SINGAPORE UNIVERSITY OF WATERLOO (SUW)

Administrative System for Automated Timetabling and Attendance Management (ATAM)

Project Specification

January 2026

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1. About Us

Name: Singapore University of Waterloo (SUW)

Mission: To deliver world-class education that empowers students to excel in their chosen fields through innovative teaching, research excellence, and industry collaboration, while fostering critical thinking and lifelong learning in a diverse, inclusive community

Vision: To be a leading global university recognised for academic excellence, groundbreaking research, and graduates who drive innovation and positive change across industries and communities worldwide

Core Business: University
Industry Sector: Education

Key Initiatives: To deliver personalised, industry-relevant education that aligns with students' academic interests and career aspirations, preparing them for success in their chosen fields

2. Project Description

Project Title

Administrative System for Automated Timetabling and Attendance Management (ATAM)

Context

SUW currently relies on a combination of manual scheduling, spreadsheets, and disconnected systems to manage academic timetables and attendance records. As student intake increases and course offerings diversify, these methods have become increasingly error-prone, time-consuming, and difficult to maintain.

Key Challenges include:

- Manual timetable creation that does not scale well across faculties and programmes.
- Inconsistent attendance tracking across modules and teaching staff.
- High administrative overhead when changes occur throughout the semester, like timetable changes and staff reassignments

The university seeks to replace these practices with a centralised administrative platform that supports structured scheduling, controlled access, and reliable attendance tracking. This platform will be used primarily by administrative staff and teaching staff, and must integrate smoothly into existing academic operations without disrupting teaching activities.

Goals

The goal of this project is to digitise and streamline staff scheduling and student attendance tracking, enabling administrators to manage timetables and staff assignments efficiently. The system shall reduce scheduling errors by at least 70% compared to manual methods within the first semester of deployment, while ensuring that attendance can be completed by students in no more than 20 seconds without disrupting lessons. It will also generate attendance reports accurately and be fully deployed to support 300 staff, 60 courses and 7,000 students. These objectives directly address inefficiencies in lecture scheduling and attendance tracking, while supporting institutional goals of improving operational efficiency and academic record accuracy.

3. Biz Ops (BO) Requirements

Below is a set of business operational requirements set out for the Administrative System for Automated Timetabling and Attendance Management System. It is represented in two levels: Level 0 - Top-Level business operations requirement theme, Level 1 - specific business operations requirement sub-level.

Precedence Indices: (Essential/Desirable/Acceptable/Tolerable)

BR - L0 Registration and Staff Onboarding

- **BAA - L1.1 Admin Account (Essential)**
    - Administrative staff shall be responsible for managing and maintaining system configuration and access.
- **BSA - L1.2 Staff Access Management (Essential)**
    - Administrative staff shall be responsible for managing staff access to academic administration functions.
- **BL - L1.3 Log-in (Essential)**
    - Staff shall be able to access academic administration functions according to their role.

- **BP - L1.4 Customise Profile (Tolerable)**
    - The staff shall be able to customise their profile.

- **BAM - L1.5 Account Management (Essential)**
    - The administrative staff shall be able to view all staff accounts and profiles registered

BC - L0 Course Administration

- **BCM - L1.1 Course & Subject Management (Essential)**
    - Administrative staff shall oversee the setup and organisation of all courses and their related subjects.
- **BRE - L1.2 Student Registration & Enrollment (Essential)**
    - Administrative staff shall register students and assign them to the appropriate courses and subjects.
- **BRS - L1.3 Register staff (Essential)**
    - Administrative staff shall assign registered teaching staff to the appropriate courses and subjects.

BT - L0 Timetable Scheduling

- **BC - L1.1 Create slot (Essential)**
    - The admin shall be able to create a slot by specifying its course and subject, date/day, start time, end time (or duration), and location.
- **BAS - L1.2 Automatic scheduling (Desirable)**
    - The application shall generate staff and time-slot suggestions based on defined constraints and availability.
- **BS - L1.3 Assign staff to slots (Essential)**
    - The admin will vet and, if there are any conflicts, the admin is able to manually overwrite the staff members to an available slot.
- **BAT - L1.4 Approve Timetable (Desirable)**
    - The admin shall be able to approve and publish the final timetable to the respective staff.

BA - L0 Attendance Management

- **BRA - L1.1: Record Attendance (Essential)**
    - The teaching staff shall be able to capture and record the student attendance automatically using a QR code during the lesson.
- **BH - L1.2: Track student attendance history (Desirable)**
    - The system shall keep a record of each student's attendance for each lesson.

