Final Project Report

Team 3

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# IEEE 830 Software Requirements Specifications

## Introduction

### Purpose

TransitPlus’ current Leave Management System (LMS) is not optimal and can be improved. TransitPlus currently manages their leave requests through a physical document system and email traffic that could lead to delay responses, misplaced leave request and potential leave crossovers. We will develop a new LMS where TransitPlus employees can create and manage their leave requests as well as have an overview of their leave balance–to include paid sick days, personal time off and vacation time. The LMS will allow an employee’s chain of command review and response to the leave request within an appropriate timeframe. Because all leave request will be housed within the system, supervisors can see who is currently on leave or have their leave approved. This reduces the possibility of have two employees within the same department on leave at any given time. Overall, the LMS will reduce the cost of keeping track of the paper trail and minimize the possibility of losing leave requests.

### Document Conventions

In order to maintain overall readability and uniformity, this document will be single spaced with the Times New Roman font and a font size of 12. The sub headers for each section have been bolded to ensure the intended audiences are able to effectively navigate the SRS document. All diagrams and other images regarding the LMS can be found at Appendix B.

### Intended Audience and Reading Suggestions

This document is intended to be read, understood and use as a reference by the development team, project managers, marketing department, technical documentation writers, and quality assurance testers. Company stakeholders and any other individual associated with TransitPlus who may benefit from this document should read as well.

### Product Scope

The LMS will be a web-based application backed by a relational database management system (RDBMS). The RDBMS will be used to manage employee information, leave requests, current leave statuses and leave request histories for each employee. The application will be integrated into TransitPlus’ current website and can access from a “Leave Request” tab on the main homepage (https://transitpluslogisitics.com) or directly by using the following weblink https://transitpluslogistics.com/leave-request.

All employees will have basic access to create and review their own leave requests while employees with the title of “Supervisor” and above will have additional permission to view, edit, remove and approve others leave request. Each department will have one Administrator account who grants these additional permissions.

### References

* This Software Requirements Specifications document
* Use Case Diagram (Appendix B)

## Overall Description

### Product Perspective

The product is an all-in-one leave management system. Within the LMS an employee can:

* Create and/or delete leave request
* Request a leave extension

Supervisors within the company can:

* Review, approve, and/or deny leave requests
* Review an employee’s leave balance (PTO, PSL)
* Review an employee’s leave history
* Review an employee’s work schedule

The system was created to make TransitPlus’ leave management easy, efficient, automated and centralized in one location. Some of the features in the LMS include:

* Automated tracking system
* All-in-one management
* Web-Based
* Report generation
* Real time alerts

### Product Functions

**New Leave Request**

When an employee wants to request leave, they will access the LMS from the “Leave Request” tab on the TransitPlus employee homepage website. Once inside the LMS, an employee will use the “Create New Leave Request” button to open up a new window where they will provide their leave start and end dates, leave location, and provide a comment for the approving supervisor.

**Reviewing Leave Request**

Once an employee creates a new leave request and routes it to their appropriate supervisor, their supervisor will receive a notification, informing them about the new request in their inbox. The supervisor will continue to receive notifications once a day until they log in and clear their inbox. Once a supervisor logs into the LMS, they review any pending leave requests. They are able to reference an employee’s leave date with any upcoming company deadlines or other employees requesting similar leave dates. A supervisor will also have oversight of an employee’s current leave balance. This ensures the supervisor does not grant leave to any employees without the appropriate accrued leave. Once the request has been reviewed in its entirety and a supervisor deems the request to be valid, they will approve the leave.

Once approved, the employee will receive a notification that the leave has been approved, their leave is added to the companywide calendar, and the approved leave request is saved within the LMS for future references.

### User Classes and Characteristics

The LMS is designed to be used by the employees of TransitPlus to manage leave requests. It’s intended to be the single point of success for all employees when it comes to creating, reviewing, and managing leave requests.

### Operating Environment

The LMS will be accessed through the employee portal on their official website with the authorized web browsers–Chrome, Internet Explorer, Mozilla Firefox, Microsoft Edge and Safari. Microsoft Windows, Linux and MacOS are acceptable operating systems.

### Design and Implementation Constraints

The LMS been created as a web-based program so that employees and HR can overlook employee sick time, paid leave, and requests for vacation time. The program will not currently be available on mobile devices. That would allow for employees to check their schedule and vacation time at their convenience.

### User Documentation

The system will be available for TransitPlus employees and HR representatives. It is mainly used for HR to clear time for employees to take off. It is also available for the employees to check if their leave request has been approved.

### Assumptions and Dependencies

The web-based system should be available on all workplace computers. Each employee should have their own computer and login credentials to access their personal account through the TransitPlus employee portal. HR should have access to all employee records to keep track of requested time off. Each computer should be up to date with the latest operating system and internet browser of choice for optimal usage.

## External Interface Requirements

### User Interfaces

TransitPlus will be designed by a team of developers who will create a LMS to create, manage, track and modify leave requests and changes to the system in regard to time off for employees. The system will run on basic Windows, Linux and Mac systems on the business computers.

### Hardware Interfaces

The software will run on any computer with the use of a monitor, keyboard, mouse and internet connection.

### Software Interfaces

TransitPlus will function on the following interfaces.

* Windows 8 or newer
* Linux Systems (Any Linux Distribution)
* Mac Systems (MacOS 10.15 or newer)
* Google Chrome
* Microsoft Edge
* Internet Explorer
* Safari
* Mozilla Firefox

### Communications Interfaces

The program will need internet connection to ensure that each employee can access the information as well as HR representatives.

## System Features

### Leave Request

The LMS will allow for the creation of leave requests from employees. It allows employees to apply for leave through a robust system which is forward to an employee with approving authority for verification, approval or denial.

**Functional Requirements**

The employee will:

* Log into the LMS with their appropriate credentials.
* Choose the type of leave request–PTO or PSL.
* Enter the leave start and end dates.
* Enter a comment or justification for the leave request.
* Choose the approving authority the request will be sent to.
* Submit the request for approval.

