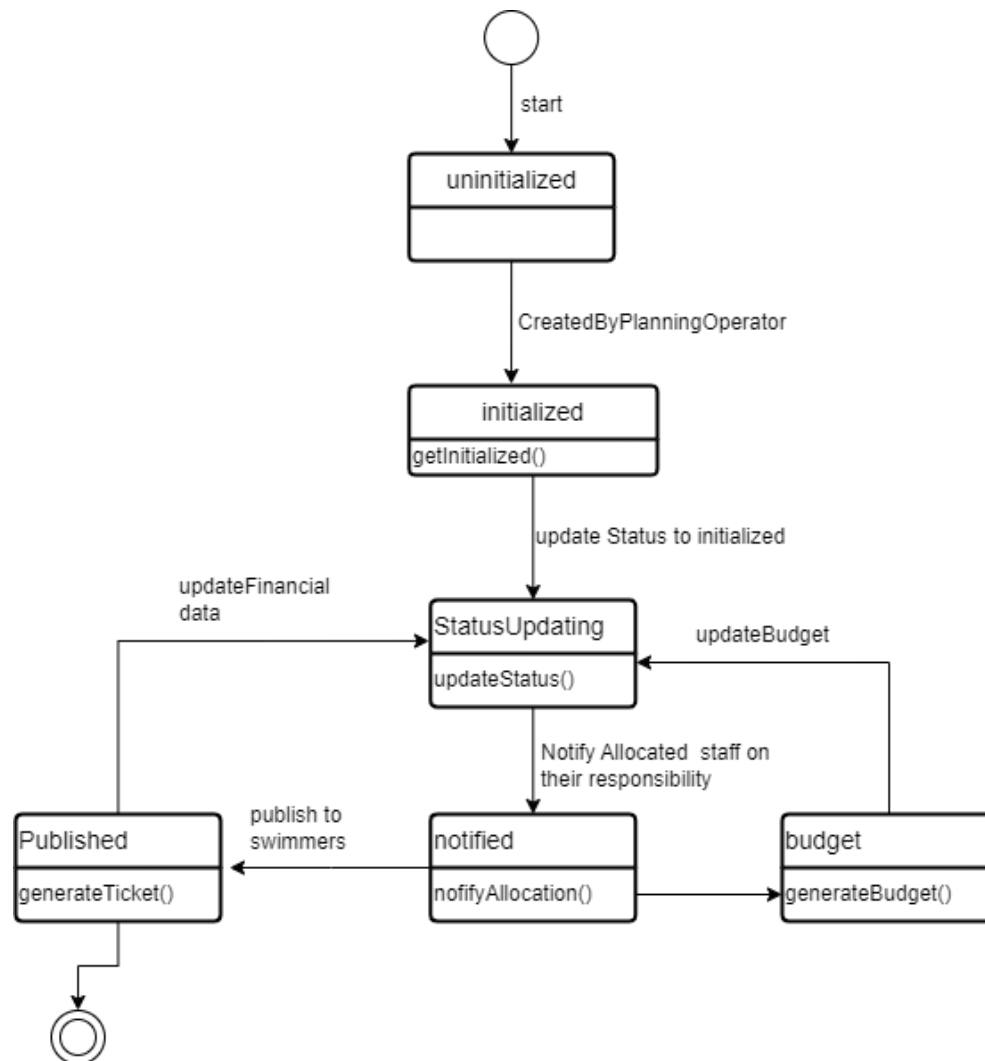
Figure 10 : Event state transition diagram

6.1.2.7 ID: 7

Name: Lesson
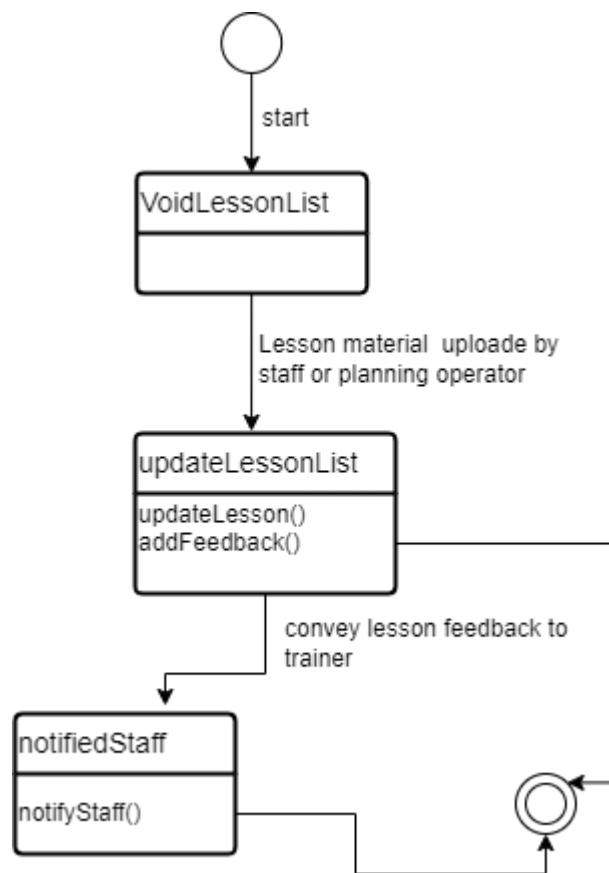
Figure 11 : Lesson state transition diagram

