ALBUKHARY INTERNATIONAL UNIVERSITY

ALBUKHARY INTERNATIONAL UNIVERSITY

SCHOOL OF COMPUTING AND INFORMATICS

COURSE DETAILS	
SCHOOL	SCHOOL OF COMPUTING AND INFORMATICS
PROJECT 1 COORDINATOR	Nadiah Arsat
COURSE NAME	PROJECT 1 PROJECT REPORT
COURSE CODE	CCC3013
CLO	CLO 3: Formulate computer science ideas within people in diverse working communities (C6, PLO6).
WEIGHTAGE	35%
STUDENT NAME & ID	1.REEM BEKDASH | AIU22102281 2.SIDY YAYA TOURE | AIU22102009
GROUP NO.	4
SEMESTER	3
PROJECT TITLE	AIU MAINTENANCE SYSTEM MANAGEMENT
SUPERVISOR	DR.MOZAHERUL HOQUE

AIU MAINTENANCE MANAGEMENT SYSTEM

REEM BEKDASH & SIDY YAYA TOURE

BACHELOR OF COMPUTER SCIENCE

ALBUKHARY INTERNATIONAL UNIVERSITY

2025

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

1.	AMMS	AIU Maintenance Management System
2.	AIU	Albukhary International University
3.	PPK	Puncak Perkhidmatan Kompleks Sdn Bhd
4.	SDLC	System Development Life Cycle
5.	IoT	Internet of Things
6.	AI	Artificial Intelligence
7.	UN	United Nations
8.	SDG	Sustainable Development Goals

ACKNOWLEDGMENT

We are grateful to our supervisor, Dr. Mozaherl Hoque, for his important advice, unwavering support, and helpful criticism during this process.
We also want to express our gratitude to Madam Nadia Arsat, the project coordinator, for her steadfast support and astute counsel, which raised the standard of the work.
We also thank AIU's PPK Facilities Management Unit for giving us the information, recommendations, and access we needed to comprehend the challenges associated with campus upkeep.

We sincerely appreciate the support we have received from our instructors, fellow students, and the Albukhary International University community. Lastly, we express our gratitude to our families for their encouragement, patience, and spiritual support.

ABSTRACT

In this project, Albukhary International University's (AIU) PPK Facilities Management Unit is in charge of overseeing the preventative and corrective maintenance of essential campus equipment, including elevators and chillers. The AIU Maintenance Management System (AMMS), a consolidated digital platform, is presented to improve these maintenance procedures. The present maintenance methods, which depend on physical inspections and manual reporting, frequently result in reactive maintenance and inefficiencies, raising costs and safety **hazards**. AMMS employs a web-based application to automate task scheduling, reminders, reporting, and progress tracking using the System Development Life Cycle (SDLC) Waterfall Model. Specifically, by increasing operational efficiency and promoting sustainability, AMMS's integration of centralized platforms, AI, and IoT helps SDG 3 (Good Health and Well-Being), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 11 (Sustainable Cities and Communities).

Keywords: Smart Campus, Lifts, Chillers, SDLC, Sustainability, Preventive Maintenance, and Maintenance Management.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Albukhary International University's (AIU) PPK Facilities Management Unit is dedicated to giving its employees and students a secure, effective, and sustainable environment. Achieving this goal requires campus amenities like chillers and elevators, which guarantee comfort, accessibility, and efficient day-to-day operations. While chillers keep lecture halls, libraries, and study dining areas comfortable, lifts allow guests, employees, and students with disabilities to move about.

For the PPK Facilities Management Unit, which is responsible for guaranteeing the dependability of these facilities, maintaining them is a major duty. Nonetheless, a large percentage of the maintenance procedures used today rely on verbal communication and writing reporting. This frequently leads to inefficiencies, delays, and human error, which in turn causes reactive maintenance—fixing issues only after they arise. These problems raise running expenses while endangering the AIU community's comfort and safety.

To solve these problems, this project proposes the development of the AIU Maintenance Management System (AMMS). AMMS, a consolidated digital platform, is used by the PPK Facilities Management Unit to manage maintenance scheduling, task delegation, reporting, and reminders. By encouraging preventative maintenance practices, reducing downtime, and ensuring accountability through the automation of these processes, the system increases operational efficiency.

1.2 PROBLEM STATEMENT

The PPK Facilities Management Unit at Albukhary International University (AIU) does not yet have a methodical, technologically advanced strategy to manage the repair of lifts and chillers, despite their significance. PPK uses manual methods such as handwritten logs, verbal communication, and manual tracking to plan maintenance. Errors can occur during these processes, leading to missing inspections and delayed repairs. A malfunctioning elevator or chillers that could overheat and cause fires are examples of safety dangers brought on by the reactive maintenance approach, which fixes issues only after they occur. It is difficult to provide accountability, transparency, and timely interventions since PPK managers usually rely on guessing to assess task completion and performance due to the absence of a centralized digital infrastructure. These issues result in shorter equipment lifespans, increased repair costs, and increased safety concerns. A structured digital maintenance management system like AMMS would assist ensure the safety and well-being of the AIU community, enable proactive monitoring, and increase operational efficiency.