### Automated Tracking System

With an automated tracking system, managing leave time for employees becomes much easier and organized as well. Looking for a specific date of leave for an employee would be easy and simple to retrieve.

### Notification Alert

Notifications for both leave request submissions and leave request approvals will be sent out to both employees and supervisors, respectively. This ensures everyone is up to date on the status of a leave request.

**Functional Requirements**

The employee will:

* Have access to an authorized web browser to login to LMS
* Be assigned to the appropriate access group
* Be able to view notifications based on their access group–approving authority or basic user.

### Report Generation

Reports of the employee’s leave can be generated for informational purposes. Allowing both the employee and approval officials to check the report to see the leave blocks and reasoning, if needed. Reports can be scheduled to be generated and download on a daily, weekly or monthly basis.

**Functional Requirements**

The employee will:

* Log into the LMS with their appropriate credentials.
* Choose the type of report they would like to generate.
* Select the format they would like the report to be generated.
* Save the report onto their computer.

### All-In-One Management

Everything is kept in one place for easy access and retrieval. No additional software or hardware required to access certain employee leave information or reports. All leave related activities can be accessed through the leave management system.

**Functional Requirements**

The employee will:

* Be assigned to the appropriate access group

### Web-Based

Being a web-based application allows the system to be easily accessed by all employees within TransitPlus. With no download required, all it takes to retrieve or request a leave is accessing the application online through any device.

**Functional Requirements**

The employee will:

* Have access to an authorized web browser
* Have the appropriate credentials to enter the employee portal

## Other Nonfunctional Requirements

### Performance Requirements

* As a web-based application, LMS can be accessed through the internet. Employee’s should have access to approved web browsers to access the system.
* Each employee must have login credentials to the TransitPlus employee portal to access the LMS.
* Each employee must be assigned the appropriate user access within the LMS. Those approved to have approving authority will have additional access and permission in the LMS.

### Portability

The LMS does not need to be portable in the traditional sense. The LMS is a web-based application and will be able to be accessed from anywhere that has an internet connection, although its preferred to access the system from a secured connection (i.e. a TransitPlus location, personal home secured internet, etc.)

### Security Requirements

Frequent maintenance will be scheduled periodically to address potential bugs and to ensure performance is always at its best. These maintenance periods will ensure the system is up to date and minimizes potential security threats. The LMS will follow the industry best practices to ensure potential attacks are minimized like “Denial of service” attacks.

The LMS will also ensure only those with the appropriate authentication are allowed with the TransitPlus employee portal. Initial user credentials are provided by TransitPlus when an employee first joins the company. The employee then must create an account within the employee portal. Their account is attached to their unique employee ID for authentication purposes. Employees will be required to change their passwords every 45 days to reduce possible hacks.

### Software Quality Attributes

**Accessibility**

The LMS is available on any device that can access the internet. It is a simple and easy to use the system with very little set up required by the employees.

**Reliability**

Reports are stored within the RDBMS in the case new reports need to be generated. Employees will never have to worry about human resources misplacing their leave request or their leave balances not being updated properly. All leave requests are tracked from start to finish with alerts to all parties to ensure a leave request is approve or denied within an appropriate timeframe.

**Efficiency**

Fast and organized system for easy access and retrieval of all leave related data. Requests and alerts are sent out to the parties involved to improve speed of approval or denials.

**Usability**

The LMS is user-friendly with a small learning curve. Employees can quickly login and quickly create leave request, approve leave request or generate reports.

### Business Rules

* Employees have to be separated into two different roles within the LMS. One role will be employees with approving authority to review and approve/deny leave request and those who only need access for the purpose of creating and managing their own leave request.
* If an employee with approving authority submits a leave request, the request will go to the next higher authority above them. An employee with approving authority cannot approve their own leave.
* Employees must be able to generate their leave reports at any given time.
* The approving authority must be able to view all pending leave request within their department.
* All employee data will be integrated into the LMS from the currently used TransitPlus database.

# OOAD Diagrams

## Use Case Diagrams

A picture containing holding, person, small, person

Description automatically generated

## Use Case Specifications

### Use Case #1

|  |  |  |  |
| --- | --- | --- | --- |
| **Use Case Name**: Review Pending Requests | **ID**: 1 | | **Employee name**: Management/HR |
| **Primary Actor**: Approving Authority | | **Use Case Type**: Special | |
| **Brief Description**: Approving authority is responsible for approving or denying leave request. TransitPlus has switched over to a new software and request all the employees to put their leave request using the new LMS. | | | |
| **Trigger**: The user has put in a leave request for PTO. The system will automatically attempt to contact the appropriate management approving authority. | | | |
| **Relationships**:  Employee: John Wick  Department: Accountant  Management: Approve/Deny  Other request pending: No overlap, multiple employees are off on the same day | | | |
| **Normal Flow of Events**:   1. Management logs-in the employee portal to view leave/PTO request. 2. Management verifies no other employee has put in the request for the same day. 3. Management can decide after reviewing the request to approve or deny the request. | | | |
| **Sub Flows**:  S-1: New Leave request   1. When an employee wants to request leave, they will access the LMS from the “Leave Request” tab on the TransitPlus employee homepage website.   S-2: Reviewing leave request   1. Once an employee creates a new leave request and routes it to their appropriate supervisor, their supervisor will receive a notification, informing them about the new request in their inbox. | | | |
| **Alternate/Exceptional Flows:** none | | | |

### Use Case #2

|  |  |  |  |
| --- | --- | --- | --- |
| **Use Case Name**: Create Leave Requests | | **ID**: 1 | **Employee name**: John Wick |
| **Primary Actor**: Employees | **Use Case Type**: Special | | |
| **Brief Description**: The RDBMS will be used to manage employee information, leave requests, current leave statuses and leave request histories for each employee. | | | |
| **Trigger**: The user has put in a leave request for PTO. The system will automatically attempt to contact the appropriate approving authority. | | | |
| **Relationships**:  Employee: Name  Department: Employee ID, once the request is put in  Management: Approve/Deny  Other request pending: No overlap, multiple employees are off on the same day | | | |
| **Normal Flow of Events**:   1. Employee chooses to put in request in the leave management system. 2. Employee is given option to choose unpaid or paid time off. 3. Employee chooses their leave dates and submits leave. 4. Employee now waits on the request to be approved or denied by the approving authority. | | | |
| **Sub Flows**:  S-1: New Leave request   1. When an employee wants to request leave, they will access the LMS from the “Leave Request” tab on the TransitPlus employee homepage website.   S-2: Reviewing leave request   1. Once an employee creates a new leave request and routes it to their appropriate supervisor, their supervisor will receive a notification, informing them about the new request in their inbox. | | | |
| **Alternate/Exceptional Flows:** none | | | |

