Project Plan

for

THE IMPLEMENTATION OF DRONES IN AGRICULTURE

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Distribution:

A research proposal is submitted in partial fulfillment of the requirements for the bachelor's degree in Computing at the Belgium Campus

The first draft document is subjected to changes!

Appendices:

<Appendix 1>

Table of Contents

[1. Overview 3](#_Toc111201314)

[2. Goals and Scope 3](#_Toc111201315)

[2.1 Project Goals 3](#_Toc111201316)

[2.2 Project Scope 4](#_Toc111201317)

[3. Organization 4](#_Toc111201318)

[3.1 Organizational Boundaries and Interfaces 4](#_Toc111201319)

[3.2 Project Organization 5](#_Toc111201320)

[4. Schedule and Budget 7](#_Toc111201321)

[4.1 Product Breakdown Structure 7](#_Toc111201322)

[4.2 Work Breakdown Structure 7](#_Toc111201323)

[4.3 Schedule and Milestone 8](#_Toc111201324)

[4.4 Budget 8](#_Toc111201325)

[4.5 Development Process 9](#_Toc111201326)

[4.6 Development Environment 10](#_Toc111201327)

[4.7 Measurements Program 10](#_Toc111201328)

[5. Risk Management 11](#_Toc111201329)

[6. Sub-contract Management 11](#_Toc111201330)

[7. Communication and Reporting 11](#_Toc111201331)

[8. -Delivery Plan 12](#_Toc111201332)

[8.1 Deliverables and Receivers 12](#_Toc111201333)

[9. Quality Assurance 12](#_Toc111201334)

[10. Configuration and Change Management 12](#_Toc111201335)

[11. Security Aspects 13](#_Toc111201336)

[12. Abbreviations and Definitions 13](#_Toc111201337)

[13. References 14](#_Toc111201338)

[14. Revision 14](#_Toc111201339)

# Overview

Farming operations now are considerably different from those of only a few decades ago. Precision agricultural methods, which may assist farmers in making more informed decisions, have advanced greatly in recent years, with the worldwide industry currently expected to reach $43.4 billion by 2025. (Pinguet, 2021) Thanks to innovative technology, farmers can now optimize every element of their operations, from field spraying to grow cycles and crop health. Drones and other unmanned aerial vehicles have been crucial in this change (UAV). Farmers may get an in-depth data analysis, mission planning, and new technology that can manage physical activities with an agriculture drone. Whether you're a small-scale farmer or the CEO of a huge corporation, drone technology may help you meet your harvest goals and produce more crops with fewer resources. Effective crop spraying and field mapping are two crucial areas where the right UAV and payload may help. Any grower will find it challenging to efficiently utilize the above. If you spray too much concentrated in one spot, you may pay additional expenses and even reduce the quality of your crop. If the concentration is too low, your crops may be swamped by weeds, famished, or consumed by insects and other predators, resulting in poor yields. However, the correct farming drones and spraying payloads can uniformly and efficiently spread pesticides. The results. Improved crop quality and yield rate without the need for heavy physical work. Drones from DJI may be utilized on almost every crop, including rice, wheat, corn, citrus trees, cotton, and many more. This proposal will handle how our modified DJI Tello Drones will improve our current farming system. Drones are becoming increasingly popular among farmers, and for good reason. We add extra features to the base drone that will add to its value for these farmers. Drones can deliver aerial footage of practically anything from almost any location. This enables farmers to keep an eye on the skies practically anywhere on their farm, regardless of how difficult the terrain is. This can be especially useful for locating animals and detecting dead patches in crops that a typical on-the-ground eye would not have noticed.

