Programme

Master of Software Engineering Course

MSE800 Professional Software Engineering

Assignment 2-Object-Oriented Project

Supervisor: Dr.Mohammad Norouzifard

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Maruthi Kiran Nandigam

Student ID: 270543985

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1. Introduction

The report introduces the project followed by the object planning, implementations, problem with solutions, flow charts, user manuals, and the conclusion. The Payroll Management System is a central system for managing employee payroll processing, timekeeping, and HR management tasks. It has key project objectives, including: Automating salary calculations and ensuring tax compliance; Tracking employee attendance and leave; Ensuring culturally inclusive features for Māori staff. A good payroll system is vital for any organization's well-being, as it guarantees that employee salaries are accurate and timely paid, leading to better job satisfaction and retention1. Payroll management, whether punctual or not, plays a part in the organization by providing a positive working atmosphere to its employees that may even reduce staff turnover as it will foster trust and confidence (Kidd et al., 2022). In addition, aligning the system with the needs of business policies and employee well-being can raise overall firm performance (Ferry et al., 2024). How the project team was formed, - How requirements were gathered and prioritized, - What the agile development process looked like, - What cost and testing considerations were made - Reflections on the project's challenges and learnings

2. Team Formation

Development work was handled by a multi-skill set and multi-background project team. A diverse group of people and a creative culture to solve at the intersection.The team composition involved members of different ethnicities and cultures, which contributed to fostering creativity and innovative problem-solving by bringing new kinds of ideas to the table. Consistent with the partnership principle of Te Tiriti o Waitangi (the Treaty of Waitangi), Māori team members and perspectives were equal partners in all project decisions. Working to this principle, meant the project operated on mutual respect, partnership, and shared decision-making with Māori stakeholders. Māori team members have had an equal voice during meetings and their cultural values (including respect for Māori language and holidays) were integrated into the project plan, for example. Cultural competency training for all team members was mandatory to educate them on the Māori value system and workplace culture. Under this framework, the various endeavours

are indicative of the value the team placed upholding the values of Te Tiriti in partnership and participation of indigenous citizens, ensuring the project was undertaken in a manner that brought together all opinions and disciplines.

Collaboratively, the team set up a professional and cooperative working environment early on. We established clear channels of communication (Slack for day-to-day chat, and Confluence or Google Docs for documentation). Work was transparently assigned and tracked using a JiraSprint board.

We had a daily stand-up meeting and code reviews, so our team members could coordinate and learn from each other. This cultivation of an inclusive culture, paired with organized collaboration tools created a strong set of groundwork in the formation of teams enabling the project's success, ethical guidelines and mutual respect principles which embrace the Treaty.

3. Project Kickoff Meeting

The project kickoff meeting was the initial gathering of all key stakeholders to officially start the project and align everyone on goals, scope, and roles. This meeting took place at the beginning of the project's timeline (prior to Sprint 1) and included the development team, the project manager, client representatives, HR stakeholders, and a cultural advisor (Kaiārahi) to represent Māori interests. In this kickoff session, the **client team presented the high-level project requirements and vision**, ensuring the developers understood the business needs and expectations. The project manager outlined the project scope, timeline, and major milestones, including the plan for six development sprints. Key discussions focused on clarifying the features to be built (such as time tracking, payroll calculation, and leave management), quality expectations, and success criteria for the system. The team also reviewed any constraints or risks (for example, data security requirements and compliance considerations) and agreed on communication channels and reporting frequency.

One of the key aims of the kickoff was to align all attendees on how the project would proceed. Getting stakeholders involved was particularly important as we gave each party the opportunity to share concerns or priorities: HR emailed some compliance needs and payroll policies, and IT/security weighed in (if such a team existed) on infrastructure or security standards. Importantly,

the Māori perspective was included from the beginning, consistent with Te Tiriti o Waitangi principles.

The cultural advisor helped to ensure that any Māori-specific needs (e.g. Te Reo language support on payslips and Māori holiday recognition) were raised early on in the conversation. An inclusive kickoff meeting is a tell-tale sign of how modern project kickoff meetings inform collaboration. In essence, the kickoff meeting established the project's foundation by uniting the team around common goals and ensuring all stakeholders – technical and non-technical, business and community – were on the same page. By the meeting's end, the team had a clear project charter, understood their individual responsibilities, and had committed to a communication and governance plan moving forward.

