SWE30010 - Managing IT Projects

TASK 07: PROJECT PROPOSAL

HUMAN RESOURCE MANAGEMENT WITH ATTENDANCE SYSTEM

Group 2

GROUP 2 INFORMATION

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Project Proposal:

Human Resource Management system with Biometric Attendance System

1) Background / Problem Description

Gemadept, a leading logistics and shipping company headquartered in Ho Chi Minh City, Vietnam, is requesting a HRM software to streamline HR processes, check attendance of employees, employee management, and improve overall organizational efficiency. The primary objective of this proposal is to introduce a robust Human Resource Management (HRM) system tailored specifically for Gemadept. This proposal aims to establish the creation of a comprehensive HRM infrastructure, spanning the stages of design, development, and maintenance.

2) Scope

a) Objectives

The main goal of this solution is to build a complete HRM system that is further improved by adding a fingerprint scanner-based biometric attendance system. With the use of this technology, the HR department can precisely track when employees clock in, which makes it possible to calculate their actual work hours for a variety of purposes, including payroll and performance reviews. As a result, this is an improvement over conventional HRM systems, where regulation is lax, and attendance is frequently not formally documented.

b) Solutions

To achieve the objectives listed, this software will include but not limited to these key features:

- **Employee Information Management:** Centralized database for storing and managing employee data, such as personal details, employment history, and contact information.
- **Recruitment and Applicant Tracking:** Tracking of applied applications and managing the recruitment pipeline.
- **Onboarding and Offboarding:** Structured procedures for integrating new hires into the organization and managing the exit process for departing employees.
- **Payroll Management:** Adjustable automated calculation of employee salaries, deductions, and taxes.
- **Time and Attendance Tracking:** Uses a fingerprint scanner for monitoring employee attendance, tracking work hours, etc.
- **Reporting and Analytics:** Generation of customizable reports and dashboards to provide insights into employee's information and status.
- **Performance Management:** System for setting performance goals, conducting evaluations, and providing feedback to employees.
- **Learning and Development:** Scheduling training sessions and tracking employee progress in skill development.
- **Integration with Existing Systems:** Integration with other business systems such as ERP and accounting software.

3) Stakeholders

Stakeholder	Interest
Management	Oversee the implementation and usage of the HRM system and expect it to deliver the desired outcomes, which include smooth operation, effectiveness, and fit business functions.
HR Department	Primary users of the HRM software. A more efficient and effective HRM system is expected to streamline their operation and maximize their efficiency in their daily endeavor.

Employees	With the new HRM system, employees can focus more on working on their projects, as this application shall reduce the time it takes to manually input data on their own.
IT Department	Involved in the implementation and maintenance of the HRM software, ensuring the compatibility with existing infrastructures, addressing technical issues, and providing support to users.
Software Vendor	Assists Gemadept IT and business users with maintenance, updates, and issues of the product. They would also ensure to deliver a high-quality product that meets the requirements, standards, and expectations of Gemadept.

4) Deliverables and schedule

a) Deliverables overview:

Our goal is to develop a comprehensive prototype that includes both the HRM application and the fingerprint scanner. The application will be accessible via a website and will have the capability to store, update, and remove employee information. To ensure scalability, we will store data from both the website and the scanner in a scalable database.

b) Schedule:

This project is expected to take around 12 weeks (3 months) to completed and the timeline for each stage of the project is outlined as follow:

- System Design and Prototyping: 2 weeks.
- Development and Testing: 6 weeks.
- Implementation and Training: 4 weeks.
- Post-implementation support and maintenance: On-going from go live date.