## Class Diagram

A screenshot of a map

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## Sequence Diagrams

A screenshot of a social media post

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A screenshot of a social media post

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A screenshot of a cell phone

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## State Machine Diagram

A screenshot of a cell phone

Description automatically generated

A screenshot of a map

Description automatically generated

# Risk Assessment Matrix

|  |  |
| --- | --- |
| Risk Scale | |
| 1 | Very Low |
| 2 | Low |
| 3 | Medium |
| 4 | High |
| 5 | Very High |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Risks** | Likelihood | Preventive Measure | Response | Impact |
| Unexpected Portal Connection Issue | 2 | Periodic checkups and maintenance on site server connection to ensure 99.99% or greater uptime. | If the employee portal is unexpectantly down, a temporary webpage with a message and estimated repair timeframe will appear. System administrators will response to the connection issue and rectify the issue based on their SOP. | Employee’s ability to create, review, and response to leave request are impacted by this risk. |
| Time Constraints | 4 | Add extra development time during the planning stage to create system. Follow a development timeline with scheduled weekly meetings to ensure certain milestones are achieved. This will allow room to add or remove certain features, if needed. | With an Agile approach, weekly sprints will keep engineers focused of weekly milestones. In the case certain we are cutting it close to the development deadline, even with the added time, an extension will be requested. | Development deadline and budget are impacted by this risk. |
| System Performance | 4 | A dedicated software testing team will be allocated time after each major milestone to test the system. Continuous testing is key to minimizing major bug issues at the time of release. | In the case continuous software testing is not feasible due to time constraints, at the minimum a dedicated testing team will be allocated time to conduct in-depth testing during the final 3 weeks of development. | Development deadline, budget, and scheduling are impacted by this risk. |
| Erroneous Leave Permission | 1 | A system administrator has the ability to assign current and new employees leave appropriate leave permission based on their title–Basic user or approving authority. To ensure the correct permissions are assign to the correct employee, Approving Authority permissions can only be assigned to employees with the title “Supervisor” or greater and must be in their employee profile. | Assignment constraints will be enforced during the development cycle to ensure only those with the title “Supervisor” or greater are allowed the Approving Authority permission. Due to this constraint being enforced in code, we do not see a possibility of an employee having the wrong permissions. | The leave management workflow is impacted by this risk. |
| System Learning Curve | 1 | The LMS was designed to be simple, easy and quick to use. This ensures that employees can immediately log in and create, review, and respond to leave request quickly and efficiently. A well-written LMS User Guide will be created and provided to be used as a user guide. | An LMS User Guide will be provided and can be used by employees who need additional help maneuvering the system. | The leave management workflow and employee training are impacted by this risk. |
| Additional Requirements | 3 | Additional requirements are possible as the development cycle goes on. Adding additional meeting/planning sessions into the development schedule to reevaluate the project. These are the times where TransitPlus officials and the development team communicate. | If additional requirements are identified, the development team will evaluate the additional development time and new estimated deadline. Also, if any additional funds are requirement, they will be identified as well. | The development deadline, budget and are impacted by this risk. |

# Test Plan

## Test Plan Identifier

LMSTestPlan 1.0

## Introduction

The LMS allows employee to submit a leave request for time off, sick time, and to check whether their request has been approved or denied. The system will also allow those with Approving Authority rights to review, approve and or deny leave request. This test plan was created to isolate four features within the LMS to ensure they function as intended and solve the TransitPlus’s leave management issue. The success of this test plan will ensure the ease of use and ability of employees to access all their leave related information in one system. This test plan involves two features that were originally identified in the early stages of planning and two features that were identified as the planning stage went on.

## Test Items

Functional requirements #1 and #4 which can be found in the “Project Management and Requirements Specifications” section.

## Features to be Tested

The following original requirements/features will be tested within the LMS:

* Leave Request
  + The test will ensure the basic user is able to successfully create a leave request and route it to the appropriate approving authority.
* Report Generation
  + The test will ensure an approving authority is able to generate a leave report for individual employees and a whole department.

The following new requirements/features will be tested within the LMS:

* Leave Extension
  + The test will ensure a basic user is able to enter a currently approved leave request and submit for a leave extension. The leave extension will request the new leave end date and justification.

* View Leave Status
  + The test will ensure a basic user is able to locate a leave request and view its current status–approved or denied.

## Features not to be Tested

The following features below are not being tested. While these features are important for the LMS, we’ve decided to focus on a few features for this test plan.

* Approval and denial of leave.
* Leave notification alert
* Checking leave balance
* Cancelling leave request
* System login

## Approach

There will be three different tests that will be done for this web-based application to ensure the quality.

* Unit Testing: Will be done to test the coding of the application to make sure that there are no errors. The code will be checked to make sure that it is operating as intended.
* Functional Testing: Will be performed to test each function within the application to ensure that they are operating as intended. With each function the outputs should be what we would expect them to be during this time of testing.
* Performance Testing: This test will comprise of how quickly and responsive the application is. The aim is for fast and accurate responses with no errors being returned.

Finally, we’ll have four software developers and four TransitPlus employees as are software testers. Having a combination of both sides will provide a usable, all-around insight about the product and any errors they may have been identified.

## Items Pass/Fail Criteria

The item pass/fail criteria to ensure that the application is working as intended.