BM - L0 Monitoring & Reporting

- **BAS - L1.1 View attendance summaries (Desirable)**
    - Staff shall be able to retrieve and review attendance information for administrative and academic purposes.
- **BAR - L1.2 Generate attendance reports (Essential)**
    - The staff shall be able to view attendance reports when requested.

4. IT Technical Requirements

TS-L0 Software

The software shall support secure management of academic administration activities for staff and students.

- **TAS - L1 Application Setup**
    - The application can be run on Android and IOS devices.
- **TAI - L1 App Icon**
    - A web-based application requires an icon
- **TDS - L1 - Data Storage**
    - Web-based application data, such as academic, staff, and student information are stored on a server within university grounds
- **TUA - L1 - URL Address**
    - Web-based application has a specific address/URL within the server

- **TUI - L1 - User Interfaces**
    - The system shall provide user interfaces for administrative staff and teaching staff to perform their academic tasks.
- **TAC - L1 - Access Control**
    - The system shall control access to functions based on user roles.

TH-L0 Hardware

- **TD - L1 - Device Used**
    - Users should be able to access the application on Apple and Android devices
    - Users should be able to assess the application on the website for easy attendance-taking if required

5. Project Cost Structure and Commercial Expectations

SUW expects vendors to propose a comprehensive and realistic cost structure covering the full lifecycle of the Administrative System for Automated Timetabling and Attendance Management. Based on prevailing market rates for enterprise-grade academic systems of similar scope and scale, the total project cost is estimated to be SGD250,000. (To be redacted in the released version.)

Vendors are required to clearly itemise costs and avoid underestimation that may lead to delivery risks, quality issues, or excessive variation requests later in the project.

Expected Cost Categories

Vendors shall provide a detailed breakdown across, but not limited to, the following categories:

1. System Design and Development
2. Testing and Quality Assurance
3. Deployment and Implementation
4. Training and Knowledge Transfer
5. Licensing and Third-Party Services

6. Maintenance and Post-Implementation Support
7. Project Management and Overheads
8. Staff training cost

Payment Schedule (by percentage of total contract value)

10% - Down payment upon contract signing.

20% - Completion of Phase 1 (requirements gathering).

30% - Delivery of prototype and successful pilot testing.

20% - Completion of staff training.

20% - Institution-wide deployment and final acceptance before Trimester 1.

Total: 100%

Contractual Expectations

- Vendor to provide a transparent breakdown of costs in the proposal.
- Vendor to declare licensing obligations for any third-party software or hosting.
- Lump-sum contract with staged partial payments tied to milestones.
- Late delivery penalties may apply if milestones are missed.
- Vendors shall submit bi-weekly written updates and monthly review meetings with SUW representatives, covering completed work, upcoming tasks, risks/issues, and updated timelines. Payments will only be released upon satisfactory progress documentation.

6. Project Delivery Requirements

The system shall be fully deployed, operational, and staff fully trained by the start of Trimester 1 (31 August 2026). The following timeline outlines the expected phases and milestones:

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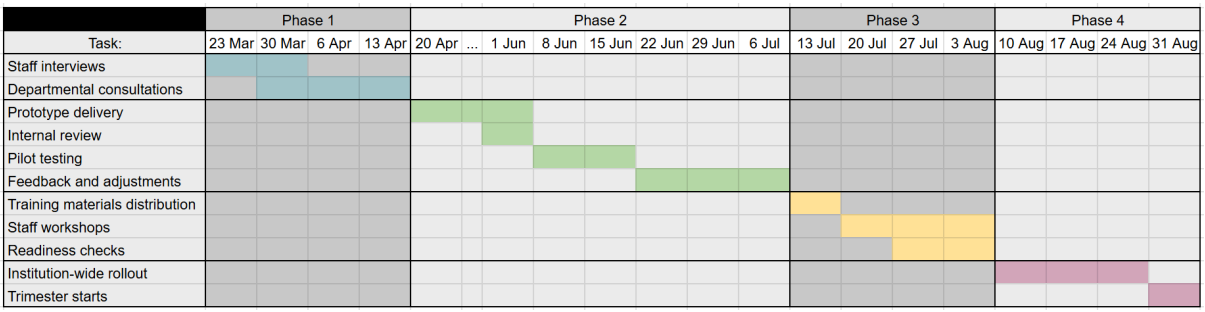
- Phase 1 (Month 1): Requirements gathering, staff interviews, departmental consultations.