Initial Release Schedule

No.	Item	Dependencies	Business Value (1 least – 10 most)	Release Schedule (Sprint 1 | 2 | 3 | …)
F1	Product UI/UX Design	None	7	Sprint 1
F2	Website for HRM	None	9	Sprint 1
F3	HR database schema design	F2	8	Sprint 1
F4	Manager Portal	F1, F3	7	Sprint 1
F5	Employee Feedback and Survey Module	F1, F3	6	Sprint 2
F6	Employee information form implementation	F3	8	Sprint 2
F7	Fingerprint scanner implementation/installation	F3	8	Sprint 2
F8	Recruitment module development	F3	7	Sprint 2
F9	Payroll calculation module development	F3	7	Sprint 2
F10	On and Offboarding template implementation	F3, F6	6	Sprint 3
F11	Leave request feature implementation	F3, F6	6	Sprint 3

F12	Performance evaluation module development	F3, F6	6	Sprint 4
F13	Implement reporting dashboard	F9	8	Sprint 4

5) Solution Direction

a) Discussion of alternative solutions

In this section, we will explore different solution directions such as web-based applications, desktop-based applications, mobile applications or hybrid solutions(web + mobile). Considering the unique requirements of HRM and attendance management, we decided to develop a web-based application, other alternatives were discarded due to the following limitations:

Alternative	Discard reasons
Desktop-based application	● Tie users to specific workstations, limiting their ability to work remotely or access HRM features from different devices. ● Require manual updates on each machine where they are installed. ● Attendance systems can be susceptible to time fraud, such as “buddy punching,” where employees clock in for absent colleagues. ● Rely on local hardware and infrastructure, making them less flexible for distributed teams or remote work. ● May lack the robust security features found in modern web or mobile apps. ● Ensuring data security and privacy on individual workstations can be challenging.
Mobile application	● Mobile apps are vulnerable to malware, data breaches, and unauthorized access. ● Mobile apps may not work on all devices (e.g., older phones, different operating systems). ● Approval process and restrictions can be time-consuming. ● Updates and compatibility issues across various devices.

Hybrid solution	● Integrating web and mobile components can be challenging. ● Requires managing both web and mobile aspects. ● Hybrid solutions may not perform as well as native apps.

The Web-Based Application offers the best balance of flexibility, scalability, ease of maintenance, and security. It supports remote work, aligns with modern work practices, and has existing successful competitors. While other solutions have merits, the web-based approach provides the most comprehensive benefits for HRM and attendance management.

b) The KoST Analysis of My Knowledge

i) Knowledge *(what you know)*

Required knowledge:

- **Web-based application**: Proficiency in HTML, CSS, and JavaScript for creating user interfaces, knowledge of server-side programming languages such as Python, Java or Node.js
- **Desktop-based application**: Proficiency in C++, Java, and C#.
- **Hosting server**: Expertise in server management, networking, databases, and understanding of hosting services.
- **Biometric Integration**: Learn about integrating biometric devices (e.g., fingerprint scanners) with your application. Understand how to capture and process biometric data securely.
- **HR Management Basics**: Possess basic knowledge of HR management through engagement in volunteer operations involving personnel allocation and administration.

My team's Knowledge:

- All of our team members had enrolled in two web development courses; hence, they can understand the basic understanding of HTML, CSS, JavaScript and PHP.
- One of our team members has enrolled in IoT programming and can develop IoT related projects.
- Two of us were enrolled in the AWS architecture designing course. Which prompts understanding of networking, DBMS and hosting services.
- One team member is in the HR sector of a club. Which helps with our domain problem.

ii) Skills *(your experience)*

Required skills:

Technical Skills:

- Understanding of responsive design principles.
- Ability to develop APIs for communication between front-end and back-end.
- Familiarity with database management (e.g., MySQL, PostgreSQL, or MongoDB).
- Understanding of server inspection and deployment into production environments.
- Knowledge of how to acquire necessary infrastructure (e.g., cloud hosting, virtual servers).
- Experience in creating intuitive and user-friendly interfaces for HRM applications.

Domain knowledge:

- Understanding of HR functions related to attendance tracking, leave management, and payroll.
- Understanding of the benefits and challenges of using biometrics for attendance management.
- Familiarity with HRM processes specific to attendance, employee records, and time tracking.
- Knowledge of how biometric attendance fits into the overall HR ecosystem.