# Goals and Scope

## Project Goals

| **Project Goal** | **Priority** | **Comment/Description/Reference** |
| --- | --- | --- |
| **Functional Goals:** | 1 | For details see the Project Requirements Specification 0 |
| The drone can survey areas |  | Determine the landscape of the field/ bush scanning for livestock and or scanning the crops |
| Drones able to identify livestock |  | Using cameras to identify lost animals around the property. |
| Database connection to interface |  | The connection between the drone that shares its with a to a user where inputs the data into a database |
| Drones can tend to crops. |  | Includes spraying of Fertilizer, Herbicide, Fungicide, Pesticide, Seeds, Desiccants |
| Drone battery level |  | If the battery reaches a certain point drone will auto return to dock so that the drone doesn’t fall in the field to prevent damages. |
| **Business Goals:** | 4 |  |
| Different from competitors |  | A database is implemented to store related data in different categories as well as identify areas of concern for the farmer/user. |
| Cost-effective |  | The product should be cost-effective time as possible to be used in rural areas by the less fortunate |
| **Technological Goals:** | 3 |  |
| Recoding of the drone |  | Recreating the app adding the user interface and linking the database |
| The drone can access camera |  | In the use of search and rescue |
| Implementing a interface |  | User friendly interface to control the drone. |
| Software and firmware updates |  | Drone able to access all the new mods for it |
| **Quality Goals:** | 2 |  |
| Lightweight but sturdy |  | The drone should be able to withstand strong winds and weather |
| Human error |  | Reducing the errors brough in by users |
| **Constraints:** | 5 |  |
| Environment |  | The drone can withstand winds up to a certain knot speed |
| Users |  | Users not schooled enough to handle the application and work the drone |

## Project Scope

Drones will be create assisting in agriculture by identifying hot spots in the field where areas of concern exist, as well as searching for and assisting in the rescue of lost animals on the land or farm. All of this information will be sent to a database so the farmer can easily track what has been done.

### Included

Support manual a user-friendly start-up guide will be provided withudes videos of troubleshooting and a user manual.

### Excluded

User training will not be provided

# Organization

This is to see if u actualy read through the doc PM me the code at the bottom of milestones

## Organizational Boundaries and Interfaces

The project is made up of an independent body of students collaborating under the supervision

of Mr. Ngoveni, he will act as our liaison towards the parent company Belgium Campus. Our

customer base would form part of the agricultural sector where we’d be working on improving

numerous aspects of the industry. As such, they would be affected the most by our results as

they would be the ones relying on our success.

We have a retail supplier RyzeRobitics, this partnership will lead

to us using them as a supplier for our Tello drones.

We do not currently have subcontracts.

### Resource Owners

All of the resources are owned by either Belgium Campus or the students participating in the project. As such managerial roles will be split between the parties with an understanding of trust where all parties ensure any resource that may be required and dedicated is in working order. This ensures that the owner of a resource has full control over his belongings. Any other party that may get added to the organizational structure such as a subcontractor would also adhere to these conditions and would thus retain control over resources.

### Receivers

The responsible party for receiving the project after completion will be Mr. Ngoveni.

### Sub-contractors

We currently have no subcontracts. But this could change with future cloud infrastructure.

### Suppliers

| **Company: Contact** | **Deliverable** | **Comment** |
| --- | --- | --- |
| RyzeRobotics: https://www.ryzerobotics.com/ | Tello mini drone | They make commercial drones with DJI. |
| - | - | - |
|  |  |  |

### Cross Functions

| **Function** | **Dept.: Contact** | **Responsibility/Comment** |
| --- | --- | --- |
| Product Mgmt | Students | The group of students will cooperate to fulfill the roles of the project. |
| Drone Software Dev | Students | The group of students will cooperate to fulfill the roles of the project. |
| Research | Students | The group of students will cooperate to fulfill the roles of the project. |
| Product Testing | Students | The group of students will cooperate to fulfill the roles of the project. |
| App Software Dev | Students | The group of students will cooperate to fulfill the roles of the project. |
| Drone Modification | Students | The group of students will cooperate to fulfill the roles of the project. |
| Documentation | Students | The group of students will cooperate to fulfill the roles of the project. |
| Oversight / Supervision | Nsuku N. Ngoveni | Will act as our supervision. |

### Other Projects

| **Project** | **Org.: Project Mgr** | **Dependency** | **Comment** |
| --- | --- | --- | --- |
| Undefined. | - | - | - |

## Project Organization

### Project Manager

| **Role** | **Organization: Name** |
| --- | --- |
| Project Manager | Nsuku N. Ngoveni |
| Technical Project Mgr. | Students |