* Each function will be tested and will have an expected output. If the output produced is intended and expected, it is acceptable.
* Checking for both sides of basic user and approving authority and ensuring that both have their own respective roles and configuration, as necessary.
* Overall application working as intended and is responding appropriately when users are handling data. This includes creating leave requests, viewing leave status or generating reports. If the desired outcome of each appropriate user (Basic User or Approving Authority), then it is accepted. If not, the test fails, and a log will be produced and provided to the software developers to fix.

## Test Deliverables

Deliverables presented before testing.

* Test Plan
* Test Strategy

Deliverables presented during testing.

* Daily Status Report

Deliverables presented after testing.

* Test Data
* Test Scenarios
* Testing Group Assignment Roster
* Test Summary Report

## Environmental Needs

Below is a compiled list of what is needed to test the functionalities of the LMS:

* A computer with an up-to-date operating system (MacOS, Linux, Windows)
* Secured internet connection
* One of the major operating systems (IE, Firefox, Chrome, Safari)
* A mouse and keyboard for data input
* Employee portal credentials
* The LMS user guide
* Testers
  + TransitPlus employees
  + Software developers from the project

## Responsibilities

While the testing is underway, we will have a small testing team overseeing the project. A couple of experts will be handling the training requirements for the employees and managers by displaying beforehand how the LMS works. Another collection of individuals will be there in the occurrence of technical issues and missteps that pop up and they will attempt their best at mitigating these.

## Staffing and Training Needs

Much like described in the responsibilities, we will have a small collection of developers help train the testers. They will provide a full briefing on how the product can be accessed, the information manipulated, and the ability to send their leave request to the approving authority. They will walk through each phase and display the screen to the employees to mitigation confusion. The testers will then be provided various scenarios that the LMS may be used for.

## Schedule

The schedule for our testing will be conducted along the date shown in our project plan and will be a weeklong event. Key testers will have one week to verify, validate and explore the beta version of the LMS. We will provide a deadline by the end of the week for certain employees, overseeing managers and developers to provide feedback, criticism, concerns or issues they may have. This deadline is in place to ensure that we will be able to adhere to these criticisms before our official rollout release date.

## Risks and Contingencies

|  |  |
| --- | --- |
| Risks and Contingencies | Possible Mitigations |
| Schedule Risks   * Preordained Schedule not being followed exactly as predicted * Possible requirements to reschedule to a different timeframe. | * Adapt the testing phase, for the consumer, to a stricter time restraint. * Shift back the rollout date for testing * Still alpha test the program with the team and brainstorm through technical reviews what ways the program could be improved. |
| Operational Risks   * Testers not handling the software properly after training * Failure of communication between testers and training members | * After demonstrating how to work the LMS, offer the LMS user guide. * Offer reoccurring assistance if the consumer seems confused/lost. |
| Program/Product Risks   * Customer does not like the integration of the product/ requests a full overhaul. | * Incorporate a communication plan with the client to ensure there are at a minimum a weekly huddle to talk about the current stages of the LMS – Take notes for the technical review after testing. |

# Test Cases

## Test Case #1

|  |  |
| --- | --- |
| Test Identifier: | Leave\_Request\_001 |
| Requirements Addressed: | Ensure that the employee can select to create a leave request and is able to select PTO or PSL. |
| Prerequisite Conditions: | Employee must be at the “Main Menu Selection” screen. |
| Test Input: | Click “Create leave Request” from the main menu selection screen. |
| Expected Test Results: | A form is loaded when you select create leave request so the employee can fill out the information. |
| Instructions for Conducting Procedure: | Click “Log-in”, Sign-in with your credentials, click “Menu”, click “Create Leave Request”, click “Choose” from the benefits screen; repeat this process for at least one other benefit option. |
| Features to be Tested: | Employee leave request. |
| Requirements Traceability: | Leave request, Employee selection, PTO option, PSL option. |
| Rationale for Decisions: | If the employee can select from PTO or PSL from the create leave request menu that means the test passes. If the employee sees no options or only one than the test fails. |

## Test Case #2

|  |  |
| --- | --- |
| Test Identifier: | Leave\_Status\_001 |
| Requirements Addressed: | Ensure that the management can see the request from the employees. |
| Prerequisite Conditions: | Management must be at the “Main Menu Selection” screen. |
| Test Input: | Click “View Leave Request” from the main menu selection screen. |
| Expected Test Results: | In the view leave request, employee will be able to see if the management approved or declined the request. Employee will also be able to see if they added any notes. |
| Instructions for Conducting Procedure: | Click “Log-in”, Sign-in with your credentials, click “Menu”, click “View Leave Request”, click “Choose” from the benefits screen; repeat this process for at least one other benefit option. |
| Features to be Tested: | Employee View Leave request. |
| Requirements Traceability: | Leave request, Employee selection, PTO option, PSL option. |
| Rationale for Decisions: | If the employee can see the pending request or if the management approved or declined the request. Employee will also be able to see if they added any notes. That means that the test is passed. |

## Test Case #3

|  |  |
| --- | --- |
| Test Identifier: | Leave\_Report\_001 |
| Requirements Addressed: | Ensure that the management can see the request from the employees. |
| Prerequisite Conditions: | Management must be at the “Main Menu Selection” screen. |
| Test Input: | Click “Generate Leave Report” from the main menu selection screen. |
| Expected Test Results: | A report is generated for the management to view all the leave request from different departments and different types of benefits leave request. |
| Instructions for Conducting Procedure: | Click “Log-in”, Sign-in with your credentials, click “Menu”, click “Generate Leave Report”, click “View or Download” from the report screen. |
| Features to be Tested: | Management generate leave report. |
| Requirements Traceability: | Leave request, Employee selection, PTO option, PSL option. |
| Rationale for Decisions: | If the management can see the report and is able to download the form to review request that means the test passes. If the report does not show any data that means the test failed. |

