



CTIS-411 SENIOR PROJECT-I

SOFTWARE PROJECT MANAGEMENT PLAN
(SPMP)



Team 5 - Members

Berk Özdoruk
Erdoğan Yağız Şahin
Oğuzhan Özkan
Ömer Levent Durdalı

Project Supervisor

Dr. Cüneyt Sevgi

CTIS
COMPUTER TECHNOLOGY AND

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1. Project Effort Estimation:

Estimate the required effort for your project based on the following 3 different estimation techniques:

1.1. Work Breakdown Structure:

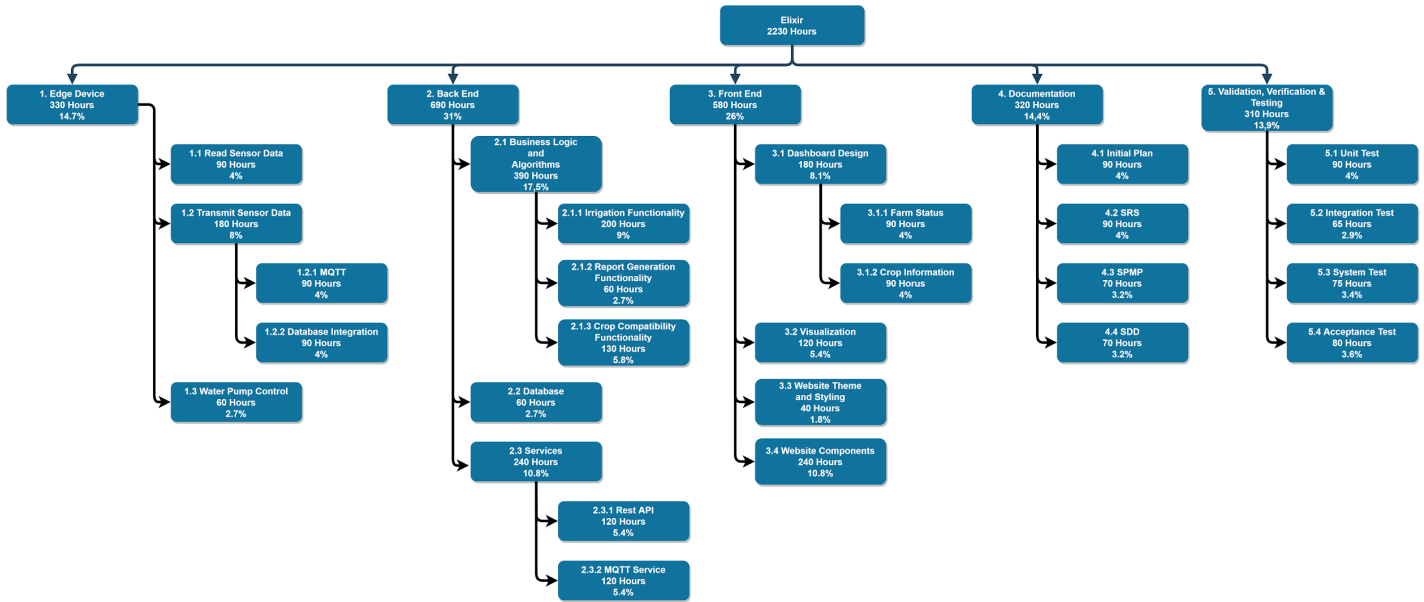


Figure 1: Work Breakdown Structure

1.2. Use Case Based Estimation:

Use Case Classification:

Use Case Classification	Weight		Number of Use Case	Result
Simple	5	x	7	35
Average	10	x	14	140
Complex	15	x	3	220
Total:				220

Table 1: Use Case Classification

Actor Classification:

- Complex Actors = Regular User, Admin User
- Average Actors = Sensors, Agricultural Weather Forecast
- Simple Actors = Timer, Meteorology API

Actor Classification	Weight		Number of Use Cases	Result
Simple	1	x	2	2
Average	2	x	2	4
Complex	3	x	2	6
Total:				12

Table 2: Actor Classification

Technical Complexity Factor:

TF Total: 20.00

$TCF = 0.6 + (TF/100)$

TCF = 0.80

Environment Complexity Factor:

EF Total: 24.00

$ECF = 1.4 + (-0.03 \times EF)$

ECF = 0.68

Use Case Points:

$UCP = (UUCW + UAW) \times TCF \times ECF$

$UCP = (220.00 + 12.00) \times 0.80 \times 0.68$

UCP = 126.21

Estimated Effort = $126.21 \times 20 = 2524$ Hours

1.3. Agile Estimation: ■

Story Points	Use Case	User Story
1	Start Irrigation	As a user, I want to start manual irrigation on my farm.
	Stop Irrigation	As a user, I want to stop manual irrigation on my farm.
	Start Auto Irrigation	As a user, I want to start auto irrigation in my field.
	Stop Auto Irrigation	As a user, I want to stop auto irrigation in my field.
2	Manage Regular User	As an admin user, I want to manage a regular user's account settings.
	Manage Manual Irrigation	As a user, I manage manual irrigation settings.
	Manage Auto Irrigation	As a user, I want to manage automatic irrigation.
	Manage Farm	As an admin user, I want to manage a regular user's farms.
3	Login	As a user, I want to login to the system.
	Change Password	As a user, I want to change my password.
	Change E-Mail Address	As a user, I want to change my E-Mail address.
	Schedule Irrigation	As a user, I want to schedule my irrigation
	Delete Farm	As an admin user, I want to delete user's farms.
	Create Farm	As an admin user I want to create a farm associated with a regular user.
	Delete Regular User	As an admin user, I want to delete user's accounts.

	Create Regular User	As an admin user, I want to create a regular user with adding name and email.
5	Manage Crop Type	As a user, I want to change my crop type.
	Change Account Details	As a user, I want to changing account details
	Start Scheduled Irrigation	As a user, I want to schedule an irrigation for my farm.
	Edit Farm	As an admin user, I want to edit a farm by changing the farm name, location, crop type and the associated user.
	Edit Regular User	As an admin user, I want to edit user information including email, password and name.
8	Get Crop Info	As a user, I want to see my crop information.
13	Get Farm Status	As a user, I want to see farm information.
	Auto Irrigation	A user's farm's irrigation schedule is maintained by the system.

Table 3 : Agile Estimation

2. Project Schedule:

Gantt chart:

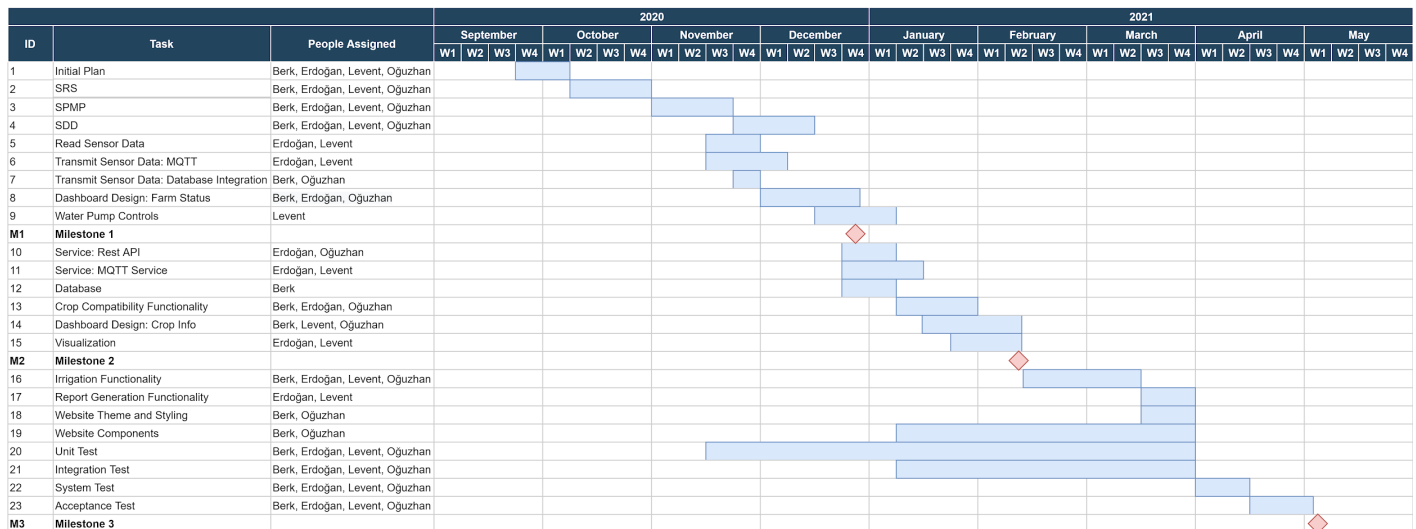


Table 4 : Gantt Chart

2.1. Milestone-1: (Wednesday December 23, 2020) - 1 st Increment

■ Tasks

- Read Sensor Data
- Transmit Sensor Data (MQTT)
- Transmit Sensor Data: Database Integration
- Dashboard Design: Farm Status
- Website Dashboard for visualization of sensor and API data