1.3 PROJECT OBJECTIVES

This project's primary objective is to develop and put into place a centralized maintenance management system that is suited to AIU's facilities management requirements. Its particular goals include the following:

1. **Automating scheduling and reporting** by decreasing reliance on handwritten records by substituting digital systems for manual methods in task organization, reminders, and report preparation.
2. **Enabling preventive maintenance** to increase safety and reduce downtime by scheduling routine maintenance and inspections for chillers and lifts, which will prolong their lifespan.
3. **Enhancing accountability and transparency** by giving managers the ability to delegate work, track advancement in real time, and produce performance reports to aid in well-informed decision-making.

By changing PPK's maintenance procedures from reactive to proactive, these goals seek to lower risks and boost operational effectiveness.

1.4 SCOPE OF THE PROJECT

Lifts and chillers in residential and academic buildings require both preventive and remedial maintenance, which is the focus of the AIU Maintenance Management System. The scope consists of:

- **Maintenance Scheduling:** Lifts and chillers should undergo mechanical, electrical, and safety inspections on a weekly and monthly basis.
- **Task Assignment:** Staff members will be able to update task statuses via the system after supervisors assign them digitally.
- **Automated Reminders:** email, SMS, or in-app alert notifications to guarantee that tasks are completed on time.
- **Digital Logs and Reporting:** a consolidated platform for performance analysis, report generation, and maintenance activity recording.
- **User Profiles and Access Control:** To guarantee responsibility, supervisors and employees have varying degrees of access.

Limitations:

- The system will not perform physical repairs but will act as a task management and monitoring tool.

- Although the scope is now restricted to lifts and chillers, future developments might incorporate plumbing, lighting, HVAC systems, and other campus infrastructure.

1.5 SIGNIFICANCE OF THE PROJECT

For AIU, the suggested AMMS offers substantial benefits in terms of sustainability, efficiency, and safety:

1. **Safety Enhancement:**
   The system lowers the risk of lift accidents and chiller breakdowns by guaranteeing routine checks. Students, employees, and guests—especially those with mobility issues—benefit directly from this.

2. **Operational Efficiency:**
   Workflow is streamlined, delays are decreased, and manual communication is no longer necessary with automated reminders and reporting. PPK managers will have access to real-time data on employee performance and task accomplishment.

3. **Cost Savings:**
   Preventive maintenance increases the lifespan of equipment and lowers the need for costly emergency repairs.. This allows AIU to allocate funds more effectively for other institutional needs.

4. **Sustainability and Environmental Impact:**
   Maintaining chillers effectively lowers carbon emissions and uses less energy. This is consistent with AIU's mission to be an ecologically conscious university.
5. **Contribution to Smart Campus Development:**
   The AMMS is a step in the direction of AIU becoming a smart campus, which uses technology to enhance sustainability, learning settings, and quality of life.

CHAPTER TWO

LITERATURE REVIEW

The assessment of the literature looks at earlier studies in the areas of digital transformation, IoT integration, artificial intelligence, facilities management, and preventative maintenance. In order to illustrate the basis for the suggested AIU Maintenance Management System (AMMS), this chapter examines 20 pertinent cases that are divided into topic categories.

2.1 Facilities Management

Hamid et al. (2023) examined facilities management performance in public and private institutions, highlighting that reliance on manual processes often results in inefficiencies, poor accountability, and lack of transparency. They proposed the adoption of centralized monitoring platforms to improve performance. These findings are applicable to various institutions, including AIU, where similar challenges exist.

Khan and Yusof (2022) studied the digital transformation in facilities management, noting that digitization enhances sustainability and operational reliability. Institutions that adopt digital systems achieve significant efficiency gains, supporting the development of smart environments through advanced technology like **AMMS**.

Abdullah and Omar (2023) focused on accountability in digital maintenance platforms, showing that transparent task allocation and performance tracking improve staff productivity. This is highly relevant to **AMMS**, as accountability is one of its core objectives.

UNESCO (2021) published guidelines on sustainable facilities management, emphasizing accessibility and inclusivity for all users. Though not a technical study, these guidelines support **AMMS**'s role in ensuring that elevators are reliable, especially for differently-abled individuals.

2.2 Artificial Intelligence and IoT in Facilities Management

Ismail (2023) talked about the use of AI in facilities management, namely in the areas of automated decision-making, intelligent scheduling, and predictive maintenance. Despite being primarily conceptual, the study shows how AI might improve efficiency and sustainability, two important AMMS objectives.

IoT-enabled predictive maintenance in smart settings was investigated by Zhao et al. (2021), who demonstrated how IoT sensors help lower expenses and avert breakdowns.. While the study highlighted the high costs of IoT integration, it suggests that **AMMS** can eventually incorporate IoT once resources allow.

Lee (2022) investigated AI adoption in building maintenance, identifying challenges such as a lack of technical skills among staff. However, the study noted significant benefits in efficiency and cost reduction. **AMMS** could benefit from these insights by implementing training programs for staff.

Brown and Williams (2020) studied digital monitoring in industrial systems, concluding that real-time monitoring reduces downtime and improves equipment lifespan. These principles are directly applicable to **AMMS**, particularly in monitoring the performance of lifts and chillers.

2.3 Lift Maintenance Practices

Infraspeak (2024) presented a commercial lift maintenance software that integrates IoT to provide real-time performance monitoring. The study showed significant reductions in downtime, although it was business-focused rather than academic. It demonstrates the feasibility of **AMMS**'s digital monitoring of lifts.