## Test Case #4

|  |  |
| --- | --- |
| Test Identifier: | Leave\_Extension\_001 |
| Requirements Addressed: | Ensure that an employee is able to request a leave extension, if needed. |
| Prerequisite Conditions: | An employee must be at the “Main Menu Selection” screen. |
| Test Input: | Click “Request Leave Extension” from the main menu selection screen. |
| Expected Test Results: | A list of approved leaves, old or new, will populate for that employee. |
| Instructions for Conducting Procedure: | Click “Log-in”, Sign-in with your credentials, click “Menu”, click “Request Leave Extension”, select the current leave, select the new leave dates and input a justification for the extension, click “Submit Request” |
| Features to be Tested: | Leave Extension |
| Requirements Traceability: | Leave request |
| Rationale for Decisions: | When the “Request Leave Extension” is clicked, the employee should be able to see a list of approved leaves. If an employee is able to select the current leave, input the new leave end date, justification and the request successfully submits, the test passes. If any portion of the “Request Leave Extension” workflow fails, the test fails. |

# Individual Level Summary Evaluations

## Team Member Maximo Liriano Evaluation

* Create a Summary Evaluation of the overall quality of the software product project in the following areas:
* **Business Analysis:** The LMS was created to provide an all-in-one leave management system for TransitPlus. This system will solve TransitPlus’ issue of having a faulty leave system where leave request and approvals were done through a paper system and emails. This could lead to missing leave requests, overlapping leaves and an inadequate employee leave history. The LMS will support leave requests, leave extensions, leave reminders, a notification system, and a leave history report that can be generate for a specific employee or for a whole department. The LMS will automate the process while the company focuses on its main mission–providing the best logistics solution for all businesses.
* **Art (Graphics, Sound):** The only sound requirement for the LMS are notification pings and alerts, though they can be enabled or disabled depending on the user. The GUI is simple, and easy to use with only the required fields, buttons and images used for the system. The LMS is meant to solve a business problem and not provide an award-winning application for its design. All sounds were created by developers with some experience in sound design.
* **User Interface:** User Interface was designed to be simple and easy to use. Only required data is requested to solve TransitPlus’ problem. No unnecessary design elements, colors, buttons, images, or text fields.
* **Design:** Since the inception of the project, simplicity while meeting the client’s requirements was paramount. No over-the-top design decisions were made, and the absolute minimum design choices were made to accent the LMS main purpose–automate and track the company’s leave requests.
* **Code and Programming:** The best approach would be utilizing the language of the web, JavaScript accompanied by HTML and CSS. Certain parts of the LMS system, like generating reports will be embedded into the web application utilizing Java.
* **Overall project quality:** The overall project quality is great. With the requirements identified in the earlier stages of planning, the end product would truly lighten the load for HR and supervisors when tracking employee leaves. Also, employees will be able to easily create, modify, or delete leave requests just by logging into the system and pressing a few buttons. The LMS will boost productivity within the company and reduce any wasted time related to leave issues.
* **What tools were used in creating competitors' products? What tools do you recommend for developing your product?**
* List and describe why
  + JavaScript – JavaScript is the programming language of choice when it comes to developing a web application. Other companies with similar leave management systems have developed their web application with JavaScript as their base programming language.
  + MySQL – MySQL is a solid, proven relational database management system that will act as our backend database to save all leave request data for every employee within the company. Other competitors are using NoSQL or PostgreSQL for their database.
* If money were no object, what tools would you recommend, and why? Why the difference?

If many were no object, I would use the money to hire more developers and testers. With more developers, we are able to implement more requirements and decrease the development time. The increase number of testers will provide us the ability to widen the scope of product testing and have a much more efficient testing plan to ensure the product to release with little to no errors.

* Describe how the recommended tools would help the quality of the software development process within the framework of each system development life cycle (SDLC) defined for your project.

By design, the LMS was created to use the basic tools for the job. Nothing fancy and nothing with high degree of maintenance for the client. We believe with the tools used, the SDLC was executed well and with a well-designed and functioning web application as the end product.

* Summarize what you have learned based on the software engineering concepts and applications defined throughout this course.
* Include concepts not only covered in detail in the lecture, but also those covered on the quizzes, discussions, textbook, or Internet resources. Include such concepts as design patterns, metrics and code metrics, release procedures, and maintenance.

This course has opened my eyes to the many different processes within a software’s development life cycle. While I was aware of class diagrams and risk matrixes, I was not aware of use case diagrams, sequence diagrams, state machine diagrams, test cases, WBS hierarchy, the many different project scopes identified throughout the process and more. Software development is much more than having an idea and converting it into code. This class has provided me with the tools and the desire to dig deeper into the SDLC and what it takes to work as a team to complete a complex project. I am more confidence in the many different diagrams, preparing test cases and their importance, and identifying early on what features are required to create a minimum viable product (MVP) to ensure no time is wasting on unnecessary iterations during production.

* How do you see these software engineering practices helping you in the software industry as a software developer or project manager?

These software engineering practices provide me with the confidence to progress in the demanding software industry. While I may not be able to run an actual project in the real-world yet, I am confident, if provided the opportunity I’ll be able to steer a project towards the right directions with the practices and tools learned in this class.

## Team Member Amber-Rose Colbert Evaluation

* Create a Summary Evaluation of the overall quality of the software product project in the following areas:
* **Business Analysis:** This program is being designed so that employees can enter into the system, request PTO, sick time, view whether the time was approved or denied, and be able to view the time off when it is upcoming. The program is being developed so that it is easier for requests to be made but also so that it can be viewed regularly. This is a perk for incoming employees and its being created to ease scheduling issues.
* **Art (Graphics, Sound):** The program is used in a professional setting so there will not be any background music but there will be visual and audio effects. Certain requested leave requests will be highlighted until either approved or denied. Once a request has been approved it will turn green, if it has been denied it will be yellow. There will be sounds effects for when a request has been submitted.
* **User Interface:** The user interface will be a website application. It will be available on most computers. It will be available on windows, mac, and Linux. At this time, it will not be a downloaded application, but it will be available for access on most computers.
* **Design:** The website will be straightforward and simple. I want the GUI to be clear so that employees are not confused. When entering the website, the main page would have options for submitting a request, viewing an approval or denial, or viewing the calendar for the time off. Fonts will be medium and Times New Roman.
* **Code and Programming:** At this time, I would proceed with Java GUI for the program. It is going to give us the most functionality that we would need. There would be multiple tabs, and buttons that will direct the flow of the program.
* **Overall project quality:** The overall project would flow smoothly for employees. They will be able to access the website and have a clear path on where to go. There will be sections for submitting and viewing the requests.
* What tools were used in creating competitors' products? What tools do you recommend for developing your product?
* Java
* MySQL
* Windows laptop

Java with GUI will be the best way to develop the website, so it is easy for employees to access. The MySQL will be used so that there will be a database to keep track of requests for each employee. A windows computer will be used so that it is accessed and used on windows but also being developed for Mac and Linux.