■ Use Cases

- Get Farm Status

2.2. Milestone-2: (Saturday Feb 13, 2021) - 2 nd Increment

■ Tasks

- Water Pump Controls
- Service: Rest API
- Service: MQTT Service
- Database
- Crop Compatibility Functionality
- Dashboard Design: Crop Info
- Visualization

■ Use Cases

- Login
- Change Account Details

- Change Password
- Change E-Mail Address
- Manage Crop Type
- Get Crop Info
- Create Regular User
- Create Farm

2.3. Milestone-3: (Saturday May 7, 201) – Final Increment

■ Tasks

- Irrigation Functionality
- Report Generation Functionality
- Website Theme and Styling
- Website Components

■ Use Cases

- Manage Regular User
- Edit Regular User
- Delete Regular User
- Manage Farm
- Edit Farm
- Delete Farm
- Manage Manual Irrigation
- Start Irrigation
- Stop Irrigation
- Schedule Irrigation
- Manage Auto Irrigation
- Start Auto Irrigation
- Stop Auto Irrigation
- Auto Irrigation
- Start Scheduled Irrigation

3. Project Monitoring & Measuring:

3.1. Monitor progress:

We are having 2 Scrum meetings every week to divide the work in order to analyze our progress and help each other when team members face problems. One of them includes our project advisor, Dr. Cüneyt Sevgi, to clarify unclear areas and to observe the progress. Our meetings are held on Discord, Whatsapp and when Dr. Cüneyt Sevgi joins us, it is held on Zoom. At the end of the two weeks, we are planning to make a report on our progress and problems.

3.2. Project Measuring Metrics

Metric	Unit	Collection Frequency	How
Project size	Lines of Code (LOC)	Project Duration	LoC will be calculated using GitHub repositories in RWG Group
Effort	Person Week	Weekly	Man-hours will be calculated in WBS in SPMP.
Productivity	Person Week	Weekly	Percentage of tasks completed in a timely manner.
Cost	TL/Hour	Monthly	AWS and Azure pay-as-you-go pricing.
Time to complete	Hours	Weekly	Gantt Chart
Defects	Error / LOC	Weekly	SonarQube bugs and GitHub issues will be used.

Table 5 : Project Measuring

4. Product Verification & Validation:

4.1. Techniques that you will use to verify and validate your software product.

- **Unit Testing:** Unit testing will be done during the development phase of a module by its developer(s). The aim is to ensure that the individual parts of the software are working correctly.
- **Integration Testing:** Integration testing will be done after the completion of the REST API and the web application database for modules that have already passed their unit tests. The aim is to ensure that individual modules that have passed their unit tests work correctly when integrated as well.
- **System Testing:** System testing will be done after all the modules are developed and after the integration tests are completed. The system will be tested as a whole and the aim is to evaluate the system's compliance with the requirements.
- **Acceptance Testing:** Acceptance testing will be done after the completion of the system tests. The aim is to decide whether the product is acceptable for delivery.
- **Continuous Testing:** SonarQube will be used for the continuous inspection of the codebase for the detection of security vulnerabilities, code smells and bugs.

4.2. Verification & Validation Tools.

Jest: Jest is a JavaScript testing framework that will be used for testing the Node.js API and the React application.

Unittest: Unittest is Python's built-in unit testing framework that will be used for the unit test of MQTT layer Python scripts.

SonarQube: SonarQube is a continuous code quality inspection tool that will be used for the static testing of both JavaScript and Python codebase.

5. Software Development Environment:

Category	Tool	Version	Description
Programming Languages	JavaScript	ES6	Programming language
	Python	3.9.0	Programming language
Runtime Environments	Node.js	14	JavaScript runtime environment
Web Frameworks	React.js	16.13.1	JavaScript web framework
APIs	OpenWeatherMap API	-	Weather forecast API
Databases	MongoDB	4.4	NoSQL database
	InfluxDB	2.0.1	Time series database
Cloud Services	Azure Virtual Machines	-	Virtual machine service
	Google Cloud Platform Compute Engine	-	Virtual machine service
Version Management	Git	2.29.2	Version control system
V&V	Jest	26.6.3	JavaScript testing framework
	unittest	3.9.0	Python unit testing framework
	SonarQube	8.5.1	Continuous inspection tool
MQTT	Eclipse Mosquitto	1.6.12	MQTT broker
	Eclipse Paho	1.5.0	MQTT client library

Table 6: Development Environments