### Project-internal Functions

| **Function** | **Organization: Name** | **Comment** |
| --- | --- | --- |
| Product Mgmt | Students |  |
| Drone Software Dev | Students |  |
| Research | Students |  |
| Product Testing | Students |  |
| App Software Dev | Students |  |
| Drone Modification | Students |  |
| Documentation | Students |  |

### Project Team

| **Name and Surname** | **Role** | **Comment** |
| --- | --- | --- |
| Bubele Lilitha Malotana | Contributor |  |
| Elmar Jacobs | Project lead |  |
| Frans Rosslee | Project Lead |  |
| Janco Botes | Contributor |  |
| Luan Bosch | Contributor |  |
| Nsuku N. Ngoveni | **Supervisor** |  |
| Tiaan van Staden | Contributor |  |

### Steering Committee

The Steering Committee (SteCo) of the project is responsible for the oversight of the overall progress and completion of the project.

The SteCo consists of the following members:

| **Organization** | **Name** | **Comment** |
| --- | --- | --- |
| Belgium Campus | Nsuku N. Ngoveni | Main Supervisor. |
| Belgium Campus | Anila Joy | Reserve Supervisor. |

# Schedule and Budget

## Product Breakdown Structure

Drone: Mini Tello Work Breakdown Structure

Phase 1: Pre-planning

Phase 2: Project Start

Phase 3: Analysis of the drone

Phase 4: Design of app and drone systems

Phase 5: Deliverables Development

Phase 6: Implementation of Module 1

Phase 7: Deliverables Development: CMS Intro Module & Module 2

Phase 8: Implementation of Module 2

Phase 9: Instructional System Evaluation

Phase 10: Evaluation

Phase 11: System Demo and Customer Review

Phase 12: Project Close-Out

## Work Breakdown Structure



## Schedule and Milestone

| **Milestones** | | **Description** | **Milestone Criteria** | **Planned Date** |
| --- | --- | --- | --- | --- |
| M0 |  | Project proposal | Budget Release | 2022-05-05 |
|  |  | Project goals, budget, and scope defined | This proposal will handle on how DJI Tello Drones can improve our current farming system. | 2022-05-16 |
| M1 |  | Project Plan Template |  | 2022-07-01 |
|  |  | Organization and Schedules | Scope and goals described | 2022-07-04 |
| M2 |  | Creating a Database |  | 2022-07-04 |
|  |  | An expected DB should be provided to be used in the project. | Requirements agreed, project plan reviewed, resources committed | 2022-07-04 |
| M3 |  | Business Logic |  | 2022-07-04 |
|  |  | Functions and the back end of the project should be discussed and developed. | Architecture reviewed and stable | 2022-16-04 |
| M4 |  | User Interface |  | 2022-16-04 |
|  |  | As we are working on a drone a UI should be developed from where the drone can be controlled. | Coding of new functionality finished,  Draft documentation | 2022-30-04 |
| M5 |  | Business Logic creation |  | 2022-30-04 |
|  |  | The Logic layer as discussed in M3 should be a functional system by this milestone. | Product system tested, documentation reviewed | 2022-07-08 |
| M6 |  | Functional Requirements |  | 2022-07-08 |
|  |  | Start development on functional requirements to improve software/hardware. | Coding of new functionality finished,  Draft documentation | 2022-16-08 |
|  | M7 | Functional Requirements |  | 2022-16-08 |
|  |  | Further development on functional requirements of software/hardware. | Coding of new functionality finished,  Draft documentation | 2022-09-09 |
|  | M8 | Functional Requirements |  | 2022-09-09 |
|  |  | Polishing of functional requirements for software and hardware. | Coding of new functionality finished,  Draft documentation | 2022-16-09 |
|  | M9 | Completed Project and Presentation |  | 2022-16-09 |
|  |  | Presentation of the final project solution to the supervisor. | Architecture reviewed and stable | 2022-11-11 |