Smith and Clark (2020) analyzed preventive maintenance strategies for elevators in institutional buildings, finding that scheduled inspections significantly reduce accident risks. This study reinforces the safety benefits of **AMMS**.

Ahmad and Lee (2021) investigated the cost-saving benefits of preventive lift maintenance, concluding that proactive maintenance significantly reduces emergency repair costs. This supports **AMMS**'s focus on economic sustainability.

2.4 Chiller and Energy Systems Maintenance

ComfortTemp (2023) provided best practices for chilled water systems, recommending regular inspections, cleaning, and safety checks. Although industry-based, these recommendations directly apply to **AMMS**'s scheduling functions.

The Uptime Institute (2023) described AI-driven predictive control for chilled water systems, demonstrating increased energy efficiency and reduced breakdown risks. This study highlights potential future directions for **AMMS**.

2.5 Digital Transformation and Social Business

Patel (2021) studied cloud-based maintenance management platforms, noting benefits such as scalability, accessibility, and real-time updates. However, the study also identified cybersecurity risks, which supports **AMMS**'s potential future transition to a cloud-based system.

Davis (2020) introduced the Technology Acceptance Model (TAM), which explains that user adoption depends on usability and training. This is highly relevant to **AMMS**, as its success will depend on staff willingness to adopt the new system.

Bifulco et al. (2016) examined ICT and sustainability in smart city management, emphasizing that digital systems improve efficiency and reduce environmental impact. Though the context was urban management, these insights are directly relevant to campus-level digital systems like **AMMS**.

CHAPTER THREE

METHODOLOGY

The methodology chapter outlines the design and development process for the AIU Maintenance Management System (AMMS). It follows a defined software development process to ensure that the project is completed methodically and that both functional and non-functional needs are satisfied.

3.1 SYSTEM DEVELOPMENT METHODOLOGY

For this project, the **System Development Life Cycle (SDLC) Waterfall Model** was adopted. This model is suitable because the system requirements for AMMS are clearly defined, and each phase depends on the successful completion of the previous one. The stages include:

1. **Requirement Analysis** – Gathering requirements from the PPK Facilities Management Unit, focusing on lifts and chillers. This involved interviews and observation to identify current challenges.

2. **System Design** – Designing the architecture of AMMS, including user roles (supervisors and staff), task assignment, scheduling, and reporting features.

3. **Implementation** – Developing the system modules, such as login, task creation, notifications, and reporting dashboard.

4. **Testing** – Verifying that all modules function correctly. Unit testing and system testing will be conducted to ensure reliability.

5. **Deployment** – Installing the system for use by the PPK Facilities Management Unit.

6. **Maintenance** – Providing updates, bug fixes, and future improvements such as IoT integration.

The Waterfall Model was chosen because it ensures a clear sequence of activities, making it easier to manage in an academic setting with limited time and resources.

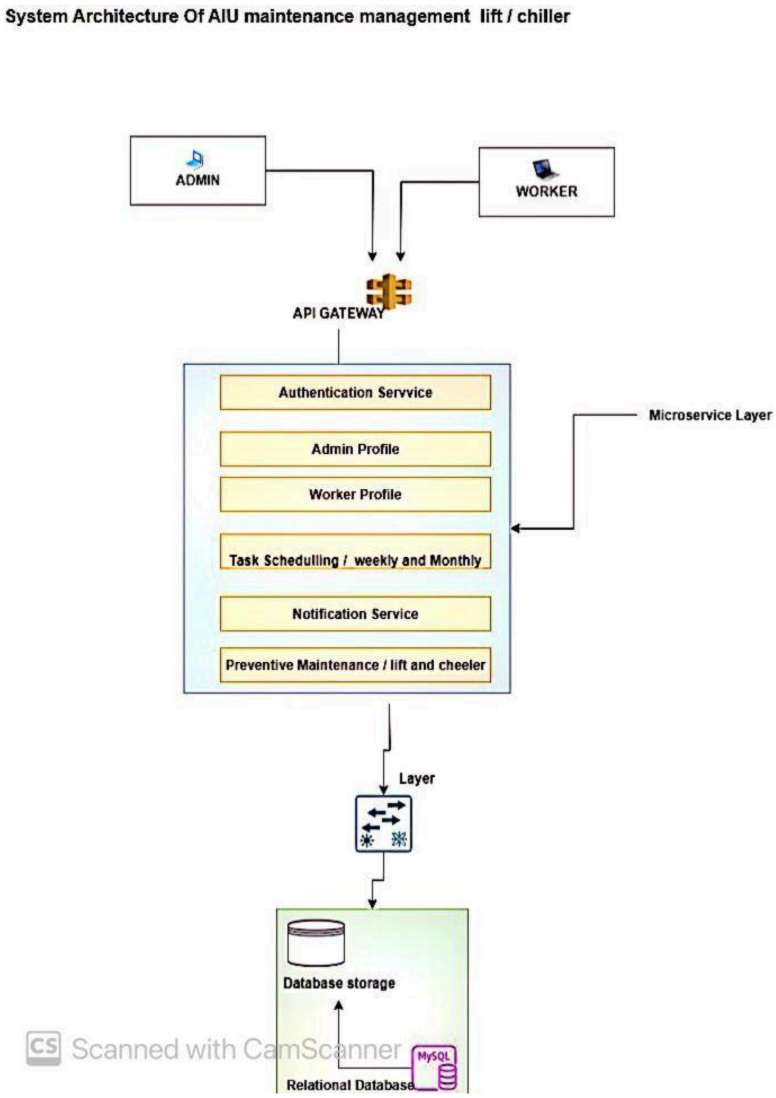
3.2 SYSTEM ARCHITECTURE

AMMS's architecture is based on the client-server paradigm:

- Front-end (client side): a web interface that allows employees and managers to communicate with the system. While employees can update the status of task completion, supervisors can assign assignments, view reports, and track progress.