    - The vendor is expected to consult/ interview relevant personnel in charge (data administrator/ IT administrator/ academic staff/ students) to gather requirements and relevant information.

- Phase 2 (Months 2–4): Prototype delivery, pilot testing
    - The vendor will make a prototype within the expected deadline, and testing will be conducted with a small sample size of university staff.
- Phase 3 (Month 5): Staff training and readiness.
    - The vendor is expected to provide training documents to be distributed to academic staff.
- Phase 4 (Months 6): Institution-wide deployment before Trimester 1.



7. Sign-Off Section

Authenticator Signature:
Name: _____
Title: _____
Date: _____

Designated Approvers:
_____ (Programme Leader)
_____ (Academic Staff Representative)
_____ (IT Administrator)
_____ (Administrative Office Representative)

8. Addendum & Attachment

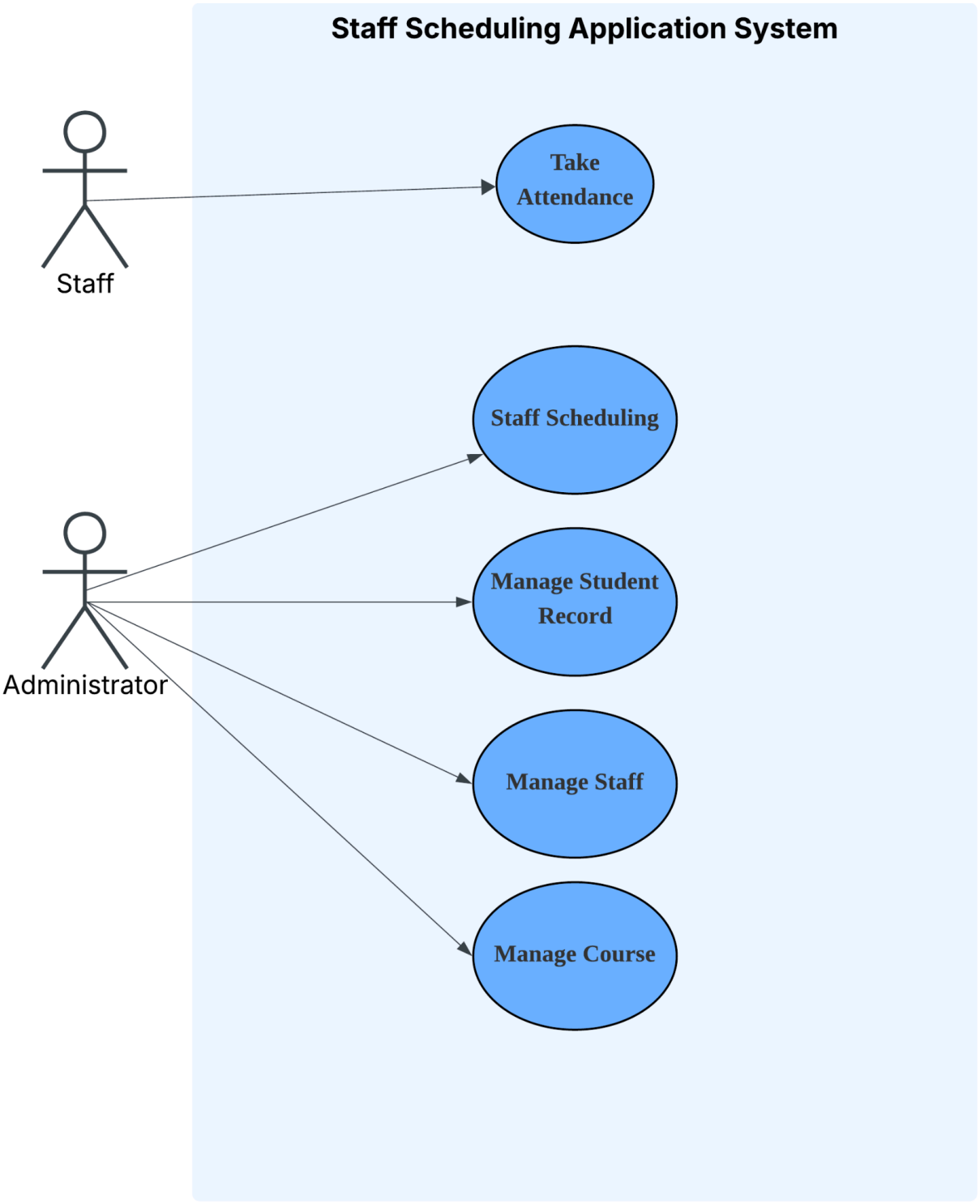
References

[1] N. Tuaycharoen, V. Prodpran and B. Srithong, "ClassSchedule: A web-based application for school class scheduling with real-time lazy loading," *2018 5th International Conference on Business and Industrial Research (ICBIR)*, Bangkok, Thailand, 2018, pp. 210-214, doi: 10.1109/ICBIR.2018.8391194.