My team's skills:

- All of us have created and hosted a few websites as our side and university projects.
- One of us had UX/UI designing experiences and is proficient in Adobe XD, Figma.
- Another one had created and managed databases using SQL developer by Oracle.
- The IoT proficient members had built various IoT machines that function well.
- We have had experience observing the HRM pipeline and process of a club.

iii) Technology *(existing solution)*

Various contemporary technologies and solutions can be leveraged to develop web-based HRM systems. Key among these are:

- **Proprietary HRM Software**: Esteemed companies such as SAP (SuccessFactors), Oracle (Oracle HCM Cloud), and Workday present comprehensive HRM suites encompassing diverse HR functions. These solutions typically include modules for core HR, talent management, workforce planning, payroll, benefits administration, and analytics.
- **Cloud-based HRM Platforms**: Scalable and adaptable solutions for managing HR processes are offered by cloud-based HRM platforms like BambooHR, Namely, Zenefits, and Gusto. These platforms commonly feature employee self-service portals, tools for onboarding and offboarding, performance management, time and attendance tracking, as well as compliance management.
- **Open-source HRM Solutions**: Flexibility and customization are core benefits of open-source HRM solutions, making them ideal for constructing web-based HRM applications. Well-regarded open-source HRM frameworks and platforms include OrangeHRM, Sentrifugo, IceHrm, and Odoo HR. These solutions provide modules for managing employee information, leave management, attendance tracking, and more.
- **HRM Modules within ERP Systems**: Enterprise Resource Planning (ERP) systems like Microsoft Dynamics 365 and SAP ERP often include HRM modules alongside other business functions such as finance, supply chain, and manufacturing. These integrated solutions provide a unified platform for managing HR processes within the broader context of organizational operations.

c) Rationale

After a gap analysis using the KsoT framework and a comparison analysis of several solutions, the following factors suggest that creating a web application is the best course of action for this project:

- Web-based apps can be easily integrated and blended in with the existing system because they are easily accessible from a variety of devices and have an intuitive interface.
- The platform can grow to meet the needs of its users thanks to the scalability features offered by Firebase and Google cloud.
- Our team is fairly competent in producing a project this scale.

d) Final Solution

- The HRM application will be developed as a web-based application with a front-end built with Vue JS and a back-end utilizing a combination of Node Js and Express Js.
- The HRM Application will be developed using Nginx Web Servers, with Firebase hosting the back end. This combination will ensure the necessary scalability and reliability for this project.
- Google Spreadsheet on Google Cloud will be utilized to store user data due to its exceptional capacity to manage vast amounts of data. Additionally, Google's security and compliance measures are of the highest caliber, helping to safeguard critical user information.