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## Budget

| **Category** | **Budget for Period in ZAR** | | | | | |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **M0-M1** | **M1-M2** | **M2-M3** | **M3-M4** | **M4-M5** | **M5-M6** | **M7-M8** | **M9** |
| Human Resources (internal) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Human Resources (external) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Purchases (COTS) | 0 | 1000 | 5440 | 5440 | 0 | 0 | 0 | 0 |
| Equipment | 0 | 0 | 3000 | 2700 | 4500 | 3800 | 0 | 0 |
| Premises | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tools | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Travel costs | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Training | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Review activities | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 0 | 1000 | 8440 | 8140 | 4500 | 3800 | 0 | 0 |
| **Total cumulated** | **0** | **1000** | **9440** | **17580** | **22080** | **25880** | **25880** | **25880** |

## Development Process

Diagram

Description automatically generated

## Development Environment

|  |  |  |
| --- | --- | --- |
| **Item** | **Applied for** | **Availability by** |
| **Methods** | | |
| Lens installing | Installing an infrared lens on the drone | M0 |
| Tag pairing | Pairing tags with the drone | M1 |
| Perfect flying controls | Perfecting drone controls and flying ability | M1 |
| **Tools** | | |
| Eclipse | Java IDE for adding web-based features. | M1 |
| TELLO app | Flying and controlling the drone | M0 |
| Visual Studio | IDE for adding UI features | M0 |
| **Languages** | | |
| C# | UI design | M2 |
| Java | Methods and new features for drone | M2 |
| JavaScript | App editing and web-based controls for the drone. | M2 |

## Measurements Program

|  |  |  |
| --- | --- | --- |
| **Type of data** | **Purpose** | **Responsible** |
| Change in project requirements | Capture and change the project to fit new requirements. | Management team |
| Detecting defects | To prevent any defects before release. | Test lead |
| Range test | Testing and expanding the range on the drone. | Test lead |
| Durability | Getting durability of drone in tough conditions | Test lead |
| Lens quality | Added lenses to be tested | Building team |
| Tag reader range | Testing and expanding the range of the drone. | Test lead |
| Failures | Capturing failures in the drone to prevent them from happening again and to remove them completely. | Building team |

# Risk Management

Risk management is the identification, assessment, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events. Any changes made in the organization which contradict the assumptions made can be accommodated with minimal changes in the code.

Possible risks and mitigation or avoidance strategies: -

1. Disk failure – all project deliverables and documents will be stored in each team member’s machine.
2. Any team member leaves – his work will be reassigned among others.
3. Lack of skill – To avoid this platform and language is chosen in which all team members are comfortable (Java).
4. Poor Quality – From time to time we will ensure that the project is doing the specified task properly and efficiently.
5. Project not completed in time – We have developed a plan to complete the project in time which will be followed strictly.

# Sub-contract Management

| **Sub-contractor** | | **Sub-contracted Work** | **Ref. to sub-contract** |
| --- | --- | --- | --- |
| **Company** | **Contact** |
| Microsoft Azure Databases | 0800007128 | Cloud Database infrastructure subscription | Server hosting of the cloud-based database for the farms. e.g. Inventory |
| Works well Thermal Imaging Systems | sales@workswell.eu | Thermal Imaging Camera | Thermal camera for night and day for cultivating |
| Global Mapper | orders@bluemarblegeo.com | 3D mapping | Vectors and sectors to map around farm or test area |

# Communication and Reporting

| **Type of Communication** | **Method / Tool** | **Frequency/Schedule** | **Information** | **Participants / Responsible** |
| --- | --- | --- | --- | --- |
| **Internal Communication:** | | | | |
| Project Meetings | Teams Meeting | Every Friday | Project status, problems, risks, changed requirements, solutions | Project Supervisor and  Project Team |
| Sharing of project data | Microsoft One Drive server | When available | All project documentation, reports, and Research gathered | Project Supervisor and  Project Team |
| Support Meetings | Discord Telecom Server | Every  Tuesday | Send help requests and Assist those that need assistance | Project Team |
| Milestone Meetings | Teams Meeting | Before milestones | Project status  Unexpected problems | Project Supervisor and  Project Team and sub-contractor Team |
| Final Project Meeting | Teams Meeting | Milestone 9 | Wrap-up  Experiences  Issues if available | Project Supervisor and  Project Team and sub-contractor Team |
| **External Communication and Reporting:** | | | | |
| Project Report | Word Document | Monthly | Project status - progress - forecast - risks | Project Manager Sub-Project Managers and |
| Stakeholders Meetings | Teams Meeting | Monthly | Give the latest update and receive constructive criticisms | Project Manager, Stakeholders |
|  |  |  |  |  |