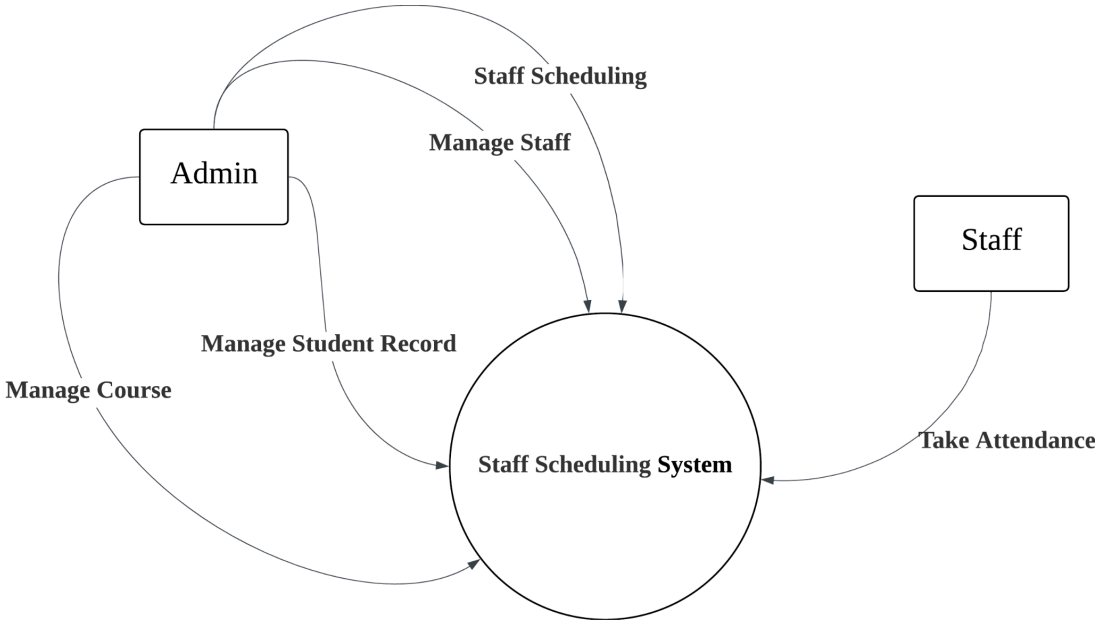
[2]A. B. Filho, A. S. Marcal, G. Costa and P. Pinheiro, "Staff Scheduling Optimization in Information Technology Projects," *2007 International Conference on Service Systems and Service Management*, Chengdu, China, 2007, pp. 1-6, doi: 10.1109/ICSSSM.2007.4280136.

[3]S. Kadry, A. Bagdasaryan and M. Kadhum, "Simulation and analysis of staff scheduling in hospitality management," *2017 7th International Conference on Modeling, Simulation, and Applied Optimization (ICMSAO)*, Sharjah, United Arab Emirates, 2017, pp. 1-6, doi: 10.1109/ICMSAO.2017.7934884.

Use Case Diagram



Data Flow Diagram



Data Dictionary

StaffAccounts
Staff_ID; Staff_Name; Staff_Role; Staff_Profile; Account_Status

Courses
Course_ID; Course_Name

Subjects
Subject_ID; Subject_Name; Assigned_Staff_ID; Course_ID

Timetable Scheduling
Slot_ID; Course_ID; Subject_ID; Date; Start_Time; End_Time; Location; Assigned_Staff; Approval_Status

Students
Student_ID; Student_Name; Course_ID

Student_Attendance
Attendance_Record_ID; Student_ID; Slot_ID; Attendance_Status; Attendance_History

AdminAccount
Admin_ID; Admin_Name; Admin_Role; Admin_Profile; Account_Status

Roles
Role_ID, Staff, Admin