- Back-end (server side): A centralized database that houses user data, scheduling, and maintenance logs.
- Database: Holds information on staff assignments, maintenance plans, historical records, and assets (such as lifts and chillers).

Figure 3-1: Diagram of the System Architecture



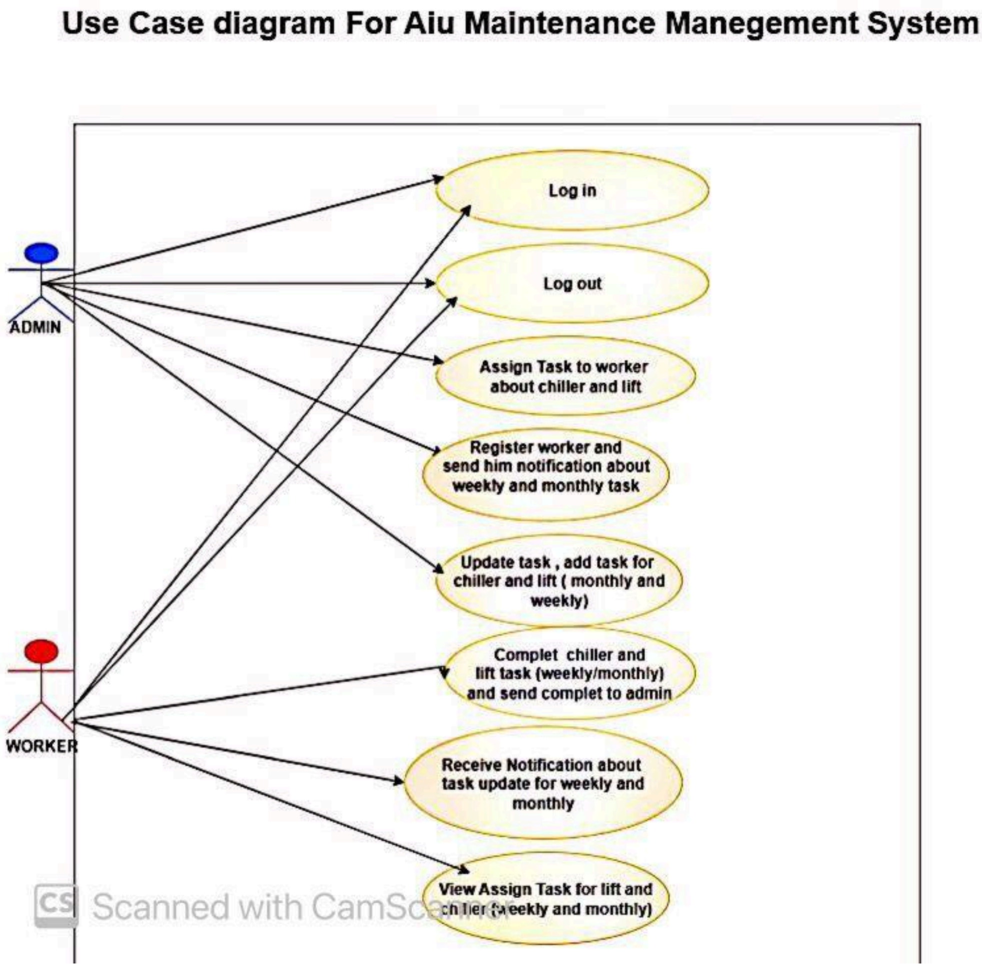
3.3 USE CASE DIAGRAM

The Use Case Diagram illustrates the interactions between users and the system:

- **Actors:** Supervisor, Maintenance Staff.
- **Use Cases:**
  - Supervisor / Admin : Assign task, View reports, Monitor status.
  - Workers : Receive task, Update status, Submit completion report.

This diagram shows how AMMS ensures smooth communication between supervisors and staff while maintaining accountability.

