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Timesheet - Project Management Solution for Finance

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Master of Information Technology in Information Technology

Semester XI

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Under the guidance of
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DECLARATION

I hereby declare that the project entitled “Timesheet - Project Management Solution For Finance“ submitted by me for the partial fulfilment of the requirement for the award of Master of Technology in Information Technology (5 ½ Years) Semester XI to International Institute of Professional Studies, Devi Ahilya Vishwavidyalaya, Indore, comprises my own work and due acknowledgment has been made in the text to all other material used.

Signature of Student:

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Place:

CERTIFICATE FROM GUIDE

It is to certify that dissertation on “Timesheet - Project Management Solution For Finance”, submitted by Ms. Mahek Negandhi to the International Institute of Professional Studies, DAVV, Indore has been completed under my supervision and the work is carried out and presented in a manner required for its acceptance in partial fulfillment for the award of the degree of “Master of Technology in Information Technology (5 ½ Years) Semester XI ”.

Project Guide: Dr. Shaligram Prajapat
Signature:

Date :

CERTIFICATE

It is to certify that we have examined the dissertation on “Timesheet - Project Management Solution For Finance”, submitted by Ms. Mahek Negandhi to the International Institute of Professional Studies, DAVV, Indore, and hereby accord our approval of it as a study carried out and presented in a manner required for its acceptance in partial fulfillment for the award of the degree of “Master of Technology in Information Technology (5 ½ Years) Semester XI”.

Internal Examiner
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Name : ____________
Date : ____________

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Signature: ____________
Name : ____________
Date : ____________

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1 Introduction

1.1 Overview and Issues Involved

1.1.1 Project Overview and Abstract

The project aims at developing a Timesheet Management module that tracks the time taken for developmental activities of individual developers and consultants. This project covers the requirements of several stakeholders and they are as follows:

1. Employee: This system would serve as an attendance management system for an employee.
2. Project Manager: This system would help project managers to help track activities of individual developers and consultants working on a project (or assignment) whilst helping them communicate with the customers to show the track of developmental activities.
3. Sales and Pre-Sales Teams: The sales teams can take insights from the activity timeline of previous projects which helps them provide the most efficient quotation to prospective customers.
4. Customers: Customers can get a completely transparent view of the developmental progress, number of consultants engaged in a project, which helps them see a clear view of the number of consultants, the cost of individual consultants, number of hours worked by each consultant (the product of which would lead to the cost of the project to be paid).

1.1.2 Organizational Overview

This project is being developed for future use and integration to Agility Suite, a product developed by Fusion Global Business Solutions for **BMC Helix**.

Agility Suite for BMC Helix is a comprehensive, graphical tool that seamlessly connects Project and Portfolio Management with Idea Sourcing, Idea Management, and Demand Generation.[7]

The proposed timesheet solution is a module that can be added to Agility Suite to manage projects, assignments, and the activities of developers and consultants in the projects.

This module was developed with the view of organizations that require basic Professional Services Automation. It can be helpful to small businesses, mid-size businesses, large enterprises alike and might as well be supportive to freelancers and individual contributors working on projects, wherein a justification of their time is required during billing of projects.

The project, with Agility Suite, as a whole would help enterprises manage their service management processes with the help of a state-of-the-art agile solution including demand, portfolio, requirement, and project management.

1.1.3 Issues Involved

To build a culture of accountability, it is important to track employee attendance. Though, a lot of organizations face issues in managing it. Old-school employee timesheets and punch cards make it very easy for time theft to occur and it costs businesses millions of dollars every year. [1][2][3]

The only way to improve an existing timesheet management process is by applying the right timesheet management system to it. Automated timesheet management systems, like Work Composer, are equipped to avoid buddy punching. Eventually, the use of a dedicated timesheet system would eliminate several issues that surround employee attendance and increase overall team productivity manifold.

The proposed timesheet solution is an advanced solution to track project progress and resources spent on individual projects for organizations. It simply replaces manual entries on timesheets.

The proposed timesheet solution introduced in this report will be useful from an employee perspective by capturing the time spent on each of their customer engagements in a better way. And managers and customers would get a better insight of employee work day and developmental progress of the project.

It helps to track the time of an employee on several projects despite geographical boundaries, and even in scenarios such as the global pandemic, wherein the time of employees contributing remotely can be tracked with the utmost accuracy.

Given below is the comparison of various types of systems that manage employee attendance and(or) manage employee activities.

Table: Comparison of Timesheet Management systems

	Manual Systems	Fully Automated Systems	Proposed Solution
Tracks Employee Attendance	Yes	Yes	Yes
Tracks employees time spent on multiple projects	No, tedious if done by the project manager with less accuracy	Yes	Yes
Tracks irrelevant time spent on other activities (such as break, travel, meetings)	No	Yes	No
Project Management	No	Yes	Yes
Billing for Customers	No	Yes, but may compose of irrelevant data that must be filtered for the customers	Yes
Micromanaged employees	No	Yes, through auto screenshots and automated time tracking to avoid time stealth. Example- work composer[8]	No
Buddy Punching	Yes	No	No

Table 1. Comparison of Timesheet Management systems

The application is built using BMC Helix - Innovation Studio thus making it a cloud-based solution that empowers the project workforce locally and provides visibility globally. [5]

1.2 Problem Definition

The issues in existing systems are as follows:

- Manual entries on timesheets cannot help to track the real work progress done by employees.
- Manual Entries track unnecessary time, which can be irrelevant to the project manager such as travel time, time spent during customer engagements, meetings.
- Does not make employees feel micromanaged.
- Helps track development progress.

1.3 Proposed Solution

This software application solves multiple issues for an organization.

- It serves as a basic attendance logging system for the finance team.
- It helps project managers by tracking the activity of the employees assigned to specific projects.
- It can help keep track of multiple projects with the lifecycle of each assignment under those projects.

2. ANALYSIS

2.1 Background

- Currently, there are two types of systems that can maintain timesheets.
    - Firstly, maintaining manual entries of individual employees on paper by managers with the help of RFID cards and/or biometrics. These systems can simply help to track the attendance of the employees.
    - Secondly, there are automated systems that track the activity of employees based on their location in the office (using WI-FI-based tracking systems) along with tracking software on the systems of employees that track activities on software that are run by the employee.[8]

- Manual entries on timesheets make it hard to track the real work progress that happens in each project and assignment that the employee is involved in.[1]

- On the contrary, automated systems track unnecessary time such as time spent in meeting rooms, cafeterias, on calls, etc. These are irrelevant to a project's consumer who needs to know the time spent by individual developers on the assignments. [2]

- From the employee perspective, employees feel micromanaged when using automated systems as every activity of the employee is being tracked.

- This prototype concentrates on tracking the actual development effort of individual employees to all projects and assignments that he is associated with. And it allows project managers to add and maintain projects and assignments for each client.

2.2 Feasibility Analysis

A feasibility study examines how beneficial the project is on an economic, technical, and nontechnical basis. The intent of the feasibility study is to decide whether or not the system under study will be usable after deployment. The main emphasis is on the following three questions elucidated below:

Is the organizational objective achieved by the system?

As discussed, the proposed system would provide an effective alternative to the current system. The system would provide an organization with an easy way to manage projects and track the time and efforts of resources, along with an interface to ease the process.

The system is also scalable, providing an opportunity for the organization to upgrade or extend the system, in the future.

What resources are available for the proposed system?

The technical resources needed for the implementation is based on BMC Helix Platform.