6.1.2.8 ID: 8

Name: Admin
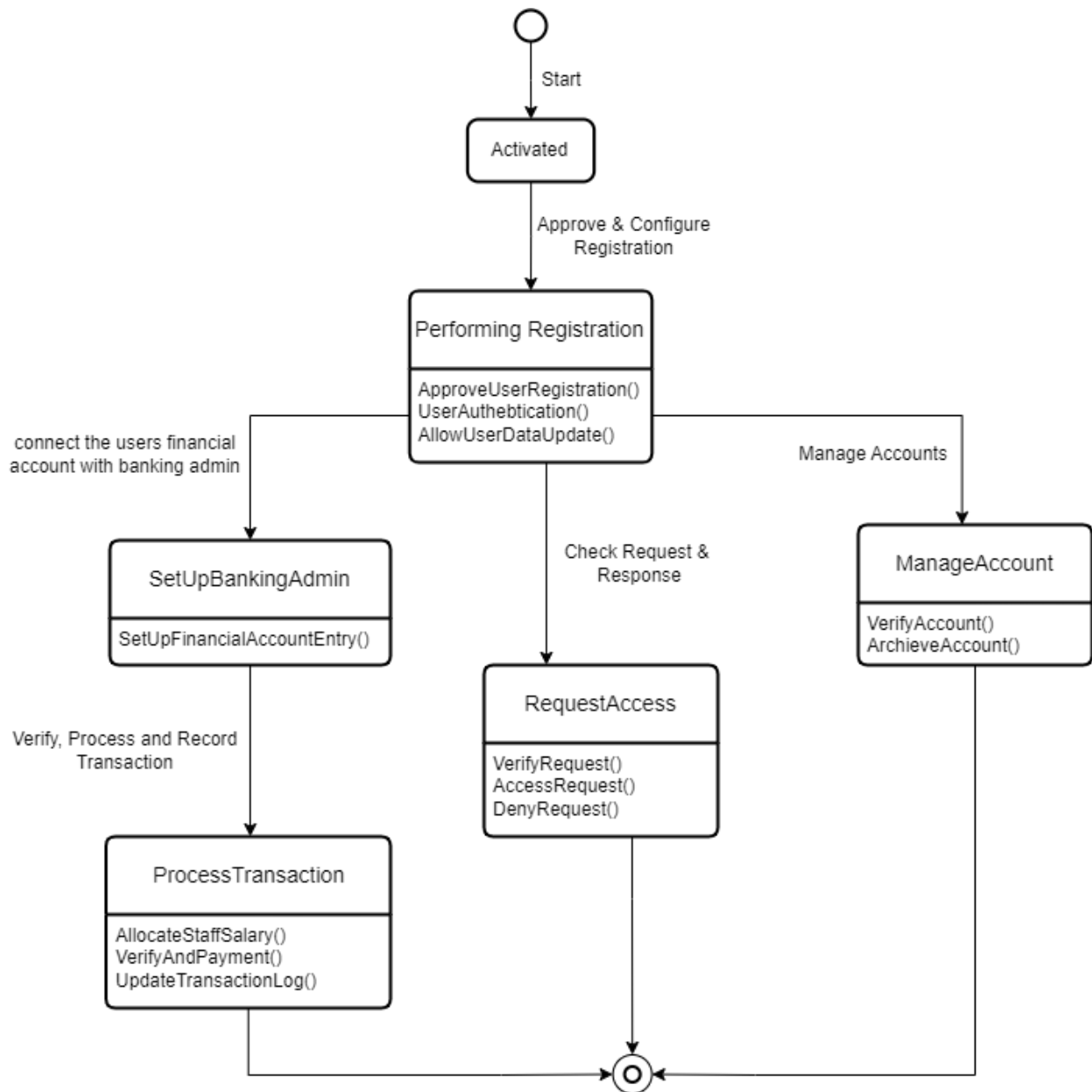
Figure 13 : Admin state transition diagram