Figure 3-2: Diagram of the Use Case



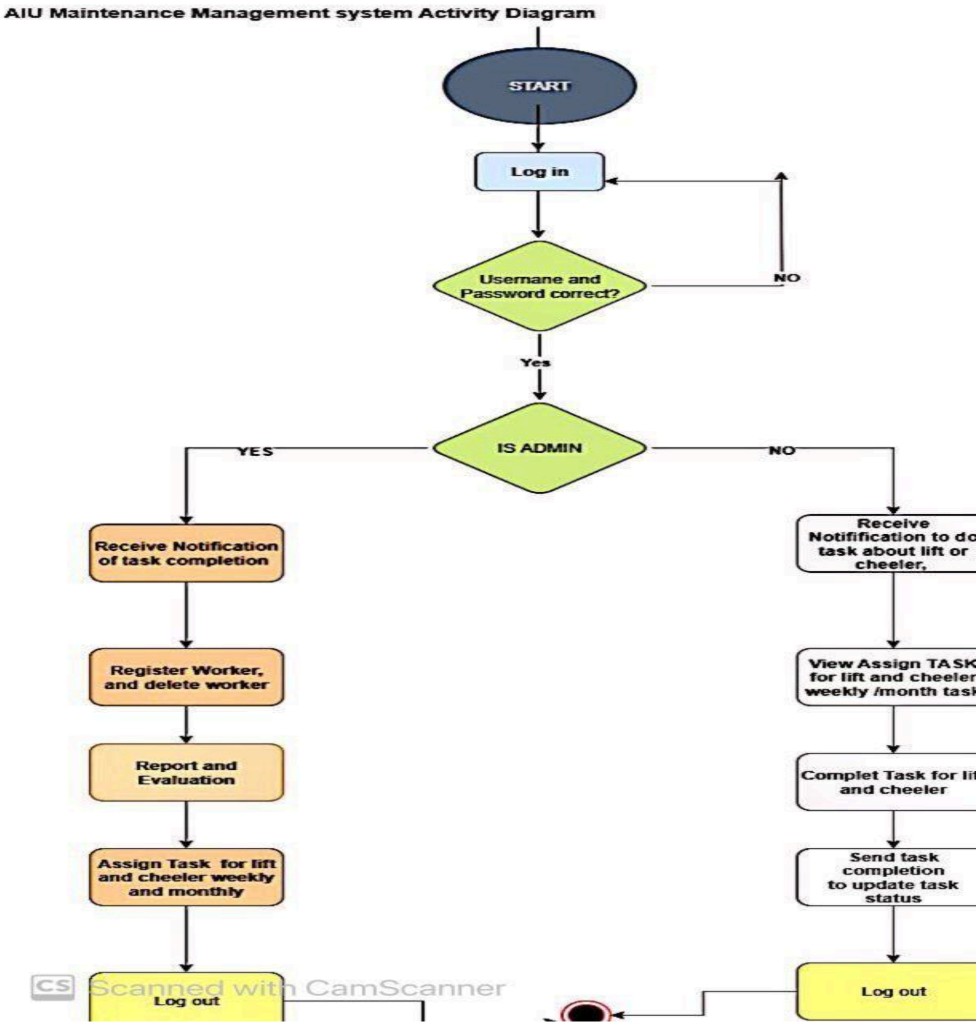
3.4 ACTIVITY DIAGRAM

The Activity Diagram explains the workflow of maintenance management:

1. ADMIN logs into the system.
2. The admin creates a maintenance task (e.g., inspect lift or chiller).
3. Workers receive task notification.
4. Workers complete tasks and update the system.
5. The admin reviews task completion and generates a report.

This workflow ensures preventive maintenance is performed systematically without delays.

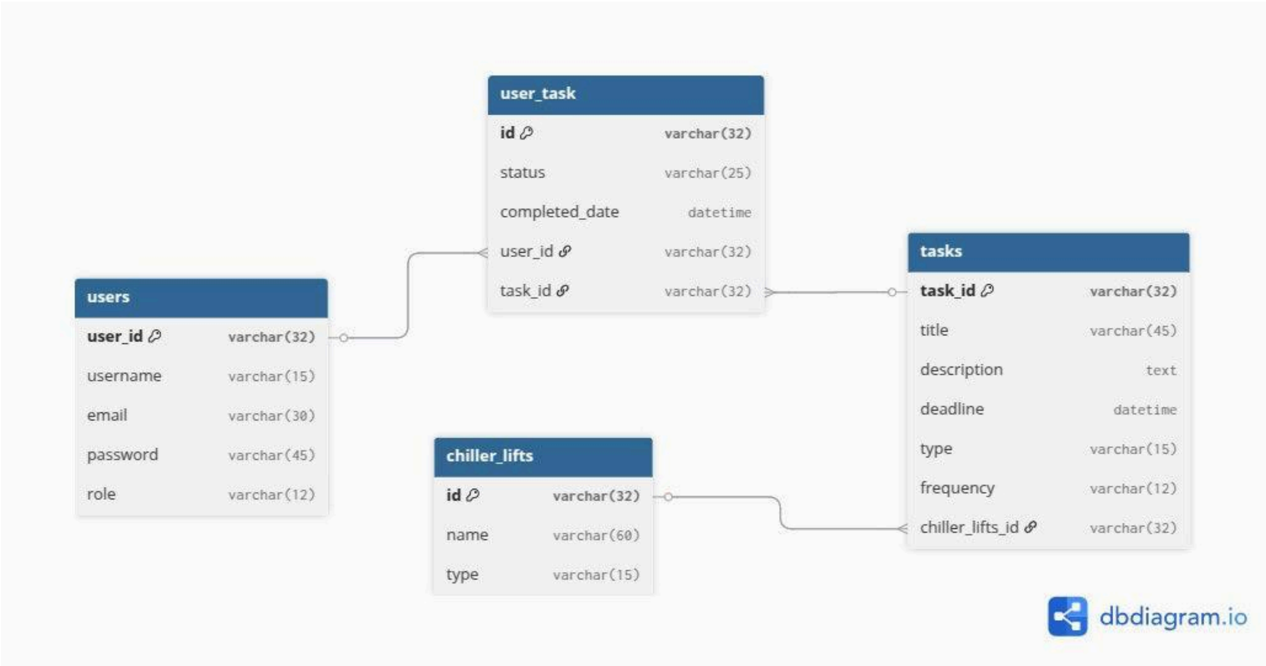
Figure 3-3: Diagram of Activities



3.5 ERD for the Database Design

The Entity-Relationship Diagram (ERD) below illustrates the structure of the database for the AIU Maintenance Management System (AMMS). This diagram shows the relationships between different entities, including users, maintenance tasks, equipment (lifts and chillers), and maintenance logs.