> The BMC Helix Platform is a cloud-native, microservices-based platform that helps companies enhance, extend, customize, and integrate new capabilities through REST APIs.[5]
>
> Innovation Suite, a cloud-based solution, equips developers and business analysts with the resources they need to quickly produce powerful enterprise apps that deliver a seamless user experience.[7]
>
> This highly scalable platform combines drag-and-drop tools along with the flexibility of modern languages for an effective business collaboration.
>
> Innovation suite includes innovation studio as a core component. Innovation Studio: Enable business analysts to rapidly tailor enterprise apps, known as Smart Apps, using visual drag-and-drop design tools.

Can the system be implemented with the help of the current technology?

To implement the system, the organization would simply require BMC helix, computers and internet connectivity. The application will be deployed as a package or a bundle on helix cloud for the users to be able to access it.

2.2.1 Economic Feasibility:

Economic feasibility is related to the cost-effectiveness of the project. This project is economically feasible. The costs required in this project are limited and affordable as the consumers would just require the agility suite platform which would cover the platform costs, they would not require maintenance cost of servers as the setup is on-cloud and not on-premise. There are no extra hardware costs involved as the system can be accessed on the existing computer systems of the organization via a web browser interface and there is no setup and installation cost involved. Successful installation of the project requires a computer system that is available with the organizations.

2.2.2 Technical Feasibility:

The technical feasibility is related to the study of technical issues regarding the proposed system. The technical needs of the system include.

- **Reliability**: Codeless creation of business logic, user interfaces, and data models in the hands of the business enhances reliability.

- **Portability**: The project is compatible with any computer system with minimal software and hardware requirements. Since the BMC Helix platform is a multi-cloud ready system it allows access to developed systems in the world's largest enterprises with built-in localization, multi-tenancy, and scalability.

- **Extensibility**: The project is easily extensible by further adding more functions and interface modules. Once the app has been built, later on, it will enable customers to brand, configure, and enhance without affecting the upgrade or support experience.

2.2.3 Behavioral Feasibility:

It is the measure of how clients and end-users respond to the implementation. The proposed system is:

- Easy to use interface for the user. End-users do not need to be trained to use the system.

- Convenient in its maintenance since the system does not depend on on-premise resources rather runs on BMC Helix which is an on-cloud solution.

- Increases productivity and enhances the power of decision-making by allowing project managers to view the actual developmental status and progress of individual project contributors. It also enables the project customers to have a completely transparent justification of project costs whilst allowing sales teams to make accurate and efficient cost estimates for future customer engagements.

2.3 Software Requirement Analysis

Software Requirements Analysis is the process of defining the expectations and granule of the end-users for an application that is to be built or modified. Therefore, requirements analysis means to analyze, document, validate and manage software requirements. The requirements of this module were managed entirely by Agility Suite which is described below.

Requirement analysis process:-

- Eliciting requirement:
  The process of gathering requirements by communicating with the customers is known as eliciting requirements. In this project, every requirement was first discussed by the project manager and was then logged as a requirement under the portfolio timesheet Module. If a developer or any other stakeholder comes up with an idea, the idea is logged, is voted by team members, and is finally accepted or rejected by the project manager. The accepted idea generates a requirement in the system.

- Analyzing requirement:
  This step helps to determine the quality of the requirements. It involves identifying whether the requirements are unclear, incomplete, ambiguous, and contradictory. These issues were resolved before moving to the next step. every requirement is carefully analyzed by the team.

- Requirement modeling:
  Different formats such as use cases, user stories, natural-language documents, or process specifications are used in requirement modelling. In the development process of this module, a task is generated against each requirement that is to be taken in the project's developmental cycle. The task contains details of the estimated effort, the requirement to be developed, and the start and end date of the task (optional). These tasks initially stay in the backlog stage and according to the sprints are added (or related) to the sprint where the task should be taken.

- Review and retrospective:
  In this step a review is conducted on the previous step of requirements to make improvements. In the development process of this module, after every sprint a review meeting was carried out which acted as a checkpoint for the deadline of the sprint, the tasks completed in that sprint, and whether all requirements specified were met or not. Based on the insights of the current sprint, the details of the next sprint would be enhanced.

2.4 Analysis of the Proposed System

- The Timesheet - Project Management Solution For Finance is a platform that allows organizations to ease the process of displaying the time spent by employees and consultants on individual assignments.

- It allows project managers to maintain projects and assignments and their associated resources.

- Employees get a dashboard to log timesheets to show the time spent on each associated assignment.

3. System Design

3.1 Logical Design

3.1.1 Use Case Diagram

A use case diagram is a dynamic or behavior diagram. Use case diagrams model the functionality of a system using actors and use cases. Use cases are a set of actions, services, and functions that the system needs to perform. In this context, a ”system” is something being developed or operated, such as a web site. The ”actors” are people or entities operating under defined roles within the system.

Importance of Use Case Diagram

- Use case diagrams are valuable for visualizing the functional requirements of a system that will translate into design choices and development priorities.
- They also help identify any internal or external factors that may influence the system and should be taken into consideration.
- They provide a good high-level analysis from outside the system. Use case diagrams to specify how the system interacts with actors without worrying about the details of how that functionality is implemented.

Table: Use Case Table

Sr. No.	Actor(s) [based on role in system]	Use Case Name	Goal	Pre - Condition	Post Condition
1.	Employee	Log timesheet	To be able to create a timesheet for a week	The user must be logged in	A timesheet for 7 days is created.
2.	Employee	Log timecard	To be able to log a timecard for the assignment that is assigned to	1. A timecard for that week must be created. 2. An assignment that is to be logged must be assigned to that	A timesheet is created in the saved state and is ready to be submitted.

			that employee	employee.	
3.	Employee	Submit Timecard	To enable the user to submit a saved timecard.	A timecard must be in the saved state	The timecard goes to the project manager for approval and appears on the console against the assignment.
4.	Employee	View Associated Assignments	To be able to view assignments that are assigned to the logged-in employee	1. The user must be logged in. 2. Some assignments must be assigned to the user.	nil
5.	Employee	Retract Timecards	To be able to call timecards back before the timecard is approved	The timecard must be in the submitted state.	The timecard will come back to the saved state after approval from the manager.
5.	Project Manager	Add/ Update Projects	To be able to create projects for individual customers	The project manager must be logged in and he must have the access permission (or role) of a project manager	Project created for individual customers.
6.	Project manager	Add/ Update assignment	To be able to associate multiple assignments to a project	The project manager must have created a project for a specific customer to which the assignment is associated	An assignment is associated with a project and assignees can be added to it.
7.	Project Manager	Add Assignees	To be able to associate	The project manager must	Employees will be able to see

			employees to assignments	have an assignment created	their associated assignments
8.	Project Manager	Approve/ Reject Timecards	To give the functionality of approving or rejecting submitted employee time cards against an assignment. a notification in the application must also be generated for the employee and project manager	The project manager must have timecards in submitted status (or there should be timecards that are submitted by employees).	Notifications will be received by employee and project managers.
9.	Project Manager	View Reports	Project Managers should be able to generate reports of timecards (submitted/approved/rejected) for financial use	nil	nil