6.1.2.9 ID: 9

Name: Banking admin
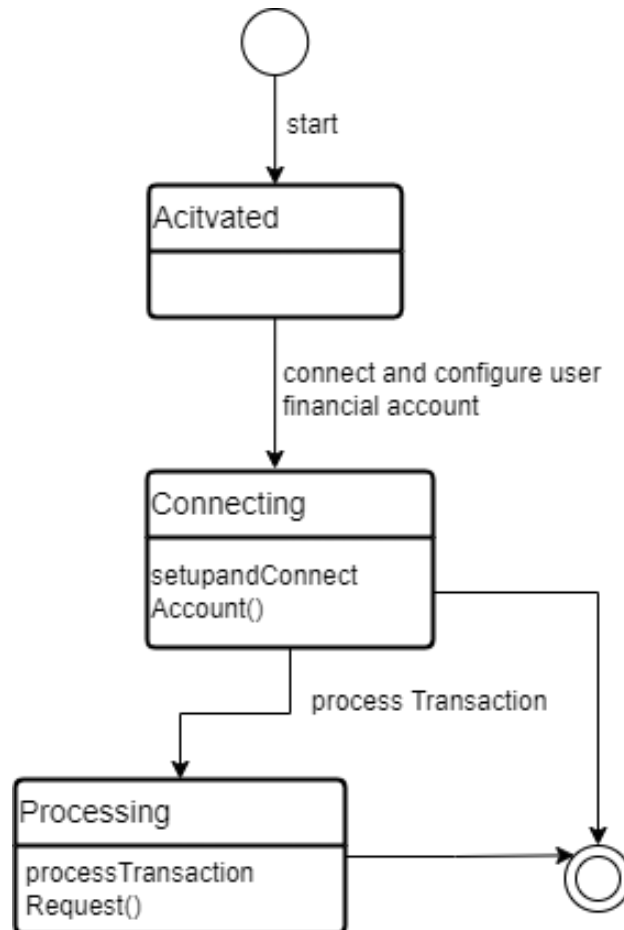
Figure 14 : Banking admin state transition diagram

6.1.2.10 ID: 10

Name: University Central Admin
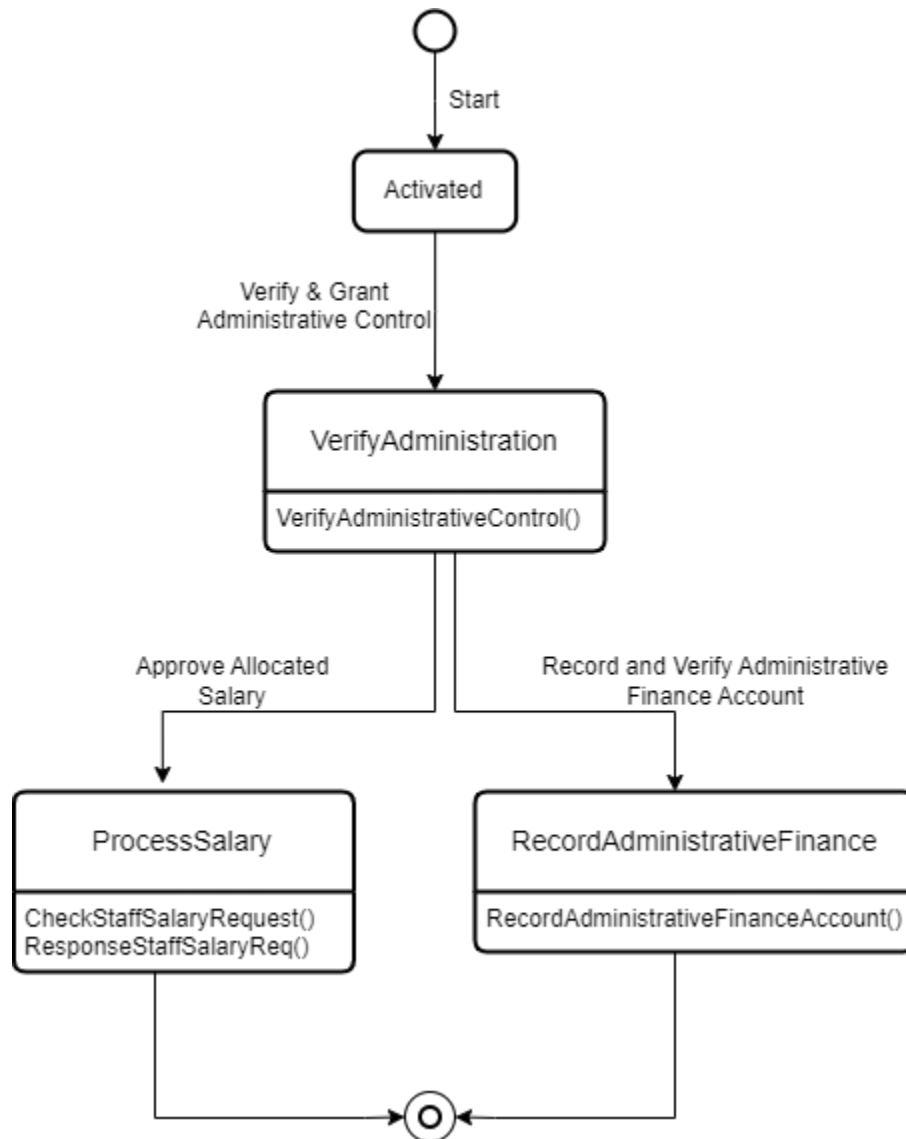
Figure 15 : University Central Admin state transition diagram