* **If money were no object, what tools would you recommend, and why? Why the difference?**

If money was no object, I would suggest Mac over Windows and a better developmental program. I would want the best software for the project.

* Summarize what you have learned based on the software engineering concepts and applications defined throughout this course.
  + This whole project has been a learning curve. I have learned a lot about the developmental process before code and programming even begins. It is important for the analysist to speak with the stakeholders to produce an idea and a design for the project. I learned a lot about different diagrams that help with the development. I still get confused on the differences between the different diagrams, but I feel that I have started to see how each one pushed the project just a little further.
* I learned a lot about the developmental process and how much work and thought goes into the design of a project. I feel like these lessons will help further my career. I was taught more on how to design a project and in my mind that will help my career.

## Team Member Matthew Kim Evaluation

* Create a Summary Evaluation of the overall quality of the software product project in the following areas:
* **Business Analysis:** There would be a series of steps that would need to be taken in order to actually develop the software that we had come up with. First would be to assess the business and their needs from the software. After assessing their needs, the ability to fit all of it into one software without compensating for performance. Assure that other programs do not do exactly as what we have to avoid any legal trouble. Find appropriate routes of advertising to hit our target clients.
* **Art (Graphics, Sound):** As for audio I do not believe there is any audio unless notifications will ping the user when requests have been updated. Visually it should be easy to see where everything is, and nothing hidden from the user. It would be a very simple layout making access simple and easy.
* **User Interface:** User interface would be a big part of this software as I believe everything should be easily displayed upfront to the both basic users and approving authority. Things should be highlighted or marked when it has been modified or changed as well as new pending requests as well. This will bring about the eye to the users making things stand out so that nothing is missed by them. The overall design would be simplistic so that there is nothing to distract the user from the core function of the software.
* **Design:** The design of the software would be specifically tailored towards businesses and their needs to help organize PTO. Any business big or small could use this to help maintain order and avoid confusion.
* **Code and Programming:** The code should be organized and well documented throughout its entirety. In the event errors occur or bugs are found during or after its production, it would make resolving those errors much easier. The method would be to document each function and important values so that when unfortunate errors do arise, it would be much easier to handle them as opposed to searching through the code blindly.
* **Overall project quality:** Without a proper test it would be hard to gauge such a statement. Due to the simplistic design of the program, I would imagine that the quality in terms of performance would be very strong. It would be simple yet very effective without overcomplicating aspects of the software.
* **What tools were used in creating competitors' products? What tools do you recommend for developing your product?**
* The tools we used for this Leave Management System was MySQL and a small group of developers.
* **If money were no object, what tools would you recommend, and why? Why the difference?**

As for other tools that would be recommended, I would stick to MySQL seeing how it is quite a reputable tool to use in the first place. It could be possible to hire more developers to help with the process of coding and quality of the process.

* Describe how the recommended tools would help the quality of the software development process within the framework of each system development life cycle (SDLC) defined for your project.

For the SDLC I would say that there are not very many tools that could make this software much higher in quality and performance. It is a simplistic program by design and function and would not require much to elevate it to a higher level. With better tools the core of the function would remain the same and perhaps would be faster in certain areas. In the end though I personally believe with the simplicity of this program and its function, it would not require much else to make it better than what it already has.

* Summarize what you have learned based on the software engineering concepts and applications defined throughout this course.
* Include concepts not only covered in detail in the lecture, but also those covered on the quizzes, discussions, textbook, or Internet resources. Include such concepts as design patterns, metrics and code metrics, release procedures, and maintenance.

Personally, the number of concepts that I have learned throughout this entire experience has come in plenty. Concepts such as cycles of development, technical reviews and the entire process of planning and thought that goes into a software before development begins. At first, I thought it started with an idea, then creating the idea to see where it goes. There are several steps that should be taken to ensure that the work will yield better results and will be more suited for whichever target audience that you are aiming for.

* How do you see these software engineering practices helping you in the software industry as a software developer or project manager?

I see these practices helping me further understand what is required out of this field of work and how much work goes into a product, before, during and after its release. With that in mind, it gives me a much better idea of what to expect and how the system works overall. Preparing myself like this could lead to better opportunities while making the work life much less stressful knowing what I should be expecting.

## Team Member Nathaniel Williams Evaluation

* Create a Summary Evaluation of the overall quality of the software product project in the following areas:
  + **Business Analysis:** Developing this software product for a company would entail two primary objectives – attaining customer satisfaction, while also maintaining a favorable and fast product. During the meeting with the company to understand their requirements for the product, we would take that information and ensure that it will be addressed with the software program. I feel that there are necessary soft skills that need to be demonstrated to the company to bring them assurance in our ability to create a product, in other words, the ability to tell them how we can code a program to their standards and not to our own standards.
  + **Art (Graphics, Sound):** This product should not have background sounds to accompany it, outside of the possible sound when they select a button on the User Interface, or the notification ping about a Leave Request being sent or received. As for graphics, it would have the logo of the company somewhere on the User Interface. When the client will be selected specific dates for time off, that zone will be highlighted in yellow, unacceptable times for PTO will be marked in red, and already accepted PTO would be green.