4. Requirement Gathering Meetings

Following the kickoff, a series of requirement-gathering meetings were conducted to capture detailed business needs and user expectations for the payroll system. These meetings were **professionally facilitated sessions with the client and key stakeholders** to elicit both functional requirements (what the system should do) and non-functional requirements (performance, security, cultural considerations). Participants included HR department representatives, who provided insight into payroll and employee management processes, project managers who would use the system for scheduling and approvals, and end-user representatives (employees) to voice user experience expectations. Importantly, a cultural advisor was present to ensure the process was **inclusive of Māori values and perspectives**, reflecting the project's commitment to culturally informed teamwork.

During these meetings, stakeholders articulated their **expectations and pain points** with the current manual process. HR stakeholders emphasized compliance with tax laws, accurate calculation of work hours, timely payslip distribution, and the need for confidentiality of payroll data. Discussions also covered common challenges like handling late logins or early logouts and integrating those rules into the system's logic. The team documented findings systematically. Key business needs and decisions from the requirement gathering sessions included:

- **Employee Authentication & Access:** The system must provide secure login for different user roles and ensure role-based access control for features (e.g., HR can manage employees, PMs can assign shifts, employees can view their own data). Security of user credentials and data privacy were underscored.
- **Time Tracking & Shift Management:** The solution should track employee clock-in and clock-out times against assigned shifts. It needs to enforce that time tracking only occurs during scheduled shift hours, log late arrivals with predefined reasons, and prompt for reasons if someone tries to log out early.
- **Payroll Processing & Compliance:** The system must accurately calculate pay based on hours worked and handle allowances or deductions. This includes overtime pay, night shift differentials, and applying a special Māori employee benefit (an additional 5% pay bonus as requested by the client for equity). It should comply with relevant tax calculations and generate pay slips.
- **Pay slip Generation & Notifications:** After each pay period, the system should automatically generate payslips for each employee (preferably in both English and Te Reo Māori for those who prefer) and email these to employees. This reduces manual paperwork and ensures timely distribution.
- **Leave Management:** Employees should be able to apply for leave through the system by providing a valid reason, and project managers should have an interface to approve or reject leave requests. Approved leave should deduct from the employee's leave balance accordingly. Māori cultural leave or specific Māori holidays needed to be recognized by the system as well.
- **Annual hike & Reporting and Audit:** Although not the priority in the present scope, HR requested basic reporting capabilities, such as weekly summaries of attendance, new hires, or payroll summaries for auditing purposes will be added as an enhancement to the project.

Throughout the meetings, the team maintained an open dialogue in which stakeholders could freely clarify details or add requirements. All requirements were documented in a comprehensive requirements specification. This document captured user stories, acceptance criteria (to be used later for testing), and any compliance or cultural notes (e.g., ensuring the system observes Māori public holidays). By the end of the requirement gathering phase, the project had a clear and shared

understanding of what needed to be built, which would guide the subsequent analysis and prioritization.

5. Requirement Analysis and Prioritization

Once requirements were gathered, the development team and stakeholders collaboratively analyzed and prioritized them to plan the implementation in an Agile manner. Given that projects often have time and resource constraints, not all features could be delivered at once; thus, requirements were categorized into high, medium, or low priority based on their business value, urgency, and impact on end-users. The prioritization process involved the project manager, lead developer, HR representatives, and the client, ensuring that technical insight and business importance were both considered.

High-Priority Requirements: These were the **must-have** features critical to the system's core functionality and compliance. High priority items included:

- **Secure Authentication & Role-Based Access:** Ensuring only authorized access for HR, PM, and Employees (crucial for data security).
- **Time Tracking with Shift Validation:** Automatic logging of work hours tied to scheduled shifts, with rules for late entry/early exit reasons (vital for accurate payroll).
- **Payroll Processing with Compliance:** Calculating salaries/wages according to logged hours and organizational pay rules, including correct tax deductions and adherence to local payroll regulations.
- **Payslip Generation & Email Delivery:** Creating payslips for each pay cycle and emailing them to employees promptly (ensures transparency and employee satisfaction).
- **Māori Employee Benefits:** Implementing the additional 5% pay bonus and holiday entitlements for Māori staff, as promised by the company's policies, to uphold equity and cultural respect.