6.2 Sequence diagram: Swimming Pool Management System

The second type of behavioral representation, called a sequence diagram in UML, represents how events cause flow from one object to another as a function of time. The sequence diagram is a shorthand version of the use case. It represents vital classes and the events that cause behavior to flow from class to class.
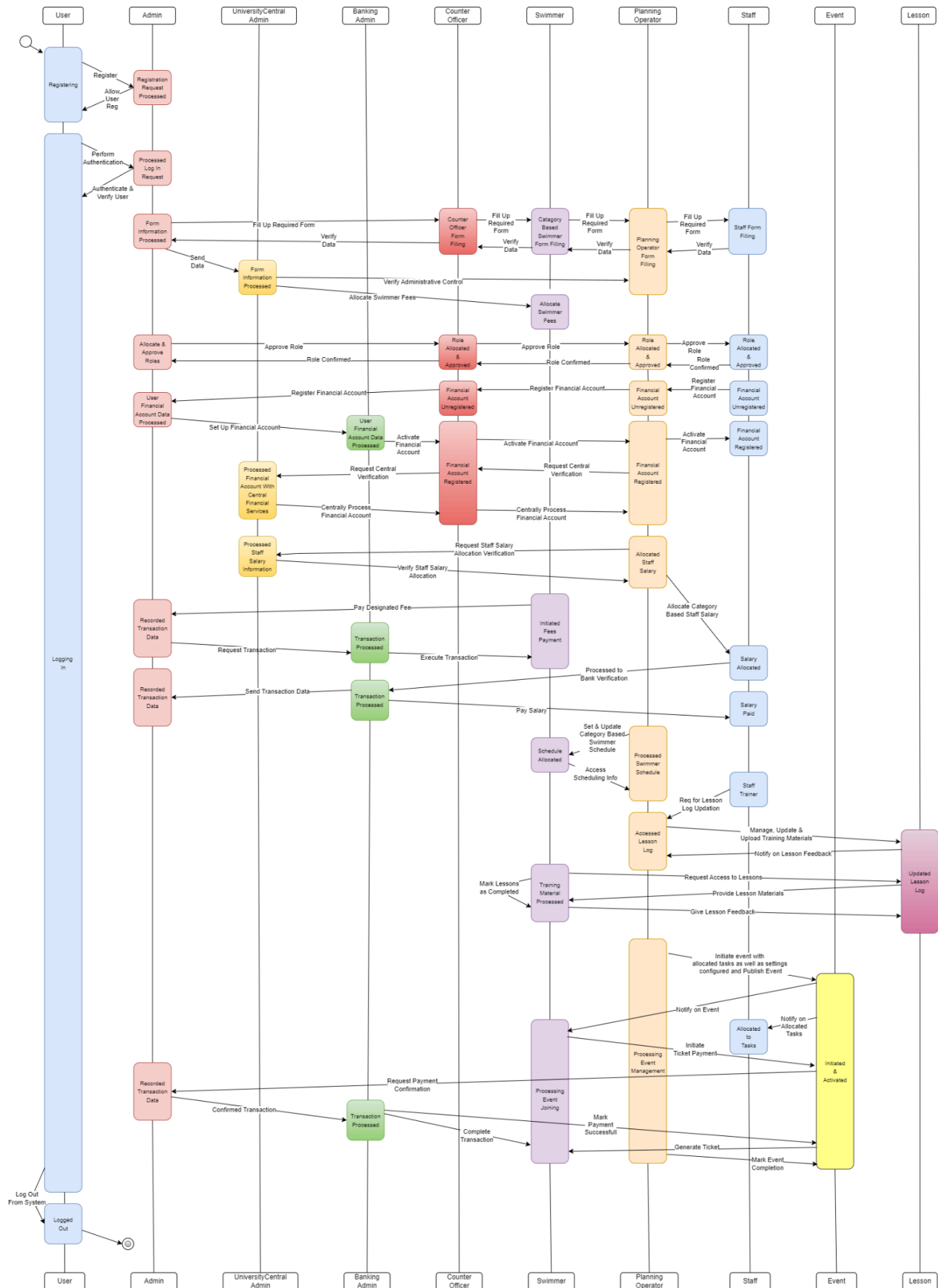
7.Data Flow Diagram (DFD)