Table 2. Use case table of Timesheet Management module

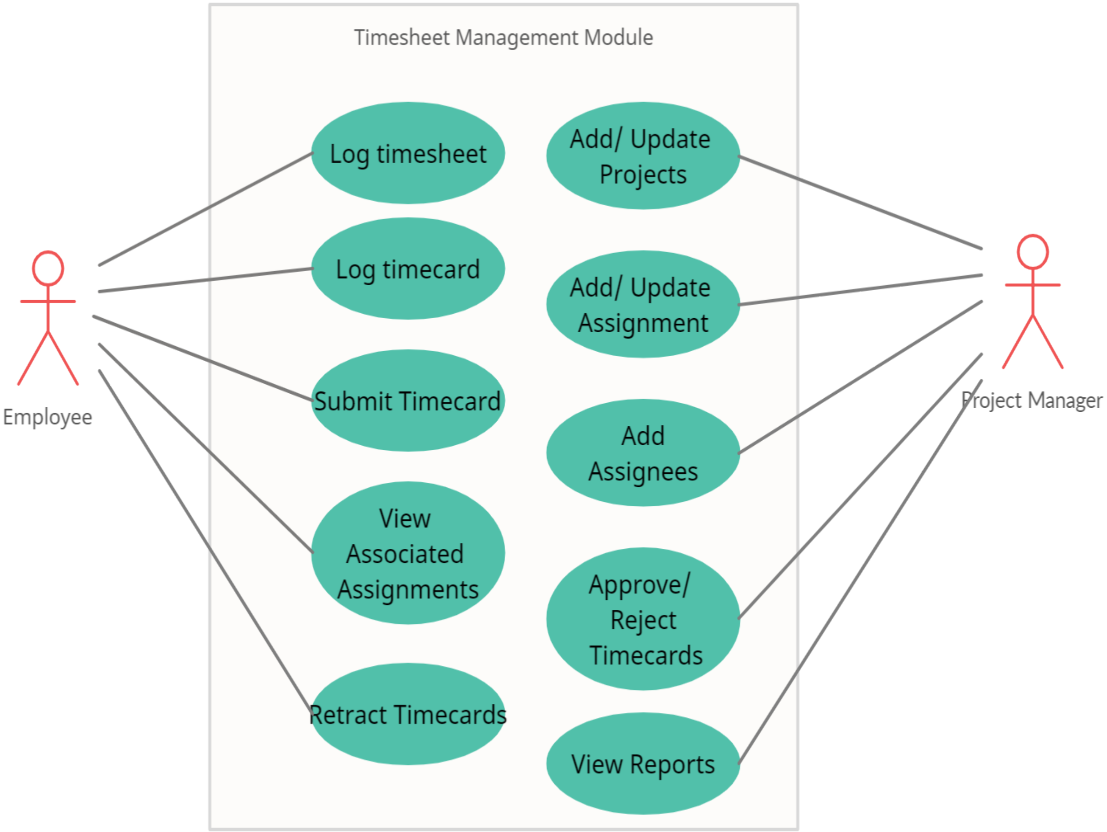


Figure 1. Use Case Diagram

3.1.2 Data Flow Diagram

Data Flow Diagram (DFD) is a graphical representation of data flow in any system. It is capable of illustrating incoming data flow, outgoing data flow, and store data. A data flow diagram describes anything about how data flows through the system.

Given below is the DFD of the proposed Timesheet Management module

3.1.2.1 Context Level diagram

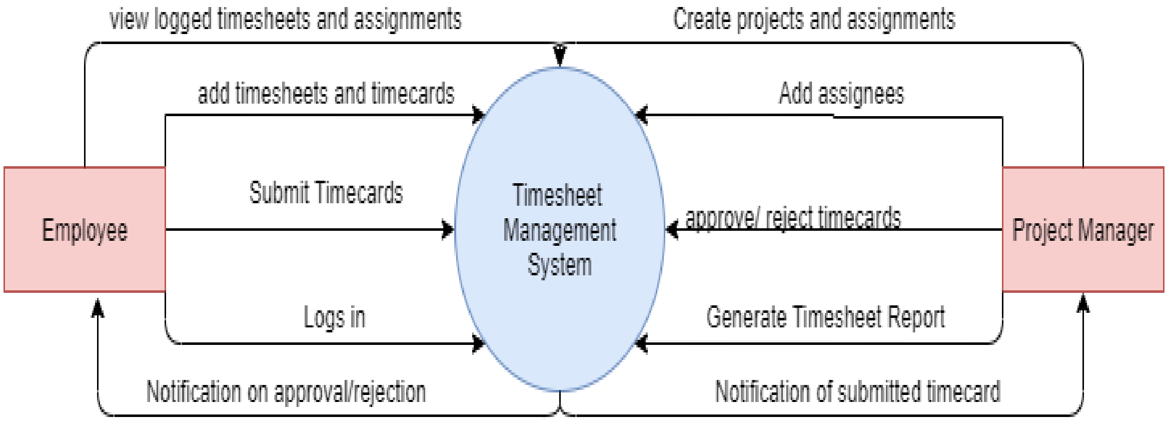

view logged timesheets and assignments
Create projects and assignments
add timesheets and timecards
Add assignees
Employee
Submit Timecards
Timesheet Management System
approve/ reject timecards
Project Manager
Logs in
Generate Timesheet Report
Notification on approval/rejection
Notification of submitted timecard

Figure 2. Context level diagram

The proposed system caters to employees as well as project managers. There is only one portal for all the users and the classification is based on the role of the user whose credentials are entered.

If project manager credentials are entered the portal will show all the information needed by the project manager to create projects and assignments and generate reports alongwith logging his own timesheets.

Whereas, when an employee enters his/her credentials the portal will show all the details specific to that user. The user will be able to see all the timesheets that he has logged and the assignments that are assigned to him.

Specific functionalities for finance such as the report of all the timecards (saved, submitted, approved and rejected) can be generated by the project managers.

3.1.2.2 Level 1 diagram

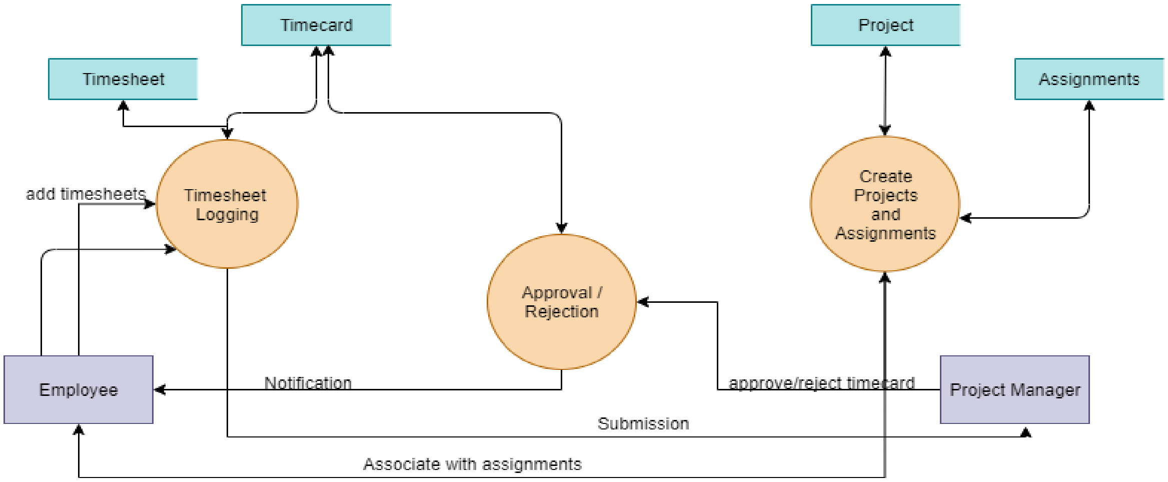


Figure 3. Level 1 diagram

The level 1 DFD depicts the basic high-level functionalities for the user. The employee can log timesheets and receives notification on approval or rejections of the timesheets. While, the project managers can create projects and assignments and have the ability to approve or reject a timesheet logged by the employee.