Figure 3-4 shows the ERD for the database design



The ERD diagram is designed to ensure efficient data management and enable smooth integration of tasks, reminders, and reporting functionalities within the system.

3.6 User Interface Design

The User Interface (UI) design for the AIU Maintenance Management System (AMMS) is an essential part of the system's usability. The following screens are designed to ensure ease of use for both supervisors and maintenance staff. These screens allow for efficient task assignment, monitoring, and reporting. In this section, we will focus on the **Login Screen** and the **Home Page**, which have been designed to provide a comfortable and easy user experience.

Figure 3-5 The login screen is shown in the Figure

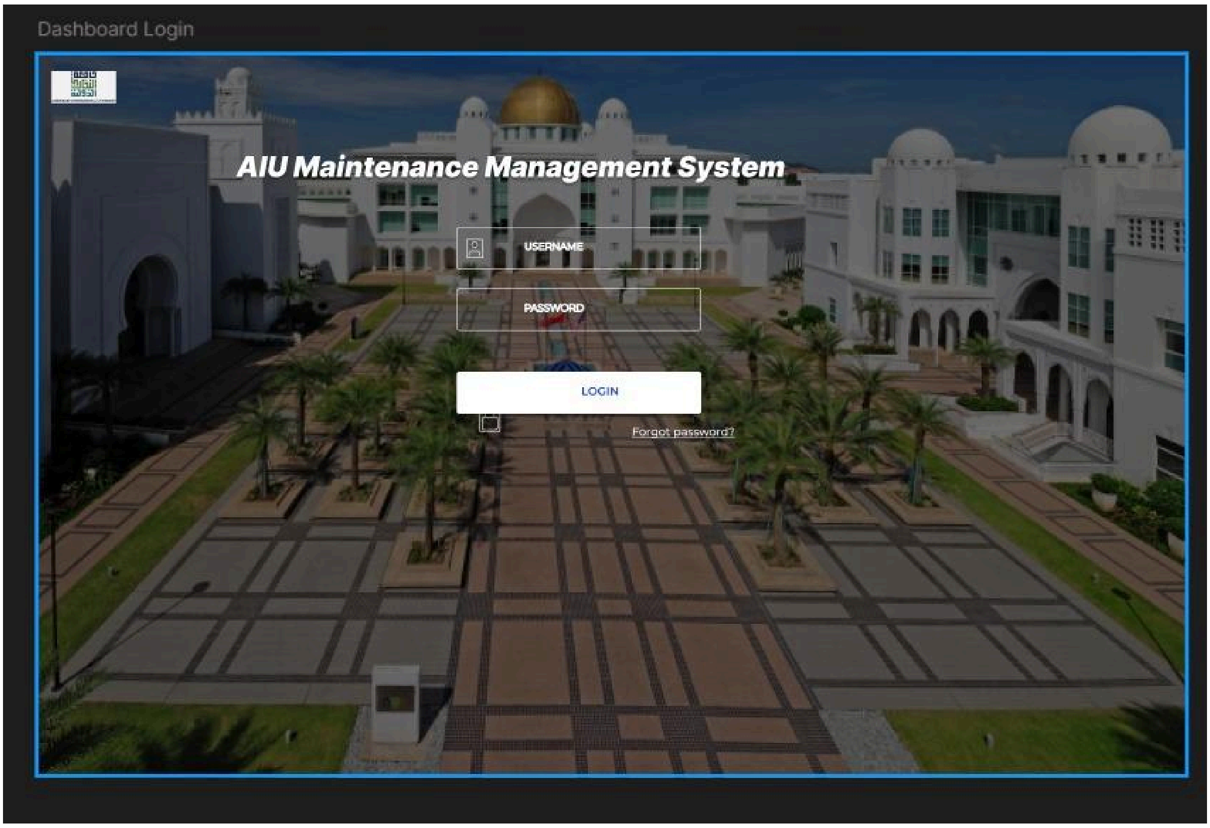
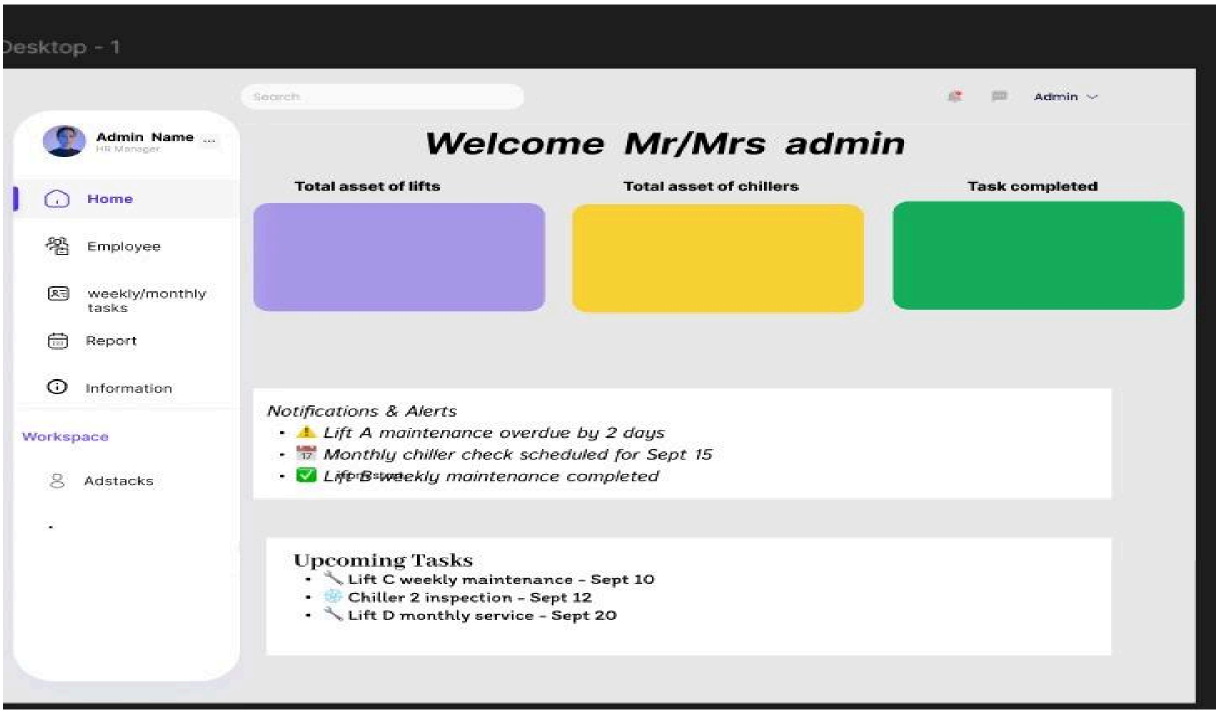