e) Architecture Design

i) High Level Design

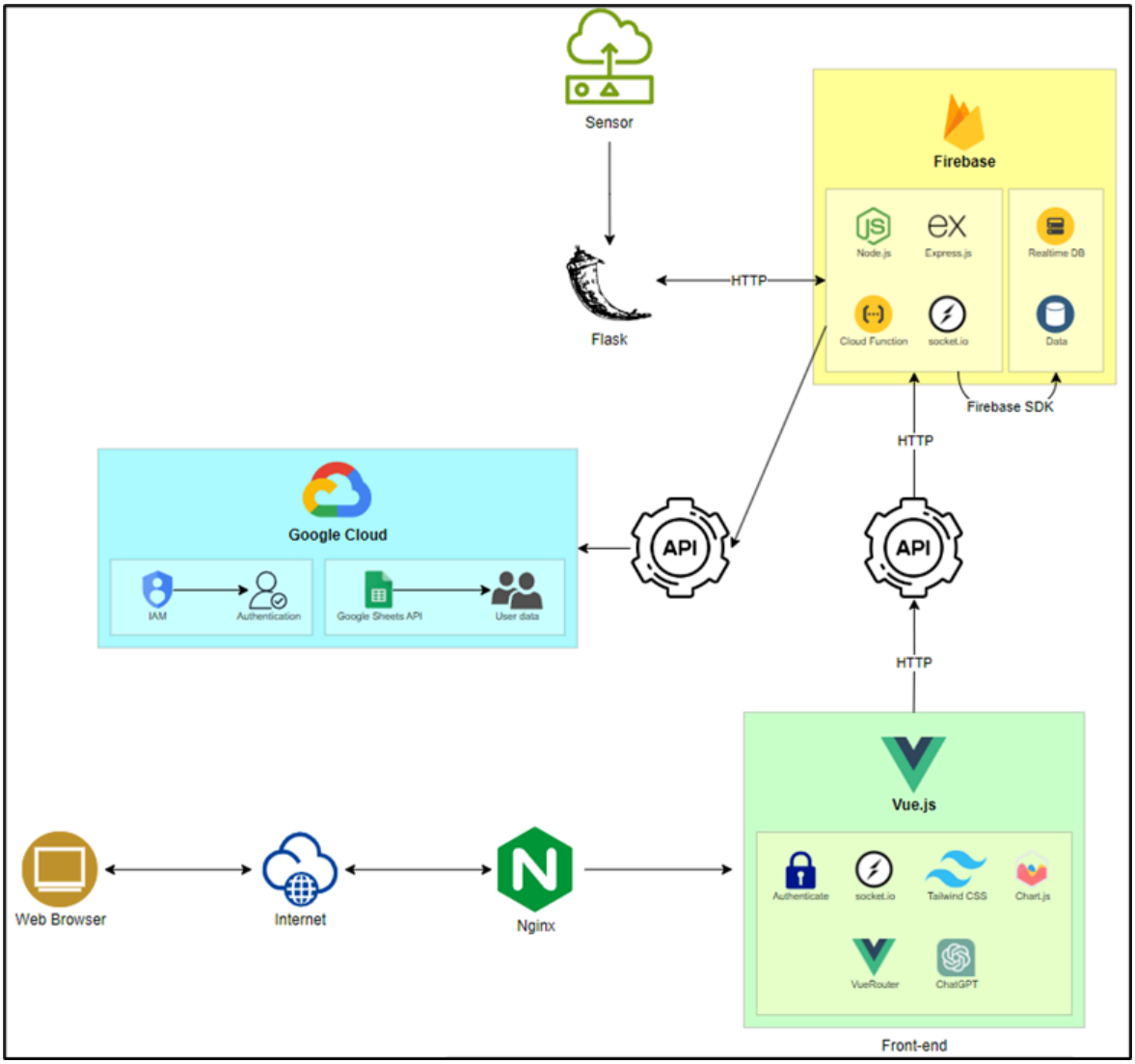


Figure A: 3-tier Website Application Design

TIER 1: PRESENTATION

- **Cloudflare:** Provides secure DNS and website optimization services.
- **Vue.js:** A progressive JavaScript framework for building user interfaces.
- **Vue Router:** For client-side routing within the Vue.js application.
- **Vuex:** State management library for Vue.js applications.
- **Vue Auth:** Authentication library for handling user authentication.
- **Socket.io:** Enables real-time client-server communication for notifications.
- **Tailwind CSS / Bootstrap:** CSS frameworks for styling user interfaces.
- **Chart.js:** JavaScript library for creating charts and graphs.

TIER 2: APPLICATION

Application 1:

- **Flask:** A micro web framework written in Python.
- **Biometric Attendance:** Module for retrieving employee attendance using biometric data.
- **Flask API:** Creates APIs to facilitate communication between servers.