3.1.2.3 Level 2 diagram

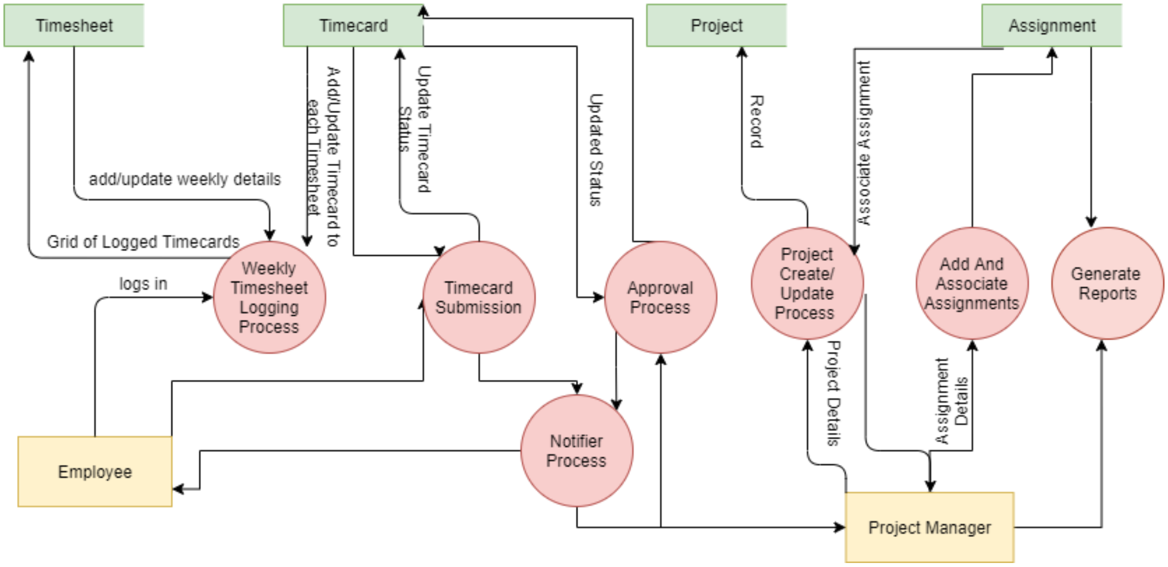


Figure 4.Level 2 Diagram

The level 2 DFD shows in detail each of the processes for the users.

For the employee, the employee can:

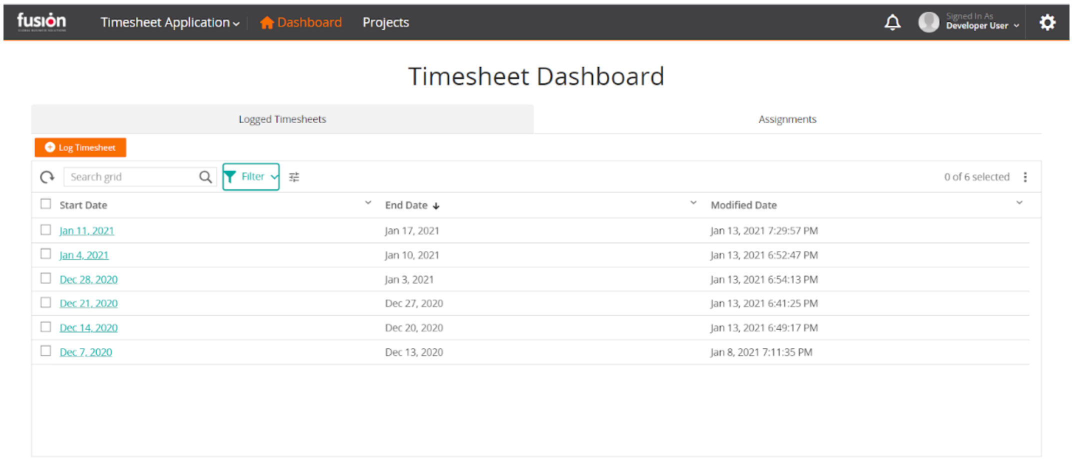
1. Log Timesheets for a week
2. Log timecards within a timecard that are each related to an assignment that is assigned to the employee.
3. Submit saved time cards to the project manager of that assignment.
4. Receive notifications for his/her approved or rejected timecards.

For the project manager, the project manager can:

1. Get all the functionalities of an employee.
2. Create projects.
3. create assignments within each project
4. View all timecards submitted for an assignment.
5. Approve or reject timecards.
6. Receive notifications for submitted timecards.
7. View the grid of approved, rejected and submitted timecards.
8. Generate reports based on desired and(or) predefined filters.

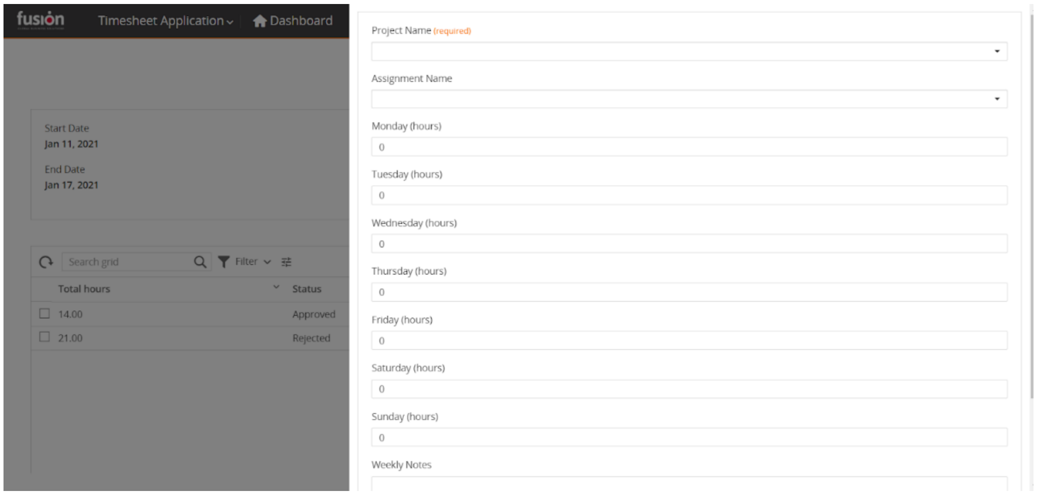
3.2 Physical Design

The physical design depicts the overall UI(User Interface) which is depicted below:



Start Date	End Date	Modified Date
□ Jan 11, 2021	Jan 17, 2021	Jan 13, 2021 7:29:57 PM
□ Jan 4, 2021	Jan 10, 2021	Jan 13, 2021 6:52:47 PM
□ Dec 28, 2020	Jan 3, 2021	Jan 13, 2021 6:54:13 PM
□ Dec 21, 2020	Dec 27, 2020	Jan 13, 2021 6:41:25 PM
□ Dec 14, 2020	Dec 20, 2020	Jan 13, 2021 6:49:17 PM
□ Dec 7, 2020	Dec 13, 2020	Jan 8, 2021 7:11:35 PM

Figure 5. Timesheet dashboard for employee



Start Date
Jan 11, 2021

End Date
Jan 17, 2021

Total hours	Status
□ 14.00	Approved
□ 21.00	Rejected

Project Name (required)