DFD, or Data Flow Diagram, is a visual representation that illustrates the flow of information within a system. It employs various symbols to depict processes, data stores, data flows, and external entities, providing a clear and concise overview of how data moves through a system. DFDs are essential in system analysis and design as they help stakeholders, including analysts and end-users, to comprehend the information flow and interactions within a complex system. By breaking down a system into manageable components and highlighting data transformations, DFDs facilitate effective communication, aid in identifying potential bottlenecks or areas for improvement, and serve as a foundation for designing and implementing efficient information systems.
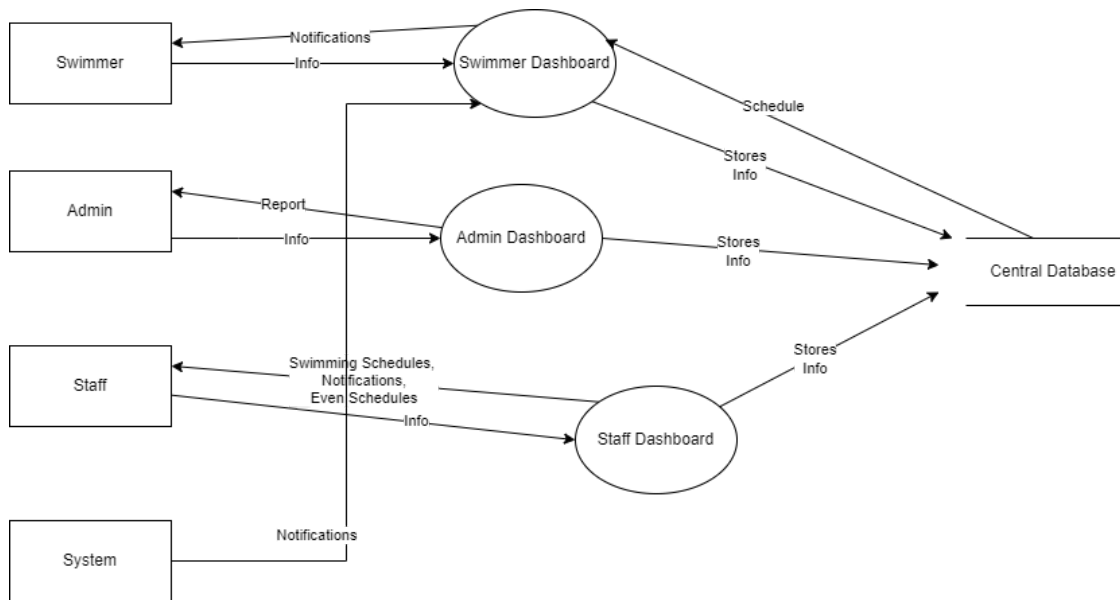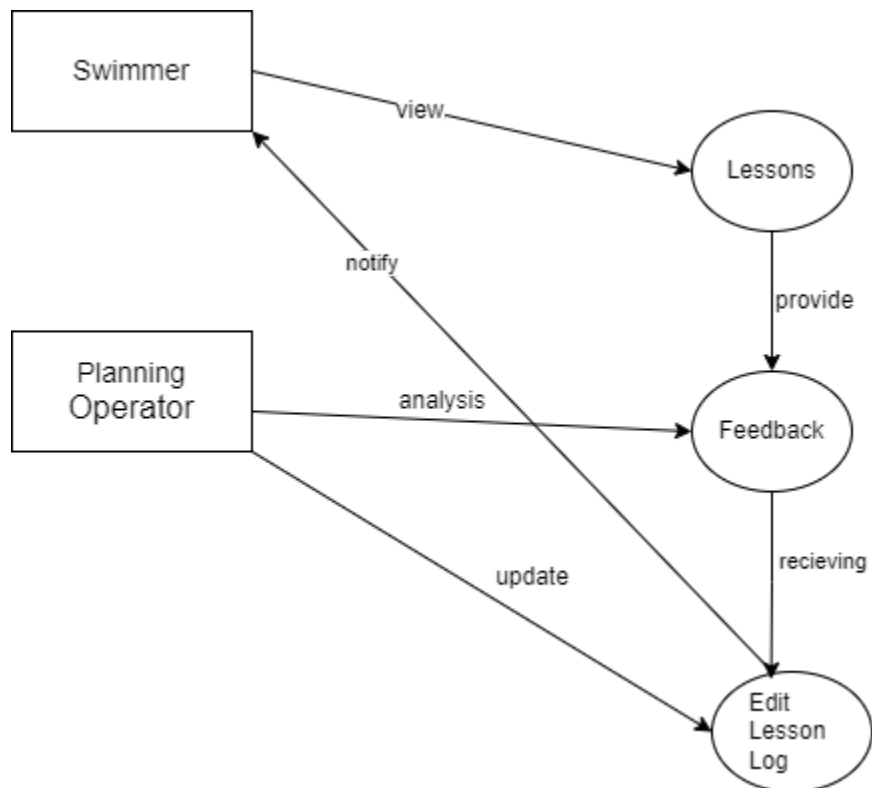
7.1 Level 0
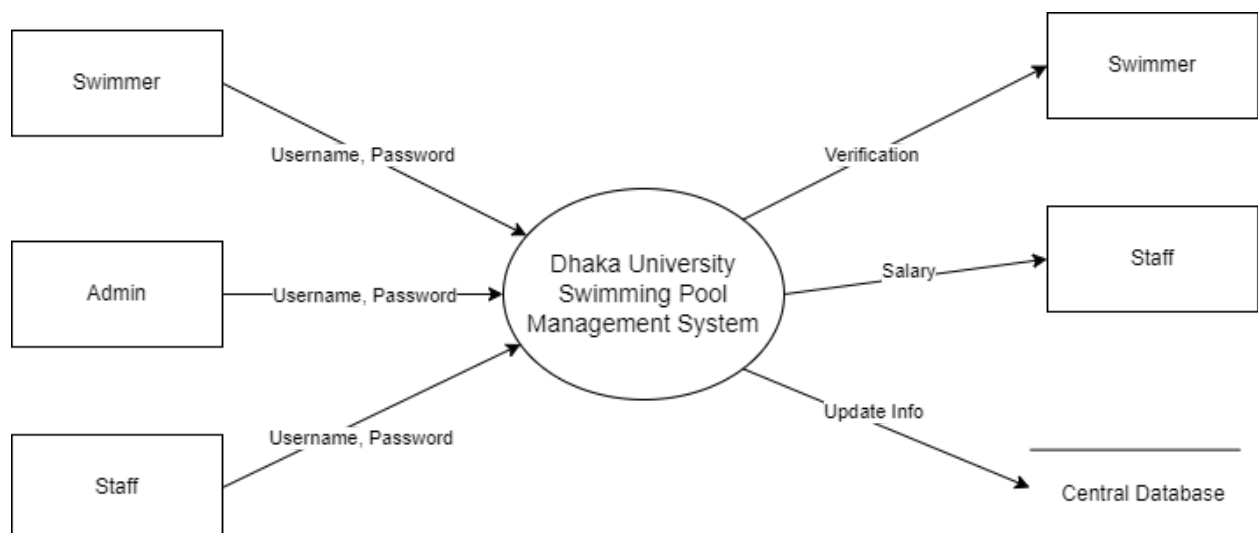