**User Interface:** The User Interface of the Leave Management System (LMS) will be on a website, accessed through a portal that employees have access to. For employees that are attempting to make a Leave Request, their main page will consist of three main buttons to select from – a “Create Leave Request” that can be used to create a leave request based on whether it is Paid Sick Leave or Paid Time Off as well as deciding on the time zone that is being requested. There will be a “View Leave Balance” that will have a pop-up display the information such as how much time they have used, how much time they have banked, and how much they are expected to receive given x amount of work hours. Another option will be a “View Leave Status” which will take the user to their submitted Leave Form to see whether it has been viewed and rejected or viewed and accepted. Finally, the “Log Out” button for exiting the program. As for the Management main menu, there will be a simpler main menu – A “Generate Leave Report” that will connect back to the LMS main menu in the instance that they desire to create a Leave Report. The other option will be “Review Pending Requests” for accessing, downloading, and reviewing submitted Leave Requests by the employees that they are responsible for. Accepted requests will be highlighted in green, rejected will be red, and pending will be yellow.

* + **Design:** The design of the product will primarily be catered to the company employees, ensuring that they find the design, color schemes, and fonts all to their liking. We want easily readable text, colors that will not strain the eyes when the viewer is making their requests, and buttons large enough to easily be clicked when necessary.
  + **Code and Programming:** Since the LMS will be website-based, I feel that JavaScript would be the best pathway for achieving this project. Paired with something like HTML or CSS, there will be an even grounding and understanding that the company wants. There will be functions in the JavaScript that will make access to every page fluent and easy on the eyes, not flashy pop-ups, and dramatic movements. The HTML and CSS will demonstrate superb front-end development in how the website’s appearance will be viewed and interpreted.
  + **Overall project quality:** Our project will be able to demonstrate and display intuitively the necessary information for the company. I feel that front-end appeal would be the most important so the main menu UI will be stressed to be flawless and exceptional in appearance. After making the foundational pieces of the project and everything works as it should, we will then begin providing aesthetically pleasing elements such as smooth transitions between webpages and interfaces.
* What tools were used in creating competitors' products? What tools do you recommend for developing your product?
* List and describe why; Describe how the recommended tools would help the quality of the software development process within the framework of each system development life cycle (SDLC) defined for your project.
  + Microsoft Project – This tool was used to maintain a fluent and achievable end goal by setting out significant sections within the program, breaking those sections down minutely into what exactly gets done there. By doing that, the project itself was rather straight forward and easily maintainable.
  + Microsoft Visio – This tool was used to demonstrate classes that would possible within the coding of the program. These would have made it easier to display the groundwork on how the coding will be built because the classes would be related in how they function, what they access, and how the overall program would run.
* If money were no object, what tools would you recommend, and why? Why the difference?

Even if the budget were limitless, I do not know how else I would go about conducting the project. There being the aspect of the coding, I feel that I would still use the software address previously – JavaScript, HTML, and CSS.

* Summarize what you have learned based on the software engineering concepts and applications defined throughout this course.
* How do you see these software engineering practices helping you in the software industry as a software developer or project manager?

I feel that I have benefitted greatly from this class. It opened my eyes to just how complex creating a software product will be within the workplace. There are many different stipulations that play critical parts within the software development process that I did not understand initially, such as what a Work Breakdown Structure was, Sequence Diagrams, and even Use Case Diagrams. I understand that there is still a vast amount of information for me to gain, but this class gave me much confidence in how I am going about getting my major. It seems that every project could be a new opportunity, where you might use the same strategy of approach when tackling it, but there will still be new implementations and details. That piques my interest at it is highest because I do not want to get bogged down in a workplace consistently doing the exact same thing every day.

## Team Member Muzammil Mansoor Evaluation

* Create a Summary Evaluation of the overall quality of the software product project in the following areas:
* **Business Analysis:** When developing a software there are many series of steps that are taken to ensure that the software meets all the requirements. Brainstorming is very important with trial and error. After all the scrum meetings it is very important to bring all those ideas to reality.
* **Art (Graphics, Sound):** Graphics and user experience is very important. Sound is not part of this interface because the software we are developing will only sound if you click the next without filling all the information.
* **User Interface:** UI developers are very important when developing a software because you would want to have a good friendly interface. An interface that is easier to use and with user feedback we make adjustment as go forward.
* **Design:** The design of the application is going to be a standard design noting fancy. The application is going to make it easy to track time off request.
* **Code and Programming:** Java or C++ are both good programming languages to start this project. SQL would also be required.
* **Overall project quality:** The software will make it easy for the employees and the management to keep track of the request. Employee can view this information from anywhere.
* What tools were used in creating competitors' products? What tools do you recommend for developing your product?

There are so many options to choose from when developing a software. We will leave this up to the developers which application they want to use. Computer languages to choose from is MySQL, JAVA, Python, and C++. We would also want to test the software and using our test tools. We can do a mock request and see if the system picks up the request and sends it to the current employee. We would also have to create and for mobile devices so it’s easier to access the information from anywhere. For now, we would recommend using the browser and copy and paste the link and you can get the same information. We want to make sure the application works perfectly in house before we release an app for the mobile devices.

* Summarize what you have learned based on the software engineering concepts and applications defined throughout this course.

This project has been so much fun, and it shows you how ideas are built and how they come together. When it comes to developing a software there is more to it than just coding. This class really showed us how to go step by step on how to execute a plan. I learned a lot that software development is a team effort and without sharing ideas and trying to make it come is true is very difficult.

# Project Level Summary Evaluations

## Analysis and Design Evaluation – Requirements

* **What would you do better or differently?**

The initial problem with TransitPlus was there unorganized leave management system utilizing physical documents and emails to track the request, approval and denial of leave requests. There was no way to quickly generate reports for each employee and their leave history and there wasn’t an efficient process in place to ensure two employee’s leave do not overlap. The current requirements for the Leave Management System (LMS) will eliminate any physical paper trail for leave requests within TransitPlus. The LMS will be web-based and backed by a database and will be developed with all the requirements described throughout this document to successfully solve TransitPlus’s leave management problem. There are no current plans to make the LMS better or different than what was initially identified. With more time, a plan could have been put in place to design and build a mobile version of the LMS.

* **What was the quality of the tools and techniques?**

Tool quality and techniques are industry standard. A work breakdown structure of the LMS was designed and developed using Microsoft Project Plan. A Use Case diagram was also developed to further assist the team with the development of the LMS.