Assignment Name

Monday (hours)
0

Tuesday (hours)
0

Wednesday (hours)
0

Thursday (hours)
0

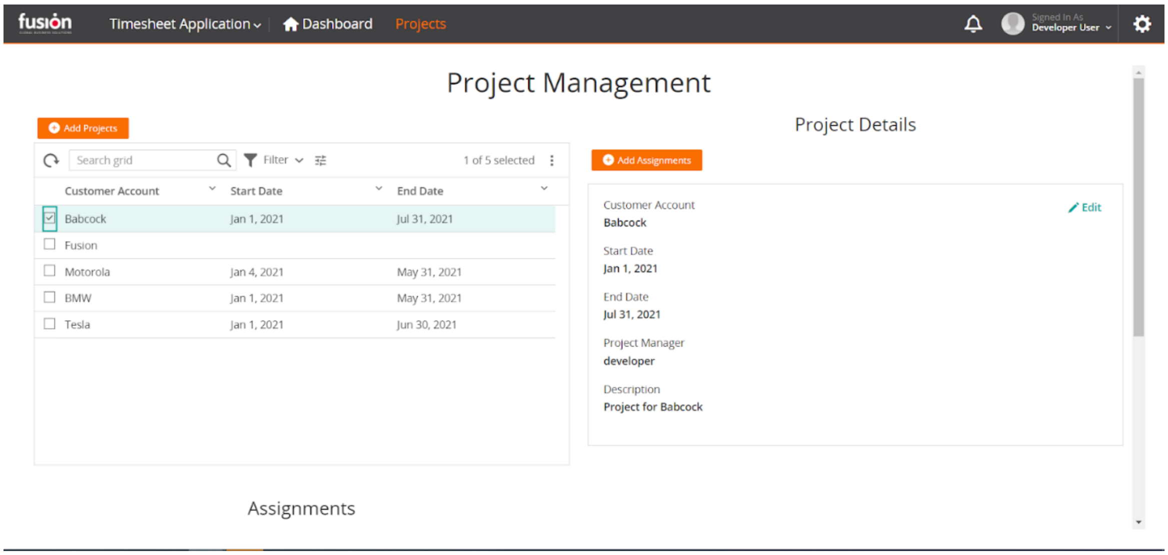
Friday (hours)
0

Saturday (hours)
0

Sunday (hours)
0

Weekly Notes

Figure 6. Timecard logging modal for employee



Project Management

1 of 5 selected

	Customer Account	Start Date	End Date
☑	Babcock	Jan 1, 2021	Jul 31, 2021
□	Fusion		
□	Motorola	Jan 4, 2021	May 31, 2021
□	BMW	Jan 1, 2021	May 31, 2021
□	Tesla	Jan 1, 2021	Jun 30, 2021

Project Details

Customer Account
Babcock

Start Date
Jan 1, 2021

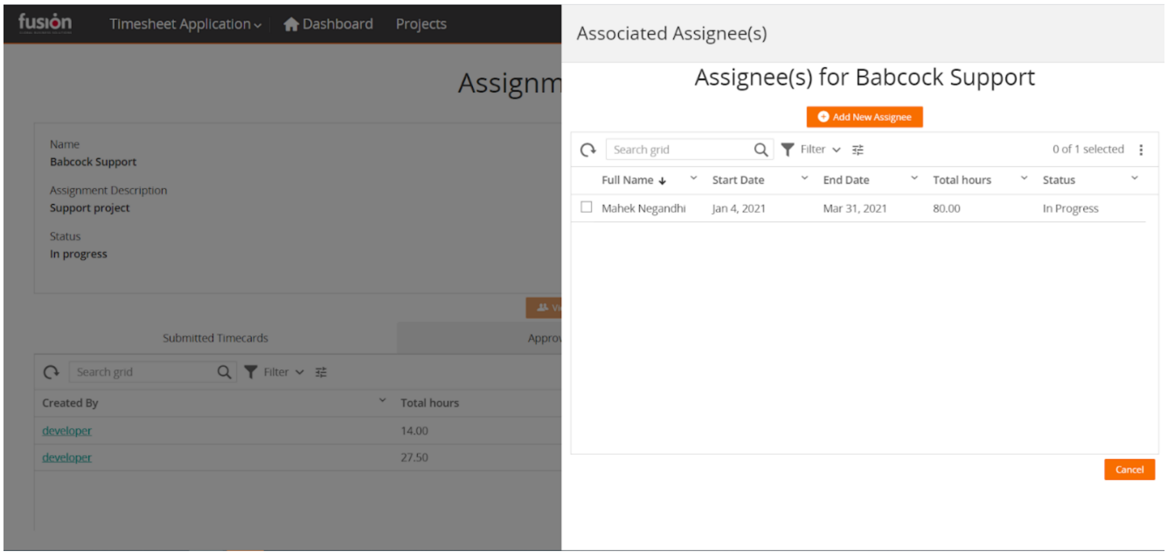
End Date
Jul 31, 2021

Project Manager
developer

Description
Project for Babcock

Assignments

Figure 7. Project Management for project manager



Assignee(s) for Babcock Support

Name
Babcock Support

Assignment Description
Support project

Status
In progress

	Full Name	Start Date	End Date	Total hours	Status
□	Mahek Negandhi	Jan 4, 2021	Mar 31, 2021	80.00	In Progress

Created By	Total hours
developer	14.00
developer	27.50

Figure 8. Project assignee association for project manager

4. Software Development Methodology

4 Software Development Methodology

We as a team have followed Agile Scrum Development Methodology.

Agile is a software development approach where a self-sufficient and cross-functional team works on making continuous deliveries through iterations and evolves throughout the process by gathering feedback from the end-users.

Agile methodology is a practice that promotes continuous iteration of development and testing throughout the software development life-cycle of the project.

Agile software development emphasizes four core values:-

- Individual and team interactions over processes and tools.
- Working software over comprehensive documentation.
- Customer collaboration over contract negotiation.
- Responding to change over following a plan.

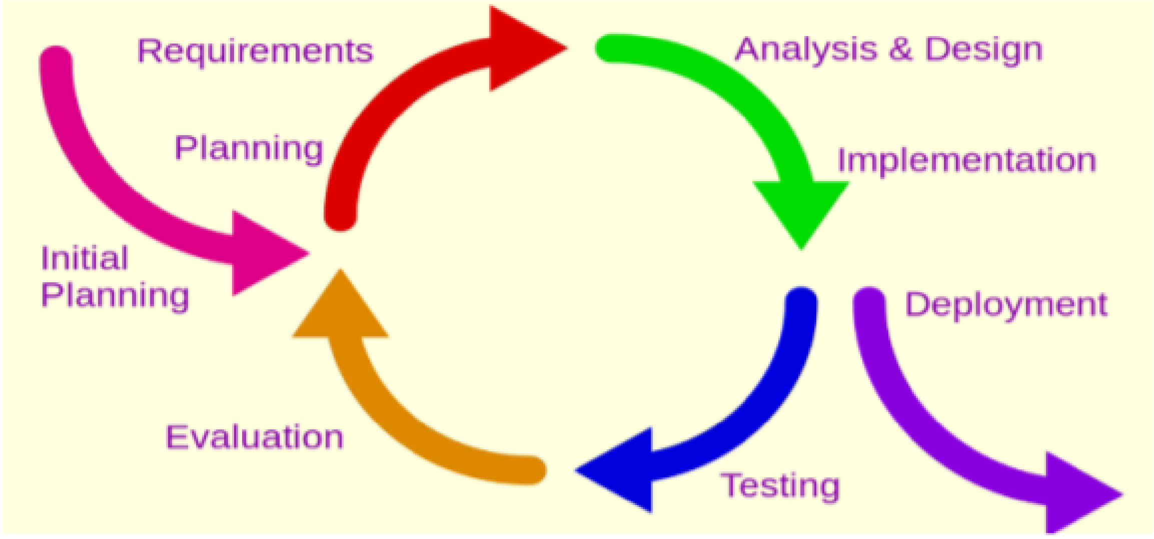


Figure 9. Agile Methodology

In an agile development process, solutions are obtained by self-organizing teams that collaborate, discuss, and constantly strive to improve their working process and become more effective in what they do.