Medium-Priority Requirements: These features were important but not absolutely critical for the first release. They add significant convenience and completeness to the system:

- **Shift Scheduling with Notifications:** Allowing PMs or HR to set up employee shift rosters in the system and send notifications (e.g., email or in-app) about assigned shifts.
- **Leave Management Workflow:** A proper interface for leave requests and approvals by managers, including notification of approval/rejection to employees, which could be implemented after core payroll is functional
- **Night Shift Allowance Calculations:** Special handling in payroll for night shift workers (additional pay percentage or fixed allowance for night hours)
- **Late Login Reason Logging:** Tracking reasons for late logins in a report or log for managerial review (important for policy enforcement, but could be added once basic time tracking works).

Low-Priority Requirements: These were "nice-to-have" enhancements and future considerations, which could be deferred until after the initial system release:

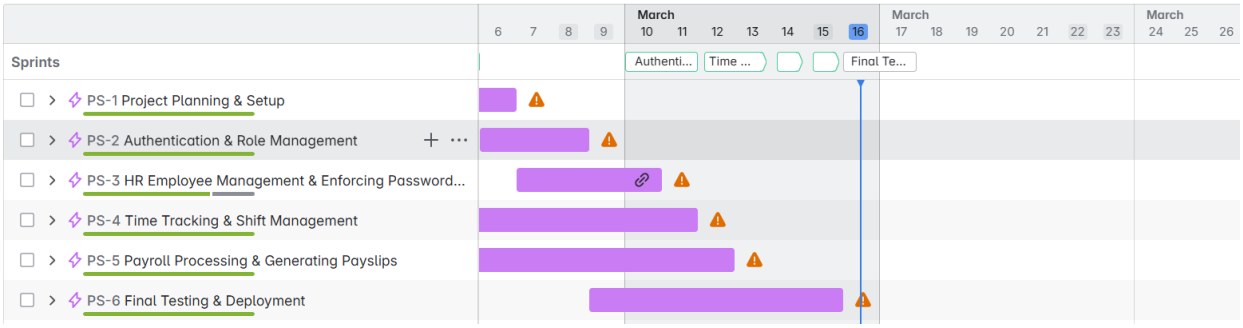
- **Advanced Reporting & Analytics:** Generating comprehensive reports or dashboards for management (beyond basic summaries), such as trend analyses of overtime or labor costs.
- **Multi-Language Support:** Extending the user interface fully in multiple languages (English and Te Reo Māori were considered; the basic requirement was just bilingual payslips).
- **Integration with External Systems:** Connecting the payroll system with third-party HR or accounting systems for data exchange (e.g., exporting data to an accounting software).

This prioritization ensured that the project would first deliver the features that are most crucial to achieving the project's objectives and satisfying the stakeholders' primary needs. It also reflected local community needs – for instance, the **high priority given to Māori employee benefits** highlights the commitment to Te Tiriti o Waitangi principles in practice. The team noted which lower-priority items could be tackled in future phases or iterative improvements. By the end of this analysis, a prioritized product backlog was established, providing clear guidance for the Agile development sprints.

6. Agile Development Sprints

The development process for the payroll system was managed using Agile methodology, breaking the work into six short sprints. Each sprint was time-boxed (approximately one to two weeks each) and aimed at delivering certain features incrementally, along with testing and feedback. This iterative approach allowed the team to adapt to changes and integrate stakeholder feedback continuously.

Jira Sprint board:



Below is an overview of the sprint breakdown and the focus of each phase:

- **Sprint 1: Project Planning & Database Setup (Mar 1 – Mar 6)** – This initial sprint focused on laying the groundwork. The team finalized the project plan, set up the development environment, and established the **database on AWS (PostgreSQL)** with basic database data model. By the end of Sprint 1, the core data model will be ready deploying it to database.
- **Sprint 2: Authentication & Role management (Mar 6 -Mar 8)** -Basic scaffolding of the application was done, including implementing the **user authentication module and role-based access controls** (so that subsequent features could be built on a secure login system). By the end of Sprint 2, the core infrastructure (database connectivity, user model) and a simple CLI login were in place.
- **Sprint 3: HR Employee Management & Enforcing Password change(Mar 6 -Mar 8)**- In this sprint Onboarding Employees to the organization, Offboarding employee from the organization, Holiday Calendar management, Password change enforcement after first

login are implemented. In Onboarding employees to the organization, HR can onboard employees with a default shift and setting up their profile. Employee receives an email with login credentials and reporting manager name. In Offboarding processes, HR will offboard an employee from the organization, ensuring their access are revoked. In Holiday calendar HR can add new holidays and delete the old holidays as per the organization policy. Employees can check the upcoming holidays in the system. Implemented enforcing password change as part of security enhancement.

- **Sprint 4: Time Tracking and Shift Management (Mar 6 -Mar 8) –** In the fourth sprint, the team completed Authentication and HR employee Management and started implementing business logic related to time tracking and shift management. Key deliverables in this sprint are a fully functional time tracking feature which records log-in and log-out timings and enforces the rules of late login and early logout. Project managers can assign shift to employees and an notification will be sent to employees every week.

- **Sprint 5: Payroll Processing & Generating Pay slips (Mar 8 -Mar 10)-** This sprint concentrated on the payroll computation. This sprint implemented **payroll calculation logic** that uses the collected attendance data to compute each employee's pay, including normal hours, overtime, night shift allowances, and the special Māori bonus where applicable. A **pay slip generation** module is developed, which creates pay slip documents and sends to the employee's based on the ethnicity. If the employee ethnicity is Māori, the pay slip will be generated in the same language.

- **Sprint 6: Final Testing & Deployment (Mar 9 – Mar 14)** – The final development sprint concentrated on wrapping up the system for delivery after the final testing. Once all the Sprint features were in place, significant time was devoted to **testing, debugging, and final refinements** to ensure the system met acceptance criteria. Sprint 6 concluded with deployment preparation and a demo to the stakeholders for feedback.

Throughout the sprints, Agile practices and collaboration tools were utilized to keep the team on track. Daily stand-up meetings were held to discuss progress and blockers, and at the end of each

sprint a review meeting showcased the new features to the client for acceptance testing. The team used Jira to manage user stories and track tasks, and version control was handled with GitHub, employing feature branches and pull requests for code reviews. Communication was maintained via Slack and documentation on Confluence, which facilitated clear information flow among team members and stakeholders. The Agile approach proved effective, as it provided flexibility to incorporate minor changes (for example, adjusting the payroll formula after client review) without derailing the project. Notably, sprint planning and retrospectives were conducted in a culturally aware manner – the team ensured meetings were inclusive and that Māori team members felt comfortable to share input, reflecting socially and culturally informed teamwork. By dividing the development into these focused sprints, the project was able to deliver a functional payroll system on time while maintaining high quality.

7. Cost Estimation

A detailed cost estimation was performed to budget for the payroll system project, covering development labor, software tools, cloud infrastructure, and ongoing maintenance. The estimation was aligned with the project's scope and Agile timeline, ensuring that resources were allocated appropriately for each sprint and phase.

Below is a breakdown of the projected costs:

Labor Costs: (one-time development costs for the project duration)

Role	**Cost**
Senior Developer (1)	$5,000
Junior Developer (1)	$3,000
Project Manager	$2,500
HR Specialist / Trainer	$1,500
Total Labor Cost	**$12,000**