# -Delivery Plan

## Deliverables and Receivers

| **Ident.** | **Deliverable** | **Planned Date** | **Receiver** |
| --- | --- | --- | --- |
| D1 | Milestone 1 Project Plan | 4 July 2022 | Nsuku N. Ngoveni |
| D1 | Milestone 1 Project plan | 7 July 2022 | Nsuku N. Ngoveni |
| D2 | Milestone 2 | 13 July 2022 | Nsuku N. Ngoveni |
| D3 | Milestone 3 Business logic | 16 July 2022 | Nsuku N. Ngoveni |
| D4 | Milestone 4 User interface | 30 July 2022 | Nsuku N. Ngoveni |
| D5 | Milestone 5 Business logic creation | 7 August 2022 | Nsuku N. Ngoveni |
| D6 | Milestone 6 Functional Requirements | 16 August 2022 | Nsuku N. Ngoveni |
| D6 | Milestone 7 Functional requirements | 9 September 2022 | Nsuku N. Ngoveni |
| D6 | Milestone 8 Functional req | 16 September 2022 | Nsuku N. Ngoveni |
| D7 | Milestone 9 Presentation | 7 November 2022 | Nsuku N. Ngoveni |
| D8 | Project completion | 11 Nov 2022 | Nsuku N. Ngoveni |

# Quality Assurance

The product's quality will be regularly improved by basic testing operations to discover technical faults in the code and analyze the overall product usability, performance, security, and compatibility.

By utilizing Agile testing, the development process is broken down into smaller pieces, iterations, and sprints. This enables work to be done in parallel with the rest of the team throughout the process, enabling defects and problems to be fixed as soon as they arise.

# Configuration and Change Management

* **Description.** What will change in the product?
* **Why it must be done.**If you think about it, it may turn out that certain changes are not needed.
* **Who will be involved?**
* **Links to documentation**
* **Pre-installation.** **Reconciliation** and **Backup**
* **Install plan**
* **Post-installation**. Check that the system and all other systems interacting with it work correctly; return all the settings that were made in preparation for the change; make changes to the documentation.
* **Backout Plan.** Actions that will be performed in case of problems within a reasonable time.
* **Applications**

# Security Aspects

https://www.wrike.com/project-management-guide/faq/why-should-i-use-security-features-in-project-management-software/

Physical security

* how often data is backed up
* power backup systems
* physical access controls

Network & system security

Application security

* User authentication
* Data sharing & role-based access control
* Monitoring user activities
* Project management software data encryption
* Mobile applications

Privacy

strict policies to limit access to customer data to employees

Compliance

* ISO/IEC 27001:2013 certification
* SOC2 Type II
* ISAE 3402

# Abbreviations and Definitions

Help: List all abbreviations and definitions used within this document.

CCB Change Control Board

CI Configuration Item

CM Configuration Management

COTS Commercial Off the Shelf

CR Change Request

CRM Change Request Management

ID Identification, Identifier

IP Intellectual Property

QA Quality Assurance

SteCo Steering Committee

V&V Verification and Validation

UAV Unmanned aerial vehicle

# References

<Doc. No.> Project Proposal for <project name>

<Doc. No.> Project Requirements Specification for <project name>

<Doc. No.> Implementation Proposal for <project name>

<Doc. No.> Project Schedule for <project name>

<Doc. No.> Risk Management Plan for <project name>

<Doc. No.> Work Breakdown Structure for <project name>

<Doc. No.> Quality Assurance Plan (if it is a separate plan)

<Doc. No.> Configuration Management Plan (if it is a separate plan)

<Doc. No.> <Sub-contract #1>

<Doc. No.>

# Revision

|  |  |  |  |
| --- | --- | --- | --- |
| Rev. Ind. | Page (P)  Chap. (C) | Description | Date  Dept./Init. |
| - | --- | original version |  |
| Elmar + Francois | Whole doc | 1st revision | 12/08/2022 |
|  |  |  |  |