The important roles in this process include:
1) Product Owner
2) Scrum Master
3) Team

Scrum, which means managing work with a small team and working on a project management framework to reveal the strengths and the weaknesses of the project. We as a small team find this agile scrum development more efficient and best to apply to our product.

We in a team has worked the same way, we broke our project into smaller modules and developed our product in iterations with continuously delivering each module as they are ready.

Following steps we followed applying this scrum process:

1. **Product Backlog:**
   Our product owner firstly created a product backlog which contained a particular set of features for each sprint. He listed all the things that we will be completing in this project. It replaces the traditional requirements specification artifacts. These items can have a technical nature or can be user-centric e.g. in the form of user stories. We used Agility Suite to accomplish this task. He(the owner) created tasks for all the to-dos on Agility Suite in specific sprints.

2. **Prioritized the list:**
   Then the top feature was selected from the tasks in backlog which was added to the sprint which was to be delivered at the end of a sprint. A task or requirement was selected to be worked on. For eg. The timesheet logging module was taken and at the end of sprint we delivered that. In that way, the process went on further.

3. **Sprint Backlog:**
   A sprint backlog (sprint in progress in agility suite) is the set of items that a cross-functional product team selects from its product backlog to work on during the upcoming sprint. Typically the team will agree on these items during its sprint planning session. In fact, the sprint backlog represents the primary output of sprint planning. After agreeing to do a particular feature, the task to implement was logged to the system and was being implemented.

4. **Daily Scrum Meeting:**
   When the sprint started, during the sprint, daily meetings were conducted where task status was provided and the problems related to a task were discussed. In this daily meeting, the scrum master was responsible for solving the problem.

5. **Sprint Review:**
   After completing the sprint, the feature was presented to the product owner for approval and the review was given to the team related to a feature in sprint review.

6. **Retrospective Meetings:**
   Finally, in a retrospective meeting the team discussed improvement in the overall process. After agreeing to do a particular feature, the feature was broken into a smaller task which was developed by the team.

In this way, all the steps mentioned above were followed in a cyclic manner applying for each module, and our product was developed successfully with this fast software development methodology.

The whole working of our team can be easily understood with the following figure:

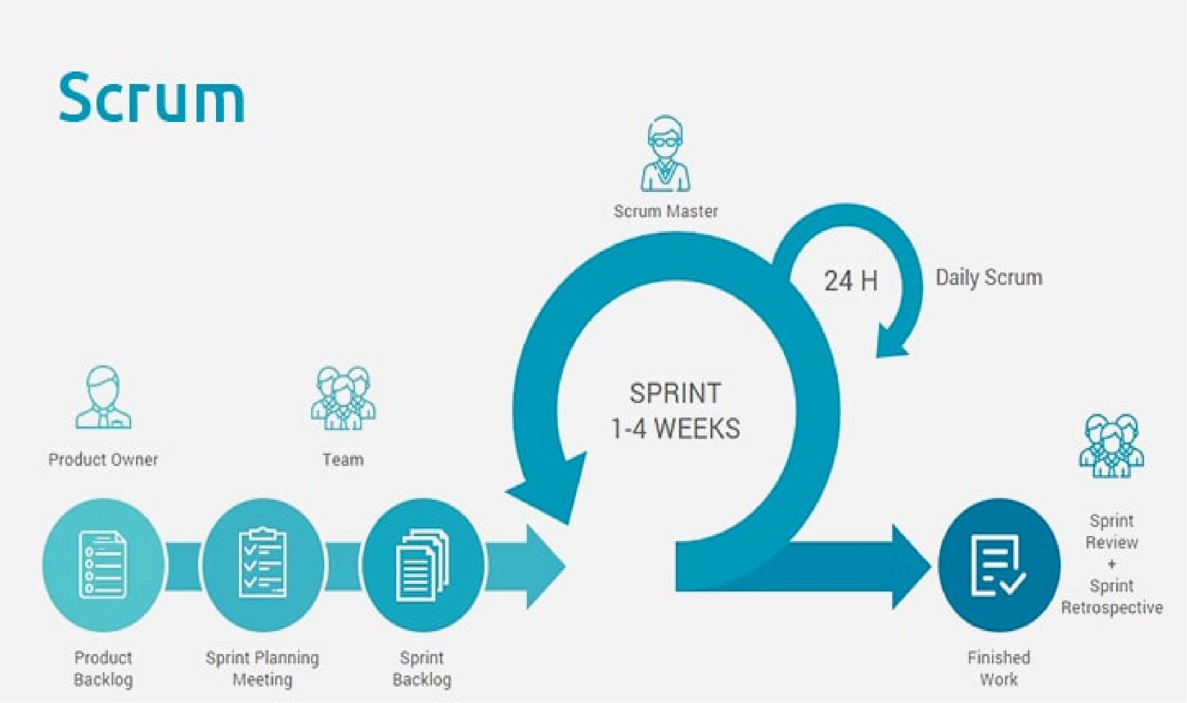


Figure 10. Agile - Scrum framework

5. System Implementation

5 System Implementation

Implementation is the process of converting the newly designed system into the operational one. There are various types of implementation. Some of these are as follows:

- Implementation of a computer system to replace a manual system.
- Implementation of a new system to replace an existing system.
- Implementation of a modified application to replace an existing one.

We are following the second implementation method to implement our system. In implementing our system, we do not need to give very hard user training.

This system was created on BMC Helix Platform which is a cloud-native, microservices-based platform that helps companies enhance, extend, customize, and integrate new capabilities through REST APIs.

5.1 Innovation Suite

Innovation Suite is a cloud-based solution which equips developers and business analysts with the resources they need to quickly produce powerful enterprise apps that deliver a seamless user experience.[7] The highly scalable platform combines the flexibility of modern coding languages with the ease of drag-and-drop visual design tools, allowing coders and non-coders to collaborate on business solutions.

5.1.1 KEY FEATURES

The Innovation Suite cloud solution enables developers to create and business analysts to modify multi-tenant, custom applications.

- **Rapidly assemble applications** – Reusable code components can be used to generate consistent design patterns

- **Tailor applications without writing code** – Business analysts can modify the user experience, data model, and business logic of applications using drag-and-drop design tools

- **Enable rich integrations** – REST APIs can be reused in any custom application for a variety of use cases.

5.1.2 KEY BENEFITS

- **Reduce total cost of ownership (TCO)–** Create new applications using a single platform, so developers don’t have to worry about multitenancy, databases, operating systems, application architecture, security, localization, or accessibility

- **Boost revenue** – Deliver IT and business solutions more rapidly using fewer resources, increasing business competitiveness

- **Enhance efficiency and productivity** – Deploy a consistent, optimized user interface across enterprise applications, fostering high adoption rates and shrinking training time.

5.2 Innovation Studio

Innovation Studio is one of the core components of Innovation Suite. It allows the business and IT to collaborate on enterprise apps.[6]

Innovation Studio enables business analysts to rapidly tailor enterprise apps, known as Smart Apps, using visual drag-and drop design tools.

This application has been implemented in an innovation studio sandbox instance.