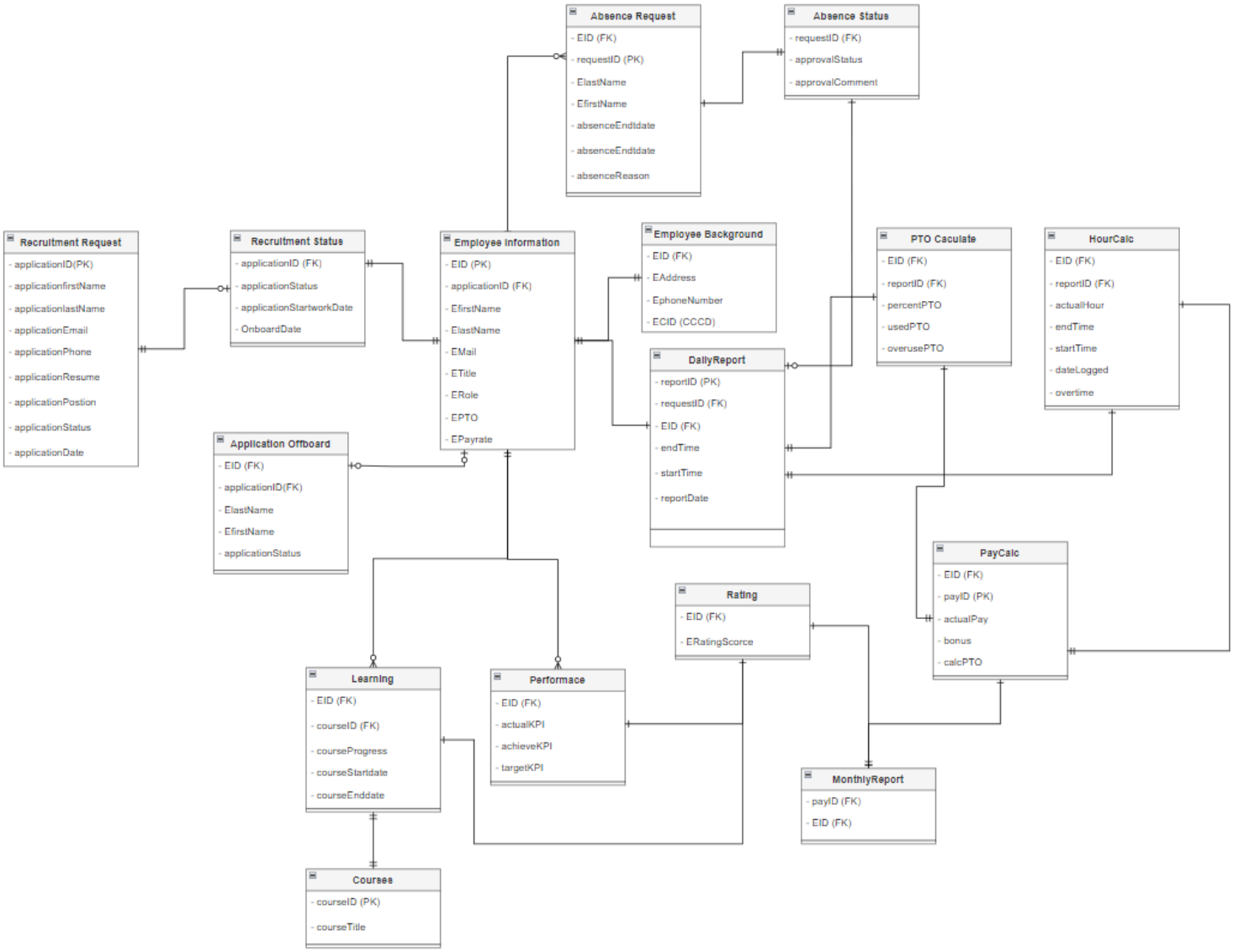
Application 2:

- **Node.js:** A JavaScript runtime environment for executing server-side code.
- **Express.js:** A web application framework for Node.js.
- **Socket.io:** Enables real-time server-client communication for notifications.
- **RESTful API:** Provides endpoints for interacting with the application.
- **Real-Time Database (RTDB):** Firebase's NoSQL database for real-time data storage, suitable for IoT data.
- **Google Spreadsheet:** Integration with Google Sheets for data storage.
- **IAM Service:** Registers and manages access permissions for connecting to Google Sheets.