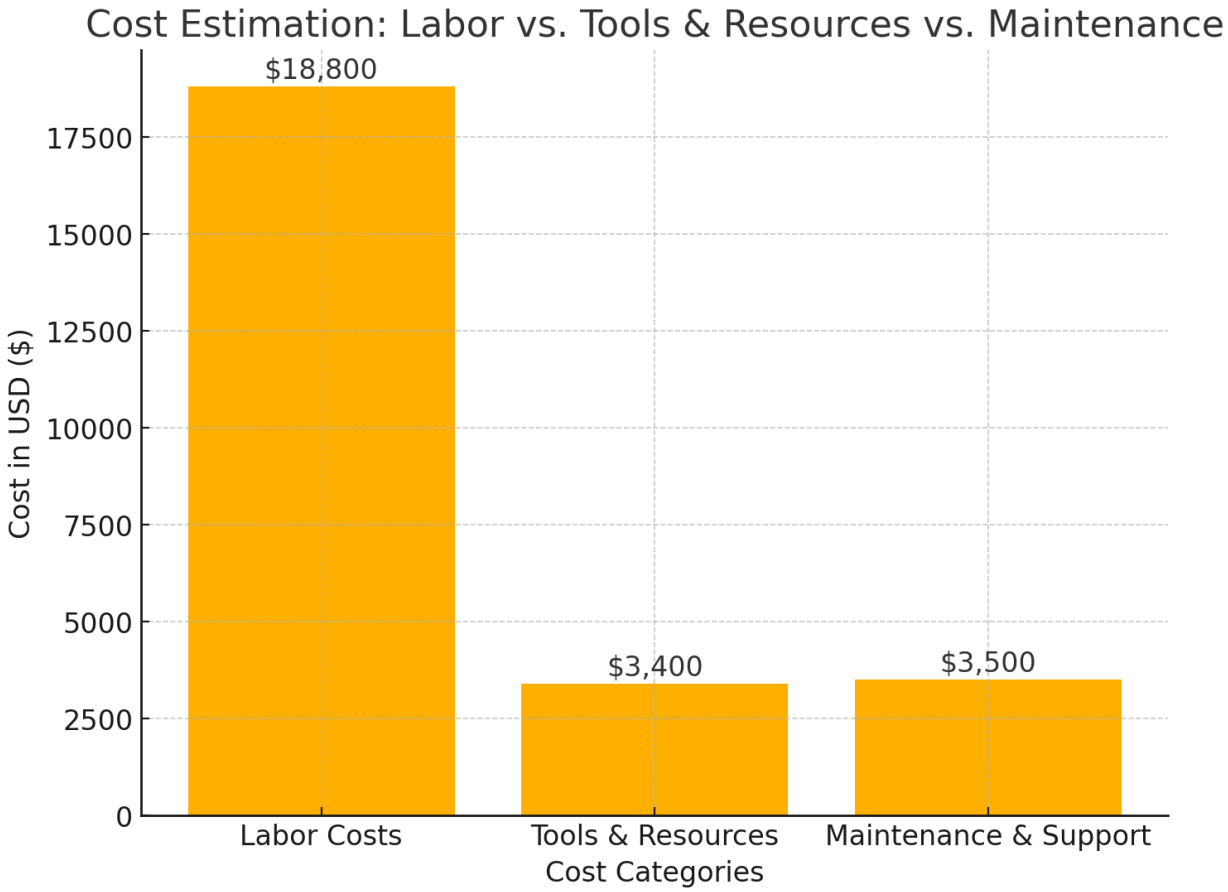


Fig 1. Cost estimation of labor, tools and maintenance

The labor cost covers the salaries or contract fees for the development team and the project manager during the development period, as well as a portion for an HR specialist's time to assist with requirements and training.

Software & Cloud Infrastructure:

Item	**Cost**
AWS PostgreSQL Database	$100 per month
Email SMTP Service (for notifications)	$50 per month

Development Tools (licenses for IDEs, Jira, etc.)	$500 one-time
Version Control (GitHub plan)	*Free* (open-source)
Total Software/Cloud Cost	**$650** one-time + **$150**/month

These costs include the cloud services needed to host the database and send emails (both recurring monthly costs). The development tools cost is a one-time expense covering any paid software or subscriptions (for example, if an advanced Jira plan or other libraries were purchased; many development tools are open-source or already available). GitHub was used on a free plan, so it did not add cost.

Maintenance & Support: (post-deployment annual costs)

Item	**Cost (annual)**
Ongoing Bug Fixes & Enhancements	$2,000 per year
Security Updates & Compliance	$1,500 per year
Total Maintenance	**$3,500 per year**

Maintenance costs were estimated to cover efforts for patching any bugs, adding minor improvements, and ensuring security compliance (such as updating libraries, applying security patches, and adjusting to any new payroll regulations annually).