5.2.1 Digital Service application

The Digital Service application or smart library that you develop is packaged as a smart bundle. The smart bundle contains all the essential elements, which are required to deploy an application in BMC Helix Innovation Studio. [5]

The code for an application development or a library development is packaged and deployed as a bundle. The following image describes the code division and code development personas:

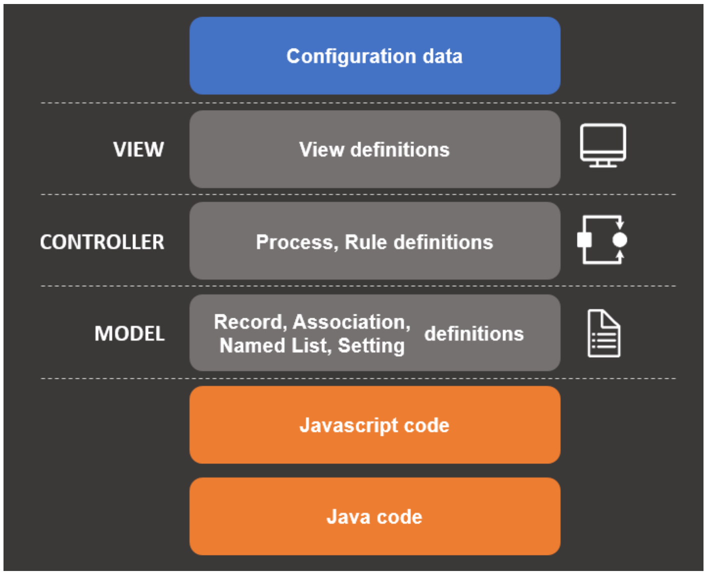


Figure 11. Smart bundle architecture

Table: Smart Definition Bundles

Data/Definitions	Description
Configuration data	Configures the application behavior through data.
Application data	Consists of data like record instances.
Definitions	Configures application definitions using BMC Helix Innovation Studio, which provides the following features: ● Provides a set of visual drag-and-drop designers ● Creates and customize application definitions ● Change application behavior without coding This includes the following definitions and their capabilities: ● Record definitions: Customize the data model of an application ● View definitions: Customizes the UI of an application ● Associations: Create or modify associations among record definitions ● Named lists: Customize a list of name-value pairs used in a drop-down menu of an application ● Processes: Customize the processes related to an application ● Rules: Customize the business rules related to an application
● Client UI—Client UI is a web application written in JavaScript or is a code for a mobile application that has REST-based interfaces. ● UI extensions—UI extensions are reusable client UI extensions that are known as view components (code in JavaScript). ● Server extensions— (code in Java)	

Table 3. Smart definition bundles

5.3 Processes

The following are some of the processes that were used in the application:

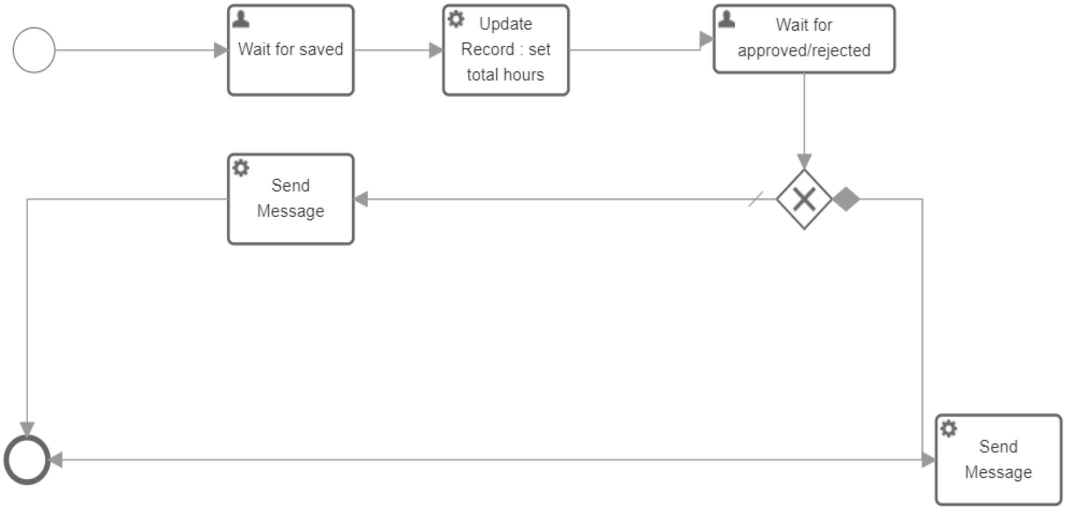


Figure 12. Process to update timecard record and notify on approval/ rejection.

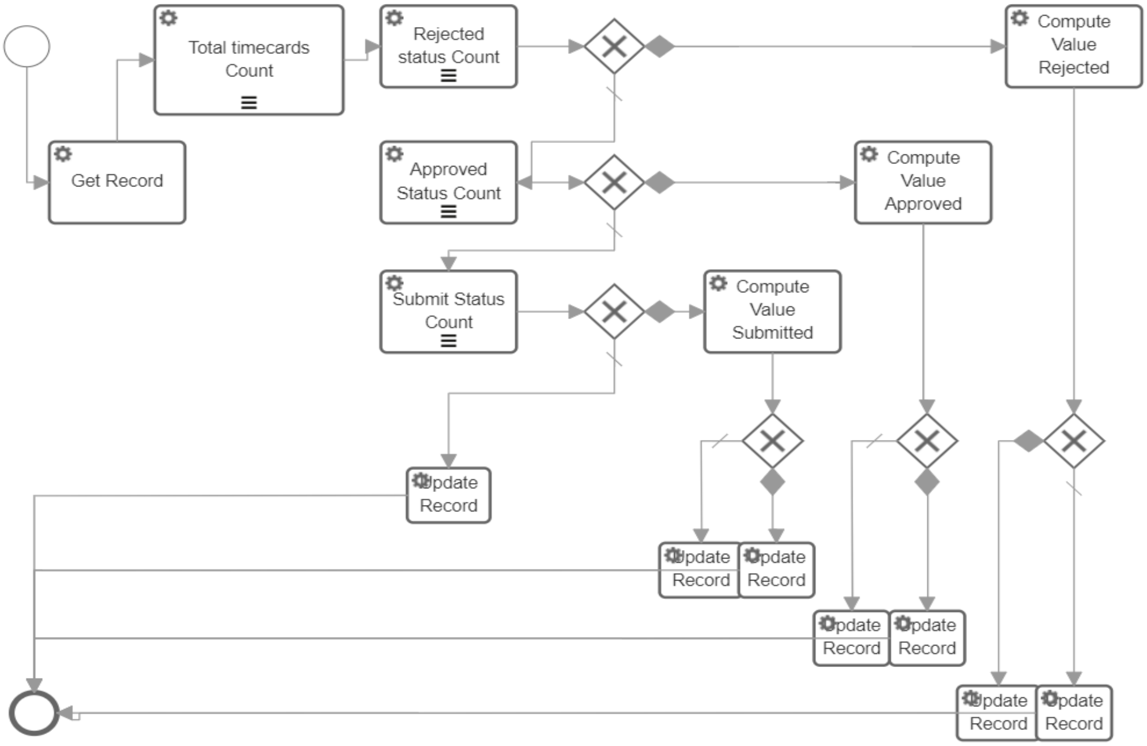


Figure 13. Process to control timesheet status

6. System Testing

6 System Testing

Testing should be done throughout the implementation process. Even before an application is installed, it makes sense to verify that the basic platform is capable of achieving its design capabilities. System testing is a critical process. Testing is a process of executing a program with the explicit intention of finding errors that are, making the program fail. This helps in finding the bottlenecks in the system. Executing a program in a simulated environment performs testing. The feedback from the testing phase generally produces changes in the software to deal with errors and failures that are uncovered.

In this project both black box and white box testing were applied. Though, there is no beta testing or user acceptance testing has been performed since, this module is being integrated with the agility suite application.

6.1 Black Box Testing

In Black Box testing or functional testing test cases are decided. Test cases are decided on the basis of the requirements or the specifications of the program or module. Black Box testing is done in the project to remove the errors:

- Incorrect or missing function.
- Interface errors.
- Errors in data structures or external database access.
- Behavioural or performance error.
- Errors in initiation and termination.