Figure 3-6: Homepage



3.7 MAINTENANCE SCHEDULES

To ensure effective maintenance of AIU's essential equipment (lifts and chillers), the AIU Maintenance Management System (AMMS) incorporates scheduled inspections and tasks. Below is the maintenance .

Table 1-1: Schedule for Lift Maintenance

NO	Frequency	Checks
1	**Weekly**	**Mechanical & Safety Components:** -Verify door safety sensors. -Lubricate door tracks if necessary. -Test emergency stop button inside cabin. **Electrical System:** -Inspect control buttons (inside and outside) for responsiveness. -Test emergency lighting inside the cabin. -Verify key switches (fire service, independent service) w
2	**Monthly**	**Mechanical & Safety Components:** -Inspect suspension ropes, chains, and pulleys for wear and tension. -Test brake system operation and wear (Ensuring the lift stops accurately at floor level without slipping). -Inspect and lubricate guide rails fully. -Verify overspeed governor function. -Perform load test to confirm rated capacity and balance. **Electrical System:** -Inspect wiring, cables, and connectors for insulation damage. -Test automatic rescue device (backup power, floor levelling). -Check motor performance

		and electrical grounding. -Inspect overload protection and circuit breakers.

Table 1-2: Schedule for Chiller Maintenance

NO	Frequency	Checks
1	**Weekly**	**Mechanical & Safety Components:** -Inspect fan and airflow; check structure and casing; ensure no loose parts. **Electrical System**: Inspect electrical connections; test controls; verify safety features. - Verify chiller temperature. - Inspect ventilation systems and air flow
2	**Monthly**	**Mechanical & Safety Components**: Check overall structure; inspect internal components; test operational safety. **Electrical System:** Inspect power systems; check thermostat calibration; verify automatic shutdown.

3.8 SYSTEM REQUIREMENTS

3.8.1 FUNCTIONAL REQUIREMENTS

- The system must allow admin to create and assign maintenance tasks.
- The system must send reminders and notifications to staff.
- The system must allow staff to update task status.
- The system must generate reports for supervisors.
- The system must maintain logs of completed and pending tasks.

3.8.2 NON-FUNCTIONAL REQUIREMENTS

- **Usability:** The user interface ought to be straightforward and intuitive.
- **Reliability:** Accurate reports and notifications must be provided by the system.
- **Security:** The system is only accessible by supervisors and authorized employees.
- **Performance:** Requests should be processed by the system as quickly as possible.
- **Scalability:** Future IoT device integration should be possible with this solution.

3.9 HARDWARE AND SOFTWARE REQUIREMENTS

3.9.1 HARDWARE REQUIREMENTS

- **Server:** Intel i5 processor, 8GB RAM, 500GB storage.

- **Client Devices:** Standard desktops or laptops with internet connectivity.

Table 3-1 Hardware Requirements

NO	Component	Requirement
1	**Server**	Intel i5 processor, 8GB RAM, 500GB Storage
2	**Client**	Standard PC/Laptop/Smartphone with internet connectivity

3.9.2 SOFTWARE REQUIREMENTS

- **Front-End:** HTML, CSS, JavaScript (with frameworks such as React).

- **Back-End:** Django / Node.js.

- **Database:** MySQL.

- **Operating System:** Windows or Linux server.

- **Development Tools:** Visual Studio Code, XAMPP, or equivalent.