* **Are the requirements clear?**

The requirements to successfully create the LMS were clear, concise and met the requirements to make a transition into a bn all-in-one leave management system.

* **What are the strengths and weaknesses?**

The strengths of the LMS are:

* Creating leave request from anywhere
* Managing all leave requests within one system
* Generating employee leave reports
* Executing notification alerts to approving authorities and basic users to ensure leave requests are approve or denied in an appropriate timeframe.

The weaknesses of the LMS are:

* Internet connection is required to access the system. If internet connection is not available, the employees cannot create, review or approve/deny leave requests.
* **What are your recommendations or suggestions?**

We recommend that the LMS is implemented and built with the requirements and specifications that were identified within this documentation. All requirements were identified and created to solve a pain point TransitPlus have been experiencing with their leave management. Recommend in the future to create and implement a mobile version of the LMS that can be installed and access on employees’ personal devices.

## Analysis and Design Evaluation – Analysis and Design

* **What would you do better or differently?** 
  + To ensure there isn’t any miscommunication between the development team and the client, a well detailed project communication plan could have been created. This communication plan will lay out the different development phases and best practice of communication during the phases.
  + Allocate time at the end of each major milestone to bring the developers and client together and discuss progress and potential trade-offs or additional features.
  + The project risks could have been identified earlier with the client to allow more risk planning and mitigation within the project.
* **Do they have a good understanding of key risks for their projects and how to mitigate risk (external and internal)?**

They have a good understanding of the internal and external risk that may be encountered. By providing the Risk Matrix and the OOAD diagrams, they have a greater understanding of the key risks for the LMS. They are confident the identified risks are the most important risks to keep an eye on and adjust, as needed.

* **What additional risks would you consider for the project (minimum of three)?**
* Erroneous System Permission
* System Learning Curve
* Additional Requirements

## Analysis and Design Evaluation – Testing and Team

### Testing Evaluation

* **What would you do better or differently?**

To increase the effectiveness of the testing plan, we would have better communication on which software developer will perform the testing and to what extent. Additionally, we would have added two more outside testing members, preferably TransitPlus higher management to ensure the tested features meet the company’s requirement.

* **Do you get a good understanding of their testing process or the thoroughness of their testing? Yes or no? Explain either way.**

The testing plan was well thought-out and addressed the LMS key features:

* Leave Request
* Leave Extension
* Report Generation
* Leave Status

There was a good understanding of the approach, environmental needs, test cases and item pass/fail criteria. More time could have been spent talking about adding more testers to have a bigger testing pool, but because of time constraints, the testers were kept to a minimum.

* **Is there traceability from requirements?**

The LMS’s main goal is to manage all leave activities within the company in an all-in-one leave management system. The leave requests, leave history, PTO/PSL and leave balance are all tracked and are updated as required. Every feature of the LMS can be linked and traced as a forward-from traceability requirement. Each requirement can be traced from each other and their corresponding elements, for example, the leave request can be traced to the approval or denial of the request by the Approving Authority.

* **Do they have a test plan and test cases? If so, describe the quality. How do they apply to the three testing concepts of verify, validate, and explore?**

The team does have a test plan that is effective enough to verify, validate and explore. The test plan involved verifying and validating the requirements after each major milestone. Once a milestone was met (i.e. leave request functionality) the testers were given the opportunity to validate what was built was in line with what the client would expect and explore the application to find any error or improvements that could be made. This process of verifying and validating will continue after each major milestone until the project was complete. Once the final project was complete, the testers will be provided a breakdown of each major section of the application and will commence a top-to-bottom testing based on the pass/fail criteria and the provided approach.

* **How would your new functional requirements for the project impact the testing process?**

The new functional requirements added (leave extension and leave status) will have minor effects on the testing process. Many of the requirements and classes are within the same scope as the original requirements. Small tweaks will be made to the testing process to ensure these new requirements are tested as well.

### Team Evaluation

* **What are the roles and responsibilities of the members of the team? Were they clear? Did they make sense for the software project?**

For this project, the team’s roles and responsibilities are as followed:

* + Lead Developer
    - Managed the team and development cycle to include all testing phases.
    - Developed the server/client networking for the LMS.
    - Managed the integration of the LMS and TransitPlus’s employee portal.
  + Developer #1
    - Developed the LMS user interface
    - Tester #1
  + Developer #2
    - Worked on the Basic User, leave request and leave extension features
    - Tester #2
  + Developer #3
    - Worked on the Basic User, leave request and leave extension features
    - Tester #3
  + Developer #4
    - Worked on the Approving Authority, report generation and leave status features
    - Tester #4
  + Developer #5
    - Integrated all features together to create a beta version of the LMS for client to try out
* **If you were to develop this project with additional human resources, how you would organize teams? What recommendations would you make?**

If additional human resources were available for this project, a separate testing/quality assurance team would be assembled. This will relieve the developers from developing and testing the LMS. This separation of concerns would better serve the client in ensuring the best product is being made. Also, an extra developer would be requested to better spread out the requirements and ensured that the LMS was built faster, but with the same quality.

* **What team dynamics do you need to be successful in developing a software application**?

In order to successfully develop a software application, the following attributes are needed to have the right team dynamics:

* + Trust
  + Accountability
  + Communication
  + Attention to Detail
  + Open minded
  + Critical Thinking
  + Innovation
  + Knowledge of a programming language (language dependent on project)

With these attributes, any team can be successful in designing, developing and testing any software application. If any attributes needed to be highlighted, trust, communication, and accountability would be top of the list. You can teach the technical knowledge for a project, but you cannot teach the needed soft skills to work together as a jelled group.

# Updated Project Plan

A screenshot of a cell phone

Description automatically generated

A close up of text on a white background

Description automatically generatedA close up of text on a white background

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# Appendix A: Glossary

**LMS** –Leave Management System

**RDBMS** – Relational Database Management System

**PTO** – Personal Time Off

**PSL** – Personal Sick Leave

**Approving Authority** – An employee who is able to review, modify, approve or deny a leave request

**Basic User** – An employee with basic permission. They allow to create and view their own leave requests.