Black box testing is done in the project. A review was performed by other employees of the company who were not in the development team and they being unaware of the programming involved tested the plugin and the tools. In this way we carried out black-box testing.

6.2 White Box Testing

The White Box testing or Structural testing performs the close operation of procedural details. They test the software logical path by having test cases exercising specific sets of conditions and loops.

- White Box testing is done in the project to remove the errors.
- All module paths have exercised at least once.
- Exercised on logical decisions.
- Executed all loops at their boundaries and within their operational bounds.
- Exercised internal data structure to ensure their validity.

The test is accurate only if the tester knows what the program is supposed to do. He or she can then see if the program diverges from its intended goal. White box testing does not account for errors caused by omission, and all visible code must also be readable.

This testing was carried out by the team members who were part of the development of this product.

6.3 Unit Testing

In Unit Testing, we tested individual components like each control for their validations to ensure that they operate correctly.

Innovation studio makes it easy to validate each process by running the process without the UI using the manage processes functionality.

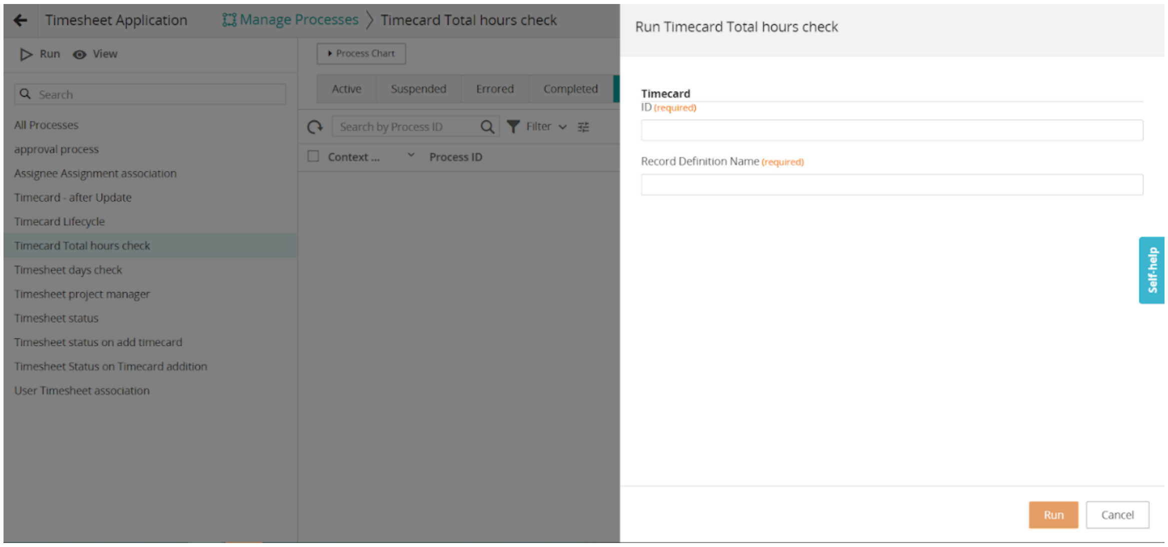


Figure 14. Running a process through manage processes

6.4 Alpha testing

Alpha testing is simulated or actual operational testing by potential users/customers or an independent test team at the developer's site. Alpha testing is often employed for off-the-shelf software as a form of internal acceptance testing, before the software goes to beta testing. The alpha testing for the application was done by the product owner and the team of developers.

6.5 System testing table

The timesheet management module of the agility suite requires users to log in, and on the basis of their role they get visibility to functionalities such as logging timesheet and timecards [employee and project managers] and creating projects, assignments, approving timecards and generating reports [project managers].

6 System Testing

The following table specifies some of the system testings performed on the module.

Table : Test Scenarios for System Testing

Sr. no.	Scenario Name	Pre-Condition s	Scenario	Expected Results	Final result
1.	Login	Landing page should be up and running	a) Login with an id who has employee role b) Login with an id who has project manager role	a) Dashboard page visible with no visibility to Projects page b) Dashboard, reports page and projects page are visible	a) Pass b) Pass
2.	Create timesheet	valid login	A timesheet should be created for the timespan of seven days only and the duration of the timesheet should be unique Clicking on the create timesheet button should open a view for the user to enter timesheet details	A timesheet could be created for 7 days only	Pass
3.	Log Timecard	created timecards	A timecard can be logged with a valid assigned assignment to the employee Clicking on the add timecard button should open a modal to add details of every day for a timecard	Timecard was created successfully in saved state	Pass
4.	Submit timecard	valid timecard must be in the saved state	User selects a timecard and clicks on the submit button	Timecard was successfully submitted and a notification	Pass

				was received by the project manager	
5.	View Assignments	valid employee login	User logs in and goes to the assignments tab of the dashboard	On the assignments tab of the dashboard, associated assignments must be visible with the correct details	Pass
6.	View Projects	valid project manager login	Project manager logs in and goes to the Projects tab	The projects tab should be visible and must have grids of the projects and their associated assignments	Pass
7.	Add assignments	valid timecard created	User must select a timecard and click on the add assignments button. this must open a modal to enter assignment details	clicking on the button opens a modal to enter details. after entering the correct and valid details the grid of assignments is refreshed	Pass
8.	View Assignments	valid assignment must be created and must appear on the grid of assignments	User should click on the assignment name for a view to open	Clicking on the assignment name opens a view with assignment name, its details and all the timecards	Pass

				in the assignment	
9.	View Assignees	user should be on the view of assignment details	click on the view assignees button	The button must open a modal with the list of assignees that must work on the assignment and a button to add new assignees	Pass
10.	Approve Timecards	timecards must be submitted by employees against that assignment	select a timecard from the grid and click on the approve button	clicking on the button must move that timecard from the submitted state to the approved state and it must appear on the approve grid. a notification must also be sent to the employee whose timecard has been approved	Pass

Table 4: Test Scenarios for System Testing

7. Limitations and Future Prospective

7 Limitations and Future Prospective

Though the system is efficient in several manners there are certain limitations to the system which can lead to further enhancements in the next developmental iterations. Some such functional enhancements are as follows:

1. **Leave Management Module:**
   The integration with a leave management application would help organisations to maintain and track total and applied leaves for each employee which could be integrated closely with the TMS

2. **Project Lifecycle Management Module:**
   The integration with a project lifecycle management application, such as Agility Suite would help project managers to maintain and track the tasks and sprints to a project. This can be integrated with the current TMS system in order to ease the load of project managers by giving them a solution to manage projects, its lifecycle and its assignees.
3. **Talent Management Module:**
   This module could maintain the skills, certifications, qualification of each employee in the organization. This would be helpful for project managers to find the right consultant on the creation of a project and add them as an assignee to the project.

4. **Payroll Module:**
   This module could integrate the no. of days and time worked by employees and their leaves applied for the payroll team to be able to have an easier method to track and maintain activities of individual employees for internal financial purposes.

All these modules integrated together would lead to a one-stop easily customizable cloud-based product suite for organizations to rely on for all their administrative and functional needs.

8. Conclusion

8 Conclusion

The aim of the project Timesheet - Project Management Solution for Finance was to be able to create a system that overcomes the manual efforts by the project managers and product owners in a manual system. It also aimed at removing a system of micromanaging employees like that in a fully automated system to track every single activity of the employee (which might not always be relevant to the billing of a project).

A Post Implementation Review (PIR) was also conducted after the project was completed. The purpose of the PIR was to evaluate how successfully the project objectives have been met and how effective the project management practices were in keeping the project on track. The PIR gave a positive response on the completion of the project.

9. Bibliography

9 Bibliography

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