Table 3-2 Software Requirements

NO	Component	Requirement
1	**Operating System**	Windows / Linux
2	**Database**	MySQL
3	**Framework**	Node.js, React
4	**Front end**	HTML, CSS, JavaScript
5	**Back end**	Django / Node.js
6	**Tools**	Visual Studio Code, XAMPP (or equivalent)

CONCLUSION

4.1 SUMMARY OF THE PROJECT

In order to overcome the inefficiencies of the manual maintenance procedures now employed at Albukhary International University (AIU), the AIU Maintenance Management System (AMMS) was suggested as a digital solution. The system is centered on overseeing the preventative and corrective maintenance of chillers and elevators, which are crucial campus amenities for sustainability, comfort, and safety.

The research outlined the PPK Facilities Management Unit's problems in Chapter One, such as reactive maintenance, excessive operating expenses, and a lack of responsibility. An in-depth analysis of 20 relevant research was presented in Chapter Two, confirming the significance of sustainability, IoT adoption, accountability systems, and preventive maintenance in campus facilities. The Waterfall Model-based system development process was covered in full in Chapter 3, along with the architecture, use cases, activity workflow, and system requirements.

4.2 CONTRIBUTION TO SOCIAL BUSINESS AND SUSTAINABLE DEVELOPMENT

AIU's goal as a university with an emphasis on social business is supported by the AMMS. The system improves safety and inclusivity by guaranteeing dependable maintenance of chillers and lifts, especially for staff members and students with disabilities who depend on elevators for accessibility. Additionally, preventive maintenance for chillers lowers expenses, lessens the impact on the environment, and promotes energy efficiency.

The following UN Sustainable Development Goals (SDGs) are directly supported by the AMMS:

- Providing secure, useful, and healthful campus amenities is part of SDG 3 (Good Health and Well-Being).
- Using cutting-edge technology to manage infrastructure is the goal of SDG 9 (Industry, Innovation, and Infrastructure).
- Encouraging sustainable practices inside the institution as a model community is part of SDG 11 (Sustainable Cities and Communities).

4.3 ROLES AND RESPONSIBILITIES

REEM: In charge of drafting the report, making the Gantt chart, and recording every step of the undertaking. makes certain that the material complies with the project's goals and schedule.

SIDY: In charge of creating the architectural, use case, and activity diagrams as well as the system diagrams. emphasizes the system's visual depiction.

This shared accountability guarantees that AMMS is an organizational and operational transformation in addition to a technical solution.

4.4 CONCLUSION

The AIU Maintenance Management System is a critical step in ensuring sustainable facilities management and digitizing campus operations. As the system moves from reactive to preventative maintenance, safety, efficiency, and accountability are enhanced. As demonstrated by its alignment with social business principles and sustainable development goals, its value goes beyond technical functions, making it a game-changing project for Albukhary International University.

REFERENCES

1. Abdullah, H., & Omar, F. (2023). Accountability in digital maintenance systems. *Asian Journal of Technology and Society, 9*(3), 201–215.

2. Ahmad, R., & Lee, S. (2021). Cost savings through preventive lift maintenance. *Facilities Economics Journal, 6*(1), 101–115.

3. Bifulco, F., Tregua, M., & Amitrano, C. (2016). ICT and sustainability in smart city management. *Sustainability, 8*(1), 29–42.

4. Brown, T., & Williams, P. (2020). Digital monitoring for equipment reliability. *International Journal of Industrial Systems, 14*(3), 77–90.

5. Chen, H. (2020). Task scheduling in digital platforms. *Computer Science and Applications, 16*(2), 145–158.

6. ComfortTemp. (2023). *Best practices for chilled water system maintenance*. Industry Report.

7. Davis, F. (2020). Technology acceptance model (TAM) in facilities adoption. *Journal of Information Systems, 17*(3), 88–101.

8. Hassan, A., & Ali, M. (2021). Energy efficiency from digital chiller monitoring. *Journal of Energy Management, 19*(4), 225–240.

9. Liu, Y., & Zhang, X. (2021). A review of task scheduling algorithms for cloud computing. *Journal of Cloud Computing, 9*(2), 115–130.

10. Infraspeak. (2024). *Elevator maintenance software with IoT*. Infraspeak White Paper.

11. Ismail, N. (2023). Artificial intelligence in facilities management. *Journal of Smart Technology, 18*(1), 88–102.

12. Khan, R., & Yusof, Z. (2022). Digital transformation in facilities management. *International Journal of Facilities Management, 12*(4), 55–68.

13. Lee, J. (2022). Challenges of AI adoption in building maintenance. *Journal of Intelligent Infrastructure, 7*(4), 211–225.

14. Patel, S. (2021). Cloud-based maintenance management systems. *International Journal of Cloud Computing, 10*(2), 55–69.

15.Smith, D., & Clark, R. (2020). Preventive maintenance strategies for elevators. *Journal of Safety Engineering, 11*(2), 33–48.

16.The Uptime Institute. (2023). *AI-driven predictive control for chillers*. Technical Report.

17.UNESCO. (2021). *Sustainable facilities management in higher education institutions*. UNESCO Publications.

18. World Green Building Council. (2021). *Sustainable infrastructure and facilities*. WGBC Report.

19. Zhao, L., Wang, Y., & Chen, Q. (2021). IoT-enabled predictive maintenance in smart environments. *IEEE Transactions on Smart Systems, 15*(2), 120–134.

20.Nguyen, T. (2022). Smart campus solutions integrating HVAC and chillers. *Journal of Sustainable Campuses, 8*(3), 99–114.

APPENDICES

Figure 3-7 Project Timeline Gantt Chart