7.2 Level 1
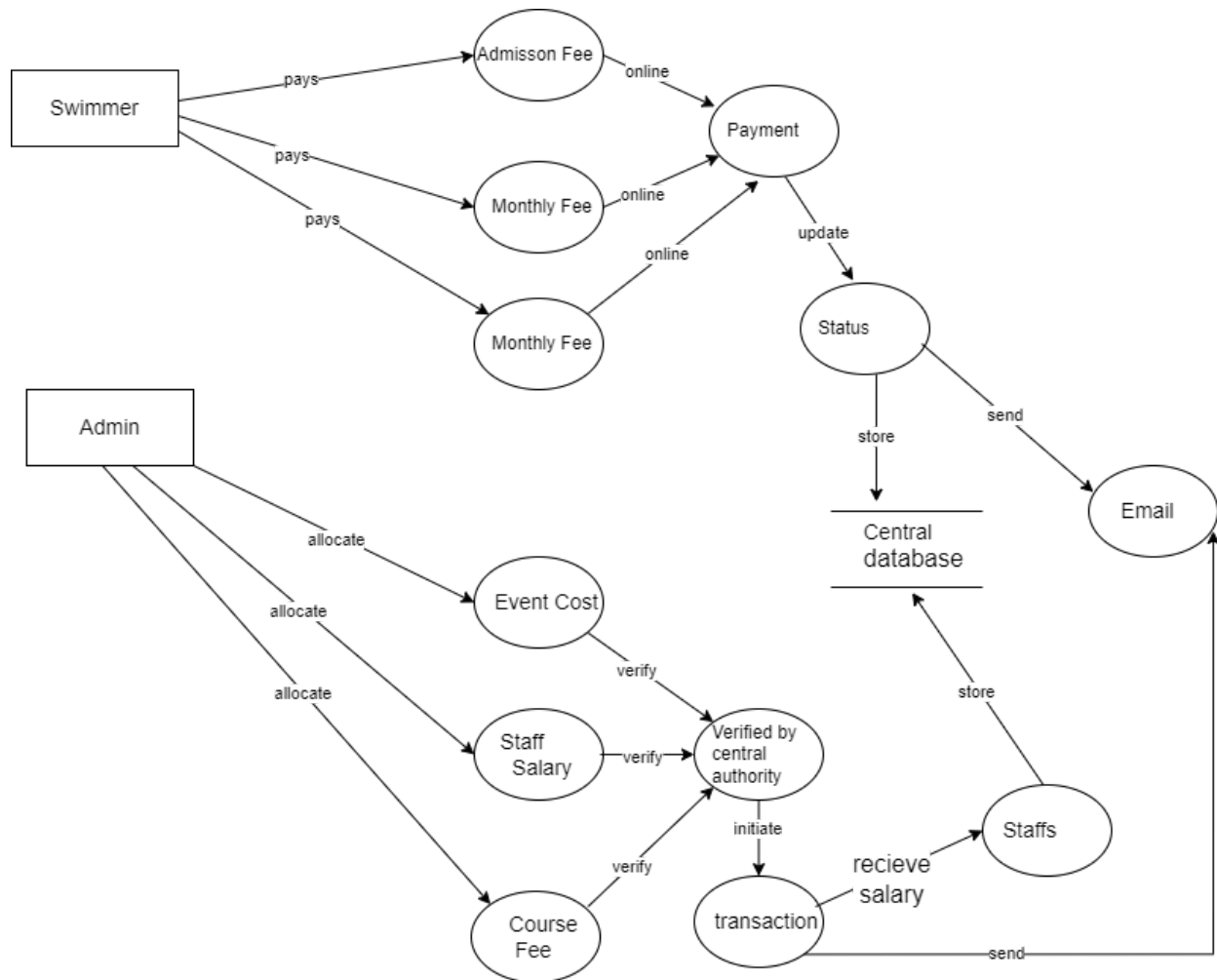
Registration and login
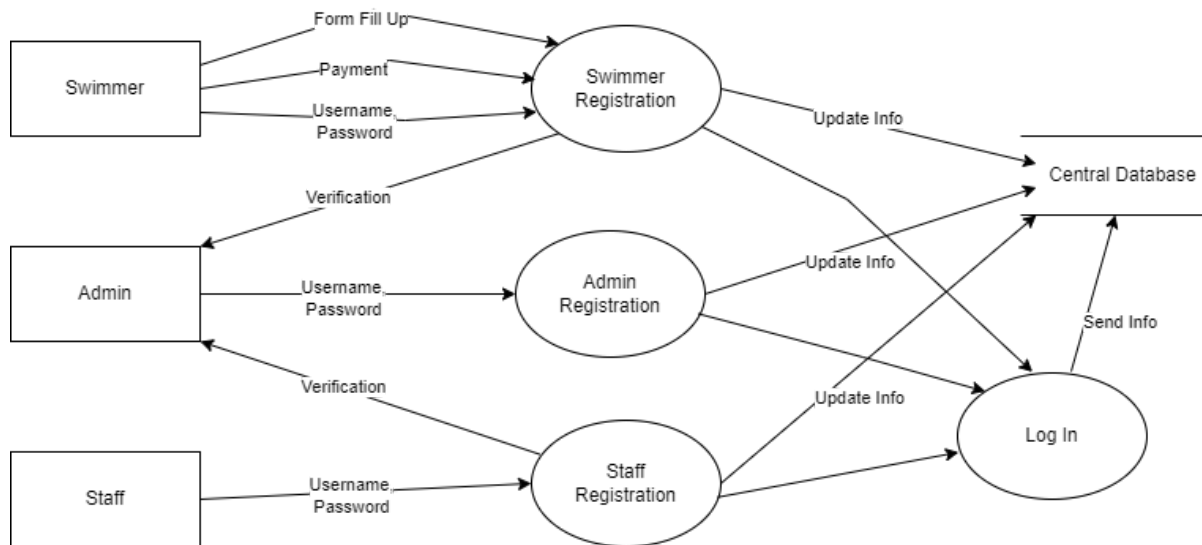
7.3 Level 2
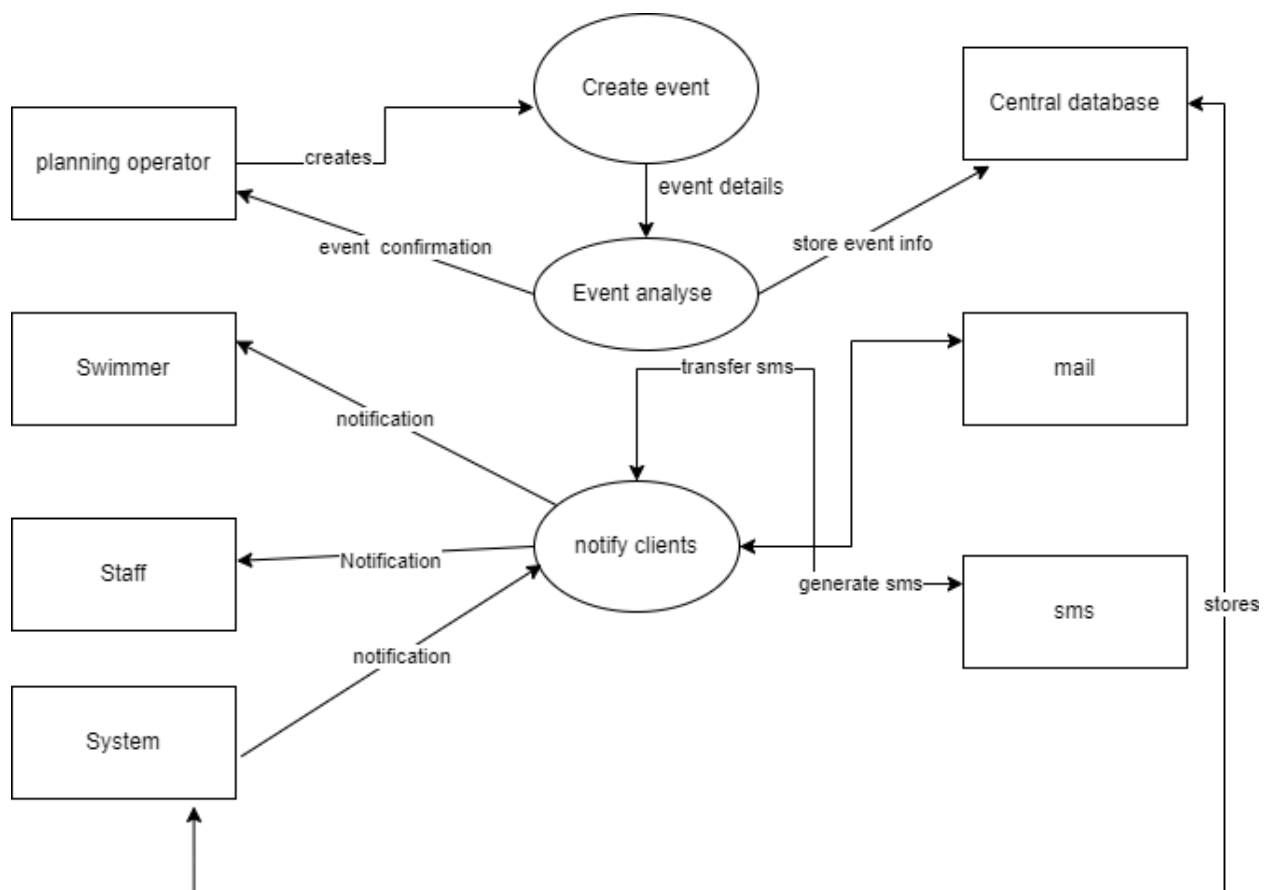
Dashboard

7.4 Level 3

Lesson Management

7.5 Level 4

Payment

7.6 Level 5

Event management

[The End]