TIER 3: DATABASE

- **Google Spreadsheet:** Google Sheets used as a database for storing structured data.
- **Real-Time Database (RTDB):** Firebase's NoSQL database for real-time data storage.

ii) Database UML



6) Quality Management

Using the S.M.A.R.T guidelines that indicate that goals and achievement should be Specific, Measurable, Achievable, Realistic, and Time-bound. We decided to pursue and align our quality definition on the ISO 25010 standard, which indicates the following objective to ensure the quality of a given software:

- **Functional Suitability:** Ensuring that the HRM software provides all necessary functions to support HR processes such as recruitment, employee onboarding, performance management, and training.

- **Performance Efficiency:** Ensuring that the HRM software performs tasks such as data processing and report generation within acceptable time frames and with minimal resource consumption.
- **Compatibility:** Ensuring that the HRM software can integrate with existing systems such as payroll software, time-tracking systems, and enterprise resource planning (ERP) systems.
- **Usability:** Ensuring that the HRM software is user-friendly and intuitive, allowing HR professionals and employees to easily navigate and perform tasks within the system.
- **Reliability:** Ensuring that the HRM software operates reliably without frequent crashes or errors, especially during critical HR processes.
- **Security:** Ensuring that the HRM software protects sensitive HR data such as employee personal information, payroll details, and performance evaluations from unauthorized access or modification.
- **Maintainability:** Ensuring that the HRM software can be updated and modified efficiently to accommodate changes in HR policies, regulations, and business requirements without introducing bugs or issues.
- **Portability:** Ensuring that the HRM software can be deployed across different hardware and software environments, such as on-premises servers or cloud platforms, with minimal effort and modifications

With ISO 25010 as the reference, we create the detail requirement as the definition of done for our project as follow:

- **Core functionalities development:** The platform must be constructed with all of the essential features listed in the project proposal. Both automated test cases and manual tests can be used throughout the testing process.
- **Usability and Scalability:** Consider factors like reaction time and resource usage while assessing the software's performance under workloads. Verify that the system is capable of handling an unexpected increase in workload.
- **Code Quality and Conventions:** Verify that the code complies with the requirements for readability, maintainability, naming conventions, and code structure.
- **Security:** Verify if the platform followed the necessary data protection and authentication guidelines. Performing security testing, reviewing protocols, and reviewing IT policies and documentation are all part of this process.
- **Testing and Documentation:** Conduct unit testing to verify individual components, integration testing to validate interactions between modules, and user acceptance testing (UAT) involving end-users.
- **UX/UI Testing:** Make that the UI is responsive, easy to use, and visually consistent. It ought to satisfy every design criterion listed in the proposal.

7) Resources

Within our team, we have four members that take on the following roles:

- **Facilitator - Minh:** Takes the lead, understands the assignment and assigns tasks to members based on their task appropriateness.
- **Initiator - Hai:** Comes up ideas, and suggests solutions, the main programer (IoT, framework, etc.) for the project. He also implemented an API to the application to make it integrate with other software.
- **Compromiser - Thy:** A good negotiator to resolve the group's conflict and mismatch in the collaboration process. She keeps the group running smoothly and efficiently.
- **Critic - Huy:** The content writer, he makes suggestions on our assignment and fine tune small details that can lead to problems. He also is the one to work on the UI design for the application.

8) Approval Signatures

a) Project Team

No.	Name of student	Student Id	Signature
1	Nguyen Dinh Nhat Minh	103802490	
2	Le Hoang Hai	103542974	
3	Nguyen Nhat Huy	103802911	

4	Nguyen Ngoc Minh Thy	103802791	

b) Project Sponsor [Your Tutor]

Tutor's name (on behalf of the client)	Signature
Thomas Hang	