From the above breakdown, the **initial development cost** of the project is approximately **$12,650** (labor + one-time tool costs). In addition, the project will incur ongoing expenses of about **$150 per month** for cloud services and around **$3,500 per year** in maintenance. These figures provide a baseline budget for the project. The cost estimation approach was careful to balance realism with efficiency – for instance, leveraging free or open-source tools where possible to keep costs down, while not compromising on essential resources (like using a reliable cloud database service for data integrity). This budget will help stakeholders plan for the required investment and ensure the payroll system's sustainability beyond initial development.

8. Acceptance Criteria and Testing

To ensure the delivered payroll system meets all requirements, the team defined clear acceptance criteria for each feature and followed a rigorous testing strategy. **Acceptance criteria** are the conditions that each user story or feature must satisfy to be considered complete; they serve as a checklist for both developers and stakeholders to verify functionality. By establishing these criteria upfront, the team and client had a mutual understanding of "done" for each requirement. The acceptance criteria for key features of the payroll system included both functional expectations and cultural considerations:

- **User Authentication & Enforce password Changing:** Users must be able to log in with a unique ID and password, and access should be granted based on role. This means role-based access control works correctly (e.g., an HR user can access HR functions, an employee cannot access admin features). Successful onboarding of new employees by HR (creating accounts and credentials) is also part of this criterion.When the user logins for the first time the system asks to enforce a password change as part of security enhancement .
- **Time Tracking & Shift Management:** The system should only allow employees to clock in within their scheduled shift times. If an employee attempts a late login, the system requires them to provide a predefined reason. Similarly, if an employee tries to log out early before their shift ends, the system must prompt for a reason and log it (notifying their manager). These rules ensure accountability and accurate time records.
- **Payroll Processing & Pay slip Generation:** Payroll calculations must accurately reflect each employee's total worked hours in the pay period. This includes applying any special pay rules such as night shift allowances or the Māori employee bonus (an extra 5% pay) correctly for eligible staff. After calculation, the system should generate payslips for each employee, in the preferred language (English or Te Reo Māori for Māori employees), and email the payslips out promptly. Any miscalculation or missing payslip would fail this acceptance criterion.
- **Leave Management:** Employees should be able to apply for leave through the system by providing a valid reason and desired dates. Project Managers should receive these requests and be able to approve or reject them. If approved, the leave days are automatically

deducted from the employee's available leave balance in the system. The criterion is met when this workflow functions smoothly and notifications are properly sent.

With acceptance criteria defined, the project adopted a multi-level **testing approach** to validate the system at different stages:

- **Unit Testing:** Developers wrote unit tests for individual modules and functions (e.g., authentication module, time calculation function, payroll computation function) to ensure each piece works correctly in isolation. For example, tests verified that entering different clock-in/out times yields correct pay calculations, and that only valid users can log in.
- **Integration Testing:** As components were built, the team performed integration tests to ensure they work together as expected. This included scenarios like an employee's time entries flowing into the payroll calculation correctly, or the leave request affecting payroll (unpaid leave should deduct hours). The integration testing helped catch interface issues between the database, the application logic, and email service.
- **User Acceptance Testing (UAT):** Once a shippable version was ready, UAT was conducted with end-users and stakeholders – including HR staff, a few project managers, and employee representatives. They used the system in a staging environment to perform real-world scenarios (e.g., an HR person onboarding a new employee, an employee logging time and checking their payslip). Notably, UAT also included **Māori-specific acceptance testing** where Māori employees verified that features like Te Reo language payslips and Māori holiday pay were implemented in a culturally appropriate manner. Their feedback ensured the system was culturally inclusive and met local community expectations.
- **Issue Resolution and Retesting:** Any defects or unmet criteria discovered during testing were logged and addressed. For instance, UAT feedback led to minor tweaks in the user interface wording and the addition of an extra confirmation step when deleting an employee (to prevent accidental removals). After fixes, the team retested the affected parts to confirm all acceptance criteria were finally satisfied.

This disciplined process provided the structure for testing where all the criteria for acceptance were set in advance. Local community acceptance was a focal point in the testing phase as well. Māori staff were consulted to ensure the system respected cultural

requirements – such as recognizing Māori holidays and producing bilingual output where required. This culture-aware testing confirmed that the system was not only functionally correct, but it also conformed to the principles of those who use it. As a result, our careful testing against the criteria outlined above produced a payroll system that is both functional where it matters, accurate, and inclusive — meeting both business goals and community